Six Mile Creek Dam Safety Upgrade project

Coordinator-General's evaluation report on the impact assessment report

May 2019

COORDINATOR-GENERAL

Queensland Government

The Department of State Development, Manufacturing, Infrastructure and Planning

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Department of State Development, Manufacturing, Infrastructure and Planning
PO Box 15009 City East, Queensland 4002.

Phone: 13QGOV (137468)
Fax: 07 3220 6465
Email: info@dsdmip.qld.gov.au
Web: www.dsdmip.qld.gov.au

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Synopsis

This report is my evaluation of the Six Mile Creek Dam Safety Upgrade project (the project). It has been prepared in accordance with section 34L of the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

Six Mile Creek Dam is located at Lake Macdonald in the Sunshine Coast Hinterland in Noosa Shire, approximately four kilometres (km) north-east of Cooroy and 15 km west of Noosa Heads. Six Mile Creek Dam has the capacity to hold 8,018 megalitres (ML) of water in Lake Macdonald, which is one of two water sources supplying drinking water to Noosa Shire residents. Lake Macdonald is also used by the community for rowing, fishing and lakeside activities while supporting habitat for native fish, waterbirds, amphibians, reptiles and mammals. Six Mile Creek Dam was constructed in 1965 using an earth and rockfill embankment. The dam was raised in 1980 to increase storage capacity.

The proponent, Seqwater (Queensland Bulk Water Supply Authority) proposes to remove and replace the existing Six Mile Creek Dam spillway and earth embankments. The spillway will be reconstructed with new, deeper, reinforced concrete foundations that will be better able to withstand erosion at the foot of the dam when water overtops in high flow events.

The project will improve dam safety, maintain flood mitigation for residential development downstream and ensure long-term local and regional water supply and the ongoing recreational use of Lake Macdonald. The project will ensure the dam is compliant with Queensland's dam safety regulations by being able to withstand large flood events and earthquakes.

The upgraded dam will work in a similar way to the existing dam, allowing water to spill over into Six Mile Creek when it exceeds full supply level. The upgraded dam will have the same capacity and inundation area as the current dam and all existing Lake Macdonald recreational uses will be reinstated following completion of the project.

Project construction is scheduled to commence in 2020 and involves lowering the water level in Lake Macdonald, and construction of a temporary dam to keep the remaining water away from construction work. The project involves demolishing and replacing the existing spillway and embankments with a new spillway and embankments and building an overflow dam to prevent flood water discharging from the lake along Collwood Road during flood events. A temporary on-site concrete batching plant will be set up to produce the concrete required for construction of the spillway foundation. The batching plant would be removed following completion of construction works.

During construction, water supply to the Noosa region will be maintained by Seqwater, a government-owned corporation, that is the statutory authority responsible for producing a safe and reliable water supply for South East Queensland.

Seqwater estimates the project will require $100 million in capital expenditure and generate a peak construction workforce of 110 full-time equivalent (FTE) positions during the two-year construction period.

In undertaking my evaluation, I have considered the Impact Assessment Report (IAR), submissions made during public consultation on the draft IAR, and advice I have received from relevant Commonwealth, state and local government agencies.

The following provides an overview of the main issues arising from my evaluation.

Aquatic ecology

The aquatic ecosystems in and downstream of Lake Macdonald play an important role in supporting local biodiversity and species listed as threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and under the *Nature Conservation Act 1992*; in particular platypi, frogs, fish and turtles.

The potential impacts on aquatic ecology during project activities could arise from the proposed drawdown of the lake, which must take place so construction to replace the dam wall can occur.

The lake drawdown will result in temporary removal of around 97 per cent of the water in Lake Macdonald, and a short-term increase in water flow downstream in Six Mile Creek.

Monitoring of species such as waterbirds, frogs and platypi will be undertaken to confirm that they are able to move out of the project area of their own accord.

To minimise impacts on species that are either unable or unlikely to move from the project area, these animals (including the Mary River cod, Australian lungfish, the Mary River turtle and white-throated snapping turtle) will be captured and transported to neighbouring areas as required in the species-specific fauna salvage program.

The fauna salvage and relocation program seeks to avoid large-scale mortality events such as fish-kills within the lowered lake by capturing (through fishing, netting and trapping) fish, turtles and other animals at various stages of the lake's drawdown. Experts trained in fauna management must undertake these works. The animals would then be relocated to other sites, such as adjoining creeks, that have been determined as being suitable.

The relocated animals will be monitored and if required, will be fed, and moved again if conditions are not suitable (for example, if waterholes dry up). Importantly, impacts on threatened species will be minimised by ensuring the lake drawdown happens outside their breeding season.

The IAR confirms adaptive management measures will also be used to manage impacts on fauna and their downstream habitats from the lake lowering process. Results from lake and downstream habitat monitoring will inform rates of water release over the 12-week lake lowering, to ensure impacts on platypi, frogs, fish and turtles and their habitats are minimised. For example, if scouring or impacts on vegetated areas downstream occur, the rate of drawdown will be scaled back to prevent water flows downstream of the dam impacting on these instream habitats.

After construction and as the dam lake refills, the proponent will re-establish native fauna habitat in the dam to assist aquatic communities to re-establish. Further, relocated Mary River cod will be returned to the dam post-construction. As part of the lake lowering program, pest species will be captured and euthanised.

I have imposed conditions (Appendix 2) to ensure the project's impacts on aquatic ecology are minimised and managed. Included in my conditions is the requirement for a flora and fauna management plan to be approved by government agencies before project activities start, which will detail how project impacts can be minimised, with specific detail tailored for different species. This plan will include appropriate performance criteria and trigger levels to detect potential impacts on water quality to initiate adaptive management measures, corrective action, or remediation and measure the success of the management measures.

My conditions require the proponent to include lake drawdown adaptive management measures and the fauna salvage and relocation program as part of this flora and fauna management plan.

The flora and fauna management plan is to be included in the project's overarching site environmental management plan (SEMP), which must be approved before project activities commence.

Spillway design

The design of the spillway has the potential to impact on fish populations of Six Mile Creek as they are washed over the dam wall in overtopping flow events. These types of incidents occur in situations where the dam reaches its full supply level and a rain event creates an influx of water to the dam, causing the excess water to flow over the dam spillway. These overtopping flows may happen without a flood event occurring.

The proponent has adjusted aspects of the spillway design during the IAR process to one that improves fish passage, and tested the new spillway design, including with a built model, to judge its success. Safer fish passage over the spillway will be achieved via an 'inclined slide' rather than a vertical drop to the spillway pool before fish move to the downstream habitats of Six Mile Creek.

This will give better outcomes for aquatic species and can be achieved in tandem with the dam's central design upgrade purpose – to move water through faster during high-flow events, which is a requirement of new dam safety standards.

I am satisfied that, while there may be a temporary impact to species and population numbers due to the project works, measures that I have included in conditions will ensure the maximum possible are able to be salvaged and relocated. The captured Mary River cod would be housed at the temporarily relocated Gerry Cook Fish Hatchery and replenished in the dam after construction. In addition, my conditions require that downstream impacts be well controlled to minimise harm from water releases. Further, conditions (Appendix 3) require that the spillway design must ensure safe fish passage on Six Mile Creek for the project's operation.

I conclude that the project is unlikely to have a significant residual impact on the aquatic ecology of the area and the residual impact must be weighed up and balanced against the overall need to improve dam safety.

Terrestrial ecology

The project area includes some vegetation that provides habitat for a range of fauna, such as koalas, bats, marsupials and birds, and it forms part of an extensive fauna corridor that extends north to Cooloola National Park, and to the west to Pomona. Directly north, the project area is beside Tewantin National Park.

To reduce the impacts on flora and fauna from project works, the IAR commits to a range of mitigation measures including:

- utilising previously disturbed areas
- employing clearing equipment that minimises impacts on surrounding vegetation
- sequential clearing allowing fauna (e.g. koalas and marsupials) to move away from the disturbance area
- employing fauna spotter catchers to perform pre-disturbance inspections and relocation
- minimising dust generation and suppressing dust
- using shielded lights to minimise light disturbance to animals
- noise controls
- controlling refuelling within bunded areas to avoid contamination
- revegetation and rehabilitation of the area affected by the construction footprint after construction.

The project area will be mostly located within previously disturbed areas around the water treatment plant. However, to allow enough space for vehicle movement and laydown areas to store construction equipment, clearing of around 1.45 hectares (ha) of listed remnant vegetation will be required.

The IAR confirms that following construction, all disturbed areas will be rehabilitated. This will include revegetation with local species, thereby ensuring that the reinstated dam will have the same footprint as the current dam. This outcome must be achieved, and I have included conditions (Appendix 2) requiring rehabilitation and revegetation of areas affected by the project to be included in the project SEMP, that must be approved before project activities commence.

Further conditions I have set require third party auditing to ensure the outcomes required by all management plans are achieved.

As a result of my conditions, I do not expect the potential impacts on the terrestrial communities to have a significant residual impact on the terrestrial ecology of the area, as the impacts would be temporary during project construction and vegetation communities will be rehabilitated post-construction.

Water resources

The IAR confirms that water supply for Noosa Shire will be maintained following the drawdown of Lake Macdonald and during construction activities. Alternative water supply arrangements proposed by Seqwater from the Mary River and through the South East Queensland water grid's northern pipeline interconnector to the local water treatment plant will ensure no disruption to Noosa region's potable water supply will occur as a result of

the project, which is in line with the proponent's responsibilities to ensure water supply for local communities.

The analysis in the IAR predicts that while groundwater users and groundwater dependent ecosystems around Lake Macdonald would be temporarily affected in the groundwater impact zone during the construction period (i.e. once the water in Lake Macdonald is drawn down), these impacts would be limited and highly localised. The spillway's construction is not expected to permanently affect groundwater flow as the design would permit groundwater to flow around the structure.

I am satisfied that potential water supply and groundwater impacts resulting from the project's construction can be managed for the duration of the project.

Noise and air quality

There are 54 residences identified within one kilometre of the project area; the closest of which are located approximately 30 metres (m) west of the dam's western embankment and 210 m west of the temporary concrete batching plant.

The IAR confirms that hours of operation for the construction phase are 6:30 am to 6:30 pm Monday to Friday and 6:30 am to 4:00 pm Saturdays, with extended work hours required for approximately one to two weeks during demolition of the current spillway.

The IAR states that some project activities will exceed noise quality objectives as defined under the Environmental Protection (Noise) Policy 2008 for the closest residences during construction works. For example, demolition works may cause noise limits to be exceeded intermittently over a two-week period because of the machinery required for the removal of the spillway. The extended working hours to be implemented during this two-week period will mean that out-of-hours noise nuisance limits will be exceeded; however, this work will be completed as quickly as possible to minimise the public safety risks from this part of the project. During construction, activities such as the east and west embankment removal and replacement, occurring over a three-month timeframe may, on occasion, exceed noise limit objectives.

Mitigation and management measures included in the IAR to minimise potential noise impacts include locating plant equipment to direct noise away from sensitive receptors and installation of noise screens. Where possible, noise-generating project activities would not occur during extended work hours.

The IAR predicts that, despite implementation of these mitigation and management measures, some unavoidable noise exceedances may still occur for short periods at the closest sensitive receptors that are close to project activities. The proponent has committed to mitigate the impact of these noise exceedances by finding suitable solutions in consultation with landholders (such as temporary relocation, air conditioning, double glazing) and notifying residents in advance of noisy activities or extended working hours.

Impacts on air quality may occur from construction activities, including emissions of particulate matter from soil/rock excavation; handling and transport of bulk materials, including for the concrete batching plant; and fuel combustion from plant equipment.

The IAR anticipates that project-related air quality emissions can be effectively managed with the implementation of the proposed mitigation and management measures. These

include daily site inspections to monitor compliance with the dust management plan, air quality monitoring, erecting solid screens or barriers around potentially dusty activities or the site boundary and use of suitable dust suppression techniques such as water sprays, or local extraction and exhaust ventilation systems on cutting, grinding and sawing equipment.

Construction activities will create some noise and air quality impacts that cannot be completely mitigated, with these impacts having the greatest effect on residents of the closest dwellings. I am satisfied that the use of appropriate management practices, along with the proponent's commitment to finding suitable solutions with individual landholders, will mitigate these impacts to the greatest extent practicable. I have imposed a condition (Appendix 2) requiring the proponent to prepare construction environmental management plans (CEMPs) for approval that include requirements for a noise, dust and vibration management and traffic management. These plans will require the proponent to ensure compliance monitoring is undertaken, complaints are dealt with appropriately and mitigation and management measures are responsive and effective. Conditions (Appendix 3) also include that, for activities such as the clay borrow pit, noise must not cause environmental nuisance to people nearby.

To ensure future stakeholder engagement is effective and stakeholder concerns are responded to, I have imposed a condition (Appendix 2) requiring the preparation of a community and stakeholder engagement plan for approval that must be implemented for the duration of project activities at the site.

These plans are also to form part of the SEMP for the project.

Further, stakeholder feedback received must be used to inform updates to the management measures in the project's SEMP. In this way, matters such as noise and how it is experienced by people near the worksite can result in work practices being improved and adapted to respond to public feedback.

In addition, I require a complaints management plan to be developed for the project, which must include how complaints will be investigated and resolved, and how long complaints take to be closed out. Further, the plan is to state that the proponent must respond to a complainant within 48 hours of the complaint being received. The project's complaints management process, which will be part of the project's community stakeholder engagement plan, must be approved before construction starts and will be made available on the project website.

I am satisfied that the proponent's mitigation and management measures, and my imposed conditions (Appendix 2) will appropriately manage the project's potential noise and air quality impacts on nearby residents.

Social

The proponent estimates that the project would require a peak workforce of approximately 110 FTEs positions during the two-year construction period and has committed to employing workers from local and regional communities as well as buying goods and services from local communities, where possible. Due to the use of a primarily local workforce, it is unlikely that housing affordability and availability will be impacted.

Project activities would:

- reduce visual amenity over the lake footprint and generate odour (e.g. from drying mud and aquatic vegetation) during lake drawdown
- cease community access to recreational activities (fishing, rowing and lakeside activities) in Lake Macdonald
- cease access to Camp Cooroora (operated by Scouts Queensland), Lake Macdonald Rowing Club and the Gerry Cook Fish Hatchery (community run facilities) located on land owned by Seqwater.

These impacts would be temporary and during construction only. The proponent has already provided early notification to the affected operators and has committed to reinstating access to Camp Cooroora and Lake Macdonald Rowing Club when construction is complete and the new dam operational. Operations of the Gerry Cook Fish Hatchery would continue during the project, with the facility temporarily relocated to an alternative site. The proponent is currently assisting the operators of the hatchery with the temporary relocation of existing fish stock. Access to the current hatchery site would be reinstated once project activities are complete.

The proponent has engaged with a range of stakeholders including the Noosa Shire Council, the local community and local businesses during preparation of the IAR. The proponent has established a community reference group, held information sessions and meetings and provided project updates through emails and a project website.

Conditions that I have set in this report requiring the preparation of a community and stakeholder engagement plan will ensure stakeholder engagement is effective and responsive to stakeholder concerns (Appendix 2). The community and stakeholder engagement plan must be reviewed at least every six months during construction and updated if required, for example, in response to community feedback. Any updates to this plan must be provided to me and be made available to the public online. Also, conditions requiring the project's SEMP to be amended in response to community feedback must be adhered to by the proponent.

Traffic and transport

The IAR states that there will be an increase in traffic on state-controlled and local roads near the township of Cooroy and around Lake Macdonald over the anticipated two-year construction period. Maximum traffic impacts of approximately 120 extra vehicle movements are estimated per morning and afternoon for the three-month peak construction period.

The IAR identifies two potential construction vehicle routes for access to and from the project site. The first (western) route is in/out along Lake Macdonald Drive, and the second (eastern) route is a one-way loop along Cooroy-Noosa, Sivyers, Gumboil and Collwood roads to the site before exiting and continuing along Lake Macdonald Drive. The proponent has not identified the preferred traffic route in the IAR.

Both routes would increase traffic on local roads and impact on roads that service the Cooroy State School and Tadpoles Early Learning Centre located near the intersection of Elm Street and Lake Macdonald Drive, as well as the school bus that operates along Lake

Macdonald Drive twice a day during school terms. The project would also increase vehicular traffic on state-controlled and local roads around Lake Macdonald, with heavy haulage vehicles delivering equipment and supplies for the demolition and construction activities.

A number of submissions received from members of the public on the IAR raised concerns about the project's vehicles, particularly truck movements, causing risks to safety and congestion, particularly for the eastern route.

To minimise traffic impacts, the IAR confirms that construction vehicle haulage hours will be controlled to avoid haulage during peak traffic periods and school pick-up and drop-off periods. Upgraded lane markings, improved signage, and speed zone changes are also proposed. I require these measures to be undertaken.

In response to submitter concerns regarding safety on the eastern access roads (Sivyers Road, Gumboil Road and Collwood Road) and considering the existing conditions of the route, I have imposed a condition (Appendix 2) that prohibits large haulage vehicles (transporting materials such as earth and rock fill and concrete raw materials) from using the eastern access roads. My condition states that these vehicles are limited to a single access route in and out of Lake Macdonald Drive.

Further, I have set conditions (Appendix 2) in this report that the proponent is to develop a traffic management plan in consultation with Noosa Shire Council, and the plan is to be approved by Council before project activities start. The plan must detail how safety will be ensured – including management of construction vehicles to and from the site, parking, temporary road closures, and traffic flow management. I have also imposed a condition for a road impact assessment to be done to identify any road upgrade works required as a result of the project, for consideration and approval by Council (Appendix 2).

I am satisfied that due to conditions I have set in this report to ensure traffic impacts are managed, including prohibiting large haulage vehicles from using part of the local road network, and managing truck haulage during times of the day when roads are at peak usage from public and school bus use, will ensure safe use by project vehicles of roads.

Matters of national environmental significance

The project will impact on matters of national environmental significance (MNES) protected under the EPBC Act. The controlling provisions for the project are listed threatened species and communities (sections 18 and 18A).

Construction of the project would require clearing of up to 3 ha of vegetation, including 1.45 ha of listed vegetation. The IAR confirms that no EPBC Act listed threatened species or vegetation communities were found during surveys in the proposed clearing area, however, some trees may be used intermittently by koalas, which are listed as vulnerable under the EPBC Act. Koalas were not confirmed on-site during surveys.

I am satisfied that the project is unlikely to have a significant impact on terrestrial threatened species and communities, including koala and flora species, provided that clearing conforms with established koala habitat clearing protocols and revegetation of the cleared area occurs following construction. I require this to be undertaken and conditions included in Appendix 2 and Appendix 4 of this report require the preparation and

implementation of appropriate environmental management plans for the site activities, in accordance with these requirements.

Drawdown of Lake Macdonald to approximately 2.8 per cent of its usual capacity is required to enable safe and dry construction of the new dam wall. This drawdown will result in the disturbance and potential loss of habitat for the following EPBC Act listed threatened species:

- *Mixophyes iterates* – giant barred frog (endangered)
- *Maccullochella mariensis* – Mary River cod (endangered)
- *Neoceratodus forsteri* – Australian lungfish (vulnerable)
- *Elusor macrurus* – Mary River turtle (endangered)
- *Elseya albagula* – white-throated snapping turtle (critically endangered).

A range of mitigation and management measures are proposed as part of the project's environmental management plan, including:

- targeted capture and relocation of Mary River cod, Australian lungfish, Mary River turtle, and white-throated snapping turtle (as part of the fauna salvage and relocation program)
- rehabilitation of disturbed habitats in and adjoining Lake Macdonald and Six Mile Creek
- weed and pest management to limit the ability for invasive species to gain or expand their presence in the area
- erosion and sediment control and regular water quality monitoring to minimise changes to water quality in Lake Macdonald as it is being drawn down and in downstream sections of Six Mile Creek
- use of variable flow discharge rates in the dewatering of Lake Macdonald to minimise disturbances to downstream habitats and scouring of stream profiles.

The impacts of the lake drawdown on these threatened species and their habitats would be monitored in Lake Macdonald and downstream in Six Mile Creek to inform the rate of water release from the dam (e.g. a reduction in the release rate if scouring occurs downstream) and the relocation activities.

The IAR concludes that impacts on MNES would be temporary, during project activities, localised and would be minimised following implementation of the mitigation and management measures.

I am satisfied that subject to the conditions I have imposed, stated and recommended at Appendices 2-4, the project will not cause significant impacts on MNES. My full assessment of MNES is provided in Appendix 1 of this report.

Coordinator-General's conclusions

I have considered the proponent's IAR, submissions received and agency advice, and detailed my findings in this report.

I consider that the IAR requirements of the SDPWO Act for the project have been met and that sufficient information has been provided to enable an evaluation of the impacts of the project.

I conclude that there are significant local and regional benefits to be derived from the project and it is essential the project proceed due to the benefits to public safety it will provide by being able to better withstand major flood events.

The project's capital expenditure, at an estimated $100 million, will represent a significant boost to the local economy, as will the requirement for 110 jobs during the two-year project period.

I am satisfied that negative environmental effects, particularly from the drawdown of the dam required so construction can be undertaken safely, are temporary and can be adequately managed and minimised. The conditions I have specified in this report have been developed to manage the potential impacts associated with the project, in conjunction with the implementation of the measures outlined in the IAR.

Accordingly, I approve the project subject to the conditions included in this report.

A copy of this report will be provided to the proponent, the Commonwealth Department of Environment and Energy, Noosa Shire Council and relevant state government agencies and will also be made publicly available at www.dsdmip.qld.gov.au/sixmilecreek.

This report will generally lapse four years from the date it is published on the department's website, or when an approval application is decided for the project, unless a later time is subsequently decided by the Coordinator-General.

Barry Broe

Barry Broe
Coordinator-General

20 May 2019

1. Introduction

This report has been prepared in accordance with section 34L of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) and provides an evaluation of the impact assessment report (IAR) for the Six Mile Creek Dam Safety Upgrade project (the project). The IAR includes the draft IAR and the supplementary information report.

This report does not record all the matters that were identified and subsequently addressed during the assessment. Rather, it concentrates on the most critical and substantive issues identified during the IAR process and the measures and conditions to address the impacts. This report:

- summarises the key issues associated with the potential impacts of the project on the physical, social and economic environments at the local, regional, state and national levels
- presents an evaluation of the project, based on information contained in the IAR, public submissions made on the draft IAR, as well as information and advice from advisory agencies and Noosa Shire Council
- imposes and states conditions under which the project may proceed, and makes recommendations including those to the Commonwealth Minister for the Environment.

2. About the project

2.1 The proponent

The proponent for the project is Seqwater (Queensland Bulk Water Supply Authority), a statutory Queensland government owned authority established under the *South East Queensland Water (Restructuring) Act 2007*. Seqwater is responsible for providing safe, secure and reliable water supply across South East Queensland (SEQ), as well as providing essential flood mitigation services. The diverse range of water supply assets managed by Seqwater include:

- SEQ Water Grid
- dams and weirs
- natural catchments of the SEQ's major water supply sources
- conventional water treatment plants
- climate resilient sources of water (Gold Coast Desalination Plant and Western Corridor Recycled Water Scheme).

Ownership of the Six Mile Creek Dam was transferred from Noosa Shire Council to Seqwater on 1 July 2008.

2.2 Project location

The project site is located at Lake Macdonald on the Sunshine Coast hinterland, approximately four kilometres (km) north-east of Cooroy and 15 km west of Noosa Heads. The project site is located wholly within the Noosa local government area (Figure 2.1)

Lake Macdonald is approximately 55 km upstream of the junction between Six Mile Creek and the Mary River, and has a catchment area of approximately 49 square kilometres (km^2).

2.2.1 Existing Six Mile Creek Dam

Six Mile Creek Dam was constructed in 1965 and is currently made of an earth and rockfill embankment with a spillway. The dam wall was raised in 1980 to increase storage capacity to hold 8,018 megalitres (ML) of water at full supply level (FSL) of 95.32 metres Australian Height Datum (AHD).

The dam retains the waters of Lake Macdonald, which is one of two principal raw water sources supplying potable drinking water to the residents of Noosa Shire. Lake Macdonald is part of the South East Queensland Water Grid, which is a network of dams, water treatment plants, reservoirs and pipelines that allow movement of water around the South East Queensland Region when required.

Lake Macdonald is also used as a recreational facility by the community, supporting a range of activities including rowing, paddling, fishing, and foreshore recreational activities. The lake supports habitat values for native fish, waterbirds, amphibians, and reptile mammalian fauna.

2.2.2 Surrounding land uses

The predominant land uses surrounding Lake Macdonald include low-density rural residential and open space conservation. There are nine properties directly adjacent to the dam on Lake Macdonald Drive and 68 properties around Lake Macdonald adjoining Seqwater land.

Direct access to the project site is via Lake Macdonald Drive and indirectly through the Noosa Water Treatment Plant adjacent to Collwood Road. There are nine properties directly adjacent to the dam on Lake Macdonald Drive and 68 properties around Lake Macdonald adjoining Seqwater land.

The project footprint will largely be located within Lot 118 on SP305289[1] and Lot 1 on RP800331, currently owned by Seqwater. Some project activities will encroach onto the road reserves of Lake Macdonald Drive and Collwood Road, controlled by Noosa Shire Council.

Within Lot 118 on SP305289, the proponent licenses areas of land for the operation of the Gerry Cook Hatchery (operated by the Mary River Catchment Coordinating Committee), Camp Cooroora (operated by Scout's Queensland) and Lake Macdonald Rowing Club.

[1] Note: Following publication of the IAR, the property description changed from Lot 118 on MCH814 to Lot 118 on SP305289.

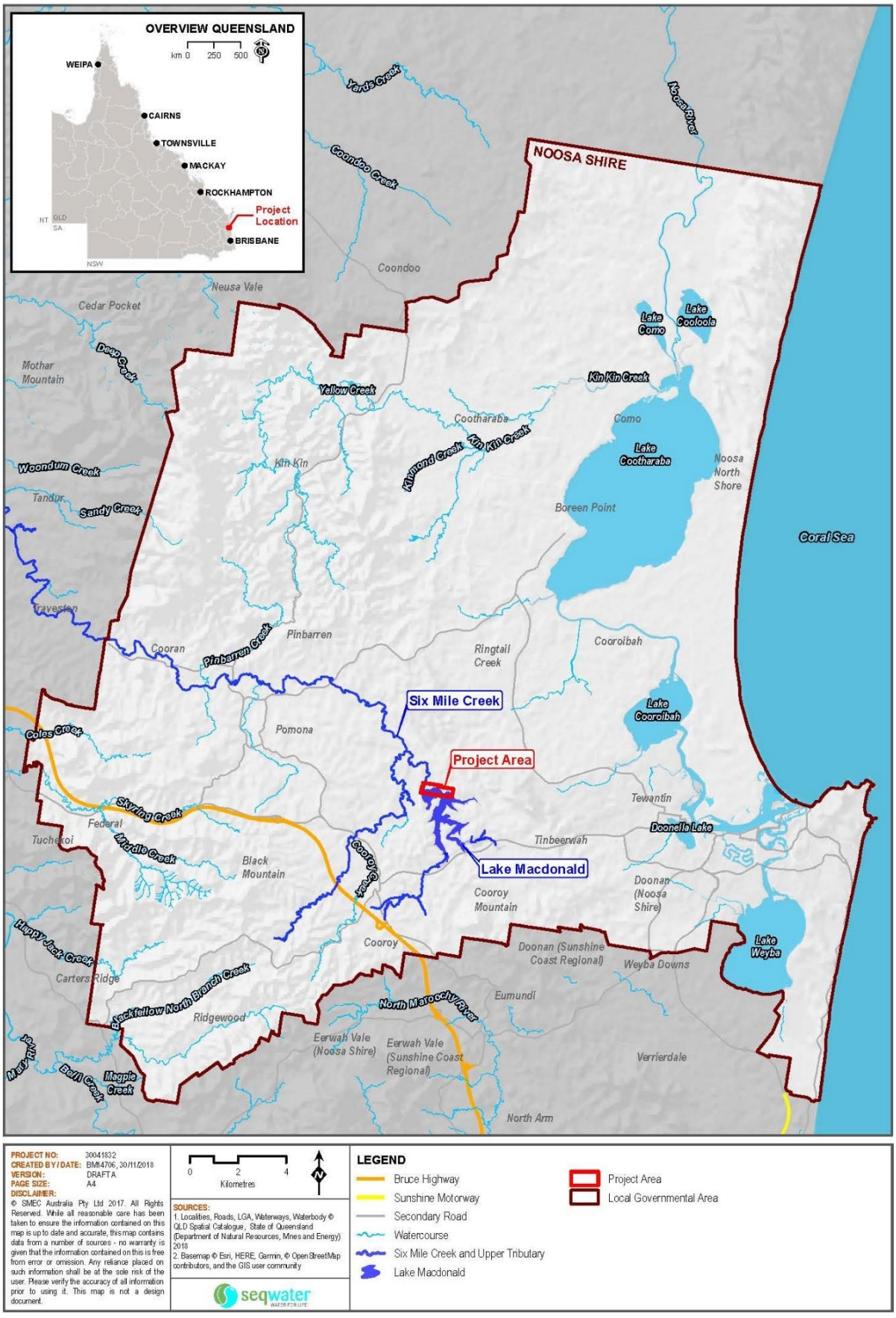

Figure 2.1 Project location

2.3 Project description

The proposed project involves removing and replacing Six Mile Creek Dam spillway and embankments to improve the safety and performance of the dam to meet current Queensland dam safety regulations. Lake Macdonald's water level will first need to be significantly lowered to enable construction works to occur.

The capacity and inundation area of the new dam will remain the same as the existing dam, following project completion.

Project construction is scheduled for between August 2020 and December 2022, with lake drawdown expected to commence earlier, in May 2020. The IAR includes an indicative construction program, advising it is subject to change based on procurement and approvals. The project's delivery strategy will involve pre-construction and construction activities.

Pre-construction activities will include:

- closing of recreational facilities and relocation of the Gerry Cook Fish Hatchery
- establishing site works area including terrestrial vegetation removal
- construction of a temporary concrete batching plant
- staged and temporary lowering of Lake Macdonald water level to a reduced level of 89 meters AHD
- salvaging and relocation of aquatic fauna
- construction of a temporary sheet pile cofferdam to a reduced level 90 meters AHD along the upstream slope of existing embankments and spillway to hold water away from the construction work
- decommissioning and removing the existing spillway and embankments
- constructing a working platform for new spillway foundation works.

Construction activities will include:

- installing mass concrete secant pile cells (new, deeper, reinforced concrete foundations) that will form the base of the spillway
- utilising on-site clay material by extracting from a pit adjacent to the dam
- constructing a new spillway and spillway wing walls
- re-constructing the left and right embankments
- constructing an auxiliary dam to prevent flood water discharging from the lake along Collwood Road during flood conditions.

A temporary concrete batching plant is proposed on-site to deliver the anticipated 38,000 cubic metres of mass concrete required for construction of the spillway foundation. The batching plant will be de-commissioned and removed following completion of spillway concrete works.

Once construction of the new spillway and embankments is complete, the site work area and recreational facilities will be reinstated. It is anticipated that Lake Macdonald will return to its FSL within the first 12 months after construction, subject to rainfall.

Operations of the upgraded dam will be similar to those for the existing dam.

2.4 Project rationale

In 2012-2013, Seqwater commissioned an independent assessment of its 26 regulated dams, which reviewed the condition of the dams and their compliance with current Queensland and Australian safety guidelines.

The assessment determined that the Six Mile Creek Dam does not meet modern Queensland and Australian standards, and, following remedial actions at a number of other dams, it now has the highest probability of failure in a major flood or earthquake event. The key contributing factor for potential dam failure was attributed to the condition of the existing foundations underlying the spillway and embankments.

Although risks associated with dam failure typically have a low probability of occurring, dam failure can result in significant impacts on life, property, the economy and the environment. The population at risk if failure occurs is greater than 100 people, with urban development downstream continually increasing the population at risk.

To improve the dam's safety, the proponent proposes to install a new dam wall with deeper mass concrete foundations to help dissipate forces during earthquake and flood. The proposed upgrade will reduce dam safety risks by improving the spillway discharge capacity and earthquake stability of the dam while maintaining water supply security.

Upgrading the dam by replacing the existing dam infrastructure using modern safety standards will maintain the current flood immunity level for development downstream of 1:100 annual exceedance probability flood level, maintain the long-term water supply of the Noosa local government area, and ensure the ongoing recreational use of Lake Macdonald.

The proposed spillway design also provides a smooth transition between the dam headwater and tailwater, which benefits fish passage in flood events by lessening the impact of plunging into shallow pools.

2.4.1 Project alternatives

The IAR describes alternative project options considered by the proponent, including:

- risk reduction strategies, while maintaining the dam in its current form
- partial dam upgrade
- reconstructing the embankment and relocating the spillway
- decommissioning the dam
- replacing the dam with a 2,000 ML weir structure downstream
- new dam options up or downstream.

In evaluating the option of maintaining the dam in its current condition while implementing risk reduction strategies, the proponent considered purchasing 'at risk' properties downstream and improving dam monitoring and early warning systems. This option would fail to satisfy legislative risk requirements.

Other project options have not been pursued by the proponent due to high cost considerations and potential environmental impacts.

The upgrade option detailed in the IAR and evaluated in this report, while essentially occupying the current dam footprint, has been identified by the proponent as the preferred option.

2.4.2 Project benefits

The project will reduce the risk of dam failure and maintain flood mitigation at the existing dam, protecting residents downstream of the dam. It will also maintain the long-term water supply to the Noosa local government area and on-going recreational use of Lake Macdonald.

During the two-year construction period, the project is estimated to generate at peak construction 110 full time equivalent jobs, as well as goods, and services sourced from local communities where possible.

3. Impact assessment process

In undertaking this evaluation, I have considered the following:

- the initial advice statement
- the IAR (including the supplementary report)
- submissions on the draft IAR
- clarification material submitted by the proponent
- advisory agency advice and clarification material throughout the IAR process from:
  - Commonwealth Department of Environment and Energy (DEE)
  - Department of Environment and Science (DES)
  - Department of Natural Resources, Mines and Energy (DNRME)
  - Department of Agriculture and Fisheries (DAF)
  - Noosa Shire Council
  - Department of State Development, Manufacturing, Infrastructure and Planning's (DSDMIP) State Assessment and Referral Agency (SARA).

The steps taken in the project's IAR assessment process are documented on the project's webpage at www.dsdmip.qld.gov.au/sixmilecreek.

3.1 Coordinated project declaration

On 22 December 2017, I declared this project a 'coordinated project' under section 26(1)(b) of the SDPWO Act. This declaration initiated the statutory environmental impact evaluation procedure of Part 4 of the SDPWO Act, which required the proponent to prepare an IAR for the project.

3.2 Commonwealth assessment

On 6 December 2017, a delegate for the then Commonwealth Minister of Environment and Energy determined the project to be a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The relevant controlling provisions triggered under the EPBC Act are sections 18 and 18A, listed threatened species and communities.

The Commonwealth has accredited the State of Queensland's SDPWO Act IAR process, under a bilateral agreement (made under section 45 of the EPBC Act) between the Commonwealth and the Queensland Government. Under the agreement, if a controlled action is a 'coordinated project for which an IAR is required' under the SDPWO Act, the project does not require assessment under Part 8 of the EPBC Act. The agreement enables the IAR to meet the impact assessment requirements of both Commonwealth and Queensland legislation.

Under Part 4 of the SDPWO Act and section 36 of the State Development and Public Works Organisation Regulation 2010, the Coordinator-General must ensure the IAR evaluates all relevant impacts that the controlled action has, will have, or is likely to have. The IAR must provide enough information about the action and its relevant impacts to allow the Commonwealth Minister of Environment to make an informed decision whether or not to approve the action under the EPBC Act.

Section 5.9 and Appendix 1 of this report explain the extent to which the IAR process for the project addresses the actual or likely impacts of the project on the matters of national environmental significance (MNES) covered by the controlling provisions of the EPBC Act.

Once a copy of my evaluation report is provided to the Commonwealth Minister for the Environment, a decision on the controlled action under section 133 of the EPBC Act may be made by the Minister (or delegate). The Minister will use the information in Section 5.9 and Appendix 1 of this evaluation report to decide whether the project should proceed and if so, whether any additional conditions beyond those I have recommend in this report (Appendix 4) are to be applied to manage the impacts on MNES.

3.3 Impact assessment report

3.3.1 Public consultation of the draft IAR

The draft IAR prepared by Seqwater was released for public and agency submissions between 11 February 2019 and 11 March 2019. A total of 67 submissions were received, comprising 61 submissions from the public, five submissions from state agencies and one submission from Noosa Shire Council.

The most prominent issues raised in submissions received were:

- traffic and transport management—objection to the proposed one-way loop route that uses the eastern access roads (Collwood Road, Sivyers Road and Gumboil Road)
- social impacts, including access disruptions to downstream properties during water release, temporary loss of access to recreational fishing, and community health and wellbeing impacts, such as noise and dust impacts for those local residents with existing health conditions

- noise and dust from increased heavy vehicle traffic and construction activities, including physical impacts from dust on sensitive receptors
- aquatic fauna salvage and relocation during lake drawdown
- additional information requirements to inform permits for the project, including the material change of use for the temporary concrete batching plant and operational works for the waterway barrier (spillway and embankments)
- clearing of koala habitat
- MNES, how threatened species (e.g. Mary River turtle, giant barred frog and platypus) will be effectively managed during project activities
- fish passage upstream and downstream
- downstream impacts on habitat from increased water flows during lake drawdown
- the operation and design of the spillway.

In response to agency and public submissions, the proponent provided additional information in the form of an IAR supplementary report. This additional information included:

- clarifying information about the proposed site layout, including vegetation clearing
- confirmation of proposed working hours and mitigation measures to address any potential noise exceedances
- an explanation of how the project activities will affect the dam's operation, including the purpose of the saddle dam, downstream flow regime and post construction water flow
- a refined hybrid spillway design that minimises the level of risk to threatened aquatic species
- confirmation of the stakeholder and community engagement strategy.

3.3.2 Final impact assessment report

On 30 April 2019 I accepted the draft IAR including the IAR supplementary report as the final IAR under section 34I of the SDPWO Act.

4. Project approvals

Following the release of this evaluation report, the proponent will be required to obtain relevant statutory approvals from Commonwealth, state and local government jurisdictions before the project can proceed.

Table 4.1 identifies those approvals and permits that have been considered as part of this evaluation report. Table 4.2 identifies other approval and permits which have not been addressed, however will subsequently be required prior to commencement of project activities. Table 4.3 identifies the imposed statutory requirements for this project.

The IAR confirms that further information may be required by the relevant authorities for the granting of these approvals prior to the commencement of project activities.

Table 4.1 Approvals and permits considered in this report

Project activity	Permit / approval	Trigger	Relevant legislation	Assessment authority
Commonwealth government approvals				
Controlled action	Approval of controlled action (EPBC 2017/8078)	Relevant controlling provisions triggered under the EPBC Act are sections 18 and 18A, listed threatened species and communities	EPBC Act	Department of Environment and Energy
State government approvals				
Clay borrow pit	EA for ERA 16 2(a) – Extractive, dredging and screening	Extracting (other than dredging) 5,000 tonnes to 100,000 tonnes of material in a year	*Environmental Protection Act 1994* / Environmental Protection Regulation 2018, Schedule 2, Part 4, Section 16(1)(b)	Department of Environment and Science
Construction of a new spillway and temporary cofferdam	Development permit for (operational works) waterway barrier works	Establishing a barrier across a waterway that may affect fish passage through the waterway	*Planning Act 2016* / *Fisheries Act 1994* / Planning Regulation 2017, Schedule 10, Part 6, Division 4, Section 12	Department of State Development, Manufacturing, Infrastructure and Planning/ Department of Agriculture and Fisheries
Local government approvals				
Temporary concrete batching plant	Material change of use for 'other use' (concrete batching) in an Open Space Conservation zone/ Community Services zone	Development of a temporary concrete batching plant	The Noosa Plan 2006 Part 6, Division 12, Table 6.10 and Part 6, Division 7, Table 6.5	Temporary concrete batching plant

Table 4.2 Possible subsequent approvals required for the project

Project activity	Permit / approval	Trigger	Relevant legislation	Assessment authority
Terrestrial vegetation clearing and lake drawdown	Permit to tamper with animal breeding place (High-risk of impacts)	A high-risk Species Management Program is required for special least concern, endangered, vulnerable and near threatened species	*Nature Conservation Act 1992* / Nature conservation (wildlife Management) Regulation 2006, Chapter 7, Part 3	Department of Environment and Science
Terrestrial vegetation clearing	Protected plant clearing permit or exempt clearing notification	If during the preclearing survey protected plants are identified in areas to be cleared a Clearing Permit (Protected Plants) is required, where no protected plants are present, an exempt clearing notification is required	Nature Conservation (Wildlife Management) Regulation 2006, Chapter 4, Part 2, Division 4, Chapter 4, Part 3 and Chapter 4, Part 4A / Flora Survey Guidelines – Protected Plants (DEHP 2016)	Department of Environment and Science
Removing and relocating wildlife	Damage mitigation permit	Where the removal and relocation of wildlife is required for project activities	*Nature Conservation Act 1992* / Nature Conservation (Administration) Regulation 2017, Section 12(a)	Department of Environment and Science
Works within local road reserve	Road permit (local road)	Road works or upgrades (local road) where not carried out in accordance with local government policy. Must be constructed in accordance with local government standards	Noosa Shire Council Subordinate Local Law No.4 (Local Government Controlled Areas, Facilities and Roads) 2015, Schedule 2	Noosa Shire Council
Use of access roads into site (local roads)	Temporary road closure permit for local government-controlled road	An application must be made to temporarily close a local government road	*Land Act 1994*, Chapter 3, Part 2, Division 2	Department of Natural Resources, Mines and Energy
Works on left embankment, adjacent Lake MacDonald Drive	Permit to occupy a road	Required where works or infrastructure is to be constructed on unallocated State land, a reserve or a road	*Land Act 1994*, Chapter 4, Part 4	Department of Natural Resources, Mines and Energy

Table 4.3 Imposed statutory requirements for the project

Project activity	Permit / approval	Relevant legislation	Administering authority
Works associated with the drawdown, demolition and construction activities	Site environmental management plan	SDPWO Act	Coordinator-General

4.1 Australian government approvals

Environment Protection and Biodiversity Conservation Act 1999

On 6 December 2017, a delegate of the then Commonwealth Minister of Environment and Energy determined the project to be a 'controlled action' under the EPBC Act (EPBC 2017/8078). The IAR process is an accredited assessment process under the Bilateral Agreement between the Commonwealth Government and the State of Queensland, as discussed in Section 3 of this report.

The Commonwealth Minister for the Environment will use the information in this report to make an informed decision under section 133 of the EPBC Act whether or not to approve the controlled action, and if approved, apply conditions to the approval necessary to limit the impact on MNES. I have recommended conditions for the Commonwealth Minister for the Environment's consideration that relate to MNES (Appendix 4).

4.2 State government approvals

ERA 16 2(a) – Extractive, dredging and screening

The project will require an environmental authority (EA) for Environmentally Relevant Activity (ERA) 16 Extractive and screening activities 2(a) for the proposed clay borrow pit, as it is proposed for a total of 5,000 tonnes or more of material to be extracted.

In accordance with section 39 of the SDPWO Act, I have stated conditions for an EA for ERA 16 (2)(a) (extractive activities) under the *Environmental Protection Act 1994* (EP Act), stated under section 47C of the SDPWO Act. These stated conditions are provided in Appendix 3.

Development permit for (operational works) waterway barrier works

The construction of the replacement spillway triggers the requirement for a development permit for operational works. The design of the replacement spillway is required to be assessed against the State Development Assessment Provisions State code 18.

In accordance with section 39 of the SDPWO Act, I have stated conditions in Appendix 3 for a development permit for operational works for waterway barrier works which must be adopted by SARA when a development approval is given under the *Planning Act 2016* (Planning Act).

4.3 Local government approvals

Under Schedule 6 of the Planning Regulation 2017, operational work, plumbing or drainage work cannot be made assessable development (requiring a development application) under a planning scheme where the works are by or for a public sector entity, such as Seqwater.

The Coordinator-General can impose conditions for matters which cannot be assessed through other legislative processes under section 54B of the SDPWO Act. As no approval process applies to the project for the regulation of general construction works (operational works), I have imposed conditions to regulate potential impacts in Appendix 2 of this report.

Development permit for material change of use (concrete batching plant)

Under the Noosa Plan 2006, the proposed construction of a temporary concrete batching plant triggers a material change of use application, requiring impact assessment (Industrial Business Type 2 – Production, alternation, repackaging and repairing).

In accordance with section 39 of the SDPWO Act, I have stated conditions in Appendix 3 that must be adopted by Noosa Shire Council when an application is for a material change of use for the temporary concrete batching plant. Under section 37 of the SDPWO Act, the information and referral stage and the notification stage prescribed by the Planning Act will not apply to the assessment of this development application.

I have recommended (Appendix 5) that further detailed supporting information be provided to Noosa Shire Council prior to submitting the development application. I have also stated conditions in Appendix 3 that must be adopted by Noosa Shire Council when a development approval is given for the material change of use.

Road permit for works within local road reserve

Under the *Local Government Act 2009*, Noosa Shire Council has established the Subordinate Local Law No.4 (Local Government Controlled Areas, Facilities and Roads) requiring any proposed road works or upgrades proposed within a local government road reserve be carried out in accordance an approved road permit and relevant local government standards.

Although the requirement for a road permit was not identified in the IAR, discussions with Noosa Shire Council identified the obligation for the proponent to obtain a permit for any works within a local government road reserve.

5. Evaluation of environmental impacts

This section discusses the major environmental effects identified in the IAR. Matters addressed in the IAR to my satisfaction have not been detailed in this report. For these matters, I am satisfied that the proponent's mitigation measures described in the IAR are appropriate.

For the remaining matters evaluated below, I have included conditions or recommendations to mitigate and/or manage adverse impacts.

5.1 Aquatic ecology

5.1.1 Project activities

Demolition and replacement of the existing spillway and embankments will improve the safety and performance of the dam to meet current Queensland dam safety regulations. The completed project will maintain the same capacity, FSL and inundation area as the existing dam.

To facilitate construction of the new spillway and embankments, it is necessary to temporarily remove around 97 per cent of the water in Lake Macdonald by controlled release of impounded waters into Six Mile Creek, downstream of the lake. This will result in approximately 97.2 percent of the aquatic habitat in the lake being temporarily removed for the duration of the two-year construction period.

Project activities that may impact on aquatic ecological values are:

- drawdown of Lake Macdonald
- construction, including the demolition of the existing spillway and embankments, and the construction of a new spillway and embankments
- filling the dam by natural inflows and normal dam operations.

5.1.2 Assessment methodology

The IAR describes the methodology used to identify the existing aquatic ecology of Six Mile Creek and Lake Macdonald. The assessment included the examination of:

- habitat condition, type and sensitivities to impacts
- aquatic plants
- fauna that live in Lake Macdonald and downstream in Six Mile Creek, including waterbirds, fish, frogs, turtles and platypi
- fauna that live in groundwater systems (stygofauna).

Literature and database reviews, along with interpretation of relevant data from other projects form the basis of the methodology for the aquatic ecology assessments of Six Mile Creek and Lake Macdonald. This information was supplemented by field surveys conducted in August and October 2015 and February 2018.

This review was followed by an assessment of the overall likelihood of occurrence of threatened species informed by the field survey results (e.g. specimens found during surveys or availability of suitable habitat) and known occurrence through desktop reviews.

An ecological value assessment methodology was applied in the IAR to determine the relative value of habitats of areas potentially affected, based on their use by protected species. Ecological values ranged from very high in Six Mile Creek downstream of Lake Macdonald, too low for the groundwater ecosystems in the project area. A risk assessment of the project's potential impacts on these ecological values was then used to determine the potential for impacts on the species and habitats within Six Mile Creek, Lake Macdonald, the groundwaters of the project and surrounding areas. The risk assessment considered the potential impacts that may negatively impact on species and

their habitats and evaluated the likelihood and potential severity of those impacts on the species and their habitats.

I am satisfied that the proponent's methodology presented in the IAR is generally acceptable for assessing the potential impacts of the project on aquatic ecology values of Six Mile Creek, Lake Macdonald and associated groundwater.

5.1.3 Submissions received

Submissions received on the IAR identified the following key issues relating to aquatic ecology:

- impacts of the drawdown of Lake Macdonald on EPBC Act and *Nature Conservation Act 1992* (NC Act) listed species, in particular fish, turtles and platypi
- salvaging and relocation procedures for fish, turtles and platypi before and during drawdown of Lake Macdonald
- impacts on Six Mile Creek, in particular its faunal habitat, water quality and sedimentation downstream of the lake.

I have considered all submissions on the IAR in my evaluation of the project.

5.1.4 Potential impacts

The IAR concludes that the project will result in the temporary disturbance and temporary loss of habitat for a number of aquatic faunal species listed under the Commonwealth EPBC Act and the NC Act, in particular fish, frogs, turtles and platypi. My evaluation of impacts to aquatic species listed under the Commonwealth EPBC Act is summarised in Section 5.9 and Appendix 1 of this report.

Lake Macdonald

The drawdown phase, where the lake volume is reduced by around 97 per cent will temporarily result in a significant reduction in the volume of aquatic habitat in Lake Macdonald. If no management or mitigation measures are put in place, this will cause overcrowding, stranding, entrapment and possible mortality of fauna. Fauna may become stranded in isolated, unshaded shallow pools in the upper reaches as the water levels reduce. Turtles and platypi may have difficulty moving to the nearest available water through exposed lake bed sediments and exposed aquatic vegetation, or their movement to alternative water may involve crossing roads and encountering hazards. Aquatic flora in Lake Macdonald that are dependent on standing water above the temporary (reduced) water level would perish.

If management or mitigation measures are not put in place, the lake drawdown is also likely to cause temporary changes to water quality, including turbidity, raised suspended solids, elevated nutrient and metal concentrations, and decreased pH and dissolved oxygen in Lake Macdonald's diminished aquatic habitat. The reduced water volume in Lake Macdonald and the exposure of the lake bed to the atmosphere may increase the concentration in the lake of nutrients and result in changes in pH and dissolved metal concentrations. Fine sediment from the reservoir floor could be mobilised as a result of the drawdown and suspended in Lake Macdonald. The fine mobilised sediments could cover

and smother aquatic vegetation. The loss of aquatic vegetation could reduce food for aquatic fauna and reduce dissolved oxygen levels in the lake.

Aquatic fauna may be injured by pumping equipment during drawdown. Impact injuries may also occur if fish and turtles flow over the low flow notch (vertical drop into receiving waters) of the temporary (during construction) cofferdam and collide with the base of the cofferdam/creek bed.

Groundwater

The rate of groundwater aquifer recharge—from the floor of Lake Macdonald—will be temporarily reduced as water levels in the lake recede. This could have the potential to impact on local groundwater stygofauna communities; however, the IAR concludes that the soils of the project area are unlikely to be suitable for stygofauna.

Fuel spills from construction activities, should they occur, may also impact shallow groundwater systems, causing negative impacts to local groundwater dependent ecosystems.

Six Mile Creek

The proposed lake drawdown strategy would create a large 'flow event' similar to a one in two-year peak flow event downstream in Six Mile Creek. The duration of the drawdown (approximately 12 weeks) would be significantly longer than a natural large flow event. The IAR identifies that if significant inflows occur to Lake Macdonald prior to the completion of the drawdown process, there would be the need to significantly increase the rate of drawdown due to the higher water volume in the lake, so construction works could commence. The IAR states that an accelerated drawdown could be accomplished, where necessary, within ten days.

The prolonged flows from the lake drawdown could have downstream impacts to aquatic species, particularly faunal species, their habitats and water quality (particularly turbidity and sedimentation). Species could be washed downstream; creek beds and banks could be scoured; vegetation and submerged/overhanging structures (e.g. logs/branches) could be mobilised and sediments could be disturbed.

During the construction phase it is likely that there would be (subject to climatic conditions) a higher frequency of low flows to Six Mile Creek due to the reduced capacity of the cofferdam to store water for later release. Overtopping of the cofferdam during large flows would also increase the risk that restricted biosecurity species from downstream areas of Six Mile Creek may spread to above the dam wall. The IAR acknowledges that water flows to Six Mile Creek during construction will be different to the operational water flows and this has the potential to impact on the aquatic ecology of Six Mile Creek.

Spillway

The IAR acknowledges that the operation of the proposed new spillway will—in a similar way to the existing spillway—act as a barrier to the movement of species, particularly fish, from downstream sections of Six Mile Creek into Lake Macdonald and the upper sections of Six Mile Creek.

The spillway design that was presented in the publicly notified draft IAR included a vertical drop of approximately ten metres from the crest of the labyrinth spillway to the spillway plunge pool, with high flow velocities modelled from the apexes (of the labyrinth design). My evaluation found that the labyrinth design has a significant potential for fish mortality or injury from abrasions caused by collisions with the spillway, hitting the spillway base after overtopping the spillway crest, or dam tailwater turbulence at the foot of the dam.

5.1.5 Proposed management and mitigation measures

Lake Macdonald

Impacts to threatened species, in particular the platypus, the Mary River cod, the Australian lungfish, the Mary River turtle and the white-throated snapping turtle would be minimised from the outset with lake drawdown proposed outside their breeding seasons. I have imposed a condition (Appendix 2) to ensure lake drawdown occurs outside of the breading seasons of threatened species.

The draft environmental management plan (EMP) in the IAR includes an outline of adaptive management practices that will be finalised (in consultation with relevant agencies) to manage impacts on aquatic ecological values from lake drawdown. The finalised 'adaptive management plan' is to be a responsive plan that will outline how specific impacts to flora and fauna species will be managed via monitoring and feedback processes. The finalised adaptive management plan will detail the adaptive approach that is to be used to manage the flow rates of drawn down waters and will also include a fauna salvage and relocation program. To ensure the management and mitigation measures outlined in the draft EMP for adaptive management practices are implemented, I have imposed a condition to require a site environmental management plan (SEMP) be developed generally in accordance with the draft EMP. The SEMP must be submitted for my approval at least two months prior to commencement of project activities.

The fauna salvage and relocation program that the proponent has committed to prepare as part of the adaptive management plan will manage impacts on aquatic fauna populations from the temporary loss of 97.2 per cent of the aquatic habitat in Lake Macdonald. An outline of the salvage and relocation program's principles is within the draft EMP. A finalised salvage and relocation program must be submitted for approval as part of the SEMP. Drawdown of Lake Macdonald cannot commence until the adaptive management plan is approved and implemented.

The salvage and relocation program must contain species specific measures to manage the capture and transportation of fauna to nearby areas (either creeks or other approved locations) and be carried out by appropriately qualified fauna management personnel. The salvage and relocation program will require fish species (including the Mary River cod and the Australian lungfish) to be salvaged and relocated in accordance with DAF Fish Salvage guidelines (DPI 2004).

Detailed salvage and relocation procedures for turtles (including the Mary River turtle and white-throated snapping turtle) will be determined during preparation of the salvage and relocation program, in consultation with DES and DAF. The salvage and relocation program outlined in the draft EMP proposes monitoring for other species (such as waterbirds, frogs and platypi) that can move out of the project area of their own accord, to

confirm if these species are required to be included in the salvage and relocation program. It is anticipated that the territorial nature of platypi may prevent intervention in their relocation. I consider this approach appropriate and I require it to be included in the fauna salvage and relocation program.

Fauna salvage and relocation is to be scheduled throughout the lake drawdown to maximise the ability to capture fauna (through fishing, netting and trapping) and avoid large-scale mortality events such as fish-kills. Pest species (e.g. tilapia fish) captured during the salvage and relocation program will be euthanised. The salvage and relocation program will include short term monitoring of fauna relocated to adjoining areas, and if required, supplemental feed. Fauna are to be further relocated if conditions are found to be not suitable. Captured Mary River cod will be housed at the temporarily relocated Gerry Cook Fish Hatchery and replenished within the dam post-construction when water levels are sufficient. Despite the implementation of a salvage and relocation program, some mortality of fauna unable to be salvaged is expected to occur.

The adaptive management plan I have conditioned will also include the following to manage impacts on fauna from the drawdown:

- screening and monitoring of pump intakes to protect aquatic fauna
- control of water velocity into pumping equipment to prevent entrainment of aquatic fauna
- control of water volume behind the cofferdam and associated overflows during construction, to remove impacts from fauna overtopping the cofferdam
- installation of barriers to minimise turtles dispersing over roads, preventing injuries/mortalities to turtles from vehicle strikes.

I require the adaptive management plan to include management of exposed sediments of the lake bed as the waters of Lake Macdonald recede, by seeding with non-invasive grasses and following established weed hygiene protocols.

After construction and as the dam refills, I require the proponent, as part of the conditioned adaptive management plan, to re-establish native fauna habitat (such as large woody debris to create submerged snags) in the dam to assist aquatic communities to re-establish. To further assist in re-establishing populations in Lake Macdonald following the lake's refill, the proponent has also committed to continue ongoing support for the Mary River cod restocking program for Lake Macdonald (as this species does not naturally recruit to Lake Macdonald).

The mitigation of water quality impacts from drawdown of Lake Macdonald are discussed in Section 5.3.

Groundwater

Management of impacts to groundwater from construction activities, including potential contamination from fuel spills, is discussed in Section 5.3 of this report.

Six Mile Creek

The adaptive management plan that I have conditioned as part of the SEMP will also consider impacts on instream habitats and species in Six Mile Creek. The plan will require the drawdown of Lake Macdonald to simulate a flow regime that minimises

impacts to instream habitats and species for the downstream sections of Six Mile Creek. Habitats will be monitored before and during drawdown to ensure flow rates are adapted in response to impacts on platypi, frogs, fish and turtles and their habitats. Where scouring or impacts to vegetated areas downstream are observed, I require the flow rates to be adjusted so that the water flows downstream of the dam do not cause widespread or irreversible impacts on instream habitats, species and/or their populations using the habitats. The flora and fauna management plan, which I have also conditioned to be part of the SEMP, must include monitoring of monitoring of water level, water quality, velocity and bed and bank stability.

The rate of water flow to Six Mile Creek during construction will also to be managed through the adaptive management plan that I have conditioned. The proponent is required to maintain a minimum downstream flow regime to protect the downstream ecology, consistent with the requirements of the *Water Act 2000*. Water will, as needed, be pumped around the cofferdam and/or piped from the Mary River to the water treatment plant and then downstream to ensure sufficient flows to Six Mile Creek are maintained.

Mitigation and management strategies to minimise the impacts from construction activities on Six Mile Creek will be detailed in the adaptive management plan that I have conditioned. The adaptive management plan will include strategies for:

- stormwater management
- traffic management
- storage of fuels/chemicals
- fauna management.

Fauna management will include inspections for fauna burrows (e.g. platypi and frogs) prior to activities that have the potential to cause bank disturbance, and then construction exclusion where fauna burrows are identified to prevent accidental impacts. Fauna management in Six Mile Creek will also include rehabilitation of habitat that may have been impacted by high flows during drawdown, including reestablishment of snags and aquatic revegetation.

Spillway

The information on the labyrinth design of the spillway presented in the draft IAR (that was publicly notified), did not provide sufficient confidence that safe fish passage over the dam wall would occur—particularly for large bodied fish such as the Mary River cod—compared to the current ogee spillway design. Consequently, the spillway design presented in the draft IAR was not found to achieve the necessary requirements for safe fish passage past the dam.

Following public notification of the draft IAR, significant consultation with the proponent and relevant agencies (particularly DAF) was undertaken to find a technical solution to improve fish passage from Lake Macdonald to downstream sections of Six Mile Creek. The proponent adjusted the design to one that improves fish passage. The amended design, presented in the supplementary report to the IAR, incorporates an ogee spillway design with the labyrinth design. The ogee part of the redesigned spillway is lower than the adjoining labyrinth section and allows for safer fish passage over the dam wall (particularly in low overflow situations) via an ‘inclined slide’ rather than a vertical drop to

the spillway pool, before water and fish move to the downstream habitats of Six Mile Creek. The proponent has modelled water flow over the revised spillway design to test that it will provide for safe fish passage as well as meeting the dam safety overflow (hydraulic) requirements for the spillway.

To ensure the detailed design of the spillway meets the necessary requirements for safe fish passage and dam safety requirements, I have stated conditions (Appendix 3) that require the spillway construction be in accordance with the hybrid labyrinth/ogee design.

5.1.6 Coordinator-General's conclusion: aquatic ecology

My evaluation of the potential impacts on aquatic ecology has considered the assessment undertaken by the proponent, submissions received and advice of agencies, including the Commonwealth DEE and the Queensland DAF, DES, and DNRME. Where relevant, these agencies and the proponent have been consulted to adjust aspects of the proposal to reduce the potential for impacts, improve mitigation/management measures and develop appropriate conditions for the project.

I am satisfied that, while there will be temporary impacts to aquatic ecology—including the loss of habitat and species during lake drawdown—the mitigation and management measures proposed will reduce the level of impact. The temporary loss of habitat in the lake requires the effective management of current populations, particularly through aquatic fauna salvage and relocation for fish and turtles; as well as for waterbirds, frogs and platypi where it is found that they are unable to naturally migrate to other areas. I have imposed conditions (Appendix 2) to ensure that this occurs through a SEMP that will detail the adaptive management practices outlined in the draft EMP and include a comprehensive and adaptive management plan with a fauna salvage and relocation program. Drawdown of Lake Macdonald cannot commence until the approved SEMP is in place and is being implemented.

Downstream impacts on Six Mile Creek are also to be managed through the adaptive management plan and a flora and fauna management plan that I have conditioned. I require flow rates to be adjusted both during drawdown and during the two year construction phase in response to impacts on instream habitats (Appendix 2).

I accept that the dam wall replacement is required to ensure the safety of downstream residential communities. I am satisfied that the operation of the modified design of the spillway that incorporates a hybrid labyrinth/ogee spillway design is unlikely to have a significant impact on downstream fish passage, while also achieving the hydraulic flow requirements to meet the new dam safety requirements. My stated conditions for the design of the spillway (Appendix 3) will ensure that the dam allows for safe fish passage.

I conclude that the project is unlikely to have a significant residual impact on the aquatic ecology of the area and the residual impact must be weighed up and balanced against the overall need to improve dam safety.

5.2 Terrestrial ecology

5.2.1 Project activities

Clearing of a maximum of three hectares (ha) of vegetated areas (including 1.45 ha of remnant vegetation) is proposed (Figure 5.1). This clearing would be restricted to the northern boundaries of Lake Macdonald to allow enough space for the project area, including construction access and activities, vehicle movement and storing equipment and supplies. The project area is generally located in previously disturbed areas adjacent the existing water treatment plant.

Following project construction, the operational phase of the project would be similar to the current dam and hence the completed project will have no significant residual impacts on terrestrial ecological values.

5.2.2 Assessment methodology

The terrestrial ecology assessment presented in the IAR was undertaken as follows:

- a detailed desktop review of available online resources to determine key species and habitat values likely to occur and identify areas of direct and indirect ecological impacts. This included environmental reports online tool to identify relevant matters of state environmental significance (MSES)
- a field survey conducted in February 2018, targeting areas and species identified during the desktop review
- assessment of the overall likelihood of occurrence of threatened species based on field survey results (e.g. found during surveys or availability of suitable habitat) and known occurrence through desktop reviews.

I am satisfied that the proponent's methodology presented in the IAR is appropriate for the purpose of assessing the potential impacts on terrestrial ecology associated with the project.

5.2.3 Submissions received

One submission was received on the IAR relating to terrestrial ecology, highlighting the proponent's requirements that clearing of any koala habitat must conform with the Nature Conservation (Koala) Conservation Plan 2017. This submission on the IAR was considered in my evaluation of the project.

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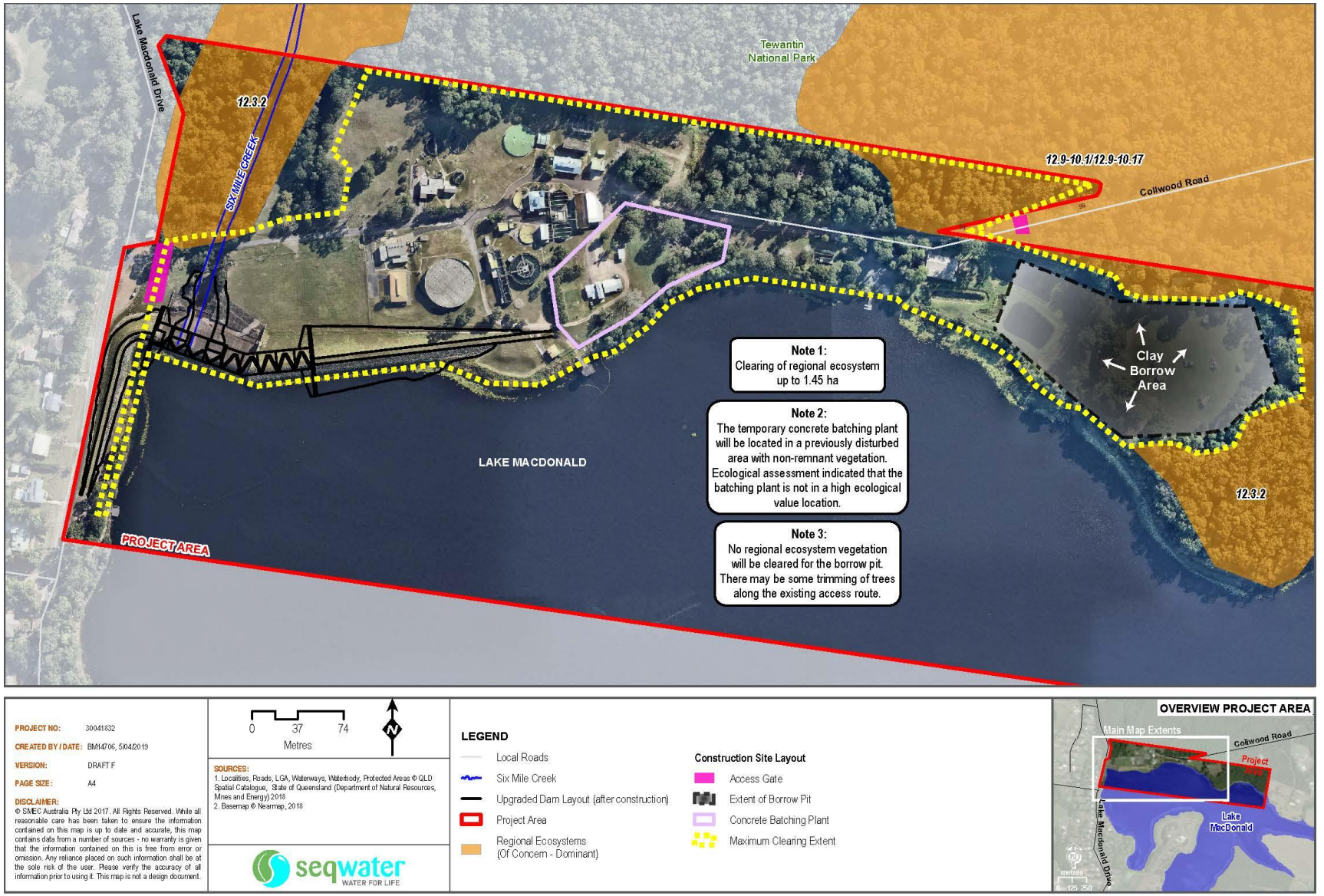

Figure 5.1 Maximum clearing extent

5.2.4 Potential impacts

The IAR states that direct disturbance impacts from clearing, demolition, excavation and building activities are predicted to cause localised effects to vegetation communities and species habitat, as well as inducing edge effects to surrounding habitat (the project site adjoins the Tewantin National Park).

The clearing of up to 1.45 ha of remnant vegetation (R.E. 12.3.2 – Riverine wetland or fringing riverine wetland, listed as of concern under the *Vegetation Management Act 1999*) is proposed within a three-hectare area, which contains cleared areas interspersed with non-remnant and remnant vegetation potentially containing fauna habitat for marsupials and bats. Within the proposed clearing area some trees may be used intermittently by koalas as they have a large home range, however the presence of koalas was not confirmed on site during surveys. Indirect project impacts on surrounding habitat could include weed spread, road kill, noise, vibration and dust nuisance. However, the IAR concludes that the project will not result in fragmentation or isolation of vegetation patches or habitats.

The proposed project works in terrestrial areas have the potential to cause changes in surface hydrology and environmental water flows from the project site during the project construction period, which could impact amphibian species and downstream waters

5.2.5 Proposed management and mitigation measures

The proponent has committed to locate as much of the project area as possible in areas previously cleared for other activities, including the temporary concrete batching plant. Where clearing is proposed to facilitate the project, the proponent has committed to the following mitigation and management measures, outlined in the draft EMP in the IAR, to minimise impacts during clearing:

- clearing to be conducted with equipment that minimises impact to surrounding vegetation
- sequential clearing to allow fauna (e.g. marsupials) to move away to adjacent areas of habitat
- engagement of a suitably qualified fauna spotter catcher during clearing.

I support the mitigation and management measures to minimise impacts during clearing outlined by the proponent in the draft EMP. To ensure these measures are implemented, I have imposed a condition to require a SEMP be developed generally in accordance with the draft EMP. The SEMP must be submitted for my approval at least two months prior to commencement of project activities.

I consider rehabilitation of the site and revegetation of the cleared areas with local species following conclusion of construction critical to ensure that in the long term the project has minimal impact on the terrestrial ecology of the area. An outline of a rehabilitation and revegetation plan is included in the draft EMP. The conditions I have imposed require this outline to be detailed in the SEMP, which must be approved prior to the commencement of construction.

In the IAR the proponent recognised that construction activities may impact on surrounding the terrestrial ecology, in particular Tewantin National Park. To minimise the impacts of construction activities on surrounding terrestrial ecology, the proponent has committed, in the draft EMP, to the following management measures during project activities:

- clearly mark no-go zones with flagging tape and signage outside the construction footprint
- impose low speed limits and confine construction activities to daylight hours where possible
- educate site personnel on how to identify key threatened species and implement a 'Stop, Manage and Notify' process if encountered
- using shield lights to minimise light spill towards any surrounding habitat, lighting that doesn't attract insects and minimise lighting through the use of motion sensor lighting to illuminate only areas in use
- minimise noise and vibration disturbance to adjacent fauna habitats by carrying out construction work in accordance with *Australian Standard 2436-2010 - Guide to noise control on construction, maintenance and demolition sites*
- minimise dust generation by suppressing dust with water (dust on leaves of nearby vegetation has the potential to cause smothering)
- minimise potential contamination of soil and water by fuels and chemicals by undertaking refuelling and maintenance within bunded areas and the implementation of spill response measures.

To minimise biosecurity risks, in the IAR the proponent, in the draft EMP, has committed to the following arrangements during project activities:

- manage weed spread through implementation of vehicle washdown procedures, rehabilitation of disturbed areas to prevent weed establishment and implementation of a weed management plan
- manage cane toad populations and inspect the lake edges regularly to detect any increased pest fauna presence.

I consider that these mitigation and management measures will appropriately minimise impacts on surrounding terrestrial ecology during construction. The draft EMP includes outlines of vegetation and biosecurity management plans as well as plans for dust, noise and vibration management plans. The conditions that I have imposed will require all of the measures outlined in the draft EMP to be detailed in the SEMP and approved prior to commencement of construction.

5.2.6 Coordinator-General's conclusion: terrestrial ecology

My assessment of the potential impacts on the terrestrial ecology has considered the assessment undertaken by the proponent, submissions received, and advice provided by DES and DNRME.

I recognise that clearing of up to 1.45 ha of remnant vegetation is necessary to enable construction of the project. However, to ensure the maintenance of terrestrial ecology in the long term I have imposed a condition to require rehabilitation and revegetation of the site at the completion of construction. The outline for rehabilitation and revegetation is in

the draft EMP and the details will be included in a rehabilitation and revegetation plan as part of a SEMP, which I will approve prior to commencement of construction.

The IAR confirms the proponent has designed the project activities with the intention of minimising the extent of disturbance to terrestrial ecology. I am satisfied that the potential impacts from clearing, noise, dust, vibration and lighting on the terrestrial communities can be satisfactorily managed and would be addressed by the mitigation, management and rehabilitation measures planned by the proponent. The SEMP that I have conditioned (Appendix 2) requires the management and mitigation measures proposed by proponent in the draft EMP to be detailed in the SEMP, which must be approved prior to commencement of construction and implemented.

As a result of the measures proposed by the proponent and requirements included in my conditions, I do not expect the potential impacts on the terrestrial communities to have a significant residual impact on the terrestrial ecology of the area, as the impacts would be temporary during construction and vegetation communities will be rehabilitated post-construction.

5.3 Water resources

5.3.1 Project activities

Lake drawdown and dam removal are the project activities most likely to impact on surface water hydrology, potentially affecting the flow regime before and during construction. These activities also have the potential to impact on the Noosa Region's water supply and the water availability for authorised water users both downstream and upstream of the spillway.

Project activities that may impact on groundwater and water quality within Lake Macdonald and downstream include lake drawdown, construction earthworks and runoff from construction equipment and stockpiles.

5.3.2 Assessment methodology

The surface water hydrology assessment presented in the IAR was informed by modelling assessments to determine the existing surface water hydrology in the project area and predict potential impacts of the project on supported ecosystems and authorised water users. These assessments included flood modelling, water balance modelling, and qualitative assessments for flow regime.

The potential impacts on surface water quality of Six Mile Creek and Lake Macdonald was assessed using a literature and database review, analysis of field survey and monitoring data, and qualitative assessments.

The groundwater assessment presented in the IAR was informed by a desktop study, which was carried out primarily on information sourced from the DNRME groundwater database. Groundwater drawdown was also modelled to predict potential impacts of the project on groundwater users and groundwater dependent ecosystems.

I am satisfied that the methodology presented in the IAR is appropriate for the purpose of assessing the potential surface water hydrology, water quality and groundwater impacts associated with the project.

5.3.3 Submissions received

One submitter raised concerns that the drawdown activities may isolate access to their property due to increased height of flows over a causeway. Another submitter raised concerns that, while authorised water users have been identified as stakeholders in the IAR, landholders adjoining Six Mile Creek[2] have not been acknowledged. An additional concern raised was that authorised water users may be impacted by changes to water availability.

I have considered all submissions on the IAR in my evaluation of the project.

5.3.4 Potential impacts and mitigation measures

Water supply

The IAR confirms that water supply for Noosa Shire will be maintained during the drawdown of Lake Macdonald and construction of the project. Alternative water supply arrangements from the Mary River, and through the South East Queensland water grid's northern pipeline interconnector to the local water treatment plant, will ensure no disruption to Noosa region's potable water supply will occur as a result of the project. This is in line with the proponent's responsibilities to ensure water supply for local communities.

Potable water used on site during project construction, and water for the concrete batching plant, will be sourced from the existing reticulated water network.

Authorised water users downstream and adjacent to Lake Macdonald may be temporarily impacted by limited water availability during the project drawdown, construction and refill phases. To ensure that impacted stakeholders are kept informed on the progress of the project and to ensure early notice of any potential impacts to water availability, I have imposed a condition (Appendix 2) requiring the proponent to develop a community and stakeholder engagement plan. This plan must be prepared as part of the SEMP for the project and be submitted for approval at least two months prior to commencement of project activities. The plan will detail how all impacted stakeholders must be engaged with, including all authorised water users and downstream property owners, during lake drawdown and construction.

Surface water hydrology

The IAR states that flow regime changes during dam drawdown may lead to a range of impacts including changes to stream form and profile, aquatic ecosystem function and difficulties meeting environmental flow objectives under the *Water Plan (Mary Basin) 2006*.

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[2] Under the *Water Act 2000*, an owner of land adjoining a watercourse, such as Six Mile Creek, may take water, without a water licence, for stock or domestic purposes.

The IAR confirms the proponent's intention to schedule peak construction activities during the dry season to reduce the likelihood of extreme flood events occurring during construction. The IAR predicts that larger floods occurring during the construction period would cause higher than usual water levels over waterway crossings (bridges), however following project completion, minimal change from current conditions is expected. The draft EMP in the IAR includes an outline of an adaptive management plan. I have imposed a condition to require a SEMP be developed generally in accordance with the draft EMP. The SEMP must be submitted for my approval at least two months prior to commencement of project activities. The adaptive management plan that will include measures to ensure the proposed drawdown flowrate is managed so that the creek banks of Six Mile Creek mimic a natural flow regime, minimising disruption to waterway crossings.

The lake drawdown activities will bring a relatively sudden rate of change in the flow downstream during a period that would normally be dry or low flow, which may impact the normal wetting and drying cycle of the creek system and the ecosystems dependent on these variations. The volume and rate of flow rate is expected to mimic a one in two-year peak flow event, downstream in Six Mile Creek, however, the duration of the event (approximately 12 weeks) would be significantly longer. The adaptive management plan, which I have conditioned as part of the SEMP, will be designed to manage and monitor these impacts. The plan will ensure that drawdown timeframes and rates reflect the non-flood flows of Six Mile Creek to minimise impact to the creek system and dependant ecosystems. Discussion on the impacts of and mitigation strategies for lake drawdown on the aquatic ecology of Six Mile Creek is in Section 5.1 of this report.

During construction and dam refilling, catchment environmental flow objectives stipulated by the *Water Plan (Mary Basin) 2006* could be difficult to meet, due to reduced dam capacity. In the situation of abnormally low flows during construction that may impact adversely on downstream habitats, flows may be supplemented from the Mary River raw water offtake. The need for supplemented flows would be identified through monitoring undertaken as part of the adaptive management plan, which I have conditioned as part of the SEMP for the project. Once the dam has been refilled to capacity, the environmental flows required by the water plan will be managed as per current operations.

Water quality

The drawdown of Lake Macdonald, construction activities, including earthworks and runoff from stockpiles of soil, and dam refill, have the potential to adversely impact water quality. Potential water quality impacts include:

- increased turbidity and total suspended solids from disturbance of bed sediments and/or the erosion of bed and banks during drawdown and construction
- decreased pH associated with exposure or disturbance of acidic soils
- increased nutrient and dissolved metal concentrations due to exposure of deep sediments
- reduced dissolved oxygen due to increased nutrients causing excessive growth of algae (eutrophication)
- contamination from chemical or fuel spills from pumping equipment or other machinery/vehicles.

The proponent has prepared a draft EMP, and an outline of adaptive management plan, which identifies the following mitigation and management measures to minimise water quality impacts associated with project activities:

- minimising disturbance of unconsolidated bed sediments, through use of pontoon-based pump stations
- taking water from mid-depth or a mix of depths during drawdown, for example with a multi-level intake
- minimising exposure of deep sediments, for example by not lowering water in Lake Macdonald to below 89 m AHD
- avoiding or managing areas of potential erosion, such as through implementation of an Erosion and Sediment Control Plan in accordance with industry standards, including monitoring effectiveness of sediment and erosion control management measures
- preparing and implementing a Stormwater Management Plan to manage stormwater on site, including stormwater runoff from the concrete batching plant, and ensure no potentially contaminated stormwater leaves the site without prior treatment
- reducing the likelihood of chemical spills or leaks, such as through storing of fuels, oils and other chemicals in bunded areas in accordance with *Australian Standard 1944:2017–The storage and handling of flammable and combustible liquids*, establishing bunded areas away from water bodies, only refuelling in bunded areas, and making spill kits available to enable a rapid response to a spill if one was to occur
- implementing real-time water quality monitoring for comparison against suitable objectives for key parameters (i.e. pH, dissolved oxygen, turbidity, TSS, nutrients), to inform an agile mitigation and management system that is able to respond to changes in water quality.

To supplement the proponent's proposed mitigation measures, I have imposed a condition (Appendix 2) requiring the proponent prepare an SEMP developed in accordance with the draft EMP. The SEMP must also include a stormwater management plan, which must incorporate specific performance measures (e.g. release criteria) to ensure that stormwater which may be contaminated (such as from suspended sediments, fuels, chemicals, and oils) by activities on site does not leave site without prior treatment. The SEMP must be submitted for approval at least two months prior to commencement of project activities.

Additionally, I have recommended the Commonwealth condition the finalisation and implementation of the Lake Lowering Adaptive Management Plan, which will ensure appropriate performance criteria and trigger levels are specified and monitoring is undertaken to detect potential impacts on water quality (consistent with the *Water Plan (Mary Basin) 2006*) during dewatering and construction activities. Further, the plan will identify adaptive management measures, corrective actions/and or remediation actions if performance criteria and trigger levels are not met.

Groundwater

The analysis in the IAR predicts that groundwater users and groundwater dependent ecosystems around Lake Macdonald would not be adversely affected as the groundwater impact zone during the construction period (i.e. once the water in Lake Macdonald is drawn down) would be limited and highly localised. The spillway's construction is not

expected to permanently impact groundwater flow as the design will permit groundwater to flow around the structure.

During clay extraction activities, groundwater would also be extracted. The proponent has committed to developing and implementing a dewatering management plan to safely manage and dispose of the extracted groundwater. I require that this plan be implemented. The plan proposes the capture of suspended solids and treatment of groundwater with high concentrations of dissolved metals or other contaminants, prior to releasing groundwater off site.

5.3.5 Coordinator-General's conclusion: water resources

The IAR predicts that, following implementation of the proposed mitigation measures, the residual risk to water hydrology would be low to medium, while the risk to surface water quality and groundwater quality and quantity would be low. I support the proponent's proposed mitigation and management measures.

To ensure the proponent's mitigation measures are carried out and potential impacts are appropriately managed, I have imposed a condition that a SEMP be prepared and implemented that includes a stormwater management plan. I have also conditioned the SEMP to be developed in accordance with the draft EMP, which includes an outline of an adaptive management plan (Appendix 2). The adaptive management plan will detail water quality criteria to inform monitoring and adaptive management measures. The SEMP must be submitted at least two months prior to the commencement of the project.

I have imposed a condition (Appendix 2) to require the preparation of a community and stakeholder engagement plan as part of the SEMP, which must be approved and implemented prior to commencement of project activities. In response to matters raised in submissions, this plan will detail how all impacted stakeholders must be engaged with, including all authorised water users and downstream property owners, during lake drawdown and construction.

I am satisfied that the implementation of the proponent's mitigation and management measures, compliance with legislative requirements, and the imposed conditions (Appendix 2), will appropriately manage the project's potential impacts on water supply, water hydrology, water quality and groundwater.

5.4 Noise and air quality

5.4.1 Project activities

The IAR demonstrates that the project has the potential to impact on noise and air quality during project activities. The project elements that have the potential to impact on noise and air quality include:

- the drawdown of the lake
- sheet piling
- spillway excavation and construction
- saddle dam construction
- clay borrow pit extractive activities

- embankment construction
- construction and operation of the concrete batching plant
- removal of construction equipment from the site.

The IAR confirms that there will be no change to impacts on noise and air quality during operation of the dam following completion of the project, as the completed project will not differ from the existing operational procedures. Therefore, this section will focus on the project elements listed above.

5.4.2 Assessment methodology

Noise and vibration

Unattended and attended noise monitoring was carried out in May and June 2018 at two locations near the existing dam. The noise modelling assessed the construction scenario at the proposed clay borrow pit, using typical plant items and defined areas of operation across the project area for standard hours and non-standard working hours, as well as respective default weather conditions. These predicted noise levels were then compared to targets in accordance with the measured ambient noise levels.

The proponent assessed the potential noise impacts associated with project activities against relevant legislation and guidelines and undertook noise monitoring at two sites adjacent to the project area. A submission on the IAR was concerned that the locations chosen for the noise monitoring were too far away from the proposed project area. The proponent states that the monitoring locations were selected to establish the baseline noise for the area, rather than the potential construction noise monitoring locations, and are therefore appropriate. I accept the proponent's chosen baseline monitoring locations.

Due to the residential nature of nearby sensitive receptors, the IAR assessed construction generated vibration against criteria for cosmetic damage. In the absence of a relevant Australian Standard, the IAR adopted a vibration value of 7.5 millimetres per second (mm/s) from *British Standard 7385-2:1993 Evaluation and measurement for vibration in buildings*. The standard sets levels for building vibration based on the lowest vibration levels above which cosmetic damage has been demonstrated.

I am satisfied that the proponent's methodology presented in the IAR is appropriate for the purpose of assessing the potential noise and vibration impacts associated with the project.

Air quality and odour

Potential project air quality impacts were assessed in the IAR by characterising the existing background air quality and the meteorological and climatic features of the site; and undertaking a qualitative assessment of potential health and nuisance impacts associated with dust emissions from the project activities on sensitive receptors.

The IAR assessed potential impacts on air quality from emissions of dust, odour and other air pollutants in accordance with the EP Act, Environmental Protection (Air) Policy 2008 (EPP (Air)) and National Environmental Protection (Air Quality) Measure (NEPM (Ambient Air)). In lieu of a lack of national air quality guideline values for the nuisance dust effect on the existing environment, the IAR adopted dust deposition limit of 120 milligrams per square metre per day, averaged over one month, in accordance with *Australian Standard*

3580.10.1 Methods for sampling and analysis of ambient air – Determination of Particulates – Deposited Matter – Gravimetric method of 1991.

The IAR states that odorous emissions will occur only as a result of lowering the water level in Lake Macdonald and exposing normally inundated soil and aquatic vegetation. The extent of odour emissions from the project could not be quantified, and no odour dispersion modelling study was carried out. Instead the proponent proposes to implement mitigation measures to minimise the potential for odour nuisance impacts.

I accept that the methodology presented in the IAR is appropriate for the purpose of assessing the potential air quality and odour emissions associated with the project.

5.4.3 Submissions received

Twelve submissions on the IAR raised concerns relating to noise, air quality and odour, including:

- noise impacts on nearby residences and other sensitive receivers resulting from construction activities and project-related vehicle movements
- air quality impacts, particularly dust and vehicle fumes, on nearby residences and sensitive receivers
- odour emanating from the project site.

I have considered issues raised in submissions in my evaluation of the IAR, and how the information provided by the proponent addresses these issues.

5.4.4 Potential impacts

There are 54 residences identified within one kilometre of the project area (Figure 5.2). The closest dwellings to the project site and construction activities are located approximately:

- 30 meters to the west of the left embankment
- 210 meters to the west of the area where the temporary concrete batching plant is proposed
- 215 meters to the west of the closest stockpile area
- 300 meters to the east of the clay borrow pit.

Tewantin National Park, located to the north of the project area, is also considered a sensitive receptor.

Noise and vibration

The IAR confirms that hours of operation for the construction phase are 6:30 am to 6:30 pm Monday to Friday and 6:30 am to 4:00 pm Saturdays, with extended work hours occasionally required during critical construction activities.

The following project activities are expected to exceed acoustic quality objectives[3] at the nearest residences, should mitigation measures not be implemented:

[3] Under the *Environmental Protection (Noise) Policy 2008*, daytime is defined as 7:00 am to 6:00 pm, evening is defined as 6:00 pm to 10:00 pm, and night time is defined as 10:00 pm to 7:00 am.

- should 24 hour a day operation of pumps be required to drain the lake, this would exceed night time noise targets for the duration of the lake draining activity (approximately 12 weeks)
- sheeting piling (coffer dam) during standard hours is anticipated to exceed daytime/evening noise targets of 50 decibels (A-weighted) (dBA) by 10 dBA[4] (approximately two to three weeks)
- demolition of the existing dam structure is anticipated to exceed daytime/evening noise targets by of 50 dBA by 10 dBA and night time noise targets by 22 dBA (approximately one to two weeks)
- new dam construction during standard hours is expected to exceed daytime/evening noise targets of 50 dBA by 7 dBA, and night time noise targets by 21 dBA (approximately four to six weeks)
- east and west embankment construction activities during standard hours are expected to exceed the daytime/evening maximum noise levels by 10 dBA for the east embankment and 14 dBA for the west embankment (approximately three months)
- removal of construction equipment from the site during standard hours is expected to exceed daytime/evening noise targets of 50 dBA by 12 dBA (approximately four weeks).

The IAR predicts that noise levels associated with the concrete batching plant, construction of the saddle dam and clay borrow pit activities are not anticipated to contribute to noise level exceedances at sensitive receptors. Exceedances are more likely to occur at residential properties near dam embankments, where excavators and other machinery will operate. The IAR also states that a standalone 150 kilovolt-amp generator may be required to provide power to the concrete batching plant, and this will contribute to noise impacts during operational hours.

Submissions on the IAR raised concerns regarding the potential noise impacts resulting from project-related traffic. Noise will occur as a result of daily project traffic, and transport and delivery of bulk materials (such as rock, stone aggregate, sand and cement powder) to site.

Vibration levels from the project are predicted to be below the nominated cosmetic damage threshold of 7.5 mm/s Peak Particle Velocity for the nearest residences, which are located approximately 30 meters from the construction area. At 30 meters, vibration levels from high energy events could reach 2.5 mm/s Peak Particle Velocity.

[4] It is generally accepted that a 3 dBA to 5 dBA increase corresponds to small but noticeable change in loudness, while a 10 dBA increase corresponds to an approximate doubling in loudness.

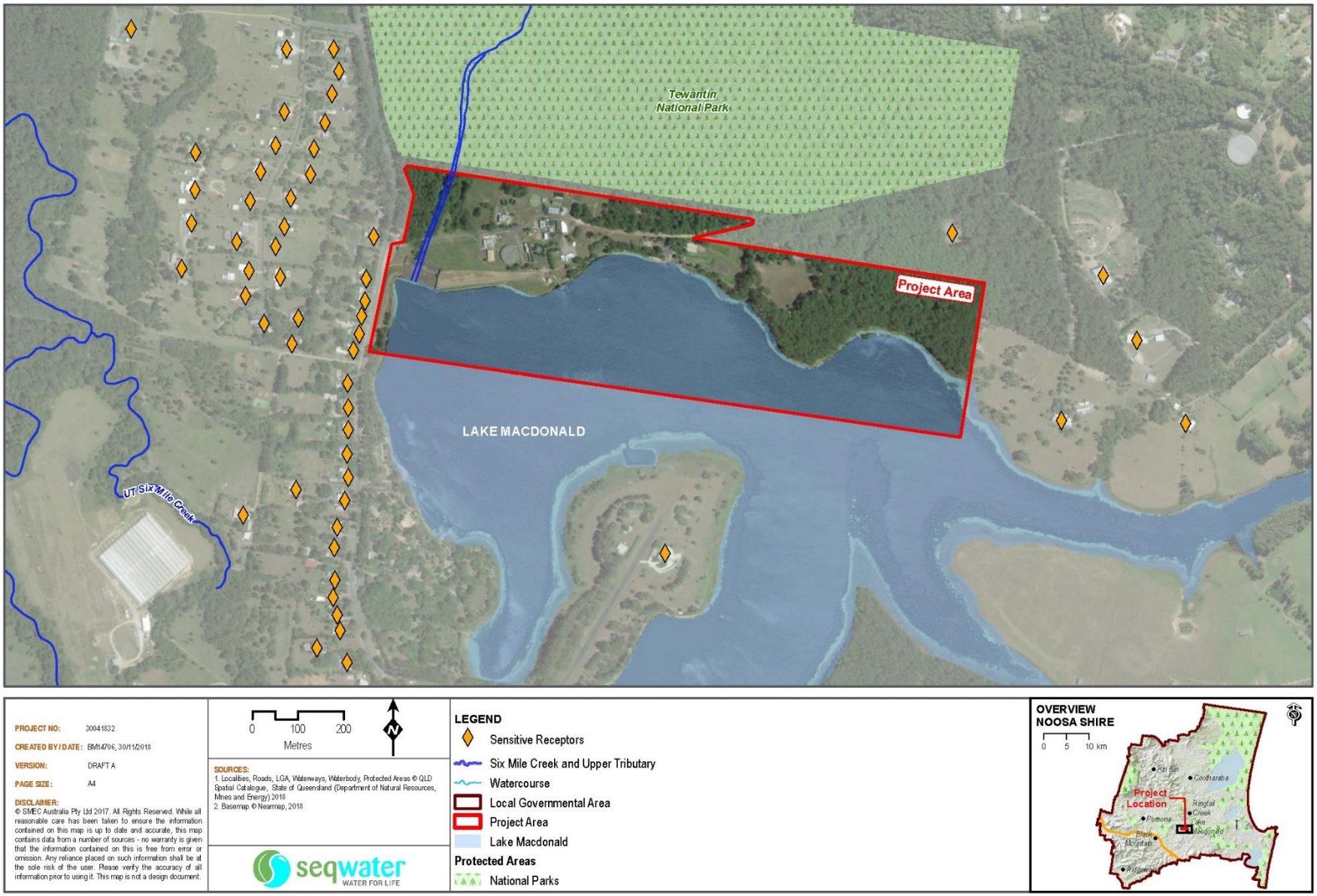

Figure 5.2 Sensitive receptors

Air quality and odour

The IAR outlines the following potential key project air quality impacts:

- emissions of particulate matter from the handling and transport of bulk materials such as rock, stone aggregate, sand and cement powder
- emissions of particulate matter from the excavation, handling and on-site transport of soil and rocks, as well as from wind erosion of disturbed soils (such as from extractive activities at the clay borrow pit)
- emissions from fuel combustion products from mobile equipment including haul trucks, dozers and front-end loaders (such as those required for the concrete batching plant), as well as generators (if required).

These emissions have the potential to exceed air quality objectives stated in the EPP (Air) and impact on health and wellbeing of nearby residents, tank water supplies (potential contamination from dust) and dust blanketing leaf surfaces, impacting on the health of vegetation. Submissions on the IAR raised concerns regarding the potential dust and fume impacts resulting from project-related traffic.

The IAR states that odorous emissions may occur as a result of lowering the water level in Lake Macdonald and exposing normally inundated soil and aquatic vegetation. A submitter was concerned this would impact on quality of life for nearby residents.

5.4.5 Proposed management and mitigation measures

Noise and vibration

The proponent has prepared a draft EMP, which identifies the following mitigation and management measures to minimise and manage noise exceedances associated with project activities:

- noise-generating construction activities to be carried out within standard hours where possible
- where possible, equipment/plant to be located/oriented to direct noise away from sensitive receptors
- where practical, acoustic barriers or localised noise screens to be installed on site at the source, to reduce the impacts of noise on sensitive receptors (e.g. temporary buildings, site sheds, material stockpiles as noise barriers)
- deliveries to be carried out within standard daytime hours where possible. Loading and unloading carried out as far as possible away from sensitive receptors
- acoustic enclosures or localised noise screens to be incorporated and maintained around fixed equipment plant or over individual pieces of equipment as appropriate based on acoustic assessment for the concrete batching plant
- where a 150 kilovolt-amp generator is required to provide power to the concrete batching plant, it would be silenced and located to avoid impacts on neighbouring residents
- design and operate all equipment to comply with Environmental Protection (Noise) Policy 2008

- plan truck movements with consideration to the nearest receptors, including minimising drive and idle time on site
- designate, design and maintain access routes to the site to minimise noise and vibration impacts
- schedule loading and unloading of bulk materials during hours that will least affect sensitive receptors, and at locations away from sensitive receptors.

I support the mitigation and management measures for noise exceedances outlined by the proponent in the draft EMP. To ensure these measures are implemented, I have imposed a condition to require a SEMP be developed generally in accordance with the draft EMP. The SEMP must be submitted for my approval at least two months prior to commencement of project activities.

To supplement the proponent's proposed mitigation and management measures outlined by the proponent in the draft EMP, I have imposed a condition (Appendix 2) requiring preparation and implementation of construction environmental management plans (CEMPs) for noise, dust and vibration and traffic management. These CEMPs are required as part of the SEMP for the project and will specify performance measures to minimise project activity impacts on sensitive places and include adaptive management measures to respond to monitoring and auditing results.

The IAR predicts that, despite implementation of these mitigation and management measures, some works (e.g. demolition of the current spillway) will cause noise limits to be exceeded intermittently over a two-week period due to the proximity of residences to the spillway and the machinery required for its demolition. This will also occur due to extended working hours being applied during this period to reduce safety risks associated with the demolition works. The proponent has committed to limit the impact of these noise exceedances by finding suitable solutions in consultation with individual landowners and occupiers (such as temporary relocation, air conditioning or double glazing) and notifying residents in advance of noisy activities or extended hours.

To ensure the proponent approaches stakeholder engagement in a coordinated and comprehensive manner and provides advance notice to impacted residents of noisy activities or extended hours, I have imposed a condition (Appendix 2) requiring the proponent develop a community and stakeholder engagement plan as part of the SEMP for the project. This plan will identify a framework through which information regarding project schedule and potential impacts will be disseminated. This plan will also identify a complaints management process and a process for incorporating stakeholder feedback into updates of the SEMP (including the CEMPs). The community and stakeholder engagement plan must be submitted for my approval two months prior to commencement of project activities and must be made publicly available on the proponent's website following my approval.

The proponent's draft EMP proposes regular monitoring of on-site noise levels during construction, to be undertaken by a suitably qualified person in accordance with *Australian Standard 2436 Guide to Noise and Vibration Control on Construction, Maintenance and*

Demolition Sites[5]. Noise monitoring is also proposed throughout the construction period at sensitive receptors to the east and west of the project area, at a minimum of two locations, in accordance with *Australian Standard 1055-1997 Acoustics – Description and measurement of environmental noise*[6]. To ensure noise monitoring is undertaken as proposed, I have imposed a condition (Appendix 2) requiring the proponent to monitor and audit the performance of the noise, dust and vibration management plan and the traffic management plan. My imposed condition also requires the noise, dust and vibration management plan and the traffic management plan to include adaptive management practices with corrective measures implemented should incidents occur.

Excessive vibration impacts are not predicted; however, the proponent has proposed general vibration management and control measures to limit any impacts from vibration. Where vibration levels are projected to exceed 1 mm/s, the draft EMP states that a dilapidation survey of all potentially affected structures will be undertaken prior to and following the vibration causing works to assess potential cosmetic damage. My imposed condition (Appendix 2) requiring development of a noise, dust and vibration management plan will ensure vibration impacts are appropriately monitored and managed.

Air quality and odour

The IAR anticipates that project-related air quality emissions can be effectively managed to meet EPP (Air), NEPM 2016 and *Australian Standard 3580.10.1 Methods for sampling and analysis of ambient air – Determination of Particulates – Deposited Matter – Gravimetric method of 1991* with the implementation of the proposed mitigation and management measures outlined in the draft EMP. These mitigation and management measures include:

- erect solid screens, barriers or fences around potentially dusty activities/stockpiles or the site boundary
- retain existing vegetation between the project site and sensitive receptors to act as natural dust suppression barrier
- minimise clearing to limit exposed areas available for dust emissions by wind erosion
- use of suitable dust suppression techniques, such as water sprays or local extraction / exhaust ventilation systems on cutting, grinding or sawing equipment
- maintain and operate plant and equipment at the project site in a proper and efficient condition/manner
- bag filter installed and maintained on the hopper vents for the concrete batching plant
- prepare and implement a traffic management plan to manage the sustainable delivery of goods and materials to minimise combustion emissions (e.g. minimise queueing along local roads adjacent to residential properties, and minimising idling times)

[5] This Standard provides noise and vibration reduction and mitigation measures which can be applied to construction sites, along with guidance on noise and vibration monitoring techniques.
[6] This Standard sets out general procedures for the description and measurement of environmental noise. Environmental noise quality objectives are set out in *Environmental Protection (Noise) Policy 2008* and governed under the EP Act.

- cover haul trucks when travelling on public roads, and implement a wheel washing system to dislodge accumulated dust and particles when leaving the site, where possible
- display on signs on the project boundary with, the name and contact details of a person accountable for air quality and dust issues, and/or available online platforms for providing feedback/complaints
- record all dust and other air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken
- air quality monitoring at nearby sensitive receptors during construction activities to ensure compliance with air quality objectives required under the EPP Air
- daily site inspections to monitor compliance with the finalised EMP and record inspection results. Inspection log to be made available to the regulatory authorities upon request.

I support the mitigation and management measures for the management of air quality emissions outlined by the proponent in the draft EMP. To ensure these measures are implemented, I have imposed a condition to require a SEMP be developed generally in accordance with the draft EMP. The SEMP must be submitted for my approval at least two months prior to commencement of project activities.

To supplement the proponent's proposed mitigation and management measures outlined in the draft EMP, I have imposed a condition (Appendix 2) requiring the preparation and implementation of CEMPs including a noise, dust and vibration management plan and a traffic management plan as part of the SEMP for the project. The CEMPs are required to specify performance measures to minimise air quality impacts, monitor the performance of air quality measures and include adaptive management practices with corrective measures implemented should incidents occur.

Potential impacts on amenity values due potential odour generation during lake lowering are largely unavoidable. However, these potential impacts will be temporary in nature, and will resolve once construction is complete and the operating water levels are reinstated. The proponent will regularly update the community on project activities and provide early notification of the proposed works, the plan for which will be outlined in the community and stakeholder engagement plan that I have required as part of the SEMP for the project. Additionally, the proponent proposes to seed exposed sediments of the lake bed with non-invasive grasses to encourage drying out of the sediments/mud, which may minimise offensive odour generation.

5.4.6 Coordinator-General's conclusion: noise and air quality

Project activities will create some noise and air quality impacts that cannot be completely mitigated, with these impacts having the greatest effect on residents of the closest dwellings. I acknowledge the proponent's preparation of a draft EMP outlining the measures to minimise and manage the potential noise, dust, vibration and odour impacts. My imposed condition (Appendix 2) requiring preparation and implementation of a SEMP in accordance with the draft EMP and CEMPs, including a noise, dust and vibration management plan, and a traffic management plan, will ensure these potential impacts are effectively managed and appropriate mitigation measures are implemented. My imposed

conditions ensure compliance monitoring is undertaken, complaints are dealt with appropriately and mitigation and management measures are responsive.

To ensure future stakeholder engagement is effective and stakeholder concerns are responded to, I have imposed a condition (Appendix 2) requiring the preparation of a community and stakeholder engagement plan for approval that must then be implemented for the duration of project activities at the site.

This plan is also to form part of the SEMP for the project.

Stakeholder feedback received must be used to inform updates to the management measures in the project's SEMP. In this way, matters such as noise and how it is experienced by people near the worksite can result in work practices being improved and adapted to respond to public feedback.

Additionally, I have separately stated conditions (Appendix 3) to manage potential noise and vibration impacts on nearby residents associated with the concrete batching plant.

I am satisfied the implementation of the proponent's mitigation and management measures, compliance with legislative requirements, together with the imposed and stated conditions (Appendix 2 and Appendix 3), will appropriately manage the project's potential noise, vibration, air quality and odour impacts on sensitive receptors.

5.5 Social

5.5.1 Project activities

The proponent undertook a social impact assessment (SIA) as part of the IAR to evaluate the potential effects of the project on the local community. The SIA reviews potential impacts and identifies management measures to mitigate potential negative impacts and enhance benefits associated with the project.

Key project activities which were assessed as part of the SIA process included:

- recruiting the construction workforce
- procuring materials and services for the project
- temporary lowering of the water level in Lake MacDonald
- restricting public access to Lake Macdonald during project activities
- day-to-day operation of construction machinery and equipment
- operating project vehicles on local and state-controlled roads.

5.5.2 Assessment methodology

The SIA was undertaken from January to October 2018, with further clarifying information provided in March 2019 at my request. While the IAR is not subject to the statutory requirements of the *Coordinator-General's Social Impact Assessment Guideline* (March 2018), the proponent has adopted the key requirements of the guideline for the SIA.

The SIA considers potential social impacts and benefits for both local and regional study areas. The local study area includes the suburbs of Lake Macdonald, Tinbeerwah,

Pinbarren, Pomona and Ringtail Creek, and the urban centres of Cooroy and Cooran. The regional study area comprises the Noosa local government area.

A range of stakeholders were engaged during the SIA process including local residents and community representatives, federal, state and local government agencies, businesses and industry, environmental and catchment care organisations, and traditional owners.

For further detail on the engagement activities and the issues raised, refer to Appendix N of the IAR.

I am satisfied with the proponent's methodology for the SIA. The SIA's local and regional study areas are appropriate to the nature and scale of the project, and the social baseline information for these study areas provides an adequate benchmark against which the project's potential impacts and benefits can be assessed. The SIA was supported by an appropriate level of stakeholder engagement, and feedback from these stakeholders was used to inform the SIA when assessing potential impacts and benefits and developing management measures.

5.5.3 Submissions received

Submissions received on the IAR identified the following key issues relating to social matters:

- potential for temporary loss of access to downstream properties due to water releases during lake lowering
- potential impacts on community health and safety due to the proposed one-way loop route that uses the eastern access roads (Collwood Road, Sivyers Road and Gumboil Road), including increased road safety risks, as well as air and noise emissions generated by project vehicles, equipment and machinery
- potential impacts on local amenity values and loss of access to recreational facilities.

I have considered all submissions on the IAR in my evaluation of the project.

5.5.4 Potential impacts and mitigation measures

Workforce, housing and local procurement

The project would require a peak workforce of up to 110 workers (full time equivalents, FTEs) during the two-year construction period. The proponent has committed to utilising workers from local and regional communities where possible. This would be a potentially significant benefit to residents of local and regional communities and would minimise any adverse impacts from the project on housing affordability and availability.

The SIA has estimated that the existing regional workforce would have sufficient capacity to meet the requirements of the project. The SIA also identifies that nearby towns such as Cooroy and Noosa offer numerous short-term accommodation options which could service any incidental temporary accommodation requirements for the project workforce. Once operational, the project would be operated and maintained by the proponent's current workforce.

The proponent has committed to providing opportunities for local industries during construction, including in the supply of construction materials and on-site services. Further

opportunities for local businesses may also be provided through incidental day to day spending by the construction workforce within the local communities. The IAR estimates that this incidental spending may total $626,400 over the two-year construction period. Once operational, the project may provide further opportunities for local businesses to support ongoing operations and maintenance works.

Health and community well-being

The SIA identifies a range of issues that may potentially impact the health and safety, lifestyle and amenity values, and social well-being of local and regional communities during project activities. These include:

- reduced visual amenity values and potential odour generation (discussed in Section 5.4) from drying mud and aquatic vegetation due to lake lowering
- loss of community access to Lake Macdonald for recreational activities, such as fishing, camping, hiking and rowing
- temporary loss of land access by the operators of Camp Cooroora, the Lake Macdonald Rowing Club and the Gerry Cook Fish Hatchery
- potential temporary restriction to access for downstream properties, due to water releases during lake lowering
- disturbance to the residents of properties adjacent to the project site due to air and noise emissions from project equipment (addressed in Section 5.4)
- increased traffic volume on local and state-controlled roads, potentially resulting in increased road safety risks to road users and pedestrians (addressed in Section 5.7).

Potential impacts on amenity values due to reduced visual appeal and potential odour generation during lake lowering are largely unavoidable. However, these potential impacts would be temporary in nature, and would resolve once construction is complete and the operating water levels are reinstated. The proponent would regularly update the community on project activities and provide early notification of the proposed works.

Community access to the lake for recreational activities would be restricted during project activities. The operators of Camp Cooroora (Scouts Queensland) and the Lake Macdonald Rowing Club (community run facility) would need to temporarily suspend their activities due to loss of access to the properties that they lease, and in turn affect users of these facilities. This may have a negative effect on the lifestyle of the local and visiting/regional community, however this potential impact would be temporary in nature as it is proposed for the property leases for the relevant operators to be reinstated once the project is operational. The proponent has provided early notification to the affected operators and the local community.

Operations for the Gerry Cook Fish Hatchery—a community-run facility which is largely staffed by volunteers—would continue during project activities, however the facility would be temporarily relocated to an alternative site. As with the other facilities, it is proposed for access to the current site to be reinstated once construction is complete. The proponent is currently engaging with the hatchery operators to assist with temporary relocation of existing fish stock.

Once the project is operational, the safety of communities downstream of Lake Macdonald would be improved due to the enhanced structural integrity of the dam wall. I consider this to be a positive impact to these communities.

Community and stakeholder engagement

The proponent has committed to keeping the local community and other relevant stakeholders informed during the two-year construction period through activities including community reference group meetings, media statements, community events, the project website and one-on-one meetings. The proponent has also committed to engaging with Noosa Shire Council to develop a strategy to maintain the overall connectivity of the recreational trail network in the vicinity of Six Mile Creek. I expect the proponent to implement these commitments.

To ensure that the proponent's engagement activities are effective and responsive to stakeholder concerns, I have imposed a condition (Appendix 2) requiring the proponent to develop a community and stakeholder engagement plan (CSEP) as part of the project's SEMP. The CSEP must describe the proponent's engagement approach during the construction phase of the project and include:

- a summary profile of the local community, focusing on potentially affected stakeholder groups
- an analysis of key stakeholders and stakeholder issues
- engagement schedules, activities and associated action plans
- roles and responsibilities for engagement
- a complaints management process appropriate to the nature and scale of the project
- objectives and key performance indicators for stakeholder engagement
- monitoring and reporting requirements.

I also require the proponent to consider stakeholder feedback received during project activities when updating the SEMP, CEMP, and any other relevant management plans required for the project.

Once the project becomes operational, the proponent proposes to continue to use existing processes and procedures for engaging with stakeholders and addressing potential enquiries and complaints.

5.5.5 Coordinator-General's conclusion: social

I am satisfied that the proponent has adequately assessed the potential benefits and impacts of the project on the local community. I require the proponent to implement their commitments (Appendix 6) and undertake ongoing engagement with the local community and other potentially impacted stakeholders during the two-year construction period. I have imposed a condition (Appendix 2) requiring the proponent to prepare a CSEP for the project. This condition also requires that management measures in the SEMP be updated based on the outcomes of consultation with stakeholders.

I consider that the project would deliver social benefits due to the increased employment and local procurement opportunities during construction. I note the proponent's intention to use a local workforce to the extent possible, and to support local industries during

construction. I consider it unlikely that the project would result in a local workforce shortage or cause excess demand on housing and accommodation.

I am satisfied that the project's potential impacts on community health and safety, lifestyles and amenity values, and social well-being would be temporary in nature, and could be appropriately managed through implementation of the commitments which the proponent has made. I am also satisfied that the safety of communities downstream of Lake Macdonald would be improved once the project is operational.

5.6 Cultural heritage

The proponent prepared a cultural heritage study as part of the IAR to assess potential impacts on both Indigenous and non-Indigenous cultural heritage, and to identify appropriate mitigation measures.

5.6.1 Assessment methodology

The proponent's cultural heritage study comprises:

- an Aboriginal Cultural Heritage Due Diligence Assessment, which was prepared in accordance with the Department of Aboriginal and Torres Strait Islander Partnership's (DATSIP's) *Aboriginal Cultural Heritage Act 2003 Duty of Care Guidelines*
- a Historical Heritage Assessment, which was prepared in accordance with the *Australian Heritage Commission Act 1975* and the *Queensland Heritage Act 1992*.

The Aboriginal Cultural Heritage Due Diligence Assessment considered reported cultural heritage sites within 500 meters of the project site. The non-Indigenous heritage assessment was limited to the area directly surrounding the proposed dam upgrade site including the Noosa Water Treatment Plant precinct, the land parcels occupied by Camp Cooroora and the Gerry Cook Fish Hatchery, and the adjacent shoreline area.

I am satisfied that the methodology presented in the IAR is appropriate for the purposes of assessing the project's potential impacts on cultural heritage values at this stage of the project.

5.6.2 Submissions received

Submissions received on the IAR did not relate to cultural heritage.

5.6.3 Potential impacts

The IAR identifies the Kabi Kabi First Nation People as the Traditional Owners for the local area. The DATSIP cultural heritage database reported a single record of a potential Indigenous heritage site in the vicinity of the project. An exact location for the site could not be determined, however available records suggested that it may be located within the inundation area of Lake Macdonald. The IAR also notes the potential for the Camp Cooroora Borrow Pit site, and an area of remnant vegetation along Collwood Road, to contain unrecorded Indigenous artefacts. The IAR does not identify any significant landscape features of potential Indigenous cultural heritage significance.

No registered heritage places have been identified within, or in close proximity to, the project area. The IAR does, however, identify several features of potential local heritage significance:

- selected structures associated with the Noosa Water Treatment Plant including the original dam wall and spillway, and lime building
- the dam dedication brick plaque structure
- selected structures within Camp Cooroora including the rotunda, entrance gate and wall, and open-air chapel.

The original dam wall and spillway will be demolished so that the upgraded dam wall structure can be built. The brick plaque structure may also require removal.

The structures at Camp Cooroora may be indirectly impacted due to their proximity to the proposed excavation in the borrow pit area.

5.6.4 Proposed mitigation measures

The proponent has committed to the following measures to mitigate potential impacts on cultural heritage:

- developing a cultural heritage management agreement for the project in consultation with the Kabi Kabi First Nation People
- creating a photographic record of structures of potential local heritage significance that require demolition, for example the original dam wall and spillway
- if the Lake Macdonald brick structure is demolished, Seqwater will create a photographic record and salvage/relocate the dedication plaque
- establishing temporary exclusion flagging or fencing around historic structures within Camp Cooroora to reduce potential for accidental damage.

I support these commitments and require that they be implemented.

5.6.5 Coordinator-General's conclusion: cultural heritage

I am satisfied that the IAR has adequately assessed potential impacts on cultural heritage at this stage of the project, and that the identified impacts can be appropriately managed. I support the commitments that the proponent has made and require that they be implemented.

I note the proponent's ongoing requirement to comply with the *Aboriginal Cultural Heritage Act 2003*, in particular to ensure all reasonable and practicable measures are taken to ensure the works do not harm Aboriginal cultural heritage.

5.7 Traffic and transport

5.7.1 Project activities

The project site can be directly accessed via either the western access roads (Lake Macdonald Drive and Seqwater Access Road) or the eastern access roads (Cooroy-Noosa Road, Sivyers Road, Gumboil Road and Collwood Road) (Figure 5.3). There are no formed roads connecting the eastern and western boundaries of Lake Macdonald.

The IAR identifies two potential construction vehicle routes for access to and from the project site:

- a single access (western) route in and out along Lak Macdonald Drive, with use of (eastern) access roads via Collwood Road, if required
- a one-way loop along (eastern) Cooroy-Noosa, Sivyers, Gumboil and Collwood Roads to the site before exiting and continuing along (western route) Lake Macdonald.

Heavy construction vehicles are expected to predominantly originate from the west, where raw material suppliers are likely located, and would access the eastern or western access roads from Bruce Highway and Elm Street (Cooroy Connection Road).

Construction of an ancillary saddle dam to prevent flood water discharging from the lake along Collwood Road during flood conditions will require works to be conducted in the road reserve. Construction works to the left embankment would also require works on the road reserve. The proponent would be required to seek the necessary permits from DNRME and NSC under the *Land Act 1994* and Noosa local laws, prior to the commencement of these project activities for partial and temporary road closures permits.

5.7.2 Submissions received

Submissions received on the IAR, including from people living nearby, identified the following key issues relating to traffic and transport matters:

- safety risks due to road conditions, such as narrow stretches, relating to the suitability of the one-way loop option that utilises the eastern access roads (Sivyers Road, Gumboil Road and Collwood Road) for construction traffic, particularly heavy truck haulage
- strong preference for a single access route in and out of Lake Macdonald Drive for construction traffic, to minimise safety issues and noise and dust impacts
- potential impacts on community health and safety from vehicle air and noise emissions and increased exposure to road safety risks
- the need for a traffic impact assessment of Lake Macdonald Drive to evaluate appropriate controls to ensure road safety for local users.

I have considered all submissions on the IAR in my evaluation of the project.

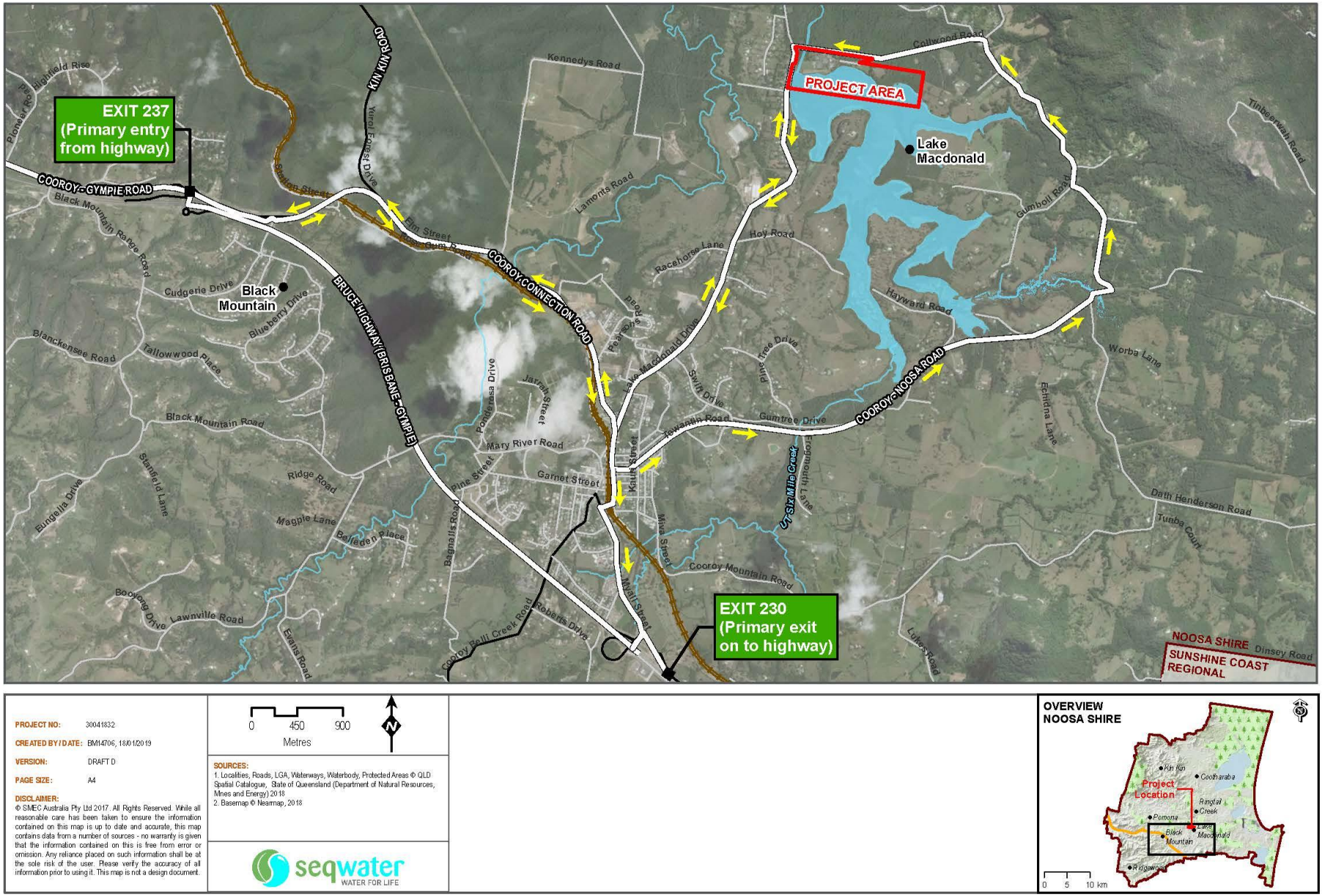

Figure 5.3 Main access roads to project site

5.7.3 Assessment methodology

The IAR provides an assessment of the potential impacts resulting from the expected additional traffic accessing the project site in accordance with the Department of Transport and Main Roads (DTMR) Guide to Traffic Impact Assessment.

The traffic assessment considered potential impacts on existing state-controlled roads and intersections from traffic generated prior to and during construction. A Sidra analysis[7] was further used to investigate the impact of construction traffic on the operational performance at existing intersections.

I accept that the methodology presented in the IAR is appropriate for the purpose of assessing the potential traffic impacts associated with the project.

5.7.4 Potential impacts

An increase in usage of state-controlled and local roads near the township of Cooroy and around Lake Macdonald is anticipated over the two-year project construction, particularly during the three-month peak construction period. The IAR estimates approximately 120 extra vehicle movements during both the morning and afternoon busy periods for the peak construction phase. Construction vehicle movements outside the peak three-month construction phase are estimated at approximately 51 vehicle movements for both the morning and afternoon busy times.

This increase in traffic on local roads would contribute to a range of social and environmental impacts, including the increase of dust and noise, number of construction vehicles parked on local roads, exposure to road safety risks, and changes to local traffic conditions.

During community consultation to inform the development of the IAR, concerns were raised regarding the potential reduced safety for school children along the proposed construction vehicle routes, particularly during drop-off and pick-up periods.

Cooroy State School and Tadpoles Early Learning Centre are located near the intersection of Elm Street and Lake Macdonald Drive, and three bus stops for an operating school bus route are located along Lake Macdonald Drive. The school bus operates twice a day during school terms and travels along Lake Macdonald Drive in the morning between 7:20 am and 8:05 am, and in the afternoon between 3:05 pm and 3:40 pm.

For the eastern access roads, concerns were raised regarding reduced road safety at intersections, with the Cooroy-Noosa Road and Sivyers Road intersection identified by the community as a known high-risk area for major traffic accidents. The IAR identifies six recorded crashes since 2004 based on available public road crash data. The IAR, however, concludes that project-related traffic generation would have minimal impact on the operations of intersections along the proposed construction traffic routes. All

[7] The meaning of, and requirements for, a Sidra analysis are located at https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Guide-to-Traffic-Impact-Assessment

intersections along the routes would continue to operate within acceptable limits during both morning and afternoon peak periods.

Traffic and transport related submissions received during public notification of the IAR indicated the unsuitability of the eastern access roads as a potential construction haulage route. The IAR states that the one-way loop option would potentially be the most effective when considering haulage efficiency. However, the road constraint along Gumboil Road, a two-way traffic road that narrows from 2-lane widths to 1.5-lane widths on certain sections, was identified as a safety concern to be considered.

The proponent has indicated their preference for the traffic route to be confirmed during the construction planning phase. Further, the proponent indicated that regardless of which construction vehicle route is determined as the preferred option, the use of Collwood Road from the east would be necessary at times for traffic to relocate fish during lake lowering and mobilisation and demobilisation of plant equipment to/from the site.

5.7.5 Proposed management and mitigation measures

To ensure additional project-related traffic does not result in unacceptable impacts on state-controlled and local roads, the proponent proposes controls on working hours to minimise truck haulage during peak traffic periods and school pick-up and drop-off periods. These controls will ensure the construction workforce travels to the project site prior to work commencing between 6:30 am and 7:30 am, and leaves the site between 3:30 pm and 4:30 pm, minimising the overlap with school bus operating times. I require this to be undertaken.

The proponent has also proposed the following management measures to minimise potential construction related traffic impacts:

- implement traffic control measures, including traffic controllers and additional warning signs regarding heavy vehicles, for the safe movement of all road users
- temporary truck turning signs and relocation of the existing speed zone change signs to improve safe intersection sight at the Lake Macdonald Drive and Seqwater access road intersection
- notify local communities about proposed changes to local traffic and provide clear signage of changed traffic conditions
- provide adequate on-site parking to accommodate project-related traffic or provide buses to transport workers on and off site
- implement a TMP that would incorporate management/mitigation measures proposed.

To ensure that the proponent's TMP effectively minimises and manages potential construction related traffic impacts, I have imposed a condition (Appendix 2) requiring the proponent to prepare a TMP as part of the CEMP. The TMP will supplement the proponent's management measures listed above and address community health and safety concerns raised in submissions. The TMP would be developed in accordance with DTMR and Noosa Shire Council requirements and in consultation with key stakeholders. The TMP must be approved by Council before construction starts.

5.7.6 Coordinator-General's conclusion: traffic and transport

To ensure all project-related traffic impacts are adequately managed, I have imposed a condition (Appendix 2) requiring the proponent to prepare and implement a CEMP, which also includes a TMP as an environmental management plan. The TMP is to be prepared by the proponent in consultation with Council and DTMR and is to be approved by the Council prior to commencement of project activities. The TMP is to detail how safety will be ensured – including management strategies of construction vehicle access to and from the site, parking, temporary road closures and traffic flow management.

Further, I have included a condition that the proponent must undertake a road impact assessment that confirms any road upgrade works that are required as a result of the project. This assessment is to be provided to Council for approval before construction can commence.

In consideration of the two options for construction vehicle access to the site, including road type and road condition, and in response to submitter concerns regarding safety on the eastern access roads (Sivyers Road, Gumboil Road and Collwood Road), I have imposed a condition (Appendix 2) requiring the proponent to limit site access for large construction vehicles to a single access route in and out of Lake Macdonald Drive.

I require this as I do not accept that the eastern access route is suitable for use of heavy construction haulage vehicles due to the nature and context of the roads, particularly the Sivyers-Gumboil-Collwood Roads section. As such, my conditions set that the proponent is to limit site access for construction vehicles (other than light motor vehicles and special purpose vehicles) to a single access route in and out of Lake Macdonald Drive.

I am satisfied that with the implementation of my imposed conditions, supported by the commitments and mitigation measures in the IAR, potential impacts on local and state-controlled road networks resulting from project related traffic will be managed appropriately.

5.8 Hazard and risk

5.8.1 Project activities

Project elements involving activities of potential hazard and risk include, demolition of the existing spillway; excavation; construction of the new dam, clay borrow pit, saddle dam and construction and operation of the temporary concrete batching plant.

5.8.2 Assessment methodology

The IAR presents a preliminary risk assessment undertaken for the project in accordance with *ISO 31000:2018: Risk Management.* The assessment describes and assesses potential hazards and risks associated with construction activities and natural events, with consideration given to the consequence, likelihood and outcome, should these impacts occur. Mitigation strategies are proposed in the IAR and the acceptability of potential residual risk is assessed. Additionally, the IAR outlines proposed emergency management planning procedures.

The IAR states that a number of technical aspects, such as dam safety risk assessment in accordance with ANCOLD Guidelines on Risk Assessment (2003), will be addressed through specific processes outside the scope of the IAR.

I am satisfied that the proponent's hazard and risk assessment methodology described in the IAR adequately captures and assesses potential hazards and risks at this stage of the project.

5.8.3 Submissions received

One submission was received on the IAR that raised issues regarding potential hazards and risks associated with the construction and operation of the concrete batching plant, including storage of hazardous material, plant access and emergency response procedures.

I have considered all issues raised in submissions on the IAR in my evaluation of the project.

5.8.4 Potential impacts and proposed mitigation measures

Demolition of spillway

Following the lowering of Lake Macdonald, the existing spillway will be demolished to form a construction working platform. This demolition process is expected to take around one week, with another two weeks required to establish the construction working platform and cap any exposed earthen surfaces for erosion control. The construction working platform would be at the level of the mass concrete foundations for the new spillway. The IAR identifies the timing of the demolition of the existing dam spillway as a key safety risk to the integrity of the dam structure as rainfall events causing flows may erode any exposed dam parts and foundations.

To reduce potential risk of erosion damage from uncontrolled flows during demolition, the proponent proposes to schedule demolition works during the dry season and extend working hours during the demolition process to complete this phase as quickly as possible.

Wet weather and catchment flows

The IAR identifies wet weather conditions as a high risk to the project, due to potential impacts on the construction schedule and construction efficiency.

Rainfall events during lake lowering would introduce additional water into the dam, potentially lengthening the lake lowering process and extending the construction schedule. Delays in the construction schedule would increase the duration of other construction impacts, such as impacts on aquatic ecology, water quality, noise and air quality. To minimise potential schedule delays due to wet weather, an adaptive drawdown approach is proposed, with the capacity to lower the lake from FSL to the required construction level within a two-week period. To reduce potential risk, lake drawdown and spillway demolition works are scheduled for the seasonal dry period, with extended work hours during the demolition process.

A temporary cofferdam and a low volume flow channel will contain the impounded dam water away from the construction site but still allow necessary environmental flows to pass through the construction working platform and into Six Mile Creek. During rainfall events, any inflows or flooding would pass over the cofferdam and through the low flow channel resulting in uncontrolled flows through the construction site which may pose risks to construction efficiency and water quality. To manage this, the proponent proposes to pump or install other water release infrastructure to bypass flows around the spillway construction site.

Natural hazard management

The IAR states that bushfires are not expected to pose a significant risk during construction, however contingency planning will be required as the bushland of Tewantin National Park borders the north of the project site. Construction activities are not anticipated to cause fire events, however standard fire safety measures will be required.

The IAR anticipates that flood events occurring during construction will present different flood characteristics from those with the dam structure, as a dam alters downstream flood characteristics (refer to Section 5.3). The proponent proposes to update flood notifications to appropriately reflect changes to flood characteristics during construction. Details of how the proponent will update flood notifications and inform landholders downstream will be detailed in the community and stakeholder engagement plan, that I have conditioned to form part of the SEMP. The SEMP must be submitted for approval at least two months prior to commencement of project activities.

Following the construction of the new dam, the probability of flooding within the Six Mile Creek catchment (inundation of properties within the floodplain) will not differ significantly from the existing situation. However, the new spillway will have the capacity to withstand more extreme floods, which the existing dam cannot. I consider the enhanced structural integrity of the new dam to be a benefit for the safety of communities downstream of Lake Macdonald.

Other environmental hazards

Public access to Lake Macdonald and its shoreline following lake lowering will be restricted during construction due to potential unsafe conditions from the lowered lake area exposing unconsolidated sediments and low water levels obscuring hidden obstacles.

The IAR explains that fencing and signage will be placed at all existing public access points. The signage will inform of condition changes and potential safety hazards and the fencing will restrict access to the lowered lake area.

The IAR confirms that some landowners with direct access to the lake from their property currently do not have fencing in place on their lake-side boundary. The proponent proposes to engage directly with these landowners to assess and implement options for fencing for the duration of project construction. Following project construction and lake refilling, public access will return to current (pre-construction) arrangements.

On-site storage and use of hazardous substances will occur during project demolition and construction. The IAR identifies negligible risks associated with the storage and handling of hazardous substances with all management measures to be in accordance with

national and industry standards, codes and practices. I have stated conditions (Appendix 3) specifically for the storage and management of hazardous substances, including fuel, lubricants and other chemicals, for the temporary concrete batching plant. I have also imposed a condition (Appendix 2) requiring a SEMP, which will include an environmental management plan for the safe management, storage and handling of hazardous substances on-site.

Emergency response planning

It is proposed for the existing Emergency Action Plan (EAP) for the current dam to remain in place throughout project construction. The proponent has committed that a dam safety management plan will be developed specifically for the project construction period, to operate in parallel with the EAP and address relevant changes to dam operations. These plans will feed into the planning for the Noosa Local Disaster Management Group (LDMG). The proponent is in regular contact with Noosa LDMG representatives and will continue to maintain this relationship throughout the life of the project.

Project construction activities are expected to impact the travel routes and timeframes for emergency response services. The proponent has committed to consulting with emergency services prior to commencement of construction activities in order to develop detailed emergency plans.

I have a stated condition (Appendix 3) to require a separate EMP for the temporary concrete batching plant to ensure construction and operational emergencies at the plant are appropriately managed.

5.8.5 Coordinator-General's conclusion: hazard and risk

Project aspects posing the greatest risk include demolition of the existing spillway and wet weather conditions potentially lengthening the lake lowering process, extending the construction schedule and subsequently increasing the duration of other construction impacts.

I am satisfied the proposed management measures in the IAR are adequate to safeguard against any potential health and safety impacts resulting from hazards associated with project construction. To further manage the risks of project hazards (including natural hazards), I have imposed a condition (Appendix 2) requiring the proponent to prepare a SEMP for approval to ensure the project's actual impacts are consistent with those evaluated and to manage activities holistically at the project site (i.e. including where activities would not otherwise be addressed through statutory approvals).

In response to concerns raised in a submission about hazard and risks associated with the concrete batching plant, I have stated conditions for the material change of use development permit to ensure emergency management planning and safety signage requirements are met (Appendix 3).

The requirements included in my conditions will, upon project completion, ensure enhanced safety and performance of the dam and benefit communities downstream.

5.9 Matters of national environmental significance

The IAR confirms the Commonwealth EPBC Act listed species that are known and likely to occur across the project area. The full MNES assessment under the EPBC Act in accordance with the Bilateral Agreement between the Commonwealth of Australia and the State of Queensland is found in Appendix 1.

5.9.1 Project activities

The project activities will impact on MNES protected under the EPBC Act, with construction activities proposed in the areas adjacent to Lake Macdonald Drive and the existing spillway, requiring clearing of remnant and non-remnant vegetation. To facilitate construction of the new spillway and embankments, the IAR states that it is necessary to lower Lake Macdonald by releasing water into Six Mile Creek downstream of the lake. A minimum of 7,792 ML of water would need to be removed, which equates to a temporary loss of approximately 97.2 per cent of aquatic habitat in the lake.

5.9.2 Assessment methodology

The controlling provisions for the project are listed threatened species and communities (sections 18 and 18A). The IAR describes the following methodology to support the assessment of MNES:

- desktop searches identifying MNES within the vicinity of the project area
- aquatic and terrestrial field surveys to ground-truth the likelihood of listed threatened species occurring in the project area
- assessment of the overall likelihood of occurrence of threatened species based on field survey results and desktop reviews.

I have identified two shortfalls in the assessment methodology presented in the IAR: a lack of impact assessment on: MNES habitat in Six Mile Creek, downstream of Lake Macdonald; and the proposed relocation and salvaging procedures. I have considered these shortfalls in my assessment.

5.9.3 Submissions received

Submissions received on the IAR identified the following key issues relating to MNES:

- impacts of the drawdown of Lake Macdonald on EPBC Act listed frog, fish and turtle species
- relocation and salvaging procedures for fish and turtles before and during drawdown of Lake Macdonald
- impacts on Six Mile Creek, in particular fauna habitat, water quality and sedimentation downstream of the dam.

I have considered all submissions on the IAR in my evaluation of the project.

5.9.4 Potential impacts

The IAR confirms that the project would require the clearing of up to three hectares (ha) of vegetation for construction activities including, construction access and activities, vehicle

movement and storing equipment and supplies. No EPBC Act listed threatened terrestrial species or vegetation communities were found in the proposed vegetation clearing area; however, some trees may be used intermittently by koalas, a threatened species in Queensland. Koalas were not confirmed on site during surveys. Clearing would be restricted to the northern boundaries of Lake Macdonald, which contains areas previously cleared for infrastructure.

The IAR concludes that the drawdown of Lake Macdonald to allow the replacement of the spillway and embankments would result in the disturbance and potential impacts on the following EPBC Act listed threatened species:

- *Mixophyes iterates* – giant barred frog (endangered)
- *Maccullochella mariensis* – Mary River cod (endangered)
- *Neoceratodus forsteri* – Australian lungfish (vulnerable)
- *Elusor macrurus* – Mary River turtle (endangered)
- *Elseya albagula* – white-throated snapping turtle (critically endangered).

Potential impacts on these threatened species would include:

- mortality during lake drawdown (e.g. stranding, poor water quality, predation)
- lower flow, reduced water quality and reduced oxygenation causing reduced survival of juveniles
- loss of habitat in Six Mile Creek downstream of the lake (e.g. from scour of creek beds and loss of instream vegetation/snags)
- removal of potential breeding habitat
- reduction in access to nesting banks for turtles
- potential impacts on water quality (e.g. via contamination) and sedimentation associated with construction activities.

The IAR states that potential impacts on listed threatened species would be temporary, during construction, and localised.

5.9.5 Proposed management and mitigation measures

The potential impacts on MNES from vegetation clearing would primarily be managed by minimising the area required to be cleared to areas previously cleared/disturbed and through the project's environmental management plan (IAR Appendix B) including:

- sequential clearing such that smaller non-habitat trees are removed in the first stage with larger habitat trees removed after the initial clearing, allowing fauna time to relocate
- where possible, removal of habitat trees should be conducted in a manner that maximises the chance of fauna survival, including pushing rather than cutting, and cushioning the tree fall with other felled timber and foliage
- performance criteria, and monitoring and reporting provisions for terrestrial flora
- weed management measures
- implement speed limits of 10 km per hour in the project area
- a fauna spotter-catcher must be present during all clearing activities

- clearly flagged or signed areas of vegetation to be retained to prevent access impacts to off-limit areas.

There is the potential for koalas to move onto the site and that listed threatened flora species/communities may have established since the site investigations were undertaken. I am satisfied that the project is unlikely to have a significant impact on the koala and listed threatened flora species and communities provided pre-clearing surveys are carried out, the draft EMP is updated, and the koala habitat clearing conforms with Queensland's Nature Conservation (Koala) Conservation Plan 2017. This outcome must be achieved, and I have recommended that the Commonwealth Minister for the Environment impose conditions that require pre-clearing surveys and a maximum disturbance limit for koala vegetation.

My assessment of potential impacts from the drawdown of Lake Macdonald on the five threatened species discussed above identified two key shortfalls in the assessment methodology presented in the IAR. To address these shortfalls, I have recommended to the Commonwealth Minister for the Environment that approval of the project under section 133 of the EPBC Act be conditional on:

- the requirement for a Six Mile Creek Baseline Data Collection and Monitoring Plan, involving pre-drawdown baseline habitat and water quality surveys at key habitat sites
- updated management plans that include monitoring the impacts of lake drawdown on these threatened species and their habitat in the lake and downstream in Six Mile Creek and mechanisms that would inform the rate of water release.

Impacts on the giant barred frog, Mary River cod, Australian lungfish, Mary River turtle and white-throated snapping turtle would be minimised through a range of proposed mitigation measures, including but not limited to:

- controlled and gradual release of water to Six Mile Creek outside the breeding season and not exceeding bankfull height
- salvage, relocation of the Mary River cod, the Australian lungfish, the Mary River turtle and the white-throated snapping turtle
- implementation of an erosion and sediment control plan
- screens to prevent aquatic fauna from being injured or trapped by pumping equipment
- supplemental flows to Six Mile Creek if necessary for environmental flow requirements
- inspections of bank disturbance
- rehabilitation of disturbed species habitat in Lake Macdonald and downstream in Six Mile Creek
- regular water quality monitoring
- spillway and plunge pool design to minimise impacts on MNES (e.g. from abrasion and fall impacts when they travel over the spillway in high flow situations)
- Lake Macdonald restocking program of the Mary River cod.

The IAR concludes that the proposed mitigation measures would minimise the potential for significant impacts on MNES. I have recommended that the Commonwealth Minister for the Environment impose conditions to ensure the proposed mitigation and management measures are carried out, with recommended conditions for the

management of water quality and for the salvage and relocation of the Mary River cod, the Australian lungfish, the Mary River turtle and the white-throated snapping turtle.

5.9.6 Coordinator-General's conclusion: matters of national environmental significance

The IAR concludes that impacts on MNES would be temporary, during construction, localised and would be minimised following implementation of the mitigation and management measures. I support the proposed mitigation and management measures and provided these are updated (as proposed) and implemented I am satisfied that the proposed project is unlikely to have a significant impact on EPBC Act listed threatened species and communities.

My full conclusion and recommended conditions to the Commonwealth Minister for the Environment, which will ensure that the appropriate mitigation measures are implemented, are presented in Appendix 4.

It is to be noted that the recommendations I have made to the Commonwealth Minister for management plans to be updated also reflects conditions that I have imposed (Appendix 2) for an adaptive management plan that addresses impacts to aquatic and terrestrial flora and fauna more broadly. There is the potential for these plans to overlap in both their management approaches and outcomes (noting that the recommended conditions to the Commonwealth Minister for the Environment relate to MNES matters only). Consequently, I recommend that when updating the managements plans, the proponent consult simultaneously with the Commonwealth and relevant state departments.

6. Conclusion

In undertaking my evaluation of the Six Mile Creek Dam Safety Upgrade project IAR, I have considered the following:

- the draft IAR and supplementary report prepared for the project
- the issues raised in submissions during the public consultation period
- the agency advice received from relevant Commonwealth, state and local government agencies.

I am satisfied that the requirements of the SDPWO Act have been met and that sufficient information has been provided to enable the evaluation of potential impacts, and to inform the development of mitigation strategies and conditions of approval.

I have assessed and considered the potential impacts identified in the IAR documentation and all submissions. I consider that the mitigation measures, all commitments and the conditions stated in this report will result in acceptable overall outcomes.

Accordingly, I approve that the Six Mile Creek Dam Safety Upgrade project proceed, subject to the conditions in Appendix 2 and Appendix 3 and the recommendations in Appendix 5. In addition, I require the proponent's commitments to be fully implemented as presented in the IAR documentation and summarised in Appendix 6 of this report.

To proceed further, the proponent will be required to obtain the following key approvals prior to project commencement:

- EPBC Act approval of controlled action
- an EA for ERA162(a) for extractive dredging and screening (clay borrow pit) under the EP Act
- development permit for (operational works) waterway barrier works under the Planning Act and *Fisheries Act 1994*
- material change of use for 'other use' (concrete batching) under The Noosa Plan.

If there are any inconsistencies between the project (as described in the IAR documentation) and the conditions in this report, the conditions shall prevail. The proponent must implement all the conditions of this report.

Section 5.9 and Appendix 1 of this report describe the extent to which the material supplied by the proponent addresses the actual or likely impacts on MNES of each controlled action for the project.

Copies of this report will be issued to:

- DEE
- DES
- DAF
- DNRME
- Noosa Shire Council.

A copy of this report will also be available on the DSDMIP website at www.dsdmip.qld.gov.au/sixmilecreek.

This report will generally lapse four years from the date it is published on the department's website, or when an approval application is decided for the project, unless a later time is subsequently decided by the Coordinator-General.

Appendix 1. Matters of national environmental significance

This appendix to the Coordinator-General's Evaluation Report (evaluation report) addresses the potential impacts on matters of national environmental significance (MNES) for the Six Mile Creek Dam Safety Upgrade project (the project).

On 18 October 2017, the proponent referred the project to the Commonwealth Minister for the Environment (EPBC 2017/8078) for consideration as a controlled action under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

On 6 December 2017, the Commonwealth Minister determined the project to be a controlled action. The relevant controlling provisions for this project under the EPBC Act are sections 18 and 18A, listed threatened species and communities.

The potential impacts of the project on the controlling provisions were assessed through the Impact Assessment Report (IAR) process under Part 4 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) which has been accredited for the assessment under the EPBC Act in accordance with the Bilateral Agreement between the Commonwealth of Australia and the State of Queensland (2014).

This information will assist the Commonwealth Minister to make an informed decision regarding the potential impacts on MNES for the project and the recommended conditions that might apply to any approval under section 133 of the EPBC Act.

The following subsections summarise the Queensland Government's assessment of the project against the controlling provisions identified above.

Project activities

The IAR states that the project involves removing and replacing Six Mile Creek Dam (that retains the waters of Lake Macdonald) with a new structure to improve the safety and performance of the dam to meet current Queensland dam safety regulations.

Lake Macdonald is located on Six Mile Creek, approximately 10 kilometres (km) from the centre of Cooroy in the Noosa hinterland, in South East Queensland (Figure A1). Lake Macdonald is primarily a water storage facility with no flood mitigation function, which is also used as a recreation facility by the community. The capacity of the dam is 8,018 megalitres (ML) at a full supply level of 95.32 metres (m) Australian Height Datum, with an existing impoundment area of approximately 260 hectares (ha) at full supply level. The capacity and inundation area of the proposed dam will remain the same as the current dam after the project is completed.

The project involves the following key activities:

- lowering of the lake waters in preparation for demolition and construction
- demolition of the existing spillway and embankments
- installation of a temporary sheet pile cofferdam in the upstream dam embankment and then construction of a working platform within the area of the existing spillway
- construction of a new mass filled concrete spillway and embankments.

Most construction activities are proposed in the areas adjacent to Lake Macdonald Drive and around the existing spillway, requiring clearing of remnant and non-remnant vegetation.

Drawdown of Lake Macdonald

To facilitate construction of the new spillway and embankments, the IAR states that it is necessary to lower Lake Macdonald before the project construction begins by releasing water into Six Mile Creek downstream of the lake.

Water in Lake Macdonald would be lowered for up to two months during construction of a temporary cofferdam and demolition of the existing spillway. The cofferdam would then maintain the maximum water level for 16 to 24 months during construction of the new spillway and embankments. The IAR states that assuming Lake Macdonald is full at the time water lowering begins, a minimum of 7,792 ML (from a total of 8,018 ML at full supply level) of water would need to be removed, which equates to a temporary loss of approximately 97.2 per cent of aquatic habitat in the lake.

The IAR states that the drawdown of the lake could theoretically occur in a period as short as eight to 10 days, assuming a maximum lowering capacity of 864 ML per day and no inflows. The key issues identified in the IAR associated with rapid drawdown would be the concentration of aquatic fauna into reduced habitat with potentially reduced water quality, stranding of fauna in isolated pools, and the rate of exposure of the lake bed (erosion/water quality). For this reason, the IAR Lake Macdonald Water Lowering Adaptive Management Plan (IAR Appendix C) proposes to lower the lake over a three-month period, ranging from 10 to 264 ML per day depending on inflow rates (IAR Appendix C, Table C.2-1). However, the Lake Macdonald Water Lowering Adaptive Management Plan also states that the project would require an adaptive approach to drawdown methodology as inflows could be unpredictable. Hence, the IAR does not exclude the possibility of lowering the lake over a 10-day period (864 ML per day) if required.

Water releases from Lake Macdonald would be undertaken using mechanical equipment such as pumps and/or siphons. The release points for drawdown flows would be installed at an appropriate discharge location with appropriate energy dissipation to minimise bed and bank erosion.

Aquatic fauna salvage and relocation

The Lake Macdonald Water Lowering Adaptive Management Plan contained in Appendix C of the IAR includes an aquatic fauna salvage and relocation plan. Salvage of the Australian lungfish, Mary River cod, Mary River turtle, and white-throated snapping turtle (but not the giant barred frog) would be performed by suitably qualified personnel.

The IAR states that the giant barred frog is expected to relocate in response to changing water levels and return once the project is complete and the lake refills. Prior to the lake drawdown commencing, targeted field surveys would be undertaken in Lake Macdonald with a focus on the upper reaches to assess the presence of key species, and at proposed relocation sites to assess their suitability and carrying capacity. The proposed salvage operation during lake drawdown focuses on MNES species, including large bodied fish and turtle species. The aquatic fauna salvage operation would be undertaken in accordance with the Department of Agriculture and Fisheries (DAF) Fish Salvage Guidelines (DPI 2004) ensuring sorting to remove pest fish before relocation. Any pest fish caught would be euthanised using ethics committee-approved methods and disposed of appropriately.

Assessment methodology

Scope of work

On 15 May 2018, the scope of work for assessing MNES was agreed between the Department of the Environment and Energy (DEE), the Coordinator-General and the proponent. The IAR scope of

works includes provision of detailed assessment of potential impacts on the following listed threatened species for the proposed action:

- *Mixophyes iterates* – giant barred frog (endangered)
- *Maccullochella mariensis* – Mary River cod (endangered)
- *Neoceratodus forsteri* – Australian lungfish (vulnerable)
- *Elusor macrurus* – Mary River turtle (endangered)
- *Elseya albagula* – white-throated snapping turtle (critically endangered).

The potential impacts addressed include:

- changes in hydrology affecting the availability of habitat for species
- water temperature changes affecting breeding conditions
- impacts on water quality from sedimentation, potential acid sulfate soils and the introduction of weeds.

Where additional listed threatened species or ecological communities are identified during surveys as occurring or having the potential to occur, it was also agreed that the IAR must provide a detailed assessment of potential impacts on these species.

For each relevant matter protected under the EPBC Act, there must be consideration as to whether any significant residual impacts exist after the proposed avoidance and mitigation measures are considered. The significant residual impacts must be assessed in accordance with the EPBC Act Environmental Offsets Policy.

Assessment of impact significance

The IAR describes the following methodology to support the assessment of MNES:

- a desktop search of the EPBC Act Protected Matters Search Tool and Queensland Government online database searches identifying potential species, communities and areas of known conservation significance within the vicinity of the project area
- a desktop assessment of habitat requirements for the species identified during the desktop search to determine the likelihood of occurrence based on the availability of habitat and key habitat features. The likelihood of occurrence for species was assigned one of the following categories: nil; low; moderate; high
- field surveys were undertaken to ground-truth the likelihood of listed threatened species occurring in the project area that targeted potential habitats of threatened species considered likely to be present
- terrestrial flora and fauna field surveys were conducted between 12 and 16 February 2018. The survey area and the terrestrial ecology field sites are shown in Figure A2 and Figure A3. The IAR notes that during the survey week:
  - weather conditions were hot and humid, with patchy evening thunderstorms each day
  - temperatures in the 11 days before the survey had been cooler, with a total rainfall of 134.2 millimetres during this time. The survey area therefore contained standing water suitable for the identification of fauna groups, such as frogs, which rely on rainfall
  - the timing was also optimal for detection of migratory birds
- aquatic ecology surveys were conducted in August 2015, October 2015 and February 2018, and incorporated sampling of fish, macroinvertebrates, aquatic plants, and water quality, as well as an assessment of the habitat condition. A total of 13 sites on Six Mile Creek and two sites on Lake Macdonald were sampled, with three sites on the Mary River also surveyed to provide comparative information (Figure A4)
- an assessment of the overall likelihood of occurrence of threatened species was then undertaken based on field survey results (e.g. found during surveys or availability of suitable habitat) and known occurrence through literature reviews.

In conclusion, the abovementioned methodology is generally acceptable, with identified gaps discussed in detail in the Significant impact assessment section of this report.

Occurrence of MNES

This section summarises the matters occurring or likely to occur within the project area based on the findings of the IAR assessment.

Listed threatened terrestrial flora species

The assessment of MNES in the IAR states that the EPBC Act protected matters search identified 19 flora species with the potential for the species or species habitat to occur within 10 km of the project area.

Terrestrial flora surveys in February 2018 specifically targeted potential habitats of threatened species considered likely to be present. Following field surveys, a likelihood of occurrence assessment was undertaken for all threatened species listed in the search results. Of these, eight flora species were determined to have a moderate or high likelihood of occurrence within the project area.

No listed threatened flora species were found within the project area during field surveys. However, database searches identified the southern penda (*Xanthostemon oppositifolius*), listed as vulnerable under the EPBC Act, in the surrounding area. The closest was a record of an individual on the eastern side of Six Mile Creek, downstream of the spillway and approximately one kilometre of the project area. The IAR states that extensive targeted survey in this area did not identify any southern penda, but that it is assumed that a limited number of specimens may be present in this area. The location of the single record suggests that the specimen is probably from Tewantin National Park, north of the project area. The other known records of this species from database searches are generally to the east of the dam and appear to be on private property.

Listed threatened terrestrial fauna species

The EPBC Act protected matters search identified 53 fauna species with the potential for the species or species habitat to occur within 10 km of the project area. Of the 53 listed threatened terrestrial species, 29 species were determined in the IAR to have a moderate or high likelihood of occurrence within the project area. Only one species listed under the EPBC Act was found during field surveys:

- *Mixophyes iterates* – giant barred frog (endangered).

Giant barred frogs were heard calling at Six Mile Creek (Site 1; Figure A2) and a single juvenile was observed downstream of the dam (Site 2; Figure A2). The IAR states that the Six Mile Creek downstream of Lake Macdonald appears to be suitable habitat for this species, although the field survey results suggest a low population density. A significant impact assessment against the EPBC criteria has therefore been undertaken for the giant barred frog below (significant impact assessment section).

Listed threatened aquatic fauna species

Two threatened fish species and two threatened reptile species listed under the EPBC Act have the potential to occur in Six Mile Creek and Lake Macdonald:

- *Maccullochella mariensis* – Mary River cod (endangered)
- *Neoceratodus forsteri* – Australian lungfish (vulnerable)
- *Elusor macrurus* – Mary River turtle (endangered)
- *Elseya albagula* – white-throated snapping turtle (critically endangered).

Field surveys confirmed the presence of Mary River cod and Australian lungfish in Six Mile Creek downstream of Lake Macdonald. The IAR states that the Mary River cod is known to breed in Six Mile Creek downstream of Lake Macdonald, and it also occurs in the lake and upstream in Six Mile

Creek due to a fish stocking program. Australian lungfish may occur in or upstream of the lake but are unlikely to be breeding as (identified in the IAR) the habitat is considered unsuitable.

The Mary River turtle and the white-throated snapping turtle were not caught during field surveys and the IAR assessment considers them unlikely to occur. The protected matters search did not predict these species to occur within 10 km of the study area and there are no locality records of the species in the study area. However, the IAR states that there is the potential for the Mary River turtle and the white-throated snapping turtle to occur in the lower reaches of Six Mile Creek.

Listed threatened ecological communities

The IAR states that the protected matters search identified one listed threatened ecological community (TEC) as occurring within 10 km of the project area, namely the lowland rainforest of subtropical Australia (critically endangered under the EPBC Act).

Lowland rainforest of subtropical Australia occurs between Maryborough in Queensland to the Clarence River in New South Wales on basalt and alluvial soils. It generally occurs below 300 m sea level, where rainfall is higher. Hence, the IAR concludes that the project area is within the geographical range of this TEC and is below the maximum elevation at which this community occurs. The listing advice notes this TEC as being equivalent to (Queensland) regional ecosystem (RE) 12.3.1.

The IAR states that RE 12.3.1 was recorded in the project area but was not present in the proposed project construction area and would not, therefore, be directly impacted by the project. None of the REs in the proposed project construction area are listed as equivalent to the lowland rainforest TEC.

Potential impacts

This section provides an overview of the potential impacts identified in the IAR. The IAR concludes that the project would result in the disturbance and potential loss of habitat for the giant barred frog, Mary River cod, Australian lungfish, Mary River turtle and white-throated snapping turtle. Potential impacts may include:

- direct mortality during dam drawdown
- fragmentation of preferred habitat
- obstruction of migration due to lower dam conditions
- injury and mortality at impoundment structures
- lower flow, reduced water quality and reduced oxygenation causing reduced survival of juveniles
- loss of habitat through direct removal and decline in water quality
- reduction in access to nesting banks, breeding partners and habitat for juvenile turtles
- removal of potential breeding habitat
- potential impacts on water quality: increasing turbidity and total suspended solids via disturbance of bed sediments and/or the erosion of bed and banks; reduced pH and dissolved oxygen; increased nutrient concentrations; contaminating water if there are spills of fuels, oils or other chemicals from pumping equipment or other machinery/vehicles.

However, the IAR states that potential impacts on MNES would be temporary and localised and are expected to be minimal providing the mitigation and management measures are implemented (refer to the Significant impact assessment section below for proposed mitigation measures for each MNES). The IAR also concludes that there would be no impacts on the southern penda and the koala. No acid sulfate soils were found in the project area.

Significant impact assessment

This section provides my evaluation of the proponent's significant impact assessment on the controlling provisions (outlined in the Occurrence of MNES section) against the Commonwealth Department of Environment and Energy's (DEE) species profile and threats database information (SPRAT), departmental and specialist advice (e.g. recovery plans), and information provided in the IAR. This evaluation also takes into account comments made in submissions on the draft IAR in regard to MNES by the following departments:

- DEE
- Department of Environment and Science (DES)
- Department of Agriculture and Fisheries (DAF).

The following information is prepared for the Commonwealth Minister for the Environment to provide appropriate information to help the Minister make informed decisions regarding potential significant impacts on MNES from the proposed project activities.

Southern penda (*Xanthostemon oppositifolius*)

EPBC Act legal status and documents

- **EPBC Act listing**: the southern penda is listed as vulnerable.
- **Approved conservation advice**: Department of the Environment, Water, Heritage and the Arts (2008). *Approved Conservation Advice for Xanthostemon oppositifolius (Penda)*. Canberra: Department of the Environment, Water, Heritage and the Arts.
- **Existing recovery plan**: A recovery plan is not required and included on the 'Not Commenced List' (1/11/2009).
- **Adopted/made threat abatement plans**: No Threat Abatement Plan has been identified as being relevant for this species.

Ecology

The southern penda is a tall rainforest tree that grows to 40 m. It is known to grow within various vine forests (including RE 12.3.1; TEC lowland rainforest of subtropical Australia) with the emergence of hoop pine or in rainforests where species are restricted to understorey or mid-storey development. The species is generally associated with watercourses on sedimentary rock and derived sandy clays (SPRAT; DEE 2019[8]).

Species distribution

The species range covers approximately 250 km and is known to occur in three general localities across south-east Queensland (SPRAT; DEE 2019).

Populations within the project area

The IAR states that the closest database record of this species to the project area was on the eastern side of Six Mile Creek downstream of the spillway and within one kilometre of the project area. Extensive targeted field surveys in this area could not locate this individual but the IAR assumes the species is likely to be present in Tewantin National Park. Tewantin National Park is located directly north of the project area (Figure A1).

[8] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=8738

Current threats to the species

Current threats to the southern penda include the loss and fragmentation of habitat through land clearing for agriculture and timber harvesting, weed encroachment, fire, and grazing.

Approved conservation advice

Key conservation actions outlined in the approved conservation advice relevant to the proposed project include:

- ensure road widening and maintenance activities (or other infrastructure or development activities as appropriate) in areas where southern penda occurs do not adversely impact on known populations
- develop and implement a management plan for the control of lantana in the region
- ensure chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on the southern penda
- manage sites to prevent introduction of invasive weeds, which could become a threat to the southern penda, using appropriate methods.

Impacts

The project would require the clearing of 3 ha of vegetation (Figure A5). Of this, approximately 1.1 ha of riverine wetland or fringing riverine wetlands (RE 12.3.2) that is potential habitat for the southern penda, would be removed during construction of the project. However, the IAR concludes that targeted searches for the southern penda did not locate any individuals within the project area.

The IAR states that while the southern penda is associated with vine forests, including the TEC lowland rainforest of subtropical Australia, no individuals were found within the project area and its preferential habitat would not be disturbed. No critical habitat would be removed, hence the area of occupancy for an important population of the southern penda would not be reduced. The IAR concludes that the proposed project is unlikely to have a significant impact on the southern penda.

The IAR states that there are no national, state or local formal strategies or management plans in place for priority actions to help recover the southern penda.

Mitigation

To reduce potential impacts on the southern penda, the following mitigation measures were outlined in the IAR:

- construction works areas utilise previously cleared and disturbed land to the greatest extent possible, thereby minimising the removal of remnant vegetation
- areas of vegetation to be retained be clearly flagged or signed to prevent construction access
- weed management measures be implemented throughout construction and operation of the Six Mile Creek dam
- implementation of an environmental management plan; including performance criteria, and monitoring and reporting provisions, for terrestrial flora
- preferentially select non-remnant vegetation over remnant vegetation for clearing.

Coordinator-General's conclusion

I am satisfied that the proposed project is unlikely to have a significant impact on listed threatened flora species, including the southern penda. Nevertheless, I recommend that pre-clearing surveys for listed threatened species and ecological communities should be undertaken to identify and manage any listed threatened plants that may be present (e.g. as a result of recruitment to the area) in the clearing footprint. My full conclusion, including recommendations for conditions, is found in the Coordinator-General's overall conclusion section of this report.

Koala (*Phascolarctos cinereus*) combined populations of Queensland, New South Wales and the Australian Capital Territory)

EPBC Act legal status and documents

- **EPBC Act listing**: the koala is listed as vulnerable.
- **Approved conservation advice**: Department of Sustainability, Environment, Water, Population and Communities (2012). *Approved Conservation Advice for* Phascolarctos cinereus *(combined populations in Queensland, New South Wales and the Australian Capital Territory)*.
- **Existing recovery plan**: Recovery Plan required; a recovery plan for the koala will be developed and is to commence following the expiration of the National Koala Conservation and Management Strategy in 2014.
- **Adopted/made threat abatement plans**: No Threat Abatement Plan has been identified as being relevant for this species.
- **Policy statements or guidelines**: EPBC Act referral guidelines for the vulnerable koala. Department of the Environment (2014).

Ecology

The koala inhabits a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by eucalypt species, and are also known to occur in modified or regenerating native vegetation communities, including urban and rural landscapes. Koala habitat can be broadly defined as any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. Shelter trees (non-food trees) also play an essential role in thermoregulation of koalas. Home ranges are estimated to be 20 ha for males and 10 ha for females, and the maximum dispersal for adult koalas is approximately 10 km. Home ranges of individuals can overlap (SPRAT; DEE 2019[9]).

Species distribution

The biological species range extends from north-eastern Queensland to the south-east corner of South Australia. In Queensland the highest density of the koala population occurs in south-east Queensland. However, populations in south-east Queensland have declined up to 65 per cent since 1999 (SPRAT; DEE 2019).

Populations within the project area

The IAR states that no koalas were observed within the study area during the field survey. However, the IAR also notes that koalas have been recorded within 10 km of the study area, to the east within Tewantin National Park. The field surveys carried out as part of the IAR identified preferred feed trees, such as swamp mahogany, forest red gum and tallowwood in the study area, including secondary food trees.

Database searches (e.g. Queensland Government's WildNet) show koala records throughout and surrounding the Tewantin National Park. No koalas were found during the field surveys, however it can be assumed that koalas could occasionally occur in the project area, although the project does not represent koala core habitat.

Current threats to the species

Habitat loss and fragmentation are currently the largest threats to koala populations. Dog attacks and vehicle strikes connected to urban expansion are also large contributors to the decline of koala populations (DEE 2019).

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[9] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=85104

Approved conservation advice

The key conservation action outlined in the approved conservation advice relevant to the proposed project requires that development plans should explicitly address ways to mitigate risk of vehicle strike when development occurs adjacent to, or within, koala habitat.

Impacts

The IAR states that a maximum of 3 ha of vegetation would be cleared for the project. This clearing is restricted to the northern boundaries of Lake Macdonald and includes areas previously cleared for existing infrastructure, such as the existing spillway (Figure A5). The proponent completed a koala habitat assessment in accordance with the EPBC Act referral guidelines and determined that the project area contains koala habitat critical to the survival of the koala.

The IAR concludes that while the koala habitat assessment tool indicates that the project area includes habitat critical to koala survival, the area to be cleared borders an already highly modified environment and no evidence of koalas was found during the field survey. As such, the IAR considers that the project is unlikely to adversely affect habitat critical to the survival of koalas, and the proposed project is unlikely to have a significant impact on koalas.

Mitigation

To reduce potential impacts on the koala, the following mitigation measures are outlined in the IAR:

- within the site induction plan/procedure, site personnel should be educated on how to recognise the physical attributes of species protected under the EPBC Act and to 'Stop, Manage and Notify' when encountered
- construction should be restricted to the project area
- implement the draft Environmental Management Plan (IAR Appendix B)
- a pre-clearing survey must be conducted by a suitably qualified person to identify possible species protected under the EPBC Act. If koalas are present, they should be allowed to move on of their own accord before clearing
- a fauna spotter-catcher must be present during all clearing activities
- implement speed limits of 10 km per hour in the project area during construction to allow animals to move out of the way and drivers to have the ability to safely stop if an animal is identified within the vehicle path
- where possible, it is recommended that preserved trees be selected based on koala habitat suitability and retained throughout the construction process. For example, selecting trees to clear that are not non-juvenile koala habitat trees
- sequential clearing must be undertaken such that smaller non-habitat trees are removed in the first stage with larger habitat trees removed three to five days after the initial clearing, allowing fauna time to relocate as required under the Nature Conservation (Koala) Conservation Plan 2017
- habitat trees must be identified by a fauna spotter-catcher with flagging tape or similar before clearing operations begin
- where possible, removal of habitat trees should be conducted in a manner that maximises the chance of fauna survival, including pushing rather than cutting, and cushioning the tree fall with other felled timber and foliage.

Coordinator-General's conclusion

I am satisfied that the proposed project is unlikely to have a significant impact on the koala population provided pre-clearing surveys for listed threatened species and ecological communities are carried out, the draft Environmental Management Plan (IAR Appendix B) is updated to specify koala mitigation measures, and that koala habitat clearing conforms with Queensland's Nature Conservation (Koala) Conservation Plan 2017. Further, the Species Management Plan (IAR

Appendix E) must be updated to include a specific management plan for the koala, including procedures required if a koala is encountered during vegetation clearing. Additionally, I have imposed a condition (Appendix 2 of the evaluation report) requiring the proponent to provide a flora and fauna management plan as part of the site environmental management plan (SEMP), to include the koala, including outlining procedures to be followed should a koala be encountered during vegetation clearing. My full conclusion, including recommendations for conditions, are found in the Coordinator-General's overall conclusion section of this report.

Giant barred frog (*Mixophyes iterates*)

EPBC Act legal status and documents

- **EPBC Act listing**: the giant barred frog is listed as endangered.
- **Approved conservation advice**: Threatened Species Scientific Committee (2017). *Conservation Advice* Mixophyes iteratus *(giant barred frog, southern barred frog)*. Canberra: Department of the Environment and Energy.
- **Existing recovery plan**: Hines, H.B. & the South-east Queensland Threatened Frogs Recovery Team (2002). *Recovery plan for Stream Frogs of South-east Queensland 2001-2005*. Report to Environment Australia, Canberra. Queensland Parks and Wildlife Service, Brisbane.
- **Adopted/made threat abatement plans**:
  - *Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis* (2016). Canberra, ACT: Commonwealth of Australia.
  - *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)* (2017). Canberra, ACT: Commonwealth of Australia.
- **Policy statements or guidelines**: *Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the EPBC Act*. Department of the Environment, Water, Heritage and the Arts (2010).

Ecology

This species can occur in upland and lowland rainforest, wet sclerophyll forest and occasionally adjacent farmland. Moist riparian habitats are often favoured for deep leaf litter that provide shelter and foraging. Spatial movements of giant barred frogs are limited. Individuals have been recorded to move a maximum of 268 m downstream and 50 m away from the stream (SPRAT; DEE 2019[10]).

The IAR describes the giant barred frog as a generalist feeder, with large insects, snails, spiders and frogs included in their diet. Giant barred frogs breed in late spring and summer, and are heavily influenced by weather events, during which females kick the fertilised eggs onto a suitable bank where they can stick. Hatchlings then drop or wriggle into the water. The full life cycle from egg to completion of metamorphosis can take up to 14 months.

Distribution

The giant barred frog is currently known to occur in mid to low altitudes below 610 m above sea level, ranging from Maryborough (Queensland) to the Blue Mountains (New South Wales). In Queensland, the giant barred frog population declined and disappeared from at least two streams in the nearby Conondale Range, as well as in the Bunya Mountains and Cunningham's Gap. Assessing the extent of the known decline of the giant barred frog is difficult because of the lack of baseline distribution and abundance data. Populations of the giant barred frog exist in small, isolated patches of forest and the effect that this may have on genetic variation within populations, the general health of individuals and the species' response to identified threats is unknown (SPRAT, DEE 2019).

[10] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1944

Populations within the project area

During field surveys, giant barred frogs were found in Six Mile Creek directly downstream of the existing dam, a location also described as potential breeding habitat for this frog (Figure A6).

Current threats to the species

DEE (2019) lists upstream clearing, changes in water flow regimes, degradation of water quality, disturbance to riparian vegetation, feral animals, domestic stock and weed invasion as potential threats to the giant barred frog. Disturbance to riparian vegetation is particularly important as many populations in south-east Queensland occur along narrow remnant riparian vegetation on private lands which are readily exposed to such disturbances. Further, the greatest impact is likely to be from increased silt on embryos and tadpoles.

Chytridiomycosis, a disease caused by infection with the chytrid fungus (*Batrachochytrium dendrobatidis*), has been identified in giant barred frog individuals. The role played by chytrid fungus in the decline of the species is addressed in the species recovery plan.

Approved conservation advice

Key conservation actions outlined in the approved conservation advice and recovery plan relevant to the proposed project include:

- developing protocols addressing frog handling and contingency planning
- developing prescriptions for effective habitat protection and management
- maintaining and restoring riparian vegetation should be encouraged to benefit the catchment, stream flows and water quality, including monitoring erosion and land clearing events upstream of existing and potential sites, preventing clearing and erosion at known sites, and implementing the rehabilitation of riparian vegetation at all sites
- minimising the spread of the chytrid fungus by implementing suitable hygiene protocols as described in the threat abatement plan for infection of amphibians with chytrid fungus.

Impacts

The IAR identifies increased water flow and sediment transport through Six Mile Creek during the lake drawdown as a localised and temporary impact on the population of giant barred frogs downstream of the dam. The IAR concludes that the drawdown process would be gradual over a period of three months, allowing the frogs to relocate if needed. Releases would not exceed bankfull height (i.e. within the existing flood regime), and it is unlikely that the project would lead to a long term decrease in the size of the existing population. The IAR further states that the giant barred frogs would temporarily move higher up the bank to account for the changing water levels. Giant barred frogs are known to move up to 50 m from the water's edge and would have experienced flood events in Six Mile Creek previously. The lake drawdown process is proposed to occur outside the giant barred frog's breeding season, hence, the IAR concludes that the project would not disrupt the breeding cycle of the local population.

It is likely that the lake drawdown process would temporarily modify, isolate or decrease the availability and quality of aquatic habitat used by the giant barred frog. However, the IAR states that this would not lead to a long term, permanent decline in the population, as the water level of the lake, and therefore the current flow regime in Six Mile Creek, would be restored to pre-existing conditions after the project is complete. In addition, environmental flows would be maintained during the project.

The IAR concludes that due to only a localised and temporary decrease in habitat, it is unlikely that the proposed project would interfere with the objectives mentioned in the *National recovery plan for Stream Frogs of South-east Queensland 2001-2005*. The IAR further states that the proposed project is unlikely to have a significant impact on giant barred frog.

Mitigation

No relocation of giant barred frogs is planned. To reduce potential impacts on the giant barred frog, the following mitigation measures were proposed in Chapter 5 (Matters of National Environmental Significance), Appendix B (draft Environmental Management Plan) and Appendix E (Species Management Plan) of the IAR:

- reduce bank degradation, riparian vegetation loss and habitat loss by facilitating a drawdown program that mimics the natural flow regime of Six Mile Creek
- plan a drawdown program outside breeding season (September to November)
- where possible, construction should be avoided on creek and dam banks with dense overhanging riparian vegetation to retain suitable breeding places
- undertake a gradual drawdown of Lake Macdonald and control the release of water during drawdown and construction to minimise sudden changes in flow in Six Mile Creek
- implement erosion control in Six Mile Creek downstream of the dam if required
- within the site induction plan/procedure, site personnel should be educated on how to recognise the physical attributes of threatened fauna species (including their burrows) protected under the EPBC Act that may occur in the project area, and to 'Stop, Manage and Notify' when encountered
- construction should be restricted to the project area
- location of stockpiles should not be placed in natural drainage areas
- designated stockpile areas should be accurately identified and communicated to all site personnel
- avoid disturbance of key habitat for the giant barred frog (i.e. vegetated riparian strips) by constraining project area to that identified in the IAR Chapter 5, Figure 5-2
- all temporarily disturbed land would be rehabilitated to achieve stable and sustainable soil cover and minimise sediment run off
- the construction site should be re-profiled to original or stable contours, re-establishing surface drainage lines and other features to prevent slumping and erosion
- temporary erosion control measures should be left in place until bare soil has stabilised. Stabilise exposed soils by using materials such as mulch, biodegradable matting, geotextile fabrics, and/or soil stabilisation products
- water quality monitoring should be conducted by qualified personnel or, where automated instrumentation is used, it is installed, calibrated and maintained by qualified personnel
- implement an environmental management plan that addresses biosecurity risks
- any plant and equipment brought onto site should comply with Biosecurity Queensland's Vehicle and Machinery Inspection Procedure
- following drawdown of the dam, install cane toad traps in areas of pooling within Lake Macdonald to minimise increased prevalence of cane toads due to the change in lake environment
- monitor the extent of introduced plant and fauna species weekly
- use only the minimum amount of lighting needed for safety and, where possible, utilise lighting that does not attract insects, avoid the use of naked bulbs, and use narrow spectrum bulbs
- all bright lights should be positioned as close to the ground as practical and shielded to minimise light spill towards any surrounding habitat patches
- where possible, use motion sensor lights to only illuminate areas in use
- no bank disturbance should be undertaken until a suitably qualified person has checked the banks for threatened fauna and fauna burrows in the direct construction area, and salvaged individuals and/or eggs
- prevent bank degradation as a result of scouring by managing drawdown rates.

Coordinator-General's conclusion

The IAR impact assessment on the giant barred frog lacked an evaluation of the potential impacts should the water be released above the proposed maximum of 264 megalitres per day. The giant barred frog was found downstream of the dam, close to the spillway. The release of water could have a higher impact on these frog populations due to the localised scour effect, turbidity and decrease of water quality. Also, limited contingency measures were proposed for a potential rapid drawdown. Consequently, increasing the flow rate to drawdown the lake within a short timeframe could have unacceptable impacts on the MNES without appropriate avoidance and mitigation measures and contingency plans.

I have recommended conditions to the Commonwealth Minister of the Environment to ensure the protection of giant barred frog habitat (Appendix 4 of the evaluation report). Conditions include the requirement for a *Six Mile Creek Baseline Data Collection and Monitoring Plan*, involving pre-drawdown baseline habitat and water quality surveys at key habitat sites. Additionally, I have imposed a condition requiring the proponent to provide a SEMP to incorporate any new findings. The SEMP must include a flora and fauna management plan. My full conclusion, including recommendations for conditions, are found in the Coordinator-General's overall conclusion section of this report.

Mary River cod (*Maccullochella mariensis*)

EPBC Act legal status and documents

- **EPBC Act listing**: the Mary River cod is listed as endangered.
- **Approved conservation advice**: Threatened Species Scientific Committee (2016). *Conservation Advice* Maccullochella mariensis *Mary River cod*. Canberra: Department of the Environment and Energy.
- **Existing recovery plan**: Simpson, R. & P. Jackson (1996). *The Mary River Cod Research and Recovery Plan*. Queensland Department of Primary Industries – Fisheries Group.
- **Adopted/made threat abatement plans**: No Threat Abatement Plan has been identified as being relevant for this species.
- **Policy statements or guidelines**:
  - *Survey guidelines for Australia's threatened fish. EPBC Act survey guidelines 6.4*. Department of Sustainability, Environment, Water, Population and Communities (2011).
  - *EPBC Act Policy Statement – Translocation of listed threatened species – Assessment under Chapter 4 of the EPBC Act*. Department of Sustainability, Environment, Water, Population and Communities (2013).

Ecology

The *Mary River Cod Research and Recovery Plan* states that very little is known about the reproduction and early life history of the Mary River cod. Experience is based on captive fish in hatcheries with no recorded observations of the spawning behaviour of wild fish. The Mary River cod is known to migrate from the main river into smaller tributaries in late winter and during high stream flows in summer. Adult cod may move more than 30 km. Homing behaviour is common among Mary River cod.

Six Mile Creek and Tinana-Coondoo Creek are considered the best remaining areas for the cod, providing abundant instream timber and heavy shading by overhanging vegetation, as compared to many other parts of the Mary River system. The Mary River cod may inhabit a variety of broad habitat types, with a strong preference for areas that provide heavy cover, such as log piles and large individual logs over smaller logs. Areas of open water are usually avoided. Cod are frequently found immediately downstream of a constriction to the stream (e.g. a riffle) where food is presumably concentrated by the water flow.

Species distribution

The *Mary River Cod Research and Recovery Plan* describes the species as one of Australia's most endangered fish. Natural populations of the species are now restricted to suitable areas of habitat in the Mary River system. It is estimated that Mary River cod now occur in less than 30 per cent of their former known range in the Mary River system. Remnant populations may have become isolated from each other due to habitat fragmentation and the impoundment of streams.

The IAR states that three of the Mary River's tributaries are known to contain abundant populations of Mary River cod, one of which is Six Mile Creek. Throughout these three tributaries, the total area of occupancy is between five and seven square kilometres with an estimated population size of less than 600 individuals (Mary River Cod Research and Recovery Plan). The populations of Mary River cod in the Mary River main channel are relatively small in comparison to those in these three tributaries.

Populations within the project area

The Mary River cod is known to occur in the Mary River, Lake Macdonald and downstream waterways. The Mary River cod has been restocked within certain impoundments in south-east Queensland since 1983, including the Mary River system and Lake Macdonald (SPRAT; DEE 2019[11]). Between 1983 and 1998, 30,000 Mary River cod were stocked in the Lake Macdonald alone.

Field surveys confirmed the presence of Mary River cod in Six Mile Creek downstream of Lake Macdonald, near the tailwater pool. The Mary River cod are known to breed in Six Mile Creek downstream of Lake Macdonald. Within and upstream of Lake Macdonald, Mary River cod are known to occur due to fish stocking program.

The *Mary River Cod Research and Recovery Plan* states that the cod inhabit most of Six Mile Creek below Lake Macdonald, a stream length of approximately 40 km, less than half of which comprises permanent pool habitats. Based on this data and electrofishing surveys, the recovery plan estimated the cod population estimated at around 250 individuals.

DAF confirmed that Six Mile Creek downstream of the dam is prime habitat for the Mary River cod, as it contains high quality habitat and food resources. The cod is known to breed in this section of the creek.

Current threats to the species

The *Conservation Advice for the Mary River Cod* identifies the following threats:

- habitat loss and fragmentation: extensive siltation and filling in of pools
- changes in flow regimes or temperature changes that may affect breeding conditions
- loss of riparian vegetation and in-stream timber and vegetation
- overfishing
- introduced fishes
- grazing and disturbance of banks by cattle.

Approved conservation advice

Key conservation actions outlined in the approved conservation advice include:

- ensure that appropriately designed fishways are installed at waterway barriers to facilitate Mary River Cod movements
- protect existing riparian vegetation and restore riparian vegetation

[11] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64680

- improve the management of stream flows, water quality and riparian vegetation
- design and implement a monitoring program
- monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary
- limit waterway barrier construction
- prohibition of stocking of non-indigenous fish in the Mary River systems
- environmental flow management
- hatchery and stocking programs.

Impacts

The IAR describes that the project would result in the temporary disturbance and potential loss of habitat for the Mary River cod. Potential impacts include:

- direct mortality during dam drawdown
- passage over spillways causing injury and mortality (e.g. abrasions, impact with spillway base, predation)
- fragmentation of preferred habitat
- obstruction of migration due to lower dam conditions
- injury and mortality at impoundment structures
- lower flow, reduced water quality and reduced oxygenation
- loss of habitat through direct removal and decline in water quality
- removal of potential breeding habitat
- during the construction phase there is a risk that tilapia may move upstream if high flows result in the drowning out of the cofferdam
- aquatic fauna may become injured in pumping equipment during the drawdown phase, which could make them susceptible to pathogens and disease, or be fatally injured, trapped and subsequently suffocate.

DAF identified potential impacts on the Mary River cod due to the drawdown of the lake and the proposed (draft IAR) labyrinth spillway design:

- increased flows into in Six Mile Creek downstream of the dam: removal of prime habitat features (removal of undercut banks, logs, macrophytes); an increase of turbidity and sedimentation; and a reduction of the existing water quality
- spillway design: fish mortality for large bodied fish due to the plunge of 10 m into a shallow pool.

Mitigation

To reduce potential impacts on the Mary River cod, several mitigation measures were outlined in the IAR:

- known biosecurity risks to the study area (e.g. cabomba, hygrophila and tilapia) would be carefully managed using an environmental management plan that addresses biosecurity
- release of water to Six Mile Creek during the lake drawdown would be controlled and not exceed bankfull height (i.e. would be within the range of naturally occurring flood events), and would avoid breeding season (spring/summer)
- temporary reduction of habitat availability for stocked Mary River cod in Lake Macdonald during the drawdown and construction phases would be mitigated by a salvage, relocation and restocking program, with long-term habitat quality for Mary River cod in Lake Macdonald enhanced during the construction phase
- invasive species (tilapia): proposed mitigation measures include managing outflows to reduce the potential for drown out of the cofferdam and undertaking post drown out drawdown and salvage in Lake Macdonald to target tilapia that may have moved upstream
- committing to continue support of the Mary cod hatchery at Lake Macdonald by provision of leased land and utilities

- aquatic habitat within Lake Macdonald would be augmented during the construction phase to increase the long-term aquatic habitat values of Lake Macdonald from current condition
- drawdown would use equipment that minimises lake bed disturbance and downstream transfer of unconsolidated bed sediments
- seeding of the exposed Lake Macdonald bed following initial drawdown with non-invasive grasses to stabilise exposed sediments
- if practical, use physical barriers (e.g. staggered baffles) at key upstream locations to slow flow and reduce erosion in the upper reaches of the lake
- implementation of an Erosion and Sediment Control Plan in accordance with applicable industry standards, including Healthy Land and Water's Erosion and Sediment Control toolkit
- maximum pumping/discharge rate of 864 megalitres per day (10 cubic metres per second (m^3/s)) would not exceed the bank full width of Six Mile Creek downstream of the lake
- releases would be over a ten-week period to avoid a major pulse flow over a shorter duration
- channelise flows past the construction zone to maintain the natural inflow/outflow regime during the construction period
- using screens of suitable design to prevent aquatic fauna from being entrained and injured or trapped by pumping equipment
- provide supplemental flows to Six Mile Creek if necessary for environmental flow requirements using water piped from the Mary River to the water treatment plant (existing raw water supply)
- within the site induction plan/procedure, site personnel should be educated on how to recognise the physical attributes of species protected under the EPBC Act and their burrows, and to 'Stop, Manage and Notify' when encountered
- construction should be restricted to the project footprint
- a modified hybrid labyrinth/ogee spillway design
- Mary River cod in Lake Macdonald would be salvaged during the drawdown and construction phases and returned to Lake Macdonald during the refill and operation phase.

The IAR identified that the inclusion of a fishway at the upgraded dam site—which would have increased connectivity in Six Mile Creek as no fishway currently exists—has been determined to be unacceptable due to the potential upstream dispersal of pest species (e.g. tilapia) that would impact fish populations (including the Mary River cod) and their habitats. Nevertheless, a fishway would be provided at Gympie Weir to improve waterway connectivity between Six Mile Creek and the Mary River leading to healthier fisheries.

Coordinator-General's conclusion

My assessment of potential impacts on the Mary River cod identified some shortfalls in the IAR assessment. These include a lack of impact assessment of the lake drawdown on the Mary River cod habitat downstream of the dam, and the proposed relocation areas of Mary River cod. Similar to my assessment on the giant barred frog, I consider the increase of flow rate to drawdown the lake within the shortened timeframe (if water is released above the maximum proposed daily flow of 264 ML per day) would have unacceptable impacts on the MNES without appropriate avoidance and mitigation measures and contingency plans. However, these were not provided in the IAR.

I have recommended conditions to the Commonwealth Minister of the Environment to ensure the protection of breeding populations and the habitat of the Mary River cod where they currently persist downstream of the dam (Appendix 4 of the evaluation report). Recommended conditions include, amongst others, the requirement for a Six Mile Creek Baseline Data Collection and Monitoring Plan and revisions to the Species Management Plan (IAR Appendix E) capable of detecting adverse impacts on the Mary River cod during and after drawdown. Additionally, I have imposed a condition (Appendix 2 of the evaluation report) requiring the proponent to provide a SEMP to incorporate any new findings. The SEMP must include a flora and fauna management plan. My full conclusion, including recommendations for conditions, are found in the Coordinator General's overall conclusions section of this report.

Australian lungfish (*Neoceratodus forsteri*)

EPBC Act legal status and documents

- **EPBC Act listing**: the Australian lungfish is listed as vulnerable.
- **Approved conservation advice**: *Approved Conservation Advice for* Neoceratodus forsteri *(Australian lungfish)*. Department of the Environment (2014).
- **Existing recovery plan**: *Draft National Recovery Plan for the Australian Lungfish (*Neoceratodus forsteri*)*. Department of the Environment and Energy (2017).
- **Adopted/made threat abatement plans**: No Threat Abatement Plan has been identified as being relevant for this species.
- **Policy statements or guidelines**:
  - *Information Sheet - Australian Lungfish (*Neoceratodus forsteri*)*. Environment Australia (2003)
  - *Survey guidelines for Australia's threatened fish. EPBC Act survey guidelines 6.4*. Department of Sustainability, Environment, Water, Population and Communities (2011).
  - *EPBC Act Policy Statement – Translocation of listed threatened species – Assessment under Chapter 4 of the EPBC Act*. Department of Sustainability, Environment, Water, Population and Communities (2013).

Ecology

The Australian lungfish is one of only six extant species of lungfishes in the world. It requires still or slow-flowing, shallow, vegetated pools with clear or turbid water in which to spawn and feed. Emergent or submerged vegetation are essential for successful deposition of eggs and for providing refuges for juveniles. Adult lungfish in the Mary River are associated with overhanging riparian (riverside) vegetation, woody debris in the water, and dense macrophyte beds. They shelter in complex, shaded habitat. The species avoids open water, and very seldom uses rocky habitat and eroded banks (SPRAT, DEE 2019[12]).

The Australian lungfish is mainly a nocturnal omnivore. In flowing (unimpounded) sections of the Burnett River and the Mary River, adults usually move around one or two pools at night and return each day to a certain habitat feature, such as a submerged log, rock or patch of macrophytes in one pool, where they rest. Movements exceeding one kilometre are rare.

There is no recent evidence of successful lungfish breeding in impoundments outside the Burnett River, Mary River, and the Brisbane River downstream of Wivenhoe Dam (DEE 2019).

Species distribution

The *Approved Conservation Advice for the Australian lungfish* describes that the lungfish occurs only in a few river systems of south-east Queensland. Naturally occurring populations exist only in the Burnett and Mary river systems, which are geographically isolated from one another by a catchment divide. Lungfish have also been introduced to other rivers and dams, including Brisbane, Condamine and Coomera Rivers and the Enoggera Reservoir. The Lungfish was comprehensively surveyed in the Burnett and Mary River systems between 1997 and 2002. The population is now estimated to be less than 10,000 individuals. Lungfish may still occur in Lake Manchester (SPRAT, DEE 2019).

[12] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=67620

Populations within the project area

The Draft National Recovery Plan for the Australian Lungfish states that recent surveys indicate Australian lungfish are widely distributed throughout the Mary River and its tributaries, including Six Mile Creek.

Field surveys confirmed the presence of the Australian lungfish in Six Mile Creek downstream of Lake Macdonald. The IAR states that the Australian lungfish may occur in or upstream of the lake but are unlikely to be breeding, as the habitat in the lake is considered unsuitable.

Current threats to the species

Because adult lungfish are very long-lived, population decline due to increasingly frequent recruitment failure would not be detectable for several decades. The *Approved Conservation Advice for the Australian lungfish* and the *Draft National Recovery Plan for the Australian Lungfish* identifies the following key threats to the lungfish:

- loss of habitat and barriers to movement caused by dams and weirs
- loss and fragmentation of riparian vegetation along banks, including roots that provide shelter and habitat
- sedimentation increases resulting from development within a catchment
- altered flow regimes
- habitat degradation/reduced water quality
- introduction of native and non-native invasive species, particularly predatory alien fish species and alien aquatic plants
- fishing and boating activities.

Approved conservation advice, recovery objectives and strategy for recovery

Key conservation actions and recovery objectives outlined in the approved conservation advice and draft national recovery plan include:

- reduce the impacts of, and remove any redundant, artificial barriers
- manage waterways to optimise breeding and recruitment opportunities
- limit habitat degradation and maintain or enhance water quality
- reduce the impacts of introduced pest and weed species
- manage the impacts of water-based recreational activities
- address key knowledge gaps to improve Australian lungfish management.

Relevant recovery objectives, performance criteria and actions for operators, including water infrastructure operators, are outlined in Table 2 of the *Draft National Recovery Plan for the Australian Lungfish*.

Impacts

The IAR describes that the project would result in the temporary disturbance and potential loss of habitat for the Australian lungfish. Replacement of the spillway would not change the current level of connectivity (i.e. no connectivity) between downstream and upstream populations of Australian lungfish.

Potential impacts include:

- direct mortality during dam drawdown
- passage over spillways causing injury and mortality (e.g. abrasions, impact with spillway base, predation)
- fragmentation of preferred habitat
- obstruction of migration due to lower dam conditions

- injury and mortality at impoundment structures
- lower flow, reduced water quality and reduced oxygenation
- loss of habitat through direct removal and decline in water quality
- removal of potential breeding habitat
- during the construction phase there is a risk that tilapia and other alien fish species may move upstream if high flows result in the drowning out of the cofferdam
- individuals may become injured in pumping equipment during the drawdown phase, which could make them susceptible to pathogens and disease, or be fatally injured, trapped and subsequently drown.

Mitigation

To reduce potential impacts on the Australian lungfish, several mitigation measures were outlined in the IAR:

- drawdown would use equipment that minimises disturbance and downstream transfer of bed sediments
- seeding of the exposed Lake Macdonald bed following initial drawdown with non-invasive grasses to stabilise exposed sediments
- if practical, physical barriers (e.g. staggered baffles) would be used at key upstream locations to slow flow and reduce erosion in the upper reaches of the lake
- implementation of an Erosion and Sediment Control Plan in accordance with applicable industry standards, including Healthy Land and Water's Erosion and Sediment Control toolkit
- avoid drawdown during the Australian lungfish breeding season (spring/summer)
- maximum pumping/discharge rate of 864 megalitres per day (10 m^3/s) would not exceed the bank full width of Six Mile Creek downstream of the lake
- releases would be over a twelve-week period to avoid a major pulse flow over a shorter duration
- channelise flows past the construction zone to maintain the natural inflow/outflow regime during the construction period
- using screens of suitable design to prevent aquatic fauna from being entrained and injured or trapped by pumping equipment
- provide supplemental flows to Six Mile Creek if necessary for environmental flow requirements using water piped from the Mary River to the water treatment plant (existing raw water supply)
- within the site induction plan/procedure, site personnel should be educated on how to recognise the physical attributes of species protected under the EPBC Act and their burrows and to 'Stop, Manage and Notify' when encountered
- construction should be restricted to the project footprint
- implement an environmental management plan that addresses biosecurity
- lungfish in Lake Macdonald would be salvaged during the drawdown and construction phases and returned to Lake Macdonald during the refill and operate phase
- aquatic habitat within Lake Macdonald would be augmented (i.e. physical habitat structures added; aquatic weeds controlled) during the construction phase to increase the long-term aquatic habitat values of Lake Macdonald from current condition
- a modified hybrid labyrinth/ogee spillway design.

Coordinator-General's conclusion

My assessment of significant impacts on the Australian lungfish against EPBC Act policies and guidelines identified the same shortfalls as identified for the Mary River cod. Similar to the giant barred frog and Mary River cod, the increase of flow rate to drawdown the lake within a short timeframe would have unacceptable impacts on the MNES without contingency plans and appropriate avoidance and mitigation measures. I have recommended conditions to the Commonwealth Minister for the Environment to ensure the protection of the lungfish habitat downstream of the dam (Appendix 4 of the evaluation report). Recommended conditions include,

amongst others, the requirement for a Six Mile Creek Baseline Data Collection and Monitoring Plan. Additionally, I have imposed a condition (Appendix 2 of the evaluation report) requiring the proponent to provide a flora and fauna management plan as part of the SEMP, to ensure it can detect any adverse impacts on the Australian lungfish during and after drawdown of the lake. My full conclusion, including recommendations for conditions, are found in the Coordinator-General's overall conclusion section of this report.

Mary River turtle (*Elusor macrurus*)

EPBC Act legal status and documents

- **EPBC Act listing**: the Mary River turtle is listed as endangered.
- **Approved conservation advice**: *Approved Conservation Advice for* Elusor macrurus *(Mary River Turtle)*. Department of the Environment, Water, Heritage and the Arts (2008).
- **Existing recovery plan**: Recovery Plan Not Required, included on the Not Commenced List (1/11/2009).
- **Adopted/made threat abatement plans**: there is no adopted or made Recovery Plan for this species
- **Policy statements or guidelines**: *Survey guidelines for Australia's threatened reptiles. EPBC Act survey guidelines 6.6*. Department of Sustainability, Environment, Water, Population and Communities (2011).

Background

Between 1970 and 1990, the Mary River turtle was known only from the pet trade. Eggs were sold to pet shops, and hatchlings were known as the 'penny turtle'. The species was not formally described, as pet traders refused to reveal their source of supply. The Mary River turtle was discovered at a property on the Mary River in late 1990.

Ecology

The Mary River turtle occurs in flowing, well-oxygenated sections of streams. Its habitat consists of riffles and shallow stretches alternating with deeper, flowing pools. It generally does not occur in impoundments. Limited data on juveniles suggest that they occur in rocky areas with sand or gravel on the river bed. Adults are usually found in areas with underwater shelter, such as sparse to dense macrophyte cover, submerged logs and rock crevices. They bask on logs and rocks.

Females are faithful to traditional nest sites. Nesting is concentrated on a small number of sand banks and occurs at night on large, steep sand banks up to 200 m from the water's edge. Their home range is small (200 to 650 m; SPRAT, DEE 2019[13]).

Species distribution

The Mary River turtle is endemic to the Mary River in south-east Queensland. The known range is 78 to 270 km from the mouth of the Mary River, at altitudes of 40 to 120 m. Populations are known to occur in major tributaries and the main channel of the Mary River. The species has been inadequately surveyed in the upper reaches of the Mary River, and the limits of its distribution in tributaries are not known. It is estimated that the population of breeding females has reduced by 95 per cent due to the indiscriminate collection of eggs (DEE 2019).

[13] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64389

Populations within the project area

The IAR states that the Mary River turtle has been recorded within Six Mile Creek on a periodic basis, with it being unlikely to breed in the area. As Six Mile Creek is not listed as one of the Mary River tributaries known to contain significant populations of the species, the IAR concludes that the species are likely to primarily use the creek for dispersal and migration. Lake Macdonald provides limited suitable foraging habitat for the species; however, it is not considered suitable for breeding. No individuals were identified within and around Lake Macdonald in field surveys.

Current threats to the species

The species profile and threats database for the Mary River turtle identified the following key threats to the species.

Lack of recruitment and predation

- the Mary River turtle has suffered very poor breeding success for three to four decades as eggs have been collected commercially
- hatching success in the wild continues to be very low due to predation of nests by foxes, dogs and goannas.

Dams and weirs

- the Mary River turtle is a habitat specialist that does not favour dams or weirs and as such are absent from most dams.
- dams can also reduce the water quality downstream, because they often release poorly oxygenated water, increase sediment and cause bank erosion through flow regime changes
- turtles can be injured or killed by abrasion and shearing against the spillway face when they pass over the top of dam walls during high water flows
- nest site loss, and loss of access to traditional nesting areas: Mary River turtle nesting areas are lost or reduced in size through flooding when dams and weirs are built, and conditions in impoundments do not create the sand banks needed for nesting. Breeding females migrate from their usual home ranges to places that have suitable sand banks for nesting. Unlike other Australian freshwater turtles which often nest in soft soil anywhere near the water, Mary River turtles use traditional nesting sites in restricted areas
- lack of access to refuge habitat during floods: Mary River turtles are known to move upstream to safer sites during floods, to protect themselves from being washed downstream of their home ranges. Dam walls block this movement
- the Mary River turtles have experienced increased predation on juveniles and a decline in food quality and availability.

Threat abatement, recovery and mitigation approach

DEE (2019) listed the following urgent actions and mitigation measures that are also applicable for the project:

- identification and protection of critical habitat
- identification of nesting sites
- predator control in nesting areas
- a public awareness program.

Impacts

The IAR states that the project would result in the temporary disturbance and potential loss of habitat for the Mary River turtle. Replacement of the spillway would not change the current level of connectivity between downstream and upstream populations of the Mary River turtle.

Potential impacts include:

- direct mortality during dam drawdown

- passage over spillways can cause injury and mortality (abrasions, impact with spillway base, predation)
- fragmentation of preferred habitat
- obstruction of migration due to lower dam conditions
- injury and mortality at impoundment structures
- lower flow, reduced water quality and reduced oxygenation
- loss of habitat through direct removal and decline in water quality
- removal of potential breeding habitat
- aquatic fauna may become injured in pumping equipment during the drawdown phase, which could make them susceptible to pathogens and disease, or be fatally injured, trapped and subsequently drown.

Mitigation

To reduce potential impacts on the Mary River turtle, several mitigation measures were outlined in the IAR:

- aquatic habitat within Lake Macdonald would be augmented (i.e. physical habitat structures added; aquatic weeds controlled) during the construction phase to increase the long-term aquatic habitat values of Lake Macdonald
- drawdown would use equipment that minimises disturbance and downstream transfer of bed sediments
- seeding of the exposed Lake Macdonald bed following initial drawdown with non-invasive grasses to stabilise exposed sediments to reduce erosion and sedimentation from rainfall events
- if practical, use physical barriers (e.g. staggered baffles) at key upstream locations to slow flows and reduce erosion in the upper reaches of the lake
- implementation of an Erosion and Sediment Control Plan in accordance with applicable industry standards, including Healthy Land and Water's Erosion and Sediment Control toolkit
- avoid drawdown during the Mary River turtle breeding season (spring/summer), where possible. Maximum pumping/discharge rate of 864 megalitres per day (10 m^3/s) would not exceed the bank full width of Six Mile Creek downstream of the lake
- releases would be over a twelve-week period to avoid a major pulse flow over a shorter duration
- channelize flows past the construction zone to maintain the natural inflow/outflow regime during the construction period
- provide supplemental flows to Six Mile Creek if necessary for environmental flow requirements using water piped from the Mary River to the water treatment plant (existing raw water supply)
- within the site induction plan/procedure, site personnel should be educated on how to recognise the physical attributes of species protected under the EPBC Act and their burrows, and to 'Stop, Manage and Notify' when encountered
- construction should be restricted to the project footprint
- implement an environmental management plan that addresses biosecurity
- avoid any unplanned disturbance of any sandy banks for the project until a suitably qualified person has confirmed turtle nests are not present
- implement slow speed limits of 10 km per hour within the project area to allow for animals to move out of the way and for drivers to have the ability to safely stop if an animal is identified within the vehicle path
- using screens of suitable design to prevent aquatic fauna from being entrained, injured or trapped by pumping equipment
- installing temporary fencing, similar to coarse sediment barriers, between Lake Macdonald and roads to prevent turtles dispersing over roads, coupled with daily surveillance and salvage of turtles along the fencing during the drawdown phase, and weekly during the construction phase.

Coordinator-General's conclusion

I am satisfied the proposed project is unlikely to have a significant impact on the Mary River turtle population provided a *Six Mile Creek Baseline Data Collection and Monitoring Plan* is prepared to specify turtle mitigation measures consistent with EPBC Act policies and statements. Requirements within the monitoring plan include pre-drawdown baseline habitat and water quality surveys at key habitat sites to set a suitable baseline for habitat and water quality for the species, and ongoing monitoring capable of detecting adverse impacts during and after drawdown, including temporary emergency shutdown procedures for water release where identified thresholds have been exceeded and response measures. Additionally, I have imposed a condition (Appendix 2 of the evaluation report) requiring the proponent to provide a SEMP to incorporate any new findings. The SEMP must include a flora and fauna management plan. My full conclusion, including recommendations for conditions, are found in the Coordinator-General's overall conclusions section of this report.

White-throated snapping turtle (*Elseya albagula*)

EPBC Act legal status and documents

- **EPBC Act listing**: the white-throated snapping turtle is listed as critically endangered.
- **Approved conservation advice**: *Conservation Advice* Elseya albagula *White-throated snapping turtle*. Department of the Environment (2014).
- **Existing recovery plan**: *Draft National Recovery Plan for the White-throated Snapping Turtle (*Elseya albagula*)*. Department of Environment and Energy (2017).
- **Adopted/made threat abatement plans**: there is no adopted or made Recovery Plan for this species
- **Policy statements or guidelines**: *Survey guidelines for Australia's threatened reptiles. EPBC Act survey guidelines 6.6.* Department of Sustainability, Environment, Water, Population and Communities (2011).

Ecology

The *Conservation Advice for the white-throated snapping turtle* and the *Draft National Recovery Plan for the White-throated Snapping Turtle* state that the turtle is recognised as a habitat specialist, and prefers clear, flowing, well-oxygenated waters. This species habitat is fragmented into three catchments (Fitzroy, Mary and Burnett rivers) and within each catchment, its habitat is further fragmented by dam and weir structures. The species has relatively small home ranges, commonly utilising stream lengths of less than one kilometre.

Almost all nesting occurs on alluvial sand. The species aggregates to breed at a restricted number of sites. Almost 100 per cent of eggs are predated or lost to trampling by stock. The principal predators throughout are feral foxes, dogs, pigs, cats, water rats, and goannas.

Species distribution

The *Conservation Advice for the white-throated snapping turtle* states that the species is found only in Queensland, in the Fitzroy, Mary and Burnett Rivers and associated smaller drainages in south-east Queensland. The present wild population is composed primarily of aging adults in each catchment.

Populations within the project area

The IAR states that the white-throated snapping turtle has been identified as potentially occurring within Six Mile Creek on a periodic basis. As Six Mile Creek is not listed as one of the Mary River tributaries known to contain significant populations of the species, the IAR concludes that the species is likely to use the creek for dispersal and migration. Field surveys determined there is

limited suitable habitat within the downstream areas of Six Mile Creek for this species and therefore the downstream population is considered to be rare.

Current threats to the species

The *Conservation Advice for the white-throated snapping turtle* lists the following key threats:

- excessive (near total) loss of eggs and hatchlings at the aggregated nesting areas in the Fitzroy, Burnett and Mary Catchments
- trampling of nests by cattle is also a threat
- the construction of dams and weirs is an additional threat, acting via:
  - fragmentation of preferred habitat by dam infrastructures and associated deep water reaches of impoundments that are largely anoxic and detrimental to cloacal ventilating species
  - obstruction of migration within rivers
  - injury and death during over-topping and water releases, drowning of turtles in filter screens
  - inappropriate water allocation leading to low flow, or cessation of flow, which may reduce oxygenation of the water and impede cloacal respiration
  - flooding of traditional nesting areas
  - loss of riparian vegetation overhanging riverine habitat, leading to reduction in fruit as food for adult turtles
  - stocking of fish (top end predators) into dam impoundments for recreational fishing increases predator pressure on juvenile turtles
- recreational fishing
- dense aquatic weeds
- extended drought periods.

Approved conservation advice

The *Draft National Recovery Plan for the White-throated Snapping Turtle* states the following areas are critical to the survival of the species:

- riverine systems with permanent water, including waterholes, within the species' distribution area
- all currently known and new nesting sites.

Key conservation actions outlined in the approved conservation advice and recovery plan relevant to the proposed project include:

- maintain functional turtle nesting banks throughout the catchments, including restriction of cattle access to river banks and predator control
- maintain stream flow and high quality in-river habitat between impoundments
- ensure that water planning includes allocation for flows that maintain water quality that allows cloacal respiration, particularly during low flow periods
- manage water levels so as to avoid inundation of nesting banks during the incubation period
- reduce the incidence of death and physical injury of turtles at existing and future impoundment structures
- manage recreational fishing and boating activities in impoundments to be compatible with the maintenance of sustainable turtle populations and reduce unnecessary injury to turtles
- increase the area of river and adjacent riverine habitat managed for conservation purposes
- raise awareness of white-throated snapping turtles within the local community.

Impacts

The IAR describes that the project would result in the temporary disturbance and potential loss of habitat for the white-throated snapping turtle. Replacement of the spillway would not change the current level of connectivity between upstream and downstream populations of the white-throated snapping turtle.

Potential impacts may include:

- direct mortality during dam drawdown
- passage over spillways causing injury and mortality (abrasions, impact with spillway base, predation)
- fragmentation of preferred habitat
- obstruction of migration due to lower dam conditions
- injury and mortality at impoundment structures
- lower flow, reduced water quality and reduced oxygenation
- loss of habitat through direct removal and decline in water quality
- removal of potential breeding habitat
- aquatic fauna may become injured in pumping equipment during the drawdown phase, which could make them susceptible to pathogens and disease, or be fatally injured, trapped and subsequently drown.

Mitigation

To reduce potential impacts on the white-throated snapping turtle, several mitigation measures were outlined in the IAR:

- aquatic habitat within Lake Macdonald would be augmented (i.e. physical habitat structures added; aquatic weeds controlled) during the construction phase to increase the long-term aquatic habitat values of Lake Macdonald from current condition
- drawdown would use equipment that minimises disturbance and downstream transfer of unconsolidated bed sediments
- seeding of the exposed Lake Macdonald bed following initial drawdown with non-invasive grasses to stabilise exposed sediments
- if practical, use physical barriers (e.g. staggered baffles) at key upstream locations to slow flow and reduce erosion in the upper reaches of the lake
- implementation of an Erosion and Sediment Control Plan in accordance with applicable industry standards, including the Healthy Land and Water's Erosion and Sediment Control toolkit
- avoid drawdown during the white-throated snapping turtle breeding season (autumn/winter), where possible
- maximum pumping/discharge rate of 864 megalitres per day (10 m^3/s) would not exceed the bank full width of Six Mile Creek downstream of the lake
- releases would be over a twelve-week period to avoid a major pulse flow over a shorter duration
- channelise flows past the construction zone to maintain the natural inflow/outflow regime during the construction period
- provide supplemental flows to Six Mile Creek if necessary for environmental flow requirements using water piped from the Mary River to the water treatment plant (existing raw water supply)
- within the site induction plan/procedure, site personnel should be educated on how to recognise the physical attributes of species protected under the EPBC Act and their burrows, and to 'Stop, Manage and Notify' when encountered
- construction should be restricted to the project footprint
- implement an environmental management plan that addresses biosecurity
- avoid any unplanned disturbance of any sandy banks for the project until a suitably qualified person has confirmed turtle nests are not present
- implement slow speed limits of 10 km per hour within the project area to allow for animals to move out of the way and for drivers to have the ability to safely stop if an animal is identified within the vehicle path
- using screens of suitable design to prevent aquatic fauna from being entrained and injured or trapped by pumping equipment
- installing temporary fencing, similar to coarse sediment barriers, between Lake Macdonald and adjoining roads to prevent turtles dispersing over roads, coupled with daily surveillance and

salvage of turtles along the fencing during the drawdown phase, and weekly during the construction phase.

Coordinator-General's conclusion

I am satisfied that the proposed project is unlikely to have a significant impact on the white-throated snapping turtle population provided a *Six Mile Creek Baseline Data Collection and Monitoring Plan* is prepared to specify turtle mitigation measures consistent with EPBC Act policies and statements. For example, strategies outlined in sections 7.1 to 7.5 of the *Draft National Recovery Plan for the White-throated Snapping Turtle* must be considered, where relevant, when preparing the plans. Requirements include pre-drawdown baseline habitat and water quality surveys at key habitat sites to establish a suitable baseline for habitat and water quality for the species, and ongoing monitoring capable of detecting adverse impacts during and after drawdown, including temporary emergency shutdown procedures for water release where identified thresholds have been exceeded and response measures. Consequently, I have imposed a condition (Appendix 2 of the evaluation report) requiring the proponent to provide a SEMP to incorporate any new findings. The SEMP must include a flora and fauna management plan. My full conclusion, including recommendations for conditions, are found in the Coordinator-General's overall conclusions section of this report.

Other species

The IAR identifies a range of terrestrial listed threatened species under the EPBC Act with a moderate to high potential to occur within 10 km of the project area, however were not found during targeted field surveys. This includes eight terrestrial flora species and 10 terrestrial fauna species. Of these 18 species, only the grey-headed flying fox (*Pteropus poliocephalus*) was considered to have a high potential to occur in the project area. Additionally, two listed threatened bird species relying on freshwater wetlands and inland lakes are identified as having a moderate potential to occasionally use the lake margins.

The significant impact assessment carried out in the IAR concludes that no significant impacts would occur on any of these species based on the lack of records of the species found in the project area, the lack of suitable habitat and/or food availability, or the lack of direct impacts (e.g. clearing of vegetation).

Coordinator-General's conclusion

I am satisfied that the proposed clearing of 3 ha is unlikely to have a significant impact on these terrestrial species, including the grey-headed flying-fox. The flying-fox may use some of the trees as food trees if they are in flower; however, no grey-headed flying-fox camps were found in the project area or surrounds. As the flying-fox is a nocturnal species, vegetation clearing carried out during the day would not directly impact on the species. Further, the clearing would occur on the northern edge of Lake Macdonald and consists of already heavily cleared areas (Figure 5). The proposed mitigation measures outlined in the draft Environmental Management Plan (IAR Appendix B), including fauna surveys that are proposed to be carried out prior clearing and the use of spotter-catcher, would ensure that any potential impacts on hollow-dependent species, like gliders, would be mitigated. Detailed recommendations are provided in my overall conclusions below.

I am also satisfied that the lake drawdown is unlikely to have a significant impact on the listed threatened bird species, as the loss of the lake foreshore would be temporary, and it is not identified as a significant habitat for the species.

Coordinator-General's conclusion: matters of national environmental significance

This section provides the overall conclusion of my analysis of the impact assessment of MNES carried out in the Significant impact assessment section of this report. I have considered the assessment of impacts provided in the IAR, the proposed mitigation and management measures proposed by the proponent, and specialist and agency advice provided on MNES (including DEE, DAF, DES) during the submission period.

Listed threatened flora and threatened ecological communities

I am satisfied that the proposed project is unlikely to have a significant impact on listed threatened flora species, including the southern penda. Nevertheless, I have recommended conditions to the Commonwealth Minister for the Environment, requiring pre-clearing surveys for listed threatened species and ecological communities to be carried out to identify and manage any listed threatened plants that may be present (e.g. as a result of recruitment to the site) in the clearing footprint (Appendix 4 of the evaluation report). Pre-clearing flora surveys can be carried out in conjunction with the proposed pre-clearing fauna surveys. This would also satisfy any requirements the proponent has with regards to Queensland's protected plants legislative framework under the *Nature Conservation Act 1992*. Further, I have recommended that contingency plans be developed as part of the pre-clearing surveys, outlining procedures to be followed should a threatened plant or threatened ecological community be encountered. I have imposed a condition (Appendix 2 of the evaluation report) requiring the proponent to provide a SEMP requiring a pre-clearing survey be undertaken and contingency measures outlined.

Koala

The koala assessment carried out for the IAR generally followed the EPBC Act referral guidelines for the vulnerable koala. Although koalas were not identified during field surveys, there is ample evidence from *WildNet* and Noosa Shire databases that the koala is found in the project area. The large home range of the koala would also indicate that koalas may be present within the project area. Although the IAR refers to mitigation measures proposed in the draft Environmental Management Plan (IAR Appendix B), it contains very limited avoidance and mitigation measures relevant to the koala. For example, the mitigation measures outlined in Chapter 5 (Matters of National Environmental Significance) of the IAR, such as 'sequential clearing; Stop, Manage and Notify procedures', were not transferred to the draft Environmental Management Plan, and there is no Species Management Plan developed for the koala in Appendix E of the IAR.

I am satisfied that proposed project is unlikely to have a significant impact on the koala population provided the proponent updates the SEMP to specify koala mitigation measures and that koala habitat clearing conforms with Queensland's Nature Conservation (Koala) Conservation Plan 2017. Clearing requirements must include sequential clearing, having a koala spotter in attendance and limits on the area of habitat that can be cleared at any one time. I have recommended to the Commonwealth Minister for the Environment that pre-clearing surveys are carried out to identify and manage any koalas that may be present in the clearing footprint and that clearing conforms to Queensland's Nature Conservation (Koala) Conservation Plan 2017. Further, I have imposed a condition requiring a flora and fauna management plan as part of the SEMP, which must contain a specific management plan for the koala, including procedures required if a koala is encountered during vegetation clearing.

Giant barred frog

The impact assessment of the giant barred frog did not include a full assessment of potential impacts resulting from increased sedimentation and decrease in water quality despite sedimentation being identified as one of the major threats (SPRAT, DEE 2019).

For example, the IAR's impact assessment did not assess potential impacts should it be necessary to release water above the proposed maximum of 264 megalitres per day (IAR Appendix C, Table C.2-1). The IAR states that the project would require an adaptive approach to the lake drawdown, because inflows are unpredictable, and that drawdown of the lake could theoretically occur in a period as short as 8 to10 days.

The giant barred frog was found downstream of the dam, close to the spillway. As such, the release of water would have a higher impact on these frog populations due to the localised scour effect, turbidity and decrease of water quality. Despite this, no contingency measures were suggested in the event of releasing more water than the proposed maximum. Increasing the flow rate to drawdown the lake within two weeks would have unacceptable impacts on the MNES without appropriate avoidance and mitigation measures.

Mitigation measures proposed for the giant barred frog in IAR Chapter 5 (Matters of National Environmental Significance), the draft Environmental Management Plan (IAR Appendix B) and the Species Management Plan (IAR Appendix E) included many unspecific statements ('*prevent bank degradation as a result of scouring through management of drawdown rates*') without identifying measurable ameliorating initiatives. Further, the mitigation measures outlined in the draft Environmental Management Plan (IAR Appendix B) and the Species Management Plan (IAR Appendix E) do not correspond the mitigation measures outlined in Chapter 5 of the IAR.

I conclude that the documents provided in the IAR do not address adequately significant impacts based on EPBC guidelines and that the mitigation measures proposed don't align with the recovery actions outlined in the *National Recovery Plan for Stream Frogs of southeast Queensland 2001-2005*.

I have recommended conditions to the Commonwealth Minister for the Environment to ensure the protection of the giant barred frog (Appendix 4 of the evaluation report). These include the requirement for a *Six Mile Creek Baseline Data Collection and Monitoring Plan*, involving pre-drawdown baseline habitat and water quality surveys at key habitat sites.

The *Six Mile Creek Baseline Data Collection and Monitoring Plan* must:

- record baseline data for species habitat and water quality before impact
- set suitable trigger limits that are able to detect any adverse impacts during and after drawdown against the baseline data collected
- provide appropriate mitigation or remediation measures that must be implemented immediately should monitoring triggers indicate unacceptable impacts on relevant water quality parameters, the giant barred frog or its habitat
- include temporary emergency shutdown procedures for water release where identified thresholds are anticipated to be exceeded and response measures do not address the impacts.

Further, I propose conditions for a *Drawdown Release Plan* that must detail how the releases would be managed over the gradual 12-week scenario and the rapid drawdown scenario to mimic natural flow regimes. Recommended conditions are found in Appendix 4 of the evaluation report.

Mary River cod, Australian lungfish, Mary River turtle, and white-throated snapping turtle

While the IAR considered the project to have only temporary impacts on the Mary River Cod, Australian lungfish, Mary River turtle and white-throated snapping turtle, review of the IAR documentation and specialist advice received from the advisory agencies (in particular DAF and

DES) indicated that the impacts of the initial labyrinth spillway design and the associated overflows of lake water into Six Mile Creek were likely to have a significant, if not permanent, impacts. However, I am satisfied that the incorporation of the ogee spillway section into the project's design alleviates the level of risk to these species so that the design of the modified hybrid spillway (and associated overflows of lake water into Six Mile Creek) is unlikely to have a significant impact on these species.

Lake drawdown and impacts on Six Mile Creek downstream of the dam

While surveys carried out as part of the IAR do not fully comply with the EPBC Act *Survey guidelines for Australia's threatened fish*, there is enough information available to ascertain the existence of the Mary River cod in the lake and in Six Mile Creek. DAF advised that the Mary River cod exists in Lake Mackenzie due to restocking practices and that Six Mile Creek downstream of the dam is a known breeding habitat for the species. While the lungfish also occurs in Six Mile Creek downstream of the lake, DAF advised that it occurs in low numbers and Six Mile creek does not provide prime breeding habitat for this species. Nevertheless, the Australian lungfish exists in this stretch of the creek and the unmitigated drawdown of the lake could have significant impacts on its habitat.

The IAR states there are no current records of the Mary River turtle and the white-throated snapping turtles in the Lake Macdonald and directly upstream/downstream of the lake in Six Mile Creek. However, a lack of records does not necessarily imply the absence of an endangered/critically endangered species where surveys have not been carried out in detail according to the EPBC Act *Survey guidelines for Australia's threatened reptiles* (e.g. snorkelling and specially built and designed traps). Hence, the absence of a result from field surveys necessitates a precautionary approach, including requiring the implementation of appropriate mitigation measures to minimise impacts from the drawdown of the lake and the spillway design. For example, the *EPBC Act Approved Conservation Advice for Mary River Turtle* specifically outlines that turtles can be injured or killed by abrasion and shearing against the spillway face when they pass over the top of dam walls during high water flows and that suitable sand banks are needed for nesting. Further, the conservation advice noted that Mary River turtles are known to move upstream to protect themselves from being washed downstream of their home ranges. Hence, the statement in the IAR that no impacts on the breeding habitats would occur because outflows would not exceed the bank full width of Six Mile Creek downstream of the lake cannot be substantiated.

Six Mile Creek downstream of the dam is a healthy, slow moving, meandering creek providing optimal habitat (comprising deep, shaded, slow flowing pools with plenty of undercuts, snags and log-piles) and prey for the Mary River cod. The impacts from the of the lake, i.e. the release of 7,792 megalitres of lake water over three months, could have a direct impact on the habitat of the Mary River cod by, for example, removing necessary undercuts under the banks of the creek. A continued high flow regime over a prolonged period of time could also flush away logs, streamside and instream aquatic vegetation for a considerable distance from the spillway. In addition, increased sedimentation may fill deep pools and decrease water quality.

The surveys carried out as part of the IAR did not adequately assess and map the existing habitats of the Mary River Cod, the Australian lungfish, the Mary River turtle, and the white-throated snapping turtle, and hence no baseline data is available to compare it against during and post-drawdown impacts. It is unknown at this stage if the release would have a direct or indirect impact on the habitat quality of fish and turtles and how long the creek would take to recover from these impacts, especially during the worst-case scenario of a release of 864 megalitres per day (10 m^3/s) over a period of 10 days. Information was provided on existing flow statistics for Six Mile Creek at the Cooran gauging station, 22 km downstream of the dam. The downstream impact assessment provided data on very high flow events (10,000 megalitres per day) that persisted over a number of

days. While this information provided valuable information on high flow events, it did not provide information on impacts (or the lack thereof) of these high flow events on erosion, banks, aquatic and riparian vegetation, and on potential MNES habitats.

Hence, at this stage I conclude that there is not enough evidence in the IAR that provides confidence that the proposed action would not have a significant impact on MNES and its habitats, and that satisfactory monitoring and mitigation/adaptive management measures have been developed and could be implemented to address the potential impacts. It is recommended that the proponent develop and implement appropriate mitigation and management measures to achieve the following objectives:

- prevent or reduce to the greatest extent feasible potential changes to the natural flow regime in Six Mile Creek downstream of the dam
- prevent or reduce downstream impacts on water quality and sedimentation, during and for some time after the drawdown of Lake Macdonald
- prevent or minimise impacts on aquatic and riparian habitat relevant to EPBC Act listed threatened species, including habitat structure and habitat quality during and for some time after the drawdown of Lake Macdonald
- prevent or minimise potential impacts on EPBC Act listed threatened species.

As outlined above for the giant barred frog, I have recommended conditions to the Commonwealth Minister for the Environment to ensure the protection of these species and their habitats. Conditions include the requirement for a *Six Mile Creek Baseline Data Collection and Monitoring Plan*, involving a pre-impact survey to establish baseline data on quality of habitat and population data for these four MNES. Ongoing monitoring during impact and post-drawdown against the baseline are required to assess if any impacts on these species and their habitats occurred. The monitoring plan must further incorporate threshold trigger levels for deteriorating habitat and water quality objectives that would inform development and implementation of appropriate responses where exceedance or impacts are detected. Additionally, I have imposed a condition (Appendix 2 of the evaluation report) requiring the proponent to provide an Species Management Plan as part of the SEMP, which must include appropriate mitigation or remediation measures to be implemented immediately should monitoring triggers indicate impacts on relevant water quality parameters that would impact on the MNES This must include temporary emergency shutdown procedures for water release where identified thresholds have been exceeded (or are anticipated to be exceeded) and identified response measures do not address the increased impacts.

Further, I propose conditions for a *Drawdown Release Plan* that must detail how the releases would be managed over the gradual 12-week scenario and the rapid drawdown scenario to mimic natural flow regimes. Recommended conditions are found in Appendix 4 of the evaluation report.

The *Six Mile Creek Baseline Data Collection and Monitoring Plan* and updated documents, such as the SEMP and a flora and fauna management plan, must be provided to DEE for approval prior drawdown of Lake Macdonald.

Salvage and relocation

The IAR has not demonstrated sufficient evidence in relation to potential success of the proposed relocation procedures and any return translocation from temporary translocation sites for each species of MNES, nor how the success of these would be monitored to provide unmitigated confidence that the measures will be successful.

DAF and DES also identified several issues in their submissions that should be resolved. For example, the IAR proposed to potentially relocate the Mary River cod to Tinana Creek and to farm dams. DAF advised that relocating the cod from Lake Macdonald could compromise the genetics of the existing stock in Tinana Creek and Obi Obi Creek and that relocating bass and golden perch would likely compete with the Mary River cod in Tinana and Obi Obi creeks. Further, relocating

Mary River cod and the lungfish to farm dams is not suitable as they may not have suitable habitat to feed and breed; and that the Mary River cod is only to be temporarily relocated to the Gerry Cook Fish Hatchery. DES also recommended that turtles should be tagged during salvage and additional monitoring is required for turtles in relocation sites, including mortality, dispersal and/or residency of relocated turtles. I have recommended to the Commonwealth Minister for the Environment that a *Fish and Turtle Salvage and Relocation Plan* should be prepared by the proponent to ensure that the salvage and relocation does not significantly impact on MNES. The *Fish and Turtle Salvage and Relocation Plan* must include a *Success Analysis Plan* that is robust and capable of determining the success of the fish and turtle salvage and relocation in relation to each of the identified MNES. A report on the success of the *Fish and Turtle Salvage and Relocation Plan* must be provided to the Minister on the completion of evaluation of the initial translocation, and on completion of evaluation of the success of any return translocations of MNES from temporary translocation sites back into Lake Macdonald. Recommended conditions are found in Appendix 4 of the evaluation report.

Additionally, I recommend post-works rehabilitation of Lake Macdonald to support the re-establishment of the Mary River cod, the Australian lungfish, the Mary River turtle and the white-throated snapping turtle populations within Lake Macdonald once the project is complete which would assist in mitigating any impacts on the health of MNES following the lowering of the lake.

Updating existing documentation

I have identified inconsistencies in the assessment of MNES in several IAR documents that are proposed as working documents once the project commences. These IAR documents would need to be updated by the proponent to include the findings of my assessment, and the deletion of incorrect references, such as references to proposed relocation areas which have been found unsuitable for the relocation for the Mary River cod, lungfish, Mary River turtle, and white-throated snapping turtle.

The *Six Mile Creek Baseline Data Collection and Monitoring Plan* and updated documents, such as the SEMP and a flora and fauna management plan, must be provided to DEE for approval prior drawdown of Lake Macdonald.

Offsets

No offsets have been proposed for the proposed project. However, where adverse impacts are detected on MNES, remediation, corrective action would be required as appropriate and where significant residual impacts remain, offsets in accordance with EPBC Act Environmental Offsets Policy 2012 would be required.

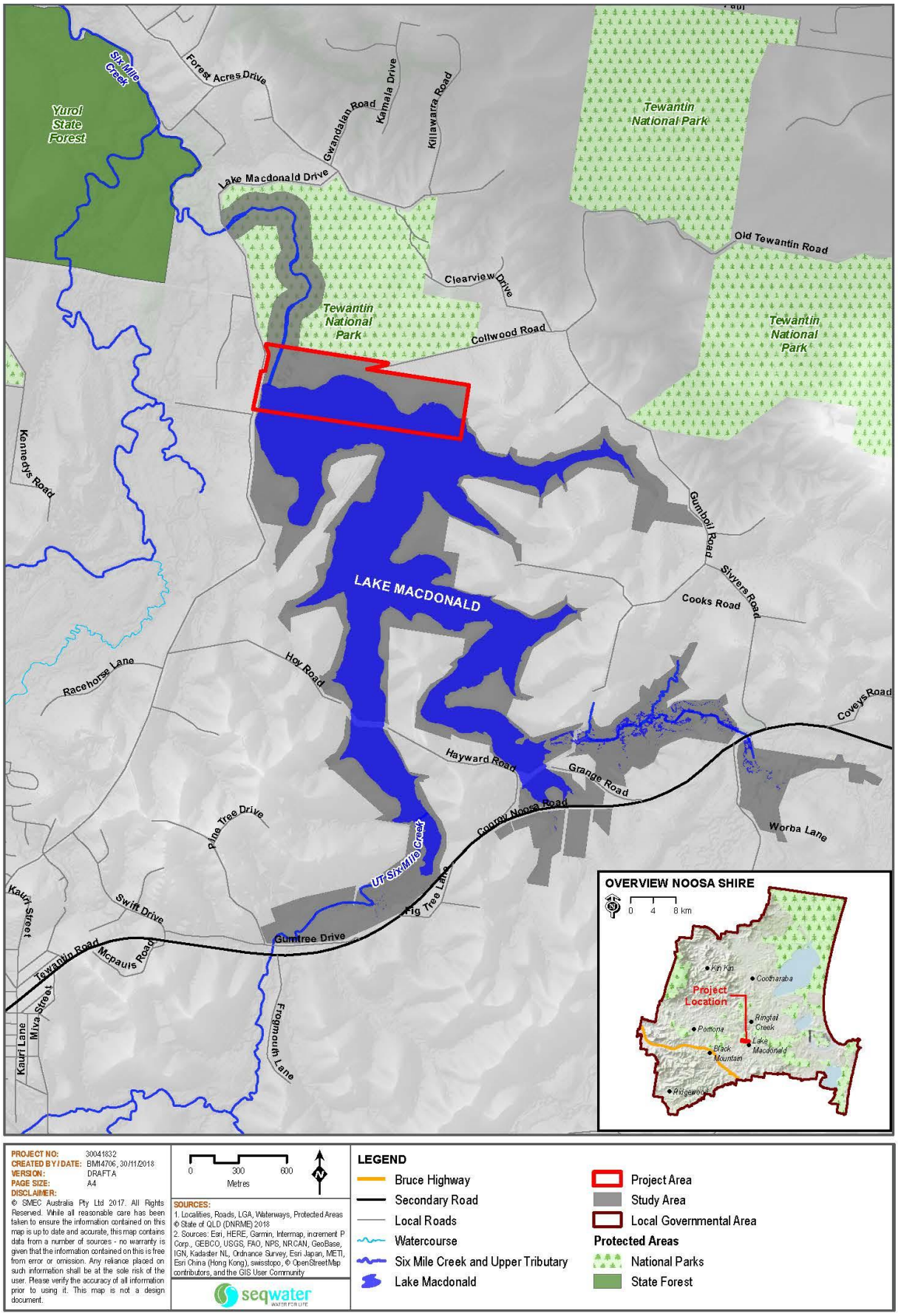

Figure A1 **Project area** (Source: IAR; Chapter 5, Figure 5-1)

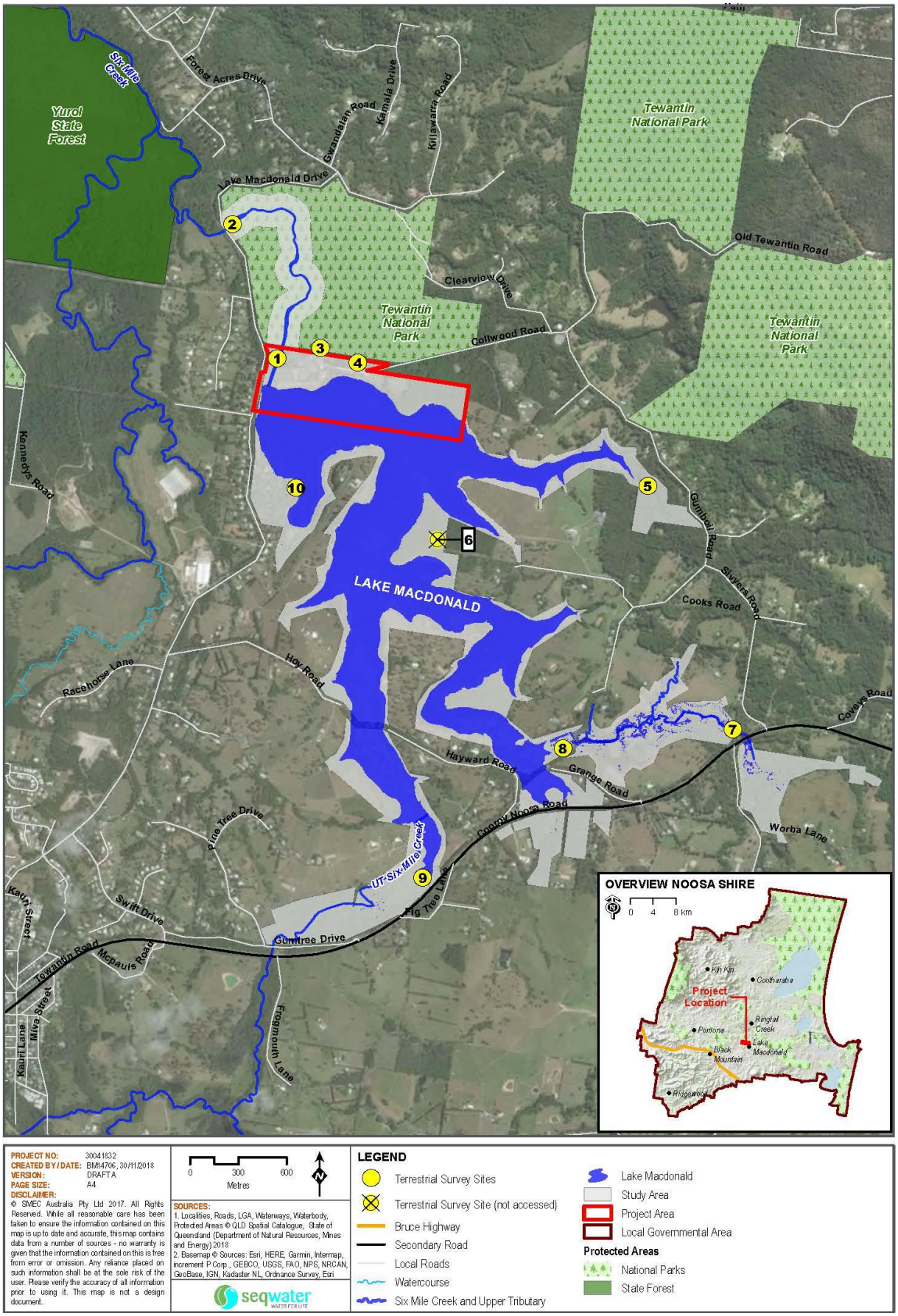

Figure A2 **Study area and terrestrial fauna survey sites** (Source: IAR; Chapter 8, Figure 8-1).

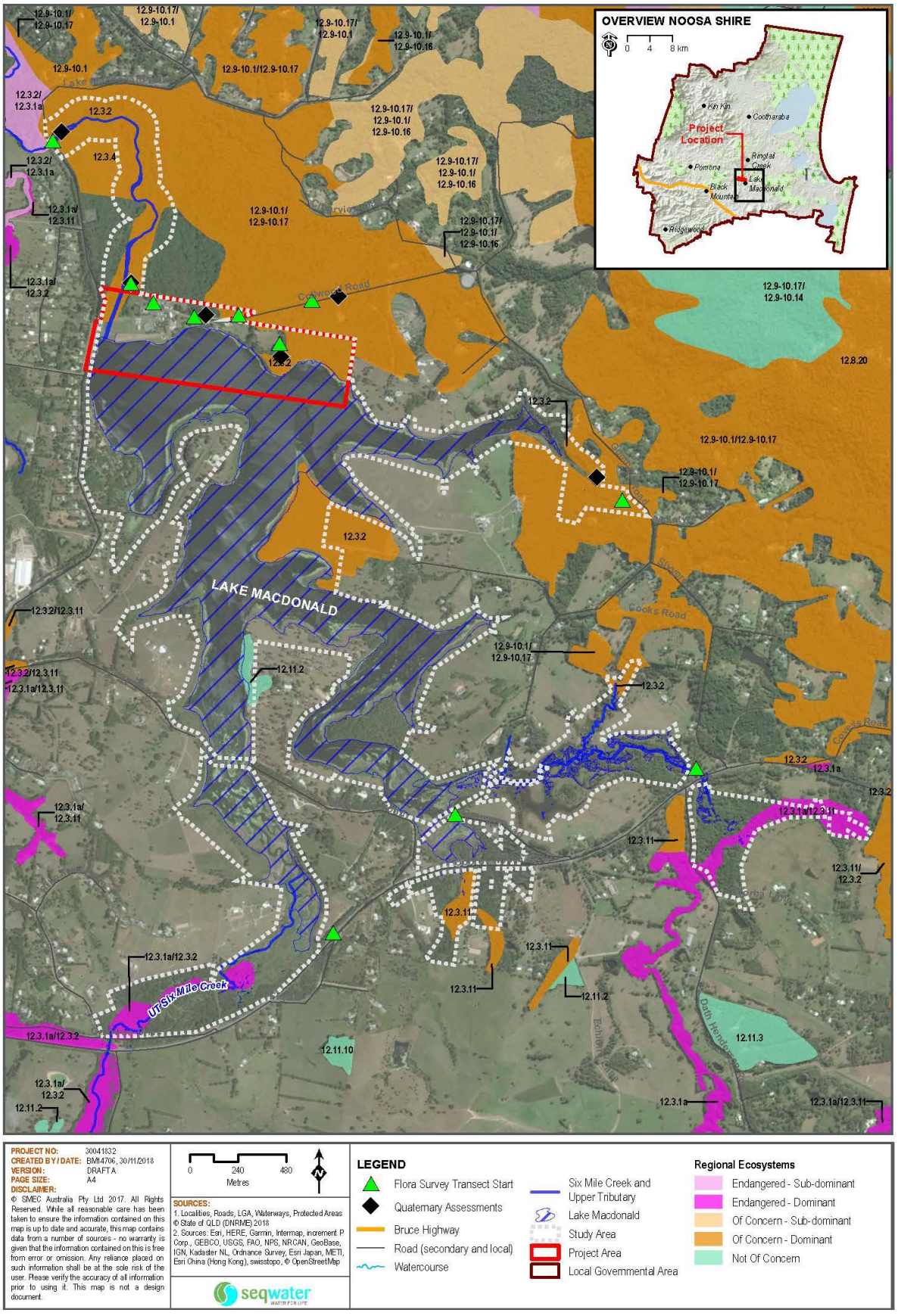

Figure A3 **Mapped vegetation communities and flora survey sites**
(Source: IAR; Chapter 8, Figure 8-2).

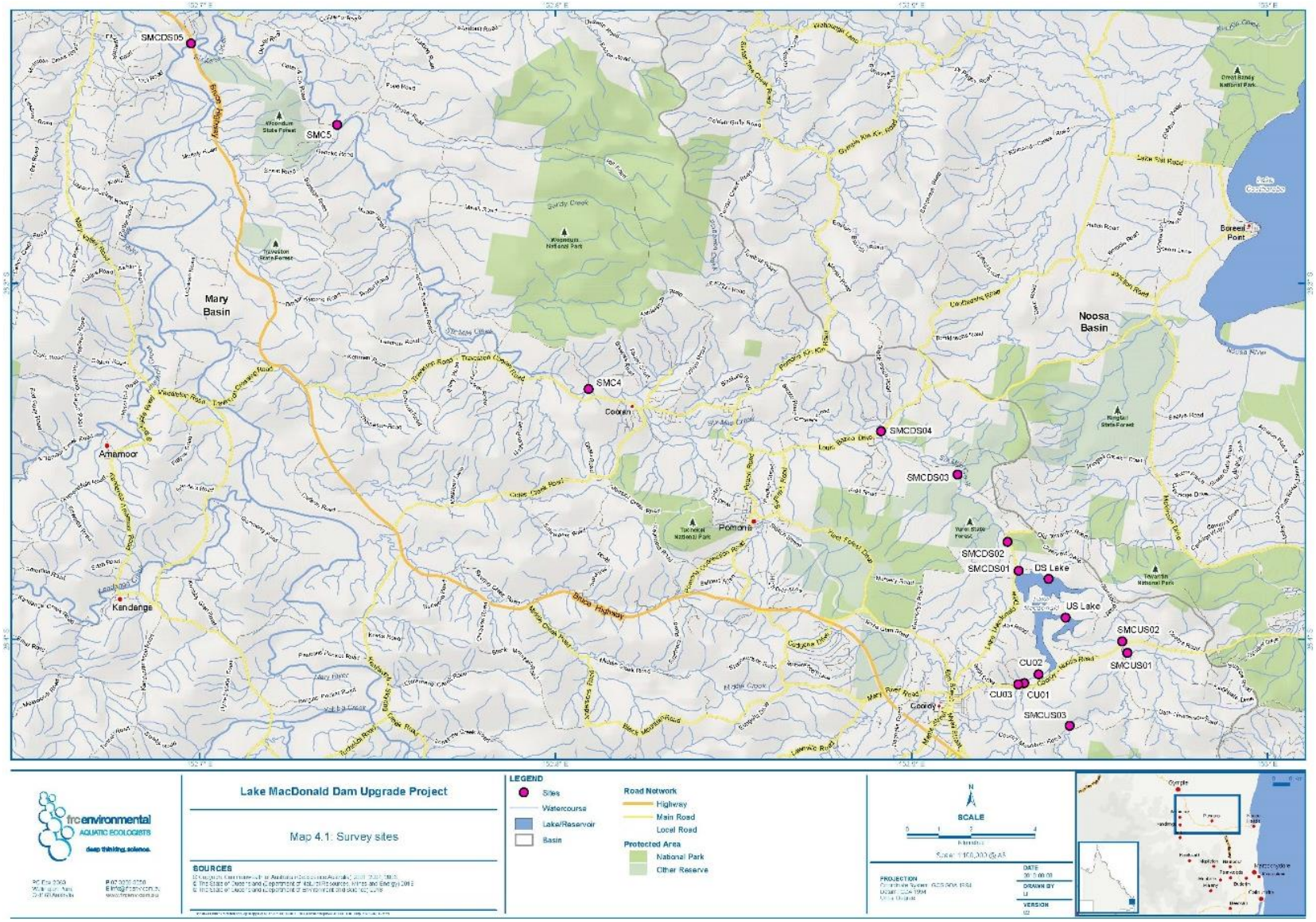

Figure A4 **Aquatic survey sites** (Source: IAR; Appendix G, Map 4.1)

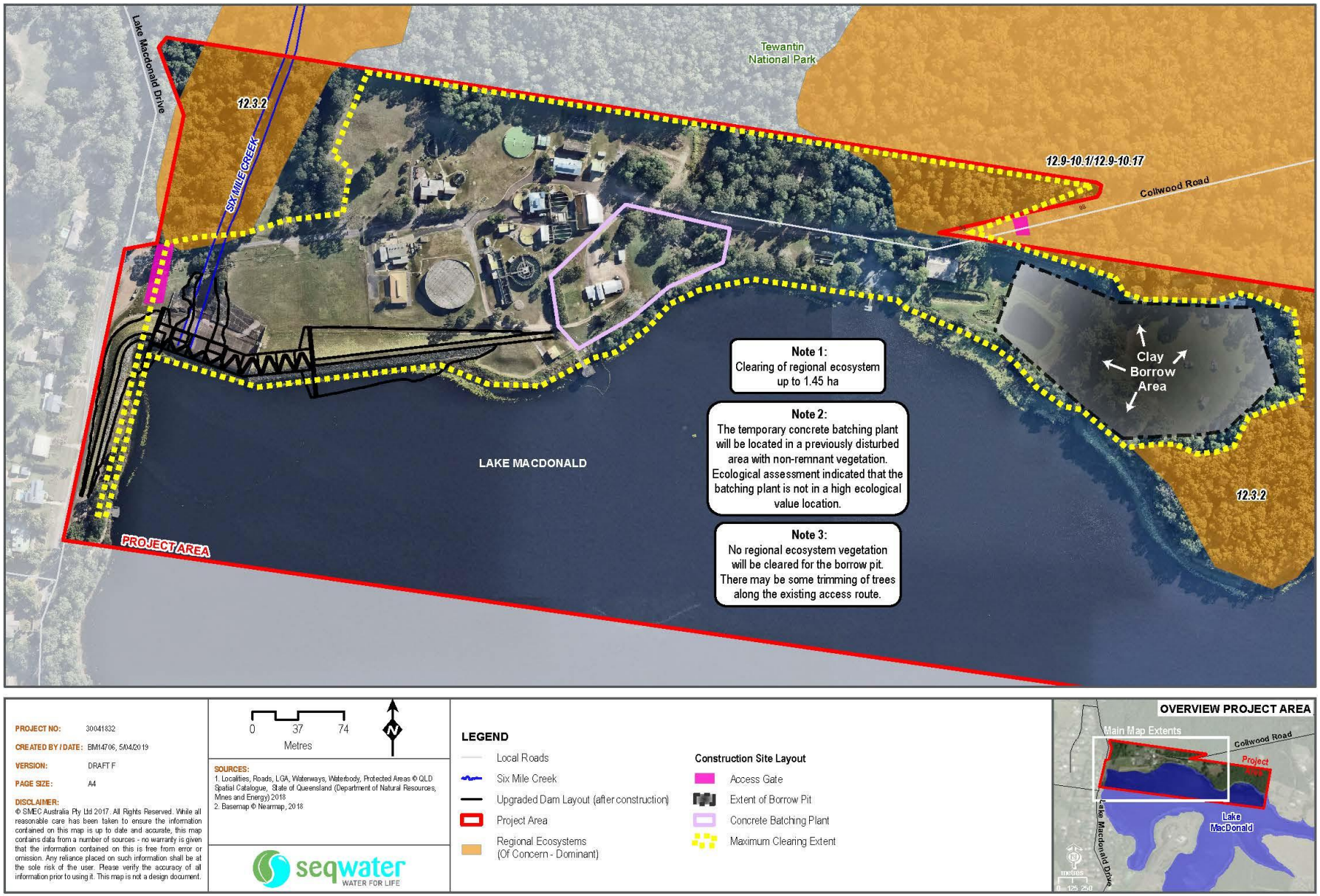

Figure A5 **Maximum clearing extent** (Source: Supplementary report to the IAR)

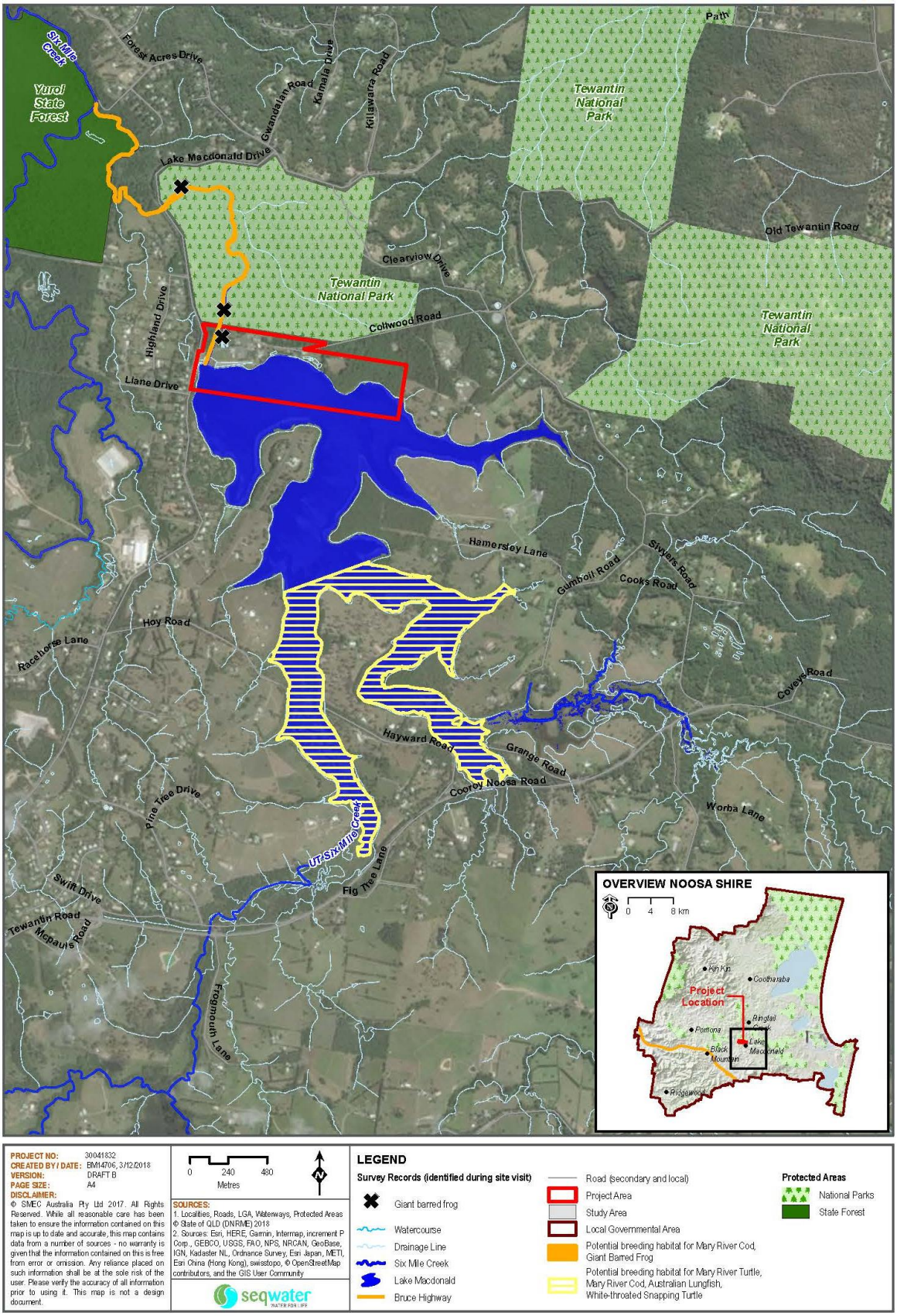

Figure A6 Potential breeding habitat and confirmed records for the giant barred frog, the Mary River cod, the Australian lungfish, the Mary River turtle and the white-throated snapping turtle (Source: IAR; Appendix E, Figure E1-1)

Appendix 2. Imposed conditions

This appendix includes conditions imposed by the Coordinator-General under section 54B of the *State Development and Public Works Organisation Act* (SDPWO Act).

All the conditions imposed in this appendix take effect from the date of this Coordinator-General's report.

These conditions do not relieve the proponent of the obligation to obtain all approvals and licences from all relevant authorities required under any other Act.

In accordance with section 54B(3) of the SDPWO Act, I have nominated several entities to have jurisdiction for the conditions in this schedule. These entities are shown in Table A1.

In accordance with section 54D of the SDPWO Act, these conditions apply to anyone who undertakes the project, such as the proponent and an agent, contractor, subcontractor or licensee of the proponent, and any public utility providers undertaking public utility works as a result of the project.

Schedule 1. Management of environmental impacts

Condition 1. Site environmental management plan

The entity with jurisdiction for this condition is the Coordinator-General.

(a) Not less than two months prior to commencement of the project activities[14], the proponent is to submit a detailed site environmental management plan (SEMP) to the Coordinator-General for approval.

(b) The proponent cannot commence the project activities until the SEMP has been approved by the Coordinator-General.

(c) The SEMP is to be developed in accordance with the draft EMP in Appendix B of the IAR, except where the matter is addressed by conditions included in the Coordinator-General's evaluation report (2019) and then to the extent required by the conditions.

(d) The SEMP must include:

- (i) construction environmental management plans (see Condition 3)
- (ii) community and stakeholder engagement plan (see Condition 4)
- (iii) flora and fauna management plan (see Condition 5).

Condition 2. Implementation of site environmental management plan

The entity with jurisdiction for this condition is the Coordinator-General.

The proponent must ensure, when project works are being undertaken, the works are conducted in accordance with the approved SEMP.

Condition 3. Construction environmental management plans

The entity with jurisdiction for this condition is Noosa Shire Council.

In accordance with Condition 1, the following adaptive construction environmental management plans (CEMPs) are to be prepared:

- (i) stormwater management plan
- (ii) vegetation management plan

[14] Project activities include drawdown of Lake Macdonald, demolition, construction, demobilisation and lake refill.

(iii) lighting and associated light spill

(iv) traffic management plan

(v) noise, dust and vibration management plan.

(b) The CEMPs must be prepared and implemented for all aspects of the Six Mile Creek Dam Safety Upgrade project, and must incorporate:

(i) specific performance measures (e.g. release criteria, setbacks as relevant) to minimise impacts on nuisance sensitive places from construction activities

(ii) actions that will avoid or mitigate and manage adverse environmental impacts on waters, traffic and the community

(iii) appropriate adaptive management practices and details of how and when the practices will be implemented to address any non-compliance with performance measures

(iv) relevant monitoring and auditing requirements.

(c) The approved CEMPs must be provided to Noosa Shire Council with any development application for a material change of use associated with the project.

Condition 4. Community and stakeholder engagement plan

The entity with jurisdiction for this condition is the Coordinator-General.

(a) The proponent must prepare a community and stakeholder engagement plan (CSEP) for the project. The CSEP is to identify and manage community and stakeholder interests in the project and ensure that management measures are updated and adapted in response to stakeholder feedback.

The CSEP is to be submitted to the Coordinator-General for review and approval at least two months prior to commencement of project activities at the site.

(b) The CSEP is to include the following:

(i) a description of affected stakeholder groups, including their location

(ii) an analysis of key stakeholder groups (including authorised water users and downstream property owners) and stakeholder issues

(iii) engagement activities, schedules and associated action plans

(iv) roles and responsibilities for engagement

(v) a complaints management process that provides for 48 hour response to any complaints received, and how complaints will be investigated and resolved

(vi) a process to update flood notifications

(vii) objectives and key performance indicators for stakeholder engagement

(viii) monitoring and reporting requirements

(ix) processes for incorporating stakeholder feedback into updates of the SEMP and any other relevant management plans required for the project.

(c) The CSEP must be made publicly available by the proponent on the project website within two weeks of receiving approval for the CSEP from the Coordinator-General. The proponent is to notify the Coordinator-General when this action has been completed.

(d) The proponent must review the CSEP at least every six months following commencement of on-site project works and update it if necessary, however the CSEP can be updated more frequently if updates are required.

(e) The proponent is to provide any updated versions of the CSEP to the Coordinator-General for information within 1 week of the update being finalised and is to make the most recent version publicly available on the project website for the duration of the project.

Condition 5. Flora and fauna management plan

The entities with jurisdiction for this condition are the Department of Agriculture and Fisheries (DAF) for 5(a), the Department of Environment and Science (DES) for 5(b) and the Department of Natural Resources Mines and Energy (DNRME) for 5(c).

The purpose of this condition is the development and delivery of an adaptive management plan for managing and minimising impacts on terrestrial and aquatic ecology habitat, including fish species, pest species, and MSES species likely to occur in Lake Macdonald, its tributaries and in Six Mile Creek.

(a) The plan must include management measures (including fauna salvage and relocation program and rehabilitation) to reduce impacts on fish species and measures for managing pest species.

(b) The plan must include effective management measures (including fauna salvage and relocation program and rehabilitation) to reduce impacts for all other aquatic MSES species.

(c) The plan must:

  (i) include aquatic habitat management measures for the management of water quantity and quality released downstream from the dam, both during dam drawdown and during construction activities, including:

    (A) monitoring of water level, water quality, velocity and bed and bank stability downstream of the dam

    (B) performance criteria and trigger levels to detect potential impacts to initiate adaptive management measures, corrective action, or remediation as appropriate

    (C) upper threshold limits for water quality that would initiate emergency response measures, including immediate reduction or temporary ceasing of water release

    (D) detail corrective measures and how they would be implemented if trigger levels are exceeded

    (E) the requirement for site photographs to record vegetation and stream structure before, during, and immediately after dam lowering to monitor effects of discharge rates on aquatic ecosystems.

  (ii) clearly set out monitoring and reporting requirements on the success of the management measures against performance criteria and trigger levels to meet the environmental flow requirements under the *Water Plan (Mary Basin) 2006*, and if necessary, how the plan has been amended to address exceedances.

This plan may incorporate/be incorporated into plans identified in conditions recommended to the Commonwealth Minister.

Condition 6. Construction vehicle haulage

The entity with jurisdiction for this condition is the Noosa Shire Council.

(a) Construction vehicle site access is limited to a single access route in and out of Lake Macdonald Drive. ‘Construction vehicle’ does not include light motor vehicles such as cars, utes and motorbikes (including mopeds and tricycles), or specialist vehicles where prior approval from Noosa Shire Council has been obtained (e.g. vehicles required for site establishment and demobilisation works, and salvage and relocation).

(b) Any laden construction vehicle must have its load fully covered and secured.

(c) Construction vehicles must not arrive at the site prior to the approved operating hours and must not leave the site with either a full or partial load after the approved operating hours.

Condition 7. Road impact assessment

The entity with jurisdiction for this condition is the Noosa Shire Council.

(a) The proponent must undertake a detailed road impact assessment that confirms any upgrades or other road works required to be undertaken because of the project and its traffic, including to Lake Macdonald Drive, and the Lake Macdonald Drive-Seqwater access road intersection.

(b) The road impact assessment must be provided to Noosa Shire Council for approval at least two months prior to commencement of any on-site project works.

(c) Any road upgrades or road works required by the approved road impact assessment must be incorporated into the traffic management plan required under Schedule 1, Condition 3.

(d) Detailed engineering plans of all road upgrades or road works must be submitted to Noosa Shire Council for approval prior to commencement of works. The road upgrades and works must be designed in accordance with the relevant Austroads standards and the Department of Transport and Mains Roads standard drawings and specifications.

In accordance with section 54B(3) of the SDPWO Act, I have nominated several entities to have jurisdiction for the conditions in Schedule 1. These entities are shown in Table A1 which lists the organisations/agencies responsible for monitoring compliance of each of the Coordinator-General's imposed conditions.

Table A1 Entities with jurisdiction for Coordinator-General imposed conditions

Part	Approval	Condition no.	Entity with jurisdiction
Schedule 1	Construction Environmental Management Plans	Condition 3, 6 and 7	Noosa Shire Council
Schedule 1	Flora and fauna management plan	Condition 5 (a)	DAF
Schedule 1	Flora and fauna management plan	Condition 5 (b)	DES
Schedule 1	Flora and fauna management plan	Condition 5 (c)	DNRME

Schedule 2. Monitoring, reporting and auditing

Condition 1. Commencement of activity

(a) The proponent must notify the Coordinator-General at least five days prior to any project activities occurring.

Condition 2. Monitoring and reporting

The proponent must prepare a report every three months that summarises compliance and monitoring results for the project's construction activities.

(a) The reports must include the following for the reporting period:

(i) an evaluation of compliance with the SEMP

(ii) monitoring data required by the Imposed Conditions included in Schedule 1 of the CGER (2019) for the period and an interpretation of the results

(iii) details of any environmental incident during the reporting period, including a description of the incident, resulting effects, corrective actions (including site

remediation activities), revised activity practices to prevent a recurrence, responsibility and timing.

(b) The reports must be provided to the entity nominated as having jurisdiction for the relevant condition for information, and also be made available on the project website within 20 business days of the end of the three-month period to which the report relates and continue to be available on the project website for the duration of the project.

Condition 3. Third Party Audit

(a) The proponent must engage an independent, appropriately skilled and experienced entity, as the environmental auditor for the duration of the project's activities.

(b) The Third Party Auditor must undertake the first audit within three months from the commencement of drawdown and then yearly thereafter during the project activities.

(c) The proponent must ensure that the Third Party auditor has reasonable site access and access to all information required to perform its function, including, without limitation:

(i) all approvals

(ii) the approved SEMP

(iii) results of all monitoring required under the Imposed Conditions.

(d) The Third Party auditor must:

(i) verify compliance with the SEMP

(ii) review the compliance and monitoring reports required by **Schedule 2, Condition 2. Monitoring and reporting** and report to the entities nominated as having jurisdiction in Schedule 1 on the contents and adequacy of those reports.

(e) The Third Party audit must meet the following requirements:

(A) commence once drawdown activities start and

(B) end once all imposed conditions have been complied with to the satisfaction of the Coordinator-General

(ii) audits must be undertaken generally in accordance with *AS/NZS ISO 19011:2014 Guidelines for auditing management systems*, by an appropriately qualified person engaged by and at the expense of the proponent

(iii) the proponent must provide the Audit Report to the Coordinator-General within 20 business days of receipt from the Third Party

(iv) the Coordinator-General may determine that an imposed condition is no longer required to be audited where:

(A) the condition (or its intent) has subsequently become a requirement of or has been addressed through new or amended legislation or another; regulatory approval; and

(B) it is no longer appropriate that the matter be addressed by the Coordinator-General, as it is managed pursuant to other regulatory requirements; or

(C) the Coordinator-General is satisfied that the condition (or its intent) has been completed.

Appendix 3. Stated conditions

This appendix includes the Coordinator-General's stated conditions, stated under section 39 and 47C of the SDPWO Act.

Schedule 1. *Planning Act 2016*

This schedule includes the Coordinator-General's stated conditions for decisions made under the *Planning Act 2016*.

Part A. Waterway barrier works

The entity with jurisdiction for this part is the Department of State Development, Manufacturing, Infrastructure and Planning's State Assessment and Referral Agency.

Condition 1. Lake drawdown

(a) Drawdown of Lake Macdonald and fish salvage operations must not occur between 1 September and 28 February.

Condition 2. Construction

(a) The construction or raising of waterway barrier works that is a permanent dam incorporating a hybrid ogee crest and labyrinth spillway within Six Mile Creek must be undertaken generally in accordance with the approved plan: Dam safety upgrade spillway General plan and sections, Seqwater, 12/03/2019, SK-1000, Revision A.

(b) The construction or raising of waterway barrier works that is a temporary cofferdam incorporating sheetpiling and a temporary working platform within Six Mile Creek must be undertaken generally in accordance with the following plans:

  (i) Upgrade concept design 2017 – Site layout during construction, AECOM, 05/10/2017, 60542495-103, Revision 0

  (ii) Upgrade concept design 2017 – Temporary works spillway demolition plan for working platform, AECOM, 05/10/2017, 60542495-107, Revision 0

  (iii) Upgrade concept design 2017 – Temporary works sheetpile long section, AECOM, 05/10/2017, 60542495-109, Revision 0

  (iv) Upgrade concept design 2017 – Temporary works working platform sections, AECOM, 05/10/2017, 60542495-110, Revision 0.

Condition 3. Offsite fish passage

(a) Within 18 months of the completion of the hybrid ogee crest and labyrinth spillway at Six Mile Creek Dam, works must be completed to improve upstream and downstream fish passage past the Gympie Weir within the Mary River at -26.194130, 152.657258. The improvements must result in adequate fish passage being provided on all expected flows and must cater for the whole fish community taking into account species, size classes, life stages and swimming abilities as well as the seasonal and flow related biomass of the fish community.

Condition 4. Safe downstream fish movement

(a) The waterway barriers and any associated infrastructure including, but not limited to intakes, walls, access structures, pipe works, spillways and dissipation devices, are to be constructed and maintained to avoid fish injury, mortality and/or entrapment.

Part B. Concrete batching plant

This part includes the Coordinator-General's stated conditions for the proposed concrete batching plant.

The entity with jurisdiction for this part is Noosa Shire Council.

Condition 1. Vegetation

(a) Clearing of native vegetation only occurs where:

(i) identified in Figure 1;

or

(i) no other suitable cleared or partially cleared area is available on the premises and

(ii) the development minimises the total footprint within which all activities, buildings, structures, driveways and other works are contained.

(b) Remnant vegetation to be retained abutting the works area must be fenced off prior to works commencing.

Condition 2. Water Quality

(a) The development and use of the concrete batching plant must comply with the following requirements of the Noosa Plan's Natural Resources Overlay Code level:

(i) Lake Macdonald dam water supplies are not adversely affected by development or the effects of the development.

(b) The development and use of the concrete batching plant must not have adverse effects on the quality or quantity of water entering Lake Macdonald or tributaries, including effects on:

(i) nutrient or other chemical levels, and

(ii) sediment loads, and

(iii) turbidity.

(c) Development in the water supply buffer areas is undertaken in a manner which contributes to maintaining and improving the water quality in those catchments.

Condition 3. Environmental Health

(a) Dust and particulate emissions must be controlled to prevent or minimise nuisance at surrounding sensitive sites.
Dust sources – aggregate piles, cement and fly ash silos and conveyor systems, vehicle movements and unloading activities.

(b) Storm and process water must be appropriately managed to prevent or minimise the release of contaminants offsite, including to ground water, to the greatest extent practicable.

(c) Storage of fuel, lubricants and other chemicals must be managed to minimise releases of contaminants to the greatest extent practicable, including the storage of solid and liquid contaminants in covered and bunded areas away from traffic movement areas.

(d) Noise nuisance must be prevented or minimised at noise sensitive places via measures including the appropriate location of noise generating equipment and processes to prevent noise nuisance to surrounding sensitive receivers (residential).

(e) The approved use must not interfere with the amenity of the adjacent neighbourhood from the operation of machinery or electrical equipment, or from light, vibration, smell, fumes, smoke, vapour, steam, soot, ash, grit, oil, dust, waste water, waste products, electrical interference or other.

(f) Waste production and disposal must be minimised, and waste must be managed to prevent environmental harm.

(g) All lights shall be directed internally and hooded to minimise light spill in to the adjoining National Park or sensitive receivers (residential).

Condition 4. Safety Signage

(a) Public signage must be erected to all boundaries of the construction site, at regular intervals, warning of the safety hazards associated with the approved use.

Condition 5. Noise and Vibration Management Plan

(a) The operation of the concrete batching plant must comply with an approved Noise and Vibration Management Plan under the SEMP.

Condition 6. Emergency Management Plan

(a) An Emergency Management Plan must be kept on premises to address procedures and protocols for emergency management. The plan must address emergencies that may be reasonably expected as a consequence of the concrete batching plant, e.g. fires, hazardous materials spills and flooding. The plan must include:

- (i) procedures for reporting an emergency
- (ii) required actions to respond and handle an emergency
- (iii) written procedures
- (iv) staff responsibilities
- (v) regular testing and evaluation.

Condition 7. Complaints Management Plan

(a) A Complaints Management Plan is to be kept on the premises to document any complaints received about the activity. The complaints management plan must include:

- (i) dedicated phone line to enable the community to contact a central project representative.
- (ii) process for ensuring the proponent responds to a complainant within 48 hours of the complaint being received
- (iii) complaints register including:
  - (A) a register of the time, date and nature of the complaint
  - (B) how the complaint was made
  - (C) details of the complainant
  - (D) investigation into the complaint and action taken, including timeframes for actions taken
  - (E) details of the person who investigated the complaint response to complainant.
- (iv) protocol for investigating and resolving complaints.

(b) An incidents register is kept on the premises to document incidents associated with the activity. The incidents register must record:

- (i) time, date and details of the incident
- (ii) how the incident occurred
- (iii) action taken to remedy the incident
- (iv) investigation into the incident
- (v) recommendations from investigation
- (vi) reporting procedures to notify Noosa Shire Council.

Condition 8. Damage to infrastructure

(a) Any damage to footpaths, street plantings, natural vegetation/trees kerb and channel, bridges or roadways from vehicles associated with the batching plant must be repaired or

reinstated to at least pre-existing conditions to the reasonable satisfaction of Noosa Shire Council.

Condition 9. Reinstatement of Site

(a) On completion of the dam upgrade the concrete batching plant must be removed and the pre-activity site functionality restored. This must include reinstatement to pre-existing land condition use and removal of waste and debris such as concrete, wire, rubble, brick/s and the like. Sediment control measures must be installed and maintained until soils are stabilised by turf, vegetation or sealed.

Schedule 2. *Environmental Protection Act 1994*

Part A. Clay borrow pit

This part includes the Coordinator-General's stated conditions for the proposed Environmentally Relevant Activity – Extractive and screening activities of 5,000 tonnes to 100,000 tonnes of material in a year.

The entity with jurisdiction for this part is the Department of Environment and Science.

Condition 1. General conditions

G1. Activities under this environmental authority must be conducted in accordance with the following limitations:

(a) must only be carried out within the area defined as follows:

Latitude	Longitude
-26.381772	152.937077
-26.381216	152.936369
-26.380712	152.936579
-26.381013	152.937386
-26.381056	152.938467
-26.381203	152.938520
-26.381602	152.938663
-26.381954	152.938243
-26.387982	152.938036
-26.382008	152.937412

(b) must not exceed 100,000 tonnes per year of material extracted.

G2. All reasonable and practicable **measures** must be taken to prevent or minimise environmental harm caused by the **activities**.

G3. Any breach of a condition of this environmental authority must be reported to the **administering authority** as soon as practicable within 24 hours of becoming aware of the breach. Records must be kept including full details of the breach and any subsequent actions taken.

G4. Other than as permitted by this environmental authority, the **release of a contaminant into the environment** must not occur.

G5. Environmental monitoring results must be kept until surrender of this environmental authority. All other information and records that are required by the conditions of this environmental authority must be kept for a minimum of five (5) years. All information and records required by the conditions of this environmental authority must be provided to the

administering authority, or nominated delegate upon request**,** within the required timeframe and in the specified format.

G6. When required by the **administering authority**, monitoring must be undertaken in the manner prescribed by the **administering authority**, to investigate a complaint of environmental nuisance arising from the **activity**. The monitoring results must be provided within 10 business days to the **administering authority** upon its request.

G7. The **activity** must be undertaken in accordance with written procedures that:

1. identify potential risks to the environment from the activity during routine operations, closure and in an emergency
2. establish and maintain control measures that minimise the potential for environmental harm
3. ensure plant, equipment and measures are maintained in a proper and effective condition
4. ensure plant, equipment and measures are operated in a proper and effective manner
5. ensure that staff are trained and aware of their obligations under the *Environmental Protection Act 1994*
6. ensure that reviews of environmental performance are undertaken at least annually.

G8. All waste generated in carrying out the **activity** must be reused, recycled or removed to a facility that can lawfully accept the waste.

G9. The holder must record the following details for all environmental complaints received relating to the clay borrow pit activities:

1. date and time complaint was received
2. name and contact details of the complainant when provided and authorised by the complainant
3. nature of the complaint
4. investigations undertaken
5. conclusions formed
6. actions taken.

Condition 2. Air

A1. Other than as permitted within this environmental authority, odours or airborne contaminants must not cause environmental nuisance to any **sensitive place** or **commercial place**.

Condition 3. Water

WT1. Contaminants must not be released from any site to any **waters** or the bed and banks of any **waters**.

WT2. Stormwater runoff from **disturbed areas** of the site, generated by (up to and including) a **24 hour storm event with an average recurrence interval of 1 in 5 years** must be retained on site or managed to remove contaminants prior to release.

Condition 4. Noise

N1. Noise generated by the **activity** must not cause environmental nuisance to any **sensitive place** or **commercial place**.

Condition 5. Land

L1. Other than as permitted within this environmental authority, contaminants must not be released to land.

L2. **Land** that has been disturbed for **activities** conducted under this environmental authority must be rehabilitated in a manner such that:

1. suitable species of vegetation for the location are established and sustained for earthen surfaces
2. potential for erosion is minimised

3. the quality of water released from the site, including seepage, does not cause environmental harm
4. potential for environmental nuisance caused by dust is minimised
5. the water quality of any residual water body does not have potential to cause environmental harm
6. the final landform is stable and protects public safety.

Condition 6. Waste

W1. All waste generated in carrying out the **activity** must be lawfully reused, recycled or removed to a facility that can lawfully accept the waste.

Definitions – Schedule 2 *Environmental Protection Act 1994*

Key terms and/or phrases used in Schedule 2 are defined in this section. Applicants should note that where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined it has its ordinary meaning.

'24 hour storm event with an average recurrence interval of 1 in 5 years' means the maximum rainfall depth from a 24 hour duration precipitation event with an average recurrence interval of once in 5 years. *For example, an Intensity-Frequency-Duration table for a 24 hour duration event with an average recurrence interval of 1 in 5 years, identifies a rainfall intensity of 7.09 mm/hour. The rainfall depth for this event is therefore 24 hour x 7.09 mm/hour = 170.16 mm.*

'activity' means the environmentally relevant activities, whether resource activities or prescribed activities, to which the environmental authority relates.

'administering authority' means the Department of Environment and Science or its successor or predecessors.

'commercial place' means a place used as a workplace, an office or for business or commercial purposes and includes a place within the curtilage of such a place reasonably used by persons at that place.

'disturbed areas' includes areas:

1. that are susceptible to erosion
2. that are contaminated by the activity and/or
3. upon which stockpiles of soil or other materials are located.

'environmental nuisance' as defined in Chapter 1 of the *Environmental Protection Act 1994*.

'holder' means the holder of the environmental authority.

'land' means any land, whether above or below the ordinary high-water mark at spring tides (i.e. includes **tidal land**).

'measures' has the broadest interpretation and includes:

- procedural measures such as standard operating procedures for **dredging** operations, environmental risk assessment, management actions, departmental direction and competency expectations under relevant guidelines
- physical measures such as plant, equipment, physical objects (such as bunding, containment systems etc.), ecosystem monitoring and bathymetric surveys.

'**records**' include breach notifications, written procedures, analysis results, monitoring reports and monitoring programs required under a condition of this authority.

'**release of a contaminant into the environment**' means to:

- deposit, discharge, emit or disturb the contaminant
- cause or allow the contaminant to be deposited, discharged, emitted or disturbed
- fail to prevent the contaminant from being deposited, discharged emitted or disturbed
- allow the contaminant to escape
- fail to prevent the contaminant from escaping.

'**sensitive place**' includes the following and includes a place within the curtilage of such a place reasonably used by persons at that place:

1. a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises or
2. a motel, hotel or hostel or

3. a kindergarten, school, university or other educational institution or
4. a medical centre or hospital or
5. a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 2004* or a World Heritage Area or
6. a public park or garden or
7. for noise, a place defined as a sensitive receptor for the purposes of the *Environmental Protection (Noise) Policy 2008*.

'waters' includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water, natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater and any part thereof.

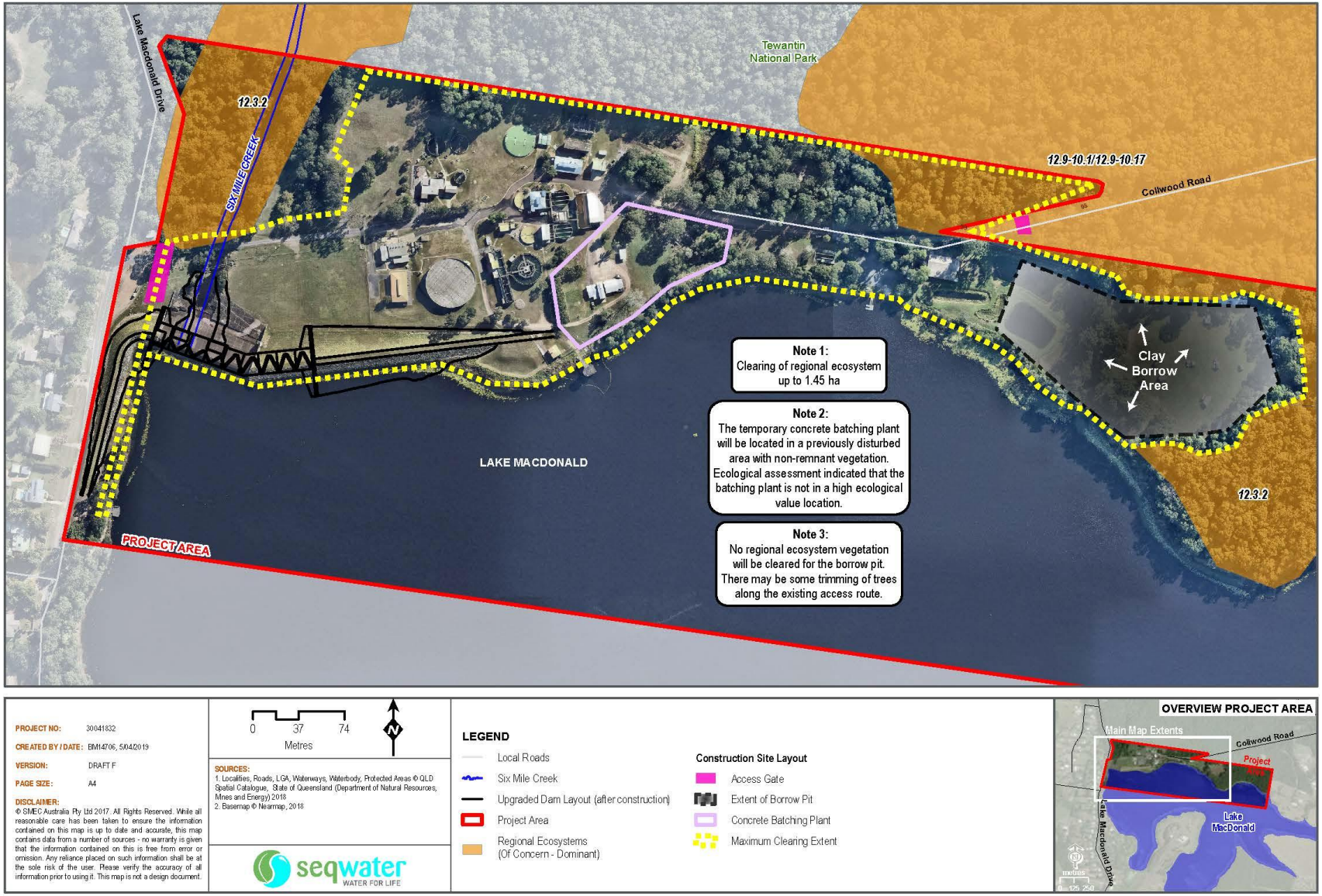

Figure 1 Maximum clearing extent

Appendix 4. Recommended conditions for the Commonwealth

In accordance with clause 21 of the Bilateral agreement between the Commonwealth Government and the State of Queensland, this section recommends conditions for consideration by the Commonwealth Minister for the Environment in making a decision on the proposed action under sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Condition 1. Disturbance limits

The outcome sought by this condition is to ensure that the clearing of vegetation does not significantly impact on EPBC Act listed threatened species and threatened ecological communities (TECs), in particular the koala (*Phascolarctos cinereus*) and the southern penda (*Xanthostemon oppositifolius*).

(a) The approval holder must not exceed the maximum disturbance limit of 3 hectares stated in Table 1.

(b) Clearing of vegetation cannot be carried out outside the maximum clearing extent shown on Figure 1.

Table 1 Maximum disturbance limit for EPBC Act species

Species	Maximum disturbance
Koala (*Phascolarctos cinereus*) Southern penda (*Xanthostemon oppositifolius*)	3 hectares

Note: Table 1 is derived from information provided in the IAR.

Condition 2. Pre-clearing survey plan for listed threatened species and ecological communities

The outcome sought by this condition is to ensure that the clearing of vegetation does not significantly impact on listed threatened species and TECs, in particular the koala and the southern penda.

(a) Conduct a pre-clearing survey of the area identified in Condition 1 to identify possible species protected under the EPBC Act, specifically the koala and southern penda.

(b) The approval holder must finalise and implement the *Environmental Management Plan – Terrestrial Ecology* to mitigate potential impacts on the koala and southern penda. The *Environmental Management Plan – Terrestrial Ecology* must:

  (A) include contingency plans in case EPBC Act listed species or TECs are encountered during the pre-clearance surveys

  (B) include a figure clearly demarcating areas to be cleared

  (C) be consistent with EPBC Act guidelines and policies, relevant recovery plans, threat abatement plans, conservation advice and any plan required under another condition of this approval

  (D) include sequential clearing and limits on the area of habitat that can be cleared at any one time

(E) include the use of fauna spotters prior to and during all clearing activities to ensure impacts on EPBC Act listed species (e.g. the koala) are minimised

(F) include measures to prevent stress, injury or and mortality of EPBC Act listed fauna species during project stages

(G) include measures to protect EPBC Act listed species and TECs and their habitat if located in the project area, including adjacent to cleared areas.

The *Pre-clearing survey plan for listed threatened species and TECs* does not need to include but must be consistent with management plans required for EPBC Act listed species and communities for which a management plan is required under another condition of this approval.

Condition 3. Six Mile Creek baseline data collection and monitoring plan

With regards to the findings of the IAR, the outcome sought by this condition is to ensure that the drawdown of Lake Macdonald does not significantly impact on EPBC Act listed threatened species within and downstream of the dam (Six Mile Creek), in particular the giant barred frog (*Mixophyes iterates*), Australian lungfish (*Neoceratodus forster*), Mary River cod (*Maccullochella mariensis*), Mary River turtle (*Elusor macrurus*), and white-throated snapping turtle (*Elseya albagula*).

(a) The authority holder must finalise the Lake Macdonald Water Lowering Adaptive Management Plan with consideration of the Impact Assessment Report – Supplementary Information (29 March 2019).

(b) The approval holder must submit the Lake Macdonald Water Lowering Adaptive Management Plan for the written approval of the Commonwealth Minister for the Environment at least three months before drawdown of Lake Macdonald starts.

(c) The authority holder cannot commence the drawdown until the Lake Macdonald Water Lowering Adaptive Management Plan has been approved by the Minister in writing.

(d) The authority holder must publish the Lake Macdonald Water Lowering Adaptive Management Plan on their website within ten (10) business days from the day of receiving the Minister's approval of the Lake Macdonald Water Lowering Adaptive Management Plan in writing.

(e) The approved plan must be implemented.

(f) The Lake Macdonald Water Lowering Adaptive Management Plan does not need to include but must be consistent with management plans required for EPBC Act listed species and communities for which a management plan is required under another condition of this approval.

(g) The Lake Macdonald Water Lowering Adaptive Management Plan must include:

(i) monitoring schedules and methodologies for regular monitoring and assessments of existing habitat, including sediment load and water quality of Six Mile Creek, before (to establish pre-construction baseline), during and post-drawdown (to identify potential significant impacts)

(ii) details of corrective actions to be undertaken if an upper threshold for water release is exceeded, including pausing or ceasing release to allow analysis, development and implementation of suitable corrective action.

(h) Monitoring must be undertaken by a suitably qualified person/s.

Flow regime

(a) The authority holder must finalise the Lake Macdonald Water Lowering Adaptive Management Plan with consideration of the IAR – Supplementary Information (29 March 2019) to mitigate significant impacts on EPBC Act listed species arising from release of water during drawdown of Lake Macdonald for either the gradual (12-week) or the rapid drawdown release scenarios.

(b) The Lake Macdonald Water Lowering Adaptive Management Plan must detail how the lake lowering releases would be managed over the gradual 12-week scenario and the rapid drawdown scenario, to mimic an existing flow regime; including information on how to:

(i) prevent or reduce to the greatest extent feasible potential changes to the existing flow regime in Six Mile Creek downstream of the dam

(ii) prevent or reduce to the greatest extent feasible downstream impacts on water quality and sedimentation, during the drawdown of Lake Macdonald

(iii) prevent or minimise to the greatest extent feasible impacts on aquatic and riparian habitat relevant to EPBC Act listed species, including habitat structure and habitat quality during the drawdown of Lake Macdonald

(iv) prevent or minimise to the greatest extent feasible potential impacts on EPBC Act listed species.

Downstream habitats

(a) To detect potential significant impacts from the Lake Macdonald drawdown on the habitats of EPBC Act listed threatened species the approval holder must finalise the Lake Macdonald Water Lowering Adaptive Management Plan with consideration of the Impact Assessment Report – Supplementary Information (29 March 2019).

(b) The Lake Macdonald Water Lowering Adaptive Management Plan must:

(i) be informed by available scientific knowledge on the preferred foraging and nesting habitat, breeding and behaviours of the giant barred frog, Australian lungfish, Mary River cod, Mary River turtle, and white-throated snapping turtle

(ii) include details of methods of assessing downstream habitat of the giant barred frog, Australian lungfish, Mary River cod, Mary River turtle, and white-throated snapping turtle

(iii) prescribe effective habitat protection adaptive management measures, corrective actions, and remediation measures for the giant barred frog, Australian lungfish, Mary River cod, Mary River turtle, and white-throated snapping turtle

(iv) include appropriate performance criteria and trigger levels to detect potential impacts on habitat parameters for each species to initiate adaptive management measures, corrective action, or remediation as appropriate

(v) include appropriate upper threshold limits for habitat that would initiate emergency response measures, including immediate reduction or temporary ceasing of water release

(vi) measure the success of the management measures against performance criteria and trigger levels, if necessary amended the plan

(vii) detail corrective measures and how they would be implemented if performance criteria or trigger levels are exceeded

(viii) outline how and when compliance will be reported on

(ix) clearly set out monitoring and reporting requirements.

Water quality

(a) To detect potential significant impacts on water quality and sedimentation of the Six Mile Creek downstream of the dam detrimental to EPBC Act listed species the authority holder must finalise the Lake Macdonald Water Lowering Adaptive Management Plan with consideration of the Impact Assessment Report – Supplementary Information (29 March 2019)

(b) The Lake Macdonald Water Lowering Adaptive Management Plan must:

(i) include details of water sampling and analysis methodologies

(ii) include appropriate performance criteria and trigger levels to detect potential impacts on water quality (consistent with the *Water Plan (Mary Basin) 2006*) to initiate adaptive management measures, corrective action, or remediation as appropriate

(iii) include appropriate upper threshold limits for water quality that would initiate emergency response measures, including immediate reduction or temporary ceasing of water release

(iv) measure the success of the management measures against performance criteria and trigger levels, if necessary amended the plan

(v) detail corrective measures and how they would be implemented if trigger levels are exceeded

(vi) outline how and when compliance will be reported on

(vii) clearly set out monitoring and reporting requirements.

Fauna salvage and relocation

(a) To ensure that the fish and turtle salvage and relocation does not significantly impact on the Mary River cod, the Australian lungfish, the Mary River turtle and the white-throated snapping turtle, the authority holder must finalise the Lake Macdonald Water Lowering Adaptive Management Plan with consideration of the Impact Assessment Report – Supplementary Information (29 March 2019)

(b) The Lake Macdonald Water Lowering Adaptive Management Plan (Aquatic Fauna Salvage and Relocation) must:

(i) include the details of survey for the Mary River cod, Australian lungfish, Mary River turtle and white-throated snapping turtle including:

(A) in Lake Macdonald prior to commencement of any lake lowering, during the drawdown and relocation process to assess the presence of key species,

(B) at proposed relocation sites prior to commencement of any lake lowering to assess their suitability (with respect to logistical concerns and aquatic fauna) and carrying capacity.

(C) after relocation at all relocation sites used for the Mary River cod, Australian lungfish, Mary River turtle and white-throated snapping turtle

(D) at the lake after any relocations back into the lake have occurred (Mary River cod only).

(ii) include details of relocation approach, including equipment for each species, with regard to expert knowledge where available.

(iii) identify the carrying capacity of each relocation site to determine how many Mary River cod, the Australian lungfish, the Mary River turtle and the white-throated snapping turtle the receiving sites can support and include protocols to achieve this during the salvage operations.

(iv) include the following relocation rules:

(A) the Mary River cod is only to be temporarily relocated to the Gerry Cook Fish Hatchery or any other dam approved by the Queensland Department of Agriculture and Fisheries

(B) no fish species, including no Mary River cod, are permitted to be relocated to Tinana Creek or Obi Obi Creek

(C) only Mary River cod are permitted to be temporarily relocated, all other native fish species (including the lungfish) must be permanently relocated. This is to

avoid risks of disease and translocation of aquatic weeds, as well as minimise risks to the health and safety of fish during capture and transport

(D) lungfish are not to be relocated to farm dams as dams may not provide suitable habitat for survival of these species. The lungfish is to be relocated permanently.

(v) include visual monitoring of the relocation sites on a monthly basis for 12 months after week +4 of the lake lowering schedule, to assess long-term success of the salvage and relocation operation.

(vi) be consistent with the EPBC Act Policy statement – Translocation of Listed Threatened Species – Assessment under Chapter 4 of the EPBC Act; and any other relevant EPBC Act guidelines and policies, relevant recovery plans, threat abatement plans, conservation advice and any plan required under another condition of this approval.

(c) A report on the success of the fish and turtle salvage and relocation must be:

(i) be undertaken by a suitably qualified person/s

(ii) based on the data collected during the monitoring required under the Lake Macdonald Water Lowering Adaptive Management Plan, and include analysis of the success of the relocation approach employed for each MNES

(iii) provided to the Minister on the completion of evaluation of the translocation following drawdown, and on completion of evaluation of the success of any return translocations of MNES from temporary translocation sites back into Lake Macdonald.

Definitions

Approved conservation advice: A conservation advice approved by the Minister under section 2668(2) of the EPBC Act for EPBC Act listed species and TECs.

Conservation advice: a conservation advice made under the EPBC Act.

EPBC Act: The *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

EPBC Act Environmental Offsets Policy: The EPBC Act Environmental Offsets Policy (October 2012), or subsequent revision, including the Offset Assessment Guide.

EPBC Act listed threatened species: A threatened flora or fauna species listed under the EPBC Act, including but not limited to the:

- koala (*Phascolarctos cinereus*) – vulnerable
- southern penda (*Xanthostemon oppositifolius*) – vulnerable
- giant barred frog (*Mixophyes iterates*) – endangered
- Australian lungfish (*Neoceratodus forster*) – endangered
- Mary River cod (*Maccullochella mariensis*) – vulnerable
- Mary River turtle (*Elusor macrurus*) – endangered
- white-throated snapping turtle (*Elseya albagula*) – endangered.

EPBC listed ecological communities: A threatened ecological community, listed under the EPBC Act, including but not limited to:

- the lowland rainforest of subtropical Australia ecological community – endangered.

Impact/s / impacted: As defined in section 527E of the EPBC Act.

Inundation: flooding of the creek above the existing water level.

Matters of national environmental significance: Matters listed under the EPBC Act for the following controlling provisions:

- listed threatened species and ecological communities.

Minimise: Minimise means to ensure the action has no lasting adverse impacts on populations, in particular breeding populations of MNES where they currently persist, or to the quality of habitat identified downstream of Six Mile Dam for each MNES.

Minister: The Minister administering the EPBC Act and includes a delegate of the Minister.

New or increased impact: A new or increased impact on or risk to any matter protected by the controlling provisions for the action, when compared to the impact on or risk resulting from implementing the plan or program that has been approved by the Minister.

Pre-construction baselines: EPBC Act listed threatened species habitat and water quality parameters (including sedimentation) derived from a regular series of measurements taken in accordance with recognised EPBC Act survey guidelines and standards for water quality monitoring and reporting at least three (3) months before the commencement of the drawdown from Lake Macdonald.

Recognised standards for water quality monitoring and reporting: The *National Water Quality Management Strategy Australian Guidelines for Water Quality Monitoring and Reporting 2000*, or subsequent revision.

Recovery plants: A recovery plan made or adopted by the Minister under the EPBC Act.

Residual significant impact: means a residual likely significant impact (as determined through application of the *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance*) of the action on matters of national environmental significance after avoidance and mitigation measures are applied.

Suitably qualified person/s: means a person who has professional qualifications, training or skills and at least five (5) years of experience relevant to the nominated subject matters to give authoritative assessment, advice and analysis about performance relevant to the subject matter using relevant protocols, standards, methods and/or literature.

TEC: EPBC Act listed threatened ecological community.

Threat abatement plans: A threat abatement plan made or adopted by the Minister under the EPBC Act.

Water quality: Nutrients such as phosphorus and nitrogen, sediments and other suspended solids. An increase in any of these parameters is a detrimental impact to water quality.

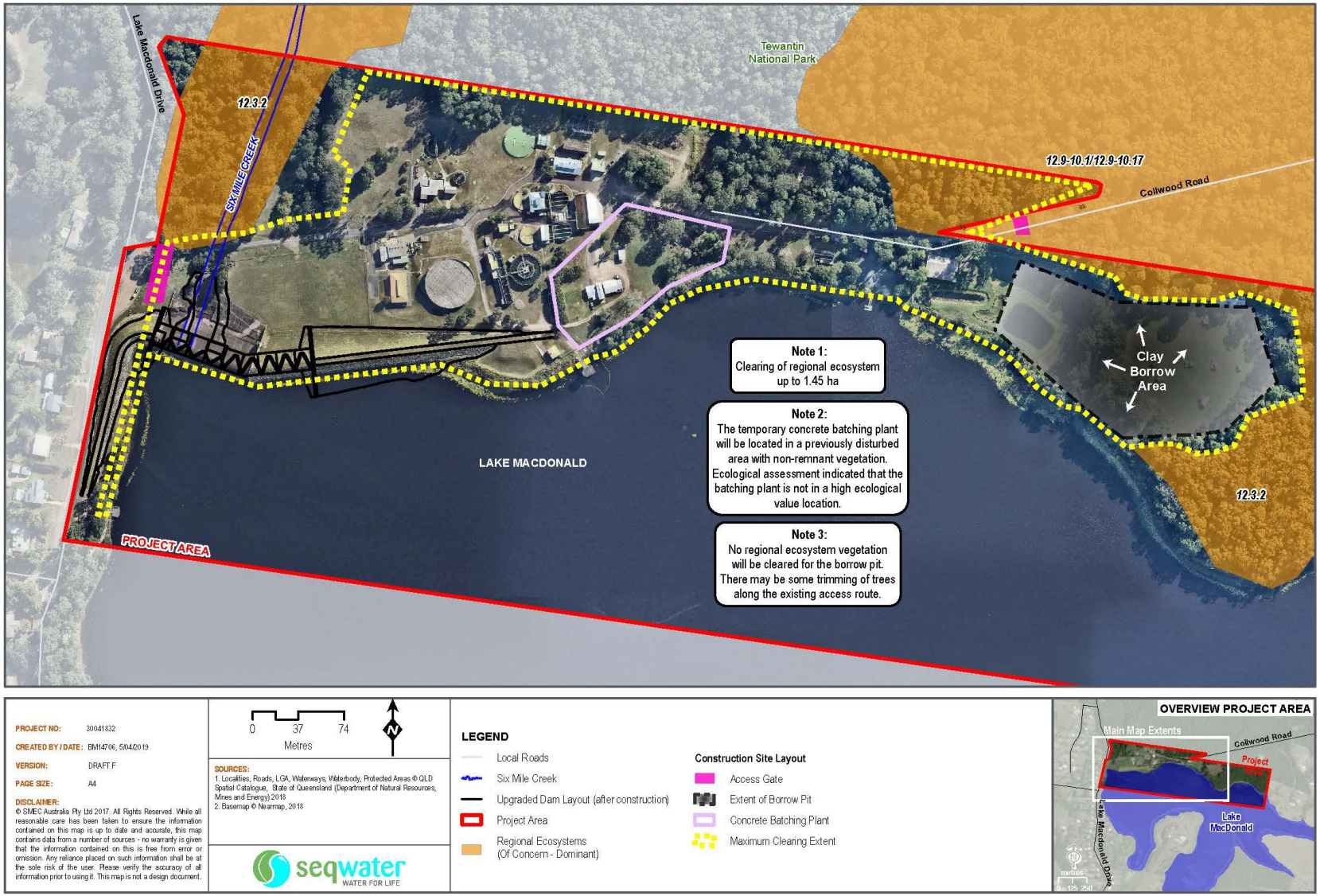

Figure 1 Maximum clearing extent

Appendix 5. Coordinator General's recommendations

This appendix includes recommendations, made under section 52 of the SDPWO Act. The recommendations relate to the applications for development approvals for the project.

While the recommendations guide the assessment managers in assessing the development applications, they do not limit their ability to seek additional information nor power to impose conditions on any development approval required for the project.

Each recommendation nominates the entity to be consulted by the proponent.

Recommendation 1. Concrete batching plant environmental management plan

(a) At least two months prior to the submission of the material change of use application for the concrete batching plant, the proponent is to submit the concrete batching plant environmental management plan to Noosa Shire Council.

Recommendation 2. Project specific information requirements for Material change of use – concrete batching plant

(a) The proponent is to provide Noosa Shire Council with the following information in support of a material change of use application for the concrete batching plant:

- (i) detailed site and elevation plans for the proposed concrete batching plant (including details of the site layout, setbacks, car parking, site access, on site turning, outdoor storage areas, existing vegetation being retained and structure heights etc)
- (ii) an Operational Management Plan – addressing relevant matters such as hours of operation, volume of production, volume of material to be stored and method of storage and number of deliveries
- (iii) an Environmental Management Plan – addressing such matters as offsite impacts mitigation, details of managing truck washout and fuel storage
- (iv) a Stormwater Management Plan including details of:
  - (A) stormwater runoff disposal of on-site including clean water diversion
  - (B) primary stormwater quality treatment system for the development for the effective removal of gross pollutants
  - (C) the maintenance program for all primary stormwater quality treatment devices which must be routinely checked, serviced and cleaned in accordance with the manufacturer's recommendations
  - (D) a stormwater quality treatment system must be provided for the development which ensures the receiving waters in the Six Mile Creek system are not adversely impacted upon by the use
- (v) details of any lighting and associated light spill for the concrete batching plant
- (vi) a Traffic Impact Assessment of Lake Macdonald Drive extending from the intersection with Elm Street to the site access driveway for traffic associated with the concrete batching plant and including but not be limited to the following:

(A) pavement impact assessment in accordance DTMR's Pavement Impact Assessment Practice Notice for Lake Macdonald Drive and the intersection with Elm Street prior to commencement of concrete batching plant activities at site.

(B) dilapidation report for Lake Macdonald Drive and the intersection with Elm Street

(C) safety review in accordance with DTMR's Route Assessment Guidelines for Multi-Combination Vehicles in Queensland for Lake Macdonald Drive and the intersection with Elm Street

(D) recommendations for any necessary improvement works to Lake Macdonald Drive and the intersection with Elm Street to cater for the proposed traffic (number and vehicle types)

(E) the number and type/size of trucks travelling to and from the site.

(vii) The Traffic Impact Assessment should include details of traffic impacts both during construction and operation of the concrete batching plant.

(viii) A Noise and Vibration Management Plan including:

(F) concrete batching plant activities (plant and equipment) to be utilised on site, including:

(I) time periods for construction

(II) legislative construction work limitations:

6.30am to 6.30pm Monday to Saturday – must be inaudible outside those hours and on Sundays and Public Holidays.

(III) legislative operational limitations for pumps and generators etc:

7.00am to 7.00pm Monday to Saturday

8.00am to 7.00pm Sundays and Public Holidays

Must be inaudible out of those hours.

(IV) activities conducted inside and outside of Standard hours.

Appendix 6. Proponent Commitments

This appendix includes commitments or management measures described in the IAR.

Where the proponent had committed to an action and this action is fully addressed by either an imposed condition or stated condition, the commitment is superseded by the condition and not included in the table below.

I expect the proponent to implement all commitments, management measures and corrective actions listed below and detailed in the IAR.

Commitment number	Proponent Commitment	IAR reference
	Traffic and driveway access	
1.	Seqwater will engage with Cooroy State School to identify appropriate mitigation measure/s to reduce traffic noise disturbance to students.	IAR Chapter 12 Table 12-4
2.	Seqwater will minimise truck haulage during school pick-up/drop-off periods in consultation with Cooroy State School. Consultation with school communities will include discussion and agreement on suitable mitigation/management, monitoring of effectiveness and adaptation as required.	IAR Chapter 9.4.3
3.	Adequate on-site parking will be provided to accommodate construction worker's vehicles.	IAR Chapter 9.4.3
	Hazard and risk	
4.	The dam will be designed to meet the Queensland Dam Safety Management guidelines. The dam design and construction will be subject to independent peer review to ensure these guidelines are met.	IAR Chapter 4.2.3
5.	The existing Six Mile Creek Emergency Action Plan (EAP) will remain publicly available throughout the project construction.	IAR Chapter 4.2.3
6.	A dam safety management plan will be developed for the project construction phase to operate in tandem with the existing EAP and address relevant changes to dam operation. The dam safety management plan will outline the responsibilities of Seqwater and the construction contractor, triggers for actions per the EAP and consultation with the Noosa Local Disaster Management Group.	IAR Chapter 4.2.3
7.	Detailed emergency plans will be developed by the contractor as the detailed engineering design takes shape. This will involve consultation with local emergency services such as police, fire brigade and State Emergency Services personnel, as well as the local emergency response groups.	IAR Chapter 4.4
8.	Community safeguards will be identified and implemented where the hazards dictate.	IAR Chapter 4.5
9.	The safety management system in place for the existing dam will be revised and updated by Seqwater as the project progresses and will have the revised systems in place prior to commissioning.	IAR Chapter 4.6

10.	The Project will result in changes for dam safety with respect to Six Mile Creek Dam (Lake Macdonald). Seqwater will undertake the following updates with respect to the new dam structure: • undertake a failure impact assessment study according to relevant guidelines • undertake dam safety risk assessment according to relevant guidelines • safety management systems for all of the operations are to be reviewed and updated for the new dam and in line with current guidelines as directed by the Queensland dam safety regulator • Emergency Action Plan (Reference ERP-00034) updated as required in annual review process, including consultation with Noosa LDMG prior to dam commissioning.	IAR Chapter 4.9
	Groundwater	
11.	The proponent has committed to developing and implementing a dewatering management plan, including the following: • if groundwater has a high turbidity, sedimentation basins will be required to capture suspended solids prior to release off site • if groundwater has concentrations of dissolved metals, or other contaminants, that require treatment prior to release off site.”	IAR Appendix B B.4.10
	Noise and vibration	
12.	Seqwater will consult with residents who are likely to experience excessive noise levels during project construction in order to determine suitable management measures which take their individual circumstances into account. Seqwater will continue these discussions throughout the planning phase of the project.	IAR Chapter 12 Table 12-4
	Biosecurity	
13.	Seqwater plans to implement an opportunistic program to eradicate Hygrophila in Lake Macdonald. The dam upgrade project team will coordinate with operational staff to make the most of opportunities arising from the temporary lowering of the lake to allow further treatment and control of *hygrophila costata* and other pest management activities during the two years construction period.	IAR Appendix C C.7.3
14.	Mosquito populations will be managed if they present a significant problem. An increase in mosquitoes is not currently considered a likely outcome from the lake drawdown.	IAR Chapter 12 Table 12-4
	Social	
15.	Seqwater will continue to collaborate with Noosa Shire Council regarding temporary and permanent changes to mountain bike and horseback trails in order to maintain connectivity of the trail network across Six Mile Creek.	IAR Supplementary Report Section 2.9

16.	Local procurement strategy—Seqwater will enhance local economic opportunities by: • prioritising recruitment of the construction workforce from local and regional communities • implementing Local Buy policies to ensure that local businesses have the opportunity to supply goods and services to the project • encouraging the construction workforce to access local goods and services.	IAR Chapter 12 Table 12-4
17.	Seqwater will inform the wider community about alternative recreation areas during project construction. Seqwater will endeavour deliver the project in efficiently to reduce the duration of impacts.	IAR Chapter 12 Table 12-4
18.	Seqwater to continue engaging with operators of Camp Cooroora and Gerry Cook Fish Hatchery to re-licence their respective facilities at Lake Macdonald once construction is complete.	IAR Chapter 12 Table 12-4
19.	Seqwater will continue to keep the community and key stakeholders informed about the project through a range of channels including: • Community Reference Group meetings • notification flyers and e-updates • media statements • community events • project website • one-on-one meetings.	IAR Supplementary Report Section 2.9
20.	Seqwater will ensure that local residents have access to suitable communication channels	IAR Chapter 12 Table 12-4
	Cultural Heritage	
21.	Seqwater has committed to the following measures to mitigate potential impacts on cultural heritage: • developing a cultural heritage management agreement for the project in consultation with the Kabi Kabi First Nation People • creating photographic record of structures of potential local heritage significance that require demolition, for example the original dam wall and spillway • if the Lake Macdonald brick structure is demolished, Seqwater will create a photographic record and salvage/relocate the dedication plaque • establishing temporary exclusion flagging or fencing around historic structures within Camp Cooroora to reduce potential for accidental damage.	IAR Chapter 13.4 and 13.6
	Salvage operations	
22.	Seqwater will collaborate with DES to provide an opportunity and working arrangement to allow DES staff to undertake turtle tagging and data collection for knowledge and research purposes.	IAR Supplementary Report Section 2.11

23.	Mary Cod hatchery at Lake Macdonald will continue to be supported where practical.	IAR Chapter 5 Table 5-8
24.	The Noosa water supply zone will continue to be supplied throughout the Project by using existing alternative water sources and Seqwater will manage operation of the alternative water sources in response to changing conditions, such as raw water quality fluctuation or emerging drought.	IAR Chapter 5.2

Acronyms and abbreviations

Acronym	Definition
AHD	Australia Height Datum
ANCOLD	Australia National Committee on Large Dams
AS	Australian Standard
CEMP	construction environmental management plan
CSEP	Community and Stakeholder Engagement Plan
DAF	Department of Agriculture and Fisheries
DATSIP	Department of Aboriginal and Torres Strait Islander Partnerships
dBA	A-weighted decibels
dB	decibel
DEE	Commonwealth Department of the Environment and Energy
DES	Department of Environment and Science
DNRME	Department of Natural Resources, Mines and Energy
DSDMIP	Department of State Development, Manufacturing, Infrastructure and Planning
DTMR	Department of Transport and Main Roads
EA	environmental authority
EMP	environmental management plan
EP Act	*Environmental Protection Act 1994* (Qld)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPP (Air)	Environmental Protection (Air) Policy 2008
EPP (Noise)	Environmental Protection (Noise) Policy 2008
ERA	environmentally relevant activity
FSL	full supply level
ha	hectare
IAR	impact assessment report
km	kilometre
kVA	kilo-volt-ampere
mg	milligram
ML	megalitre
MNES	matters of national environmental significance
MSES	matters of state environmental significance
NC Act	*Nature Conservation Act 1992* (Qld)
Planning Act	*Planning Act 2016* (Qld)
PM	particulate matter
RL	reduced level
SARA	State Assessment and Referral Agency
SDAP	State Development Assessment Provisions
SDPWO Act	*State Development and Public Works Organisation Act 1971* (Qld)

Acronym	Definition
SDPWO Regulation	State Development and Public Works Organisation Regulation 2010
SEQ	South East Queensland
SEMP	site environmental management plan
SIA	Social Impact Assessment
SPRAT	species profile and threats database information
TEC	threatened ecological community (EPBC Act)
TMP	traffic management plan

Glossary

Term	Definition
ambient noise levels	Background noise levels that occur prior to and separate from any construction activity.
amphibian	Any class (Amphibia) of coldblooded, scaleless vertebrates (with a backbone), consisting of frogs, toads, newts and salamanders, that usually begin life in the water as tadpoles with gills and later develop lungs.
assessment manager	For an application for a development approval, means the assessment manager under the *Planning Act 2016* (Qld).
Australian Height Datum (AHD)	The datum used for determining elevations in Australia which uses a national network of benchmarks and tide gauges and has set mean sea level as zero elevation.
bilateral agreement	The agreement between the Australian and Queensland governments that accredits the State of Queensland's IAR process. It allows the Commonwealth Minister for the Environment to rely on specified environmental impact assessment processes of the state of Queensland in assessing actions under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).
borrow pit	An excavation dug to provide fill to make up ground elsewhere.
carrying capacity	The maximum number of individuals that an area of land can support, usually determined by their food requirements.
catchment	The area of land which collects and transfers rainwater into a waterway.
cofferdam	A watertight structure, usually of sheet piling, that encloses an area usually under water, pumped dry to enable construction work to be carried out.
concrete batching plant	Equipment that combines various ingredients to create concrete on a large scale.
confluence	A point along a river system where one river or stream joins and flows into another.
construction areas	The construction worksites, construction car parks, and any areas licensed for construction or on which construction works are carried out.
controlled action	A proposed action that is likely to have a significant impact on a matter of national environmental significance; the environment of Commonwealth land (even if taken outside Commonwealth land); or the environment anywhere in the world (if the action is undertaken by the Commonwealth). Controlled actions must be approved under the controlling provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).
controlling provision	The matters of national environmental significance, under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth), that the proposed action may have a significant impact on.
coordinated project	A project declared as a ' coordinated project' under section 26 of the SDPWO Act.

Coordinator-General	The corporation sole constituted under section 8A of the *State Development and Public Works Organisation Act 1938* and preserved, continued in existence and constituted under section 8 of the SDPWO Act.
cultural heritage	The legacy of physical artefacts and intangible attributes of a group or society that is inherited from past generations. Cultural heritage includes tangible culture (such as buildings, monuments, landscapes, books, works of art, and artefacts), intangible culture (such as folklore, traditions, language and knowledge), and natural heritage (including culturally significant landscapes and biodiversity).
decommission	Safe removal of plant and equipment following the completion of construction.
dewater	To remove water from.
dilapidation	The state or process of falling into decay or being in disrepair.
dissolved oxygen	The amount of oxygen dissolved in water.
drawdown	The intentional draining of a body of water, such as a lake or reservoir, to a given depth.
due diligence	Reasonable care and caution exercised by a person who is buying, selling, giving professional advice, etc., especially as required by law to protect against incurring liability.
electrofishing	The practice of catching fish by stunning them with electric current or by attracting them through the use of electricity.
endangered	A species is endangered if: • there have not been thorough searches conducted for the wildlife and the wildlife has not been seen in the wild over a period that is appropriate for the lifecycle or form of the wildlife; or • the habitat or distribution of the wildlife has been reduced to an extent that the wildlife may be in danger of extinction; or • the population size of the wildlife has declined, or is likely to decline, to an extent that the wildlife may be in danger of extinction; or • the survival of the wildlife in the wild is unlikely if a threatening process continues.
endangered regional ecosystem	A regional ecosystem is listed as endangered under the *Vegetation Management Act 1999* if remnant vegetation is less than 10 per cent of its pre-clearing extent across the bioregion, or 10-30 per cent of its pre-clearing extent remains and the remnant vegetation is less than 10,000 hectares.
environment	As defined in Schedule 2 of the SDPWO Act, includes: • ecosystems and their constituent parts, including people and communities • all natural and physical resources • the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community • the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned above.
environmentally relevant activity (ERA)	An activity that has the potential to release contaminants into the environment. Environmentally relevant activities are defined in Part 3, section 18 of the *Environmental Protection Act 1994* (Qld).

extant species	A species that is still existing, not extinct, lost or destroyed.
fauna	The collective animals of a given region.
flora	The collective plants growing in the geographic area.
full supply level (FSL)	The maximum normal operating water surface level of a reservoir.
hydrology	The science dealing with the waters of the earth, their distribution on the surface and underground, and the cycle involving evaporation, precipitation, flow to the seas.
impact assessment report (IAR)	A report that evaluates the key issues associated with the project's potential impacts on physical, social and economic environments at the local, state and national levels. It concentrates on the most critical and substantive issues identified during the IAR process and the measures and conditions required to address the impacts.
imposed condition	A condition imposed by the Queensland Coordinator-General under section 54B of the SDPWO Act. The Coordinator-General may nominate an entity that is to have jurisdiction for the condition.
initial advice statement	A scoping document, prepared by a proponent, that the Coordinator-General considers in declaring a coordinated project under Part 4 of the SDPWO Act. An initial advice statement provides information about: • the proposed development • the current environment in the vicinity of the proposed project location • the anticipated effects of the proposed development on the existing environment • possible measures to mitigate adverse effects.
inundation area	Flooding of the creek above the existing water level.
invertebrate	An animal that neither possess nor develops a vertebral column, commonly known as a backbone or spine.
labyrinth spillway	A spillway that is made up of a series of zig zag crests that increase the horizontal width of spillway.
least concern regional ecosystem	A regional ecosystem is listed as "least concern' under the Vegetation Management Act 1999 (Qld) if remnant vegetation is over 30 per cent of its pre-clearing extent across the bioregion, and the remnant area is greater than 10,000 hectares.
macroinvertebrate	An animal without a backbone which is visible to the naked eye.
macrophytes	A plant (typically aquatic) which is visible to the naked eye.
material change of use	A material change of use is applicable when the way a property is being used is altered. An example of a material change of use would be when a vacant block of land changes to have a dwelling on it.

matters of national environmental significance (MNES)	The matters of national environmental significance protected under the *Environment Protection and Biodiversity Conservation Act 1999*. The eight matters 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 • nuclear actions (including uranium mines).
mitigation	A reduction in the unpleasantness or seriousness of something.
nominated entity (for an imposed condition for undertaking a project)	an entity nominated for the condition, under section 54B(3) of the SDPWO Act.
'of concern' regional ecosystem	A regional ecosystem is listed as of concern under the *Vegetation Management Act 1999* (Qld) if remnant vegetation is 10-30 per cent of its pre-clearing extent across the bioregion, or more than 30 per cent of its pre-clearing extent remains and the remnant extent is less than 10,000 hectares.
ogee crest	The shape of the dam wall crest and spillway that has a cross-section in the form of the letter S.
precipitation	A collective term for the moisture, either liquid or solid, that falls on the earth from the atmosphere.
project activities	Includes drawdown of Lake Macdonald, demolition, construction, demobilisation and lake refill
properly made submission (for an IAR or a proposed change to a project)	Defined under Schedule 2 of the SDPWO Act as a submission that: • is made to the Coordinator-General in writing • is received on or before the last day of the submission period • is signed by each person who made the submission • states the name and address of each person who made the submission • states the grounds of the submission and the facts and circumstances relied on in support of the grounds.
proponent	The entity or person who proposes a coordinated project. It includes a person who, under an agreement or other arrangement with the person who is the existing proponent of the project, later proposes the project.
recommended conditions	Conditions recommended by the Coordinator-General for consideration by the Commonwealth Minister for the Environment in making a decision on the proposed action under sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999* in accordance with clause 21 of the Bilateral agreement between the Commonwealth Government and the State of Queensland.
regional ecosystem (RE)	Defined in the *Vegetation Management Act 1999* as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil.
rehabilitation	Making the land useful again after a disturbance; may involve the recovery of ecosystem functions and processes in a degraded habitat.

remnant vegetation	Small remaining areas of naturally occurring vegetation in a landscape that has been altered by human activity, such as agriculture. These remnants were once part of a continuously vegetated landscape.
riparian	Of, adjacent to, or living on, the bank of a river or, sometimes, of a lake.
saddle dam	An auxiliary dam constructed to limit the extent of overflow flooding.
salinity	The concentration of any salt.
sediment	Any unusually finely divided organic and/or mineral matter deposited by air or water in non-turbulent areas.
salinity	The concentration of any salt.
sediment	Any unusually finely divided organic and/or mineral matter deposited by air or water in non-turbulent areas.
sedimentation pond	An artificial retention basin designed to trap suspended sediments carried in overland water flow before discharge into a water storage facility.
sensitive receptor	A place where noise, dust, odour, light or smoke is measured to investigate whether impacts are occurring.
species	A group of biological entities that (a) interbreed to produce fertile offspring, or (b) possess common characteristics derived from a common gene pool.
stated condition	Conditions stated (but not enforced by) the Coordinator-General under sections 39, 45, 47C, 49, 49B and 49E of the SDPWO Act. The Coordinator General may state conditions that must be attached to a development approval under the *Planning Act 2016.*
stygofauna	Aquatic invertebrates that live within the groundwater systems.
tailwater pool	A pool immediately downstream of a dam.
terrestrial	Pertaining to land, the continents or dry ground.
threatened	A collective term for native plants and animals which are presumed extinct, endangered and vulnerable.
thermoregulation	The ability of an organism to regulate its body temperature at a constant level by processes of heat production and heat transport.
translocation	The transfer of plants and animals from one area of habitat to another area of suitable habitat.
turbidity	The clarity of the water, which depends on the concentration of particles that are suspended in the water column.
velocity	The rate of water movement which respect to time.
vulnerable	A species is vulnerable if its population: • is decreasing because of threatening processes; or • has been seriously depleted and its protection is not secured; or • while abundant, is at risk because of threatening processes; or • is low or localised or depends on limited habitat that is at risk because of threatening processes.

works	Defined under the SDPWO Act as the whole and every part of any work, project, service, utility, undertaking or function that: • the Crown, the Coordinator-General or other person or body who represents the Crown, or any local body is or may be authorised under any Act to undertake, or • is or has been (before or after the date of commencement of this Act) undertaken by the Crown, the Coordinator-General or other person or body who represents the Crown, or any local body under any Act, or • is included or is proposed to be included by the Coordinator-General as works in a program of works, or that is classified by the holder of the office of Coordinator-General as works.

The Coordinator-General
PO Box 15517, City East Qld 4002
fax +61 7 3452 7486
info@dsdmip.qld.gov.au
www.dsdmip.qld.gov.au

Queensland Government