APPENDIX E

E1 - Species Management Plan (EPBC Act)

E2 - Species Management Plan (NC Act)

SMEC
Member of the Surbana Jurong Group

local people
global experience

Species Management Program for Species Listed under the Environment Protection and Biodiversity Conservation Act 1999

Six Mile Creek Dam Safety Upgrade

Reference No. 30031970
Prepared for Seqwater
29 November 2018

SMEC INTERNAL REF. 30031970

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E1.1 Introduction

Six Mile Creek Dam, commonly referred to as Lake Macdonald, is located on the Sunshine Coast in Noosa Shire and is one of two principal raw water sources that supply potable drinking water to the residents of Noosa Shire. Ownership of the dam was transferred from Noosa Council to Seqwater on 1 July 2008. The Project site and its position within the shire are presented in Figure 1.

The dam requires an upgrade to meet modern safety standards and the performance requirements of the Queensland dam safety regulations into the future. The upgrade will allow the dam to better manage severe weather and earthquake events. This includes improving the spillway discharge capacity and earthquake stability while maintaining water supply security. Studies have considered a range of options including decommissioning of the dam, retrofitting of strengthening works and new build options.

The proposed upgrade of Six Mile Creek Dam does not change the scale of the existing water impoundment. The dam's Full Supply Level (FSL) will remain the same post-upgrade and the proposed dam infrastructure will largely occupy the existing footprint. The operation of the upgraded dam will effectively reinstate the existing situation, with some improvement in flow regime anticipated.

In January 2018, a fauna survey and assessment was undertaken by SMEC. The objective of the fauna survey assessment was to identify key fauna constraints within the impact area. As a result of this survey, it was identified that a Species Management Program (SMP) would be required for tampering with Endangered, Vulnerable, Threatened and Near Threatened (EVNT) species breeding places that were found within the Project area.

The threatened species protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) identified on site were:

- Australian lungfish (*Neoceratodus forsteri*) - Vulnerable
- Giant barred frog (*Mixophyes iteratus*) – Endangered
- Mary River cod (*Maccullochella mariensis)* - Endangered
- Mary River turtle (*Elusor macrurus*) – Endangered
- White-throated snapping turtle (*Elseya albagula*) – Critically Endangered

Noting that some of these species are also threatened under the *Nature Conservation Act 1992*.

The intention of this SMP is for the Principal Contractor to refer to it, in conjunction with the draft Environmental Management Plan (EMP), and assist with the incorporation of management actions that will avoid or minimise the immediate and long term impact of tampering with an animal breeding place. Monitoring and reporting requirements will also be established to demonstrate the effective implementation of specific management actions within the SMP. This SMP will need to be revised, finalised and submitted with the relevant forms to DES for approval prior to commencing works.

E1.1.1 Proponent and project description

Summarised are the details of the applicant, terms and timeframes of the works, provided in Table E1-1 in accordance with the requirements of the Department of Environment and Science (DES): Developing a species management plan

Table E1-1 Applicant details, terms and timeframes of the works

APPLICANT	QUEENSLAND BULK WATER SUPPLY AUTHORITY (TRADING AS SEQWATER) ABN 75 450 239 876 117 BRISBANE STREET, IPSWICH, QLD, 4305; OR PO BOX 328, IPSWICH, QLD 1800 902 294 COMMUNICATIONS@SEQWATER.COM.AU WWW.SEQWATER.COM.AU
ORGANISATIONAL SUMMARY	Seqwater is the Queensland Government statutory authority responsible for providing a safe, secure and cost-effective bulk drinking water supply for 3.1 million people across South East Queensland.
TERM OF APPROVAL	This SMP applies only to the drawdown of the dam and clearing activities that will be undertaken during the construction phase of Lake Macdonald Dam upgrade. This program is intended to be valid and in effect for 24 months after approval is granted by DES.
APPROVED PARTIES	*Approved parties will be included in the final SMP*

E1.1.2 Activity details

The Project is the removal of the existing Six Mile Creek Dam and replacement with a new structure to improve the safety and performance of dam to meet current Queensland dam safety regulations (the Project).

The Project sequence will occur as follows:

- Pre-construction works including vegetation clearing, haul road establishment, borrow area and site works area establishment
- Drawdown Lake Macdonald to 89.5 m AHD
- Construct a sheet pile coffer dam and a working platform, including low flow channel at 89.5 m AHD
- Implement aquatic species salvage and relocation
- Demolish spillway and training walls
- Construction of new spillway and outlet works
- Demolish right embankment
- Construct right embankment
- Demolish left embankment
- Construct left embankment
- Construct saddle dam

Ancillary activities of the Project will include:

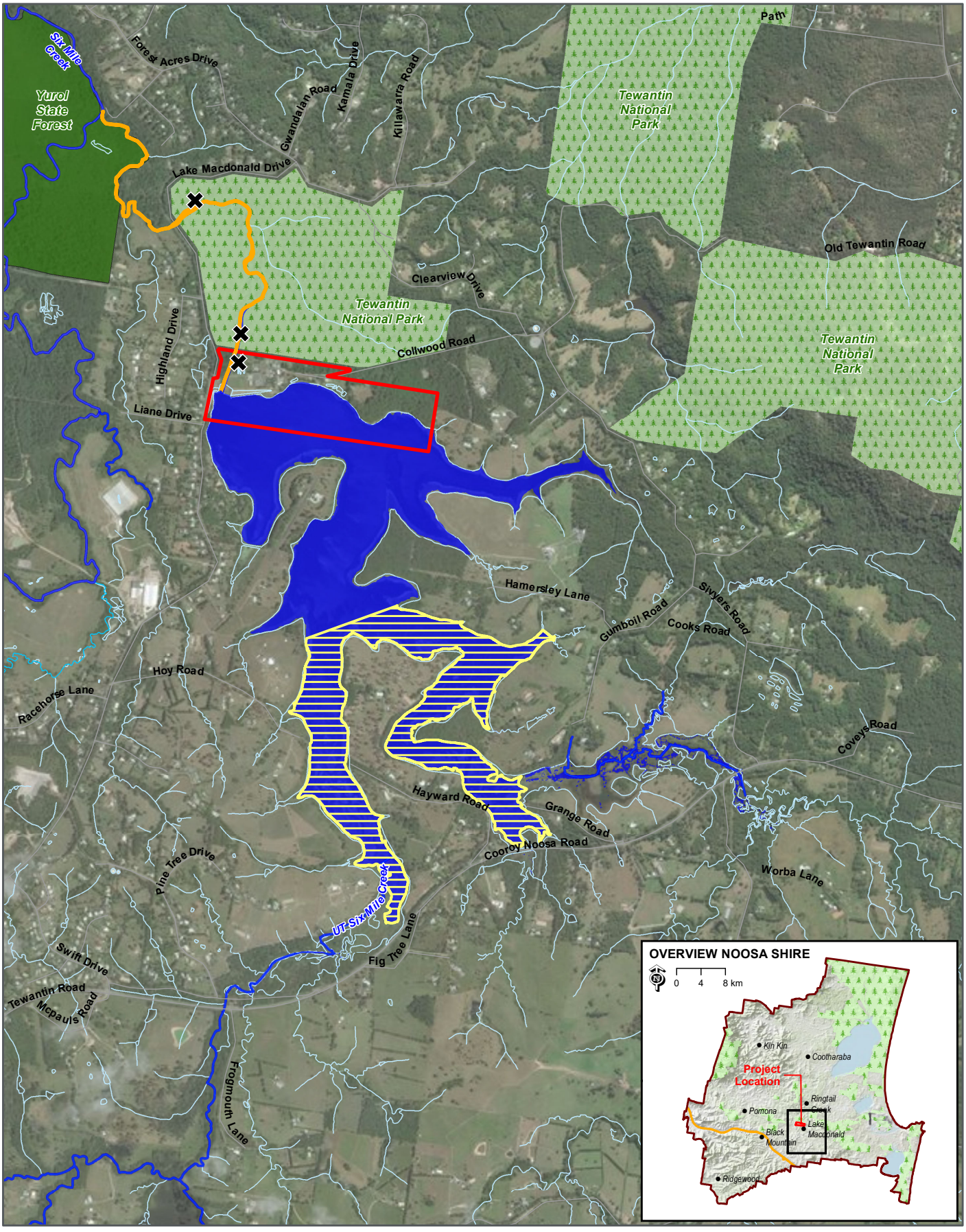
- Establishment of stockpile and spoil areas
- Establishment of lay down areas
- Sourcing water for construction activities
- Sourcing construction materials
- Screening of materials sourced onsite

Post construction:

- Implementation of weed maintenance, landscaping and revegetation.
- Construction and site decommissioning

FIGURE E1-1:
POTENTIAL BREEDING HABITAT AND CONFIRMED RECORDS

Six Mile Creek Dam Safety Upgrade Project



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SOURCES:
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LEGEND

Survey Records (identified during site visit)
- Giant barred frog

- Watercourse
- Drainage Line
- Six Mile Creek
- Lake Macdonald
- Bruce Highway
- Road (secondary and local)
- Project Area
- Study Area
- Local Governmental Area
- Potential breeding habitat for Mary River Cod, Giant Barred Frog
- Potential breeding habitat for Mary River Turtle, Mary River Cod, Australian Lungfish, White-throated Snapping Turtle

Protected Areas
- National Parks
- State Forest

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E1.1.4 Scope of Plan

This SMP provides management measures to be implemented during Project works by Seqwater (the Proponent) and other subcontractors and agents relevant to the Project, to avoid and/or mitigate impacts on conservation significant species protected under the NC Act and associated breeding places.

The purpose of this SMP is to:

- Assess the threats to native animal breeding places resulting from Project activity
- Incorporate management actions to avoid or minimise immediate and long term impacts of removing or altering an animal breeding place.
- Set monitoring requirements that demonstrate the effective implementation of management actions discussed in the SMP to produce intended results.

E1.1.4.1 Variations to the SMP

Once the SMP has been approved by DES, any revisions will require re-submission to DES.

Any revision to the approved SMP, DES will require 20 business days for review and consideration of the revised SMP. During this time, works must be conducted in accordance with the original SMP, unless mitigation measures are required immediately. Once approved the revised SMP will supersede the original SMP.

E1.1.5 Legislation and Regulatory Framework

Seqwater is obligated to comply with all relevant environmental legislation. The legislation applied throughout this report is summarised below.

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, or matters of national environmental significance (MNES). The nine MNES categories protected under the EPBC Act are:

- World heritage properties
- National heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth marine areas
- The GBRMP
- Nuclear actions (including uranium mines)
- A water resource, in relation to coal seam gas development and large coal mining development.

The EPBC Act enables bilateral management of environment, heritage protection and biodiversity conservation between the Australian Government and State Governments. The EPBC Act focuses on Australian Government interests on the protection of MNES, with the states and territories having responsibility for MSES and MLES.

Under the EPBC Act there are five levels of assessment, depending on the significance of the project and how much information is already available. Each level involves considering technical information assembled by the proponent and comments made by the public. If an action has the potential to have a significant impact on a MNES it must be referred to the Commonwealth Minister for Environment and Energy (the Environment Minister) to determine whether the action will need formal assessment and approval under the EPBC Act. The Environment Minister then decides whether an action will require approval, and determines the process of assessment.

The proposed works associated with the Lake MacDonald safety upgrade project was referred to the Department of Environment and Energy (DoEE) for assessment and confirmed as a controlled action on the 6th of December 2016, for the possible impact on listed threatened species.

Nature Conservation (Wildlife) Regulation 2006

The *Nature Conservation (Wildlife) Regulation 2006* prescribes particular species in accordance with the categories set out in the Act.

It is an offence to 'take' protected wildlife without a license, permit or other authority (s 320 of the *Nature Conservation (Wildlife Management) Regulation 2006*). It is also an offence for a person, without a reasonable excuse, tamper with an animal breeding place that is being used by a protected animal to incubate or rear the animal's offspring (s 332, Nature Conservation (Wildlife Management) Regulation 2006).

DES are responsible for administering the NC Act.

The works associated with the Lake Macdonald dam upgrade have the potential to impact animal breeding places. For any activity that will have an impact on EVNT (or special least concern) species breeding places, a SMP for the impacted species is required. Animal breeding places are classified as obvious structures such as bird nests, hollows, as well as reptile and amphibian habitat, where breeding takes place.

E1.2 Site assessment

E1.2.1 Desktop assessment

A desktop assessment was conducted to understand mapped vegetation communities, potential habitat for threatened fauna species, and confirmed records in the Project area. Desktop searches were conducted in October 2017, before the field survey and were subsequently reviewed on 27 August 2018 to account for changes in species listings over this time. The initial desktop searches identified species to target in the field survey and included a review of the following sources:

- Department of the Environment and Energy's Protected Matters Search Tool (10 km), which provides lists of Matters of National Environmental Significance (MNES) under the EPBC Act based on predictive modelling
- DES Wildlife Online Database (10 km), which provides record-based lists of Endangered, Vulnerable or Near Threatened (EVNT) species listed under the NC Act
- DES' Species Profile Search
- Atlas of Living Australia, including HERBRECs data, which provides records of flora and fauna species, including threatened species
- Department of Natural Resources, Mines and Energy's (DNRME) remnant vegetation mapping (Version 10.1), including essential habitat mapping
- Published literature and research papers

Previous studies of the Lake Macdonald area including the Project's Initial Advice Statement.

E1.2.2 Suitably qualified person

The animal breeding places survey was coordinated and lead by Dr David Sharpe who has more than 20 years' experience as a fauna ecologist. David meets the criteria for a suitably qualified and experienced person as required by the Information sheet: Species Management Program, Requirements for tampering with an animal breeding place in Queensland, by satisfying the following:

- An ecological consultant with experience in conducting surveys for animal breeding places – Dr Sharpe has approximately 23 years of experience as an ecological consultant
- A person who possesses a degree in natural science or similar with experience in conducting surveys for animal breeding places – Dr Sharpe holds a Bachelor of Applied Science (first class honours) and a PhD in Squirrel glider ecology. He has conducted many fauna surveys over the past 20 years, including specific animal breeding places surveys for the purpose of SMPs and Fauna Management Plans for major infrastructure projects.

E1.2.3 Survey results

The aquatic plant community of Lake Macdonald is characterised by a dense cover of the 'restricted biosecurity matter' Cabomba (*Cabomba carolina*), scattered occurrence of the native water snowflake (*Nymphoides indica*), and isolated occurrences of other native aquatic plants, such as Javan pondweed (*Potamogeton javanicus*), water primrose (*Ludwigia peploides*), spike rush (*Eleocharis sp.*), and bull rush (*Typha sp.*). A range of native aquatic plants grow on the banks of Lake Macdonald and Six Mile Creek, including sedges (*Carex spp.* and *Cyperus spp.*), knot weeds (*Persicaria spp.*) and mat rushes (*Lomandra* sp.). The 'restricted biosecurity matter' hygrophila (*Hygrophila cosata*) occurs in high cover along the margins of the lake.

No threatened species of aquatic plant is known from the Project area. Several aquatic plants known from the Project area are biosecurity matters, including notable infestations of cabomba and hygrophila.

Six Mile Creek is a low-gradient, low energy stream, with notophyll vine forest comprising the predominant natural riparian vegetation (DNRM 2004). Extensive deposits of large woody debris are an important natural feature of low energy streams, and are a common habitat feature in Six Mile Creek (DNRM 2004). Medium length pools (i.e. between 6 and 12 channel widths in length) that are less than 2 m deep are common in Six Mile Creek, with riffles and shallow glides over sand also present (DNRM 2004). Due to the presence of these medium length pools, it is possible for both the Mary River turtle and white-throated snapping turtle to occur infrequently throughout the lower reaches of Six Mile Creek. No known breeding habitat for either species has been identified within the Project area and it is therefore unlikely that nests and eggs will be found throughout the construction phase.

Due to the abundance of spawning habitat in Six Mile Creek, downstream of Lake Macdonald, Mary River cod and Australian lungfish populations are generally in good condition. Field survey results also identified macroinvertebrate communities as highly variable in Six Mile Creek, with taxonomic diversity low at some sites due to limited microhabitat diversity (DNRM 2004).

A field survey identified one giant barred frog individual within the riparian vegetation of downstream Six Mile Creek. It is likely that other individuals exist and are breeding within this area.

E1.3 Species information and impacts

The field survey completed in January 2018, identified two species that are threatened under the *Environment Protection and Biodiversity Conservation Act 1999* within the impact area:

- Mary River cod (*Maccullochella mariensis)* - Endangered
- Giant barred frog (*Mixophyes iteratus*) – Endangered.

Three additional species or their habitat are considered likely to be impacted by the proposed works:

- Mary river turtle (*Elusor macrurus*) – Endangered
- White-throated snapping turtle (*Elseya albagula*) – Critically Endangered
- Australian lungfish (*Neoceratodus forsteri*) – Vulnerable.

This section provides a summary of the status, ecology, population dynamics and potential impacts of the project on each of these species.

E1.3.1 Disturbance to species protected under the EPBC Act

The impacts, mitigation and management measures have been collectively discussed as all species listed under the EPBC Act have similar habitat preferences. Furthermore, mitigation and management actions listed in Table E1-7 will apply to all species listed under the EPBC Act.

Temporary Disturbance:

The Project will result in the disturbance and potential loss of habitat for all five of these species. Potential impacts include:

- Direct mortality during dam drawdown (though only Mary River cod were confirmed within the lake)
- 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.

Destruction of habitat:

Construction and drawdowns within the Project area will result in the removal of potential breeding habitat for EPBC species.

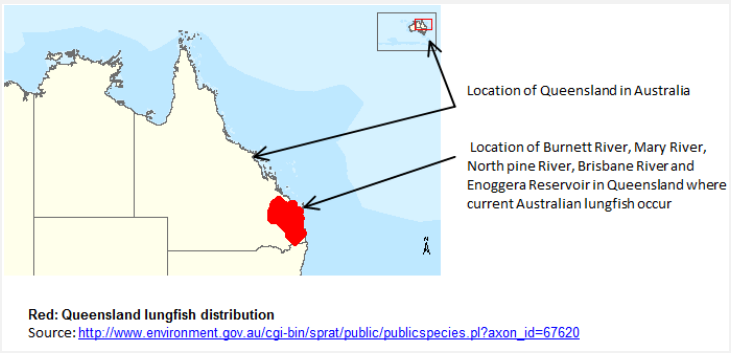
Impacts on Local Regional or State Wide Populations of the species:

Potential impacts to EPBC species will be localised and are expected to be minimal provided that the mitigation and management measures mentioned in Table E1-7 are adhered to. The Project is unlikely to result in impacts on the regional and State wide population of EPBC species, given the small area of habitat present within the proposed Project area and the absence of records confirming many of these species actually occur within the lake.

E1.3.2 Australian lungfish (*Neoceratodus forsteri*)

Table E1-2 Australian lungfish species description

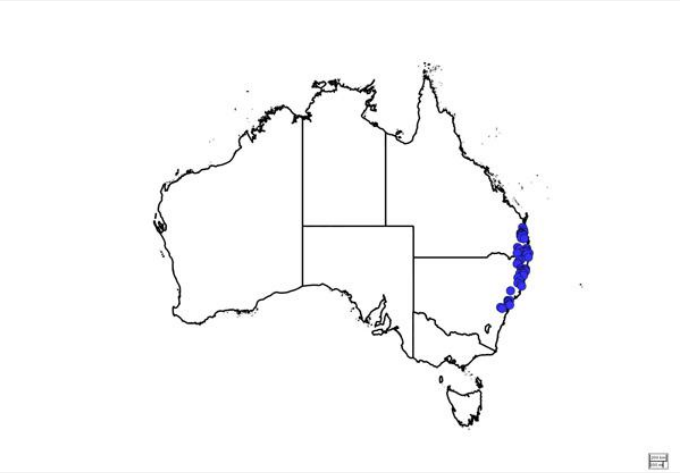
SCIENTIFIC NAME	NEOCERATODUS FORSTERI
COMMON NAME	Australian Lungfish
STATUS	EPBC Vulnerable
DESCRIPTION	The Australian lungfish has a long, dense body with large scales. The eyes of the lungfish are small and the pectoral and pelvic fins are paddle-like. The dorsal fins begin midway along the back and are continuous with the caudal and anal fins (Australian Museum, 2018). The Australian lungfish's coloration is typically olive-green to brown on the back and sides with some scattered dark blotches, with white blotches ventrally (Australian Museum, 2018).  *An Australian Lungfish, Neoceratodus forsteri, in Suma Aqualife Park, Kobe, Japan, n.d. photograph, viewed on 31 July 2018 http://fishesofaustralia.net.au/home/species/1988*
HABITAT	Australian lungfish (*Neoceratodus forsteri*) is known to occur in the Mary River and several of its tributaries between Conondale (220 km from the mouth of the river) and the Mary River Tidal Barrage (59.3 km from the mouth of the river) (DoE, 2014c). It has previously been caught at Coles Crossing and near the confluence of the Mary River with Six Mile Creek (LinkWater Projects, 2008). Australian lungfish are generally found in wide, slow-flowing or still permanent reaches with deep pools (i.e. 1 – 3 m); riffles or runs may also be present along the reach (DEWHA, 2009). Open water with an absence of complex in stream structures is not a preferred habitat of the species. The species prefers low flow conditions to slightly above (e.g. approximately 10 cm) cease to flow water levels, although between August and December Australian lungfish prefer water levels to be slightly higher (e.g. approximately 30 cm above cease to flow water levels) for breeding and recruitment (Hydrobiology, 2008b). Australian lungfish tend to inhabit reaches with complex submerged habitat, including submerged

	logs, high aquatic plant cover and underwater crevices formed by rock scouring and / or undercut banks (SKM 2007; Hydrobiology 2008a).  **Red: Queensland lungfish distribution** Source: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?axon_id=67620
FEEDING	Typical food items for the Australian lungfish include frogs, tadpoles, small fishes, snails, shrimp and earthworms. Occasionally, this species can also be found feeding on plant material (Australian Museum, 2018). Research suggests that the Australian lungfish has poor eyesight, using sense of smell to locate prey rather than sight. A recent study completed by Watt et al (1999) has shown that the Australian lungfish can use electroreception to locate hidden prey.
LIFE CYCLE	Australian lungfish spawn over a variety of habitats (e.g. woody debris, rocks, boulders and aquatic plants); however, in flowing conditions they tend to spawn more exclusively in aquatic plants e.g. ribbon weed (*Vallisneria sp*.) (Department of the Environment, 2013). Lungfish spawn from August to December, with hatching of eggs occurring approximately one month after fertilisation (McGrouther, 2013). Juvenile lungfish are almost exclusively found in dense submerged aquatic plant beds (DEWHA, 2009).

E1.3.3 Giant barred frog (*Mixophyes iteratus*)

Table E1-3 Giant barred frog species description

SCIENTIFIC NAME	*MIXOPHYES ITERATUS*
COMMON NAME	Giant barred frog
STATUS	EPBC Endangered NC Act Endangered
DESCRIPTION	The Giant barred frog ranges from dark-olive green to black in colour and can grow up to 115 cm in length. One of the defining features is its pointed snout and broad lateral band of dark spots. The limbs have dark crossbars and the hind side of the thighs are black with large yellow spots. The skin appears finely granular above and smooth below (QLD DERM, 2005). 

SCIENTIFIC NAME	*MIXOPHYES ITERATUS*
	Hines, H., (1998), Mixophyes iteratus (giant barred frog) female, n.d. photograph, viewed on 31 July 2018 https://wetlandinfo.ehp.qld.gov.au/wetlands/ecology/components/species/?mixophyes-iteratus
HABITAT	Giant barred frogs are distributed along the coast, ranging from Eumundi in South East Queensland to Warrimoo in the Blue Mountains. This species can occur in upland and lowland rainforest and wet sclerophyll forest and occasionally adjacent farmland (Hines et al., 2004). Moist riparian habitats are often favoured for deep leaf litter that provide shelter and foraging (GBRMPA, 2018). Populations have also been recorded in disturbed areas with riparian vegetation, such as cattle farms and previously logged areas (Hines et. Al, 2004). Species have also been found within eucalypt plantations and streams within partially to completely cleared lands (Hines et. Al, 2004). Spatial movements of giant barred frogs have been monitored, describing their average area of utilisation of 622m^2 for females and 403m^2 for males (Streatfield, 1999). Individuals moved a maximum of 268m downstream and 50m away from the stream.  *Hooper, J., (2018), Breeding and Distribution, n.d photograph, viewed on 31 July 2018* http://www.froggingaround.com/mixophyes_iteratus.php
FEEDING	The giant barred frog is a generalist feeder, with large insects, snails, spiders and frogs included in their diet. Observations have also revealed that tadpoles of the giant barred frog feed on a range of organic matter such as algae and fallen fruit (TMR).
LIFE CYCLE	Giant barred frogs breed within late spring and summer, heavily influenced by weather events (TMR). This species is a stream breeding species, where eggs are deposited and fertilised in the water. The female will kick the eggs onto a suitable bank where they are able to stick. Hatchlings will then drop or wriggle into the water. Tadpoles reach maturity at around 11cm. The full life cycle from egg to completion of metamorphosis can take up 14 months.

E1.3.4 Mary River cod (*Maccullochella mariensis*)

Table E1-4 Mary River cod species description

SCIENTIFIC NAME	*MACCULLOCHELLA MARIENSIS*
COMMON NAME	Mary River cod
STATUS	EPBC Endangered

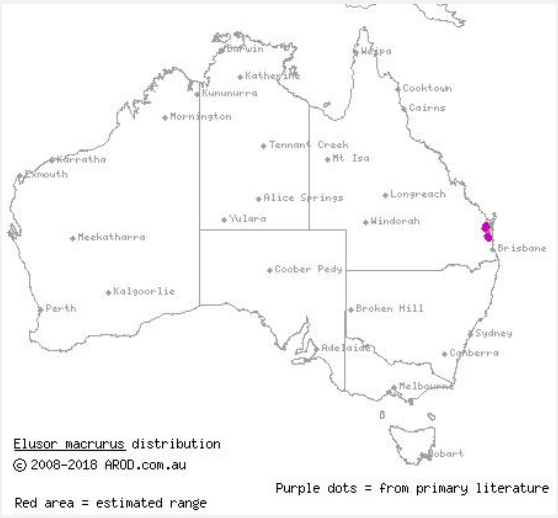
DESCRIPTION	The Mary River cod is an elongate, percoid fish with a concave head and protruding lower jaw. The species coloration varies from yellow to green and dark brown. The dorsal, pectoral, caudal and anal fins are clear to dark in colouring with mottling on the base. The soft fins contain whitish margins, with the pelvic fins containing white filaments. Research by Merrick and Schmida (1984) suggest that there are two distinct cod variations, recognised by anglers – the 'sharp nose' and the 'boof headed.' The boof headed form is reportedly spotted rather than mottled, an attribute not thought to be influenced by size or sex. Mary River cod can grow up to 23.5 kg, which is smaller than their Murray River cod counterparts which can reach a weight of 113.5 kg.  *Rowland, S., (1993), Mary River Cod, Maccullochella mariensis, n.d photograph, Viewed on July 31 2018, http://fishesofaustralia.net.au/home/species/3000*
HABITAT	The distribution of the species includes upland streams through to slow flowing reaches of the Mary River, and it has been caught during previous studies in the Mary River at the confluence with Six Mile Creek (SKM, 2007). Mary River cod are also known to occur in Six Mile Creek between Lake Macdonald and the confluence with the Mary River (a distance of approximately 40 km), with this population historically considered to be in a stable condition (Simpson & Jackson, 1996). The preferred habitat of the Mary River cod is shaded pools with complex in-stream structures i.e. rock ledges, boulders, undercut banks, large woody debris (SKM, 2007; DoE, 2014b). Adults of the species typically prefer water depth to be 1 – 3 m, usually avoid shallow areas, and generally prefer slow flowing water, taking shelter from fast flows in woody debris and undercut banks. However, juvenile Mary River cod utilise shallow water habitats, including shallow runs and shallow margins of pools. Pool habitats within Six Mile Creek are a known strong-hold for Mary River cod; these pools are not particularly deep and can be isolated or connected by shallow riffles (Simpson & Jackson, 1996). Therefore, Mary River cod will utilise a range of pool sizes and depths, despite a reported preference for deeper pools. 

	Presumed historic distribution and known present distribution of freshwater cod (Maccullochella) in coastal drainages of southeast Queensland, n.d photograph, viewed on 31 July 2018, http://www.environment.gov.au/system/files/resources/1450d9f6-8d17-4354-8e6b-dd51169edf8f/files/mary-river-cod.pdf
FEEDING	Mary River cod is a predator and generally feeds on fish and crustaceans, most commonly during dawn and dusk, but the species is also known to consume waterbirds and other fauna. The species often forages on prey immediately downstream of riffles, presumably due to a constriction of the watercourse and concentration of prey items (SKM, 2007). This suggests that shallower riffle habitats are important habitats for Mary River cod, although may not be commonly directly occupied by the species.
LIFE CYCLE	Mary River cod mature at approximately 38 cm and are considered to be a large, slow growing, long-lived fish with relatively low fecundity (DoE SPRAT Profile; Dunlop; Aurecon, 2013b). The cod is presumed to spawn more than once a year, initiated by a rise in water temperature to 20°C during spring and into early summer (Simpson & Jackson, 1996). Eggs are typically deposited inside a nest formed by a hollow log or similar habitat features (e.g. submerged open pipe) (Simpson & Jackson, 1996). The male will subsequently guard the eggs until they begin to hatch towards the end of the fourth day at 20°C (Dunlop; Aurecon, 2013b). The male will continue to guard the brood until they are ready to search for food between seven and nine days after hatching (Aurecon, 2013; Simpson & Jackson, 1996; Dunlop). In the event that conditions do not coincide i.e. water temperature of at least 19°C, moon phase at full and light episodic rainfall up to 20 mm, female Mary River cod will reabsorb their eggs and will not spawn (DoE SPRAT Profile).

E1.3.5 Mary River turtle (*Elusor macrurus*)

Table E1-5 Mary river turtle species description

SCIENTIFIC NAME	*ELUSOR MACRURUS*
COMMON NAME	Mary River turtle
STATUS	EPBC Endangered NC Act Endangered
DESCRIPTION	The adult Mary River turtle has a smooth, streamlined and unpatterned carapace. The eyes are dull and dark, containing a pale eye ring, which is a feature of many freshwater turtles. The neck contains tubercles in two longitudinal rows, and 4 chin barbels. Typically, there is one large median pair of chin barbels between two much smaller lateral barbels (DES, 2018).  Campbell, H., (2010), The strange Tale of the Mary River turtle, n.d photograph, viewed on 31 July 2018, http://www.australiangeographic.com.au/topics/wildlife/2010/03/the-strange-tale-of-the-mary-river-turtle
HABITAT	The Mary River turtle is endemic to the Mary River and several of its tributaries, such as Yabba Creek and Tiana Creek. The species has been recorded from Kenilworth (260 km

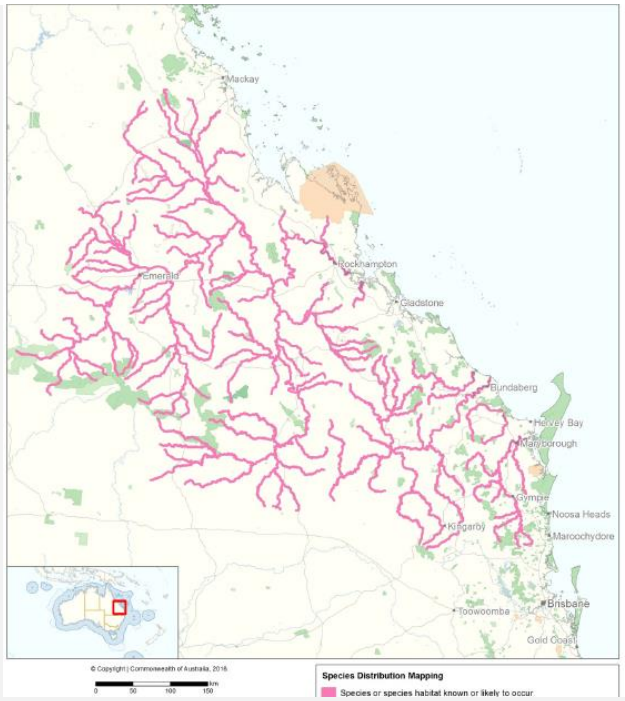
	from the river mouth) to the Mary River tidal barrage at Tiaro (60 km from the river mouth) in permanent streams and large pool habitats. Limpus (2008) noted higher numbers of juvenile turtles in the upstream reaches of the Mary River near Kenilworth. Individuals of the species have well defined home ranges (Cann & Legler, 1994; Department of the Environment, 2008; Kuchling, 2008; Limpus, 2008; Micheli-Campbell et al., 2013). During winter months' movement is generally limited to within a particular reach; however, movement of up to 2 km has been recorded in summer.  *Elusor macrurus distribution, n.d photograph, viewed on 31 July 2018* *http://www.arod.com.au/arod/reptilia/Testudines/Cheluidae/Elusor/macrurus*
FEEDING	The dietary requirements of the Mary River turtle vary between life history stages. Adult Mary River turtles are mainly herbivorous and eat aquatic plants, with filamentous algae, the most important plant in the diet. The buds, fruit and seeds of terrestrial plants, aquatic insect larvae, freshwater mussels and eggs of other aquatic animals make up the rest of the diet of adult Mary River turtles (Cann & Legler,1994; Flakus, 2002). Juvenile Mary River turtles eat aquatic insect larvae, supplemented by freshwater sponges and aquatic plants, predominantly green algae (Flakus, 2002; Micheli-Campbell et al., 2013).
LIFE CYCLE	Mary River turtles grow slowly, and breeding begins when they are approximately 15 to 20 years old. Most adult females lay one clutch of 14 to 25 eggs every year. Sparsely vegetated, north-facing sloping sandy river banks in close proximity to riffles and pools are preferred nesting habitats, with these sites revisited across decades. However, females will only nest on a limited number of banks. Females have been recorded moving up to 2 km to nest on suitable banks, despite other similar sites available nearby (Flakus, 2002; Limpus, 2008; Micheli-Campbell, 2012). Nesting occurs at night, commonly after rain. As successful hatching depends on 50 days of dryness after nesting, nests are located 5 m above the water level and up to 30 m inland from the watercourse. Nesting occurs in late October to December, with an incubation period of approximately 56 days (Cann & Legler, 1994).

E1.3.6 White-throated snapping turtle (*Elseya albagula*)

Table E1-6 White-throated snapping turtle species description

SCIENTIFIC NAME	*ELSEYA ALBAGULA*
COMMON NAME	White-throated snapping turtle
STATUS	EPBC Critically Endangered

	NC Act Endangered
DESCRIPTION	The white-throated snapping turtle is one of the largest short-necked freshwater turtles in Australia. Adults of this species are large and heavily built. Females are larger than males, but males have a longer tail length than females (Hamann et al., 2007; Limpus et al., 2007). Straight carapace length for adult males ranges from 15.6 – 29.2 cm, while the average carapace length for adult females ranges from 26.1 –40.1 cm (Limpus et al., 2007). The size of white-throated snapping turtles also varies between geographic locations; however, the cause of this variation is unknown (Hamann et al., 2007; Limpus et al., 2007). Female white-throated snapping turtles are distinguished from similar species by irregular white or cream markings on the face, and the shell margin is strongly serrated on juveniles (Threatened Species Scientific Committee, 2014).  *The white-throated snapping turtle is in danger of having its habitat destroyed, n.d photograph, viewed on 31 July 2018 https://www.chinchillanews.com.au/news/turtle-in-greater-danger/2468697/*
HABITAT	The White-throated snapping turtle is restricted to the Fitzroy, Mary and Burnett river catchments in Queensland (Threatened Species Scientific Committee, 2014). The species has also been recorded in: • Small coastal river adjacent basins, including the Kolan and Gregory-Burrum systems (Hamann et al., 2007) • Impoundments upstream of weirs such as Eden Bann Weir and Glebe Weir (Limpus et al., 2007), and • The spring-fed pools of the Dawson River (Hamann et al., 2007; frc environmental, 2008). White-throated snapping turtles are habitat specialists that prefer permanent, clear, well oxygenated water that is flowing and contains shelter (e.g. large woody debris and undercut banks) (Todd et al., 2013). The species has also been recorded in non-flowing waters, such as impoundments, but only in low numbers (Threatened Species Scientific Committee, 2014). Within the greater Fitzroy, Burnett and Mary river catchments, this species has been recorded almost exclusively in close association with permanent flowing stream reaches that are typically characterised by a sand-gravel substrate with submerged rock crevices, undercut banks and / or submerged logs and fallen trees (Hamann et al., 2007).



National Recovery Plan for the White-throated Snapping Turtle (Elseya albagula), n.d photograph, viewed on 31 July 2018 http://www.environment.gov.au/biodiversity/threatened/recovery-plans/comment/draft-recovery-plan-white-throated-snapping-turtle

FEEDING	White-throated snapping turtles feed primarily on aquatic plants along with fruits and leaves from overhanging riparian vegetation (Limpus et al., 2007). They may also eat periphyton, freshwater bivalves and insects, particularly when plant food resources are limited (Limpus et al., 2007). The species alters its diet from being largely carnivorous when juvenile to primarily herbivorous once older. Animal material forms a small part of the adult diet, including freshwater sponges, carrion, cane toads and insect larvae (Thomson et al., 2006).
LIFE CYCLE	The age at first breeding is approximately 15 to 20 years (Limpus et al., 2011). Breeding occurs once per year, mostly during autumn and winter, with adult females breeding in each successive year unless the turtle has been injured or debilitated, or riverine habitat has been altered (e.g. water extraction, drought or weeds) (Threatened Species Scientific Committee, 2014). Females generally nest on sandy banks, although nests have been observed on loose gravels and soils. Females lay a single clutch of eggs during the breeding season, with an average of 14 eggs per clutch (Hamann et al., 2007; Limpus et al., 2011). Nests are generally laid in areas of low canopy cover and in areas of dense grass cover; however, dense weeds at the water's edge may limit suitability of potential nesting banks (Hamann et al., 2007; Limpus et al., 2011). There is no parental care, and egg and small juvenile survival is typically low (Hamann et al., 2007).

E1.4 Mitigation and management

The upgrade of Lake Macdonald Dam, presents a number of risks and threats associated with the design, drawdown, construction, operation and decommissioning phases of the Project. The risks and threats are particularly important to the survival of the threatened fauna found within the direct impact area.

The specific mitigation and management measures for each risk and the species that it is applicable to is listed below in Table E1-7.

Table E1-7 Mitigation and management actions for species listed under the Environment Protection and Biodiversity Conservation Act 1999

RISK	PROJECT PHASE	MANAGEMENT ACTIONS
Freshwater habitat reduction	Design	Reduce bank degradation, riparian vegetation loss and habitat loss by facilitating a drawdown program that mimics the natural flow regime of Six Mile Creek to the greatest extent possible. Plan a drawdown program outside of breeding season for species protect under the EPBC Act: • White throated snapping turtle – nesting (May – September), Hatching (September – December) • Mary River turtle – nesting (October -November), Hatching (November to February) • Mary River cod – September to November • Australian lungfish – August to December • Giant barred frog – September to November Where possible, construction on creek and dam banks with dense overhanging riparian vegetation should be avoided to retain suitable breeding places. Design and implement erosion and sediment control in Six Mile Creek downstream of the dam where necessary.
	Pre-construction	Within the site induction, site personnel should be educated on how to recognise the physical attributes of species protected under the EPBC Act and their habitat to STOP, MANAGE and NOTIFY when encountered: • White throated snapping turtle – Cream markings on the throat and lower sides of the face, 420mm in length. Females generally nest on sandy banks, although nests have been observed on loose gravels and soils. Look for fresh turtles tracks in the sand and disturbed soils. • Mary River turtle – The neck contains tubercles in two longitudinal rows, and 4 chin barbels, there are no markings on the carapace. Sparsely vegetated, north-facing sloping sandy river banks in close proximity to riffles and pools are preferred nesting habitats. • Mary River cod – Elongate, percoid fish with a concave head and protruding lower jaw. The species coloration varies from yellow to green and dark brown. Eggs are typically deposited inside a nest formed by a hollow log or similar habitat features (e.g. submerged open pipe), check and retain all submerged logs disturbed by the works.

RISK	PROJECT PHASE	MANAGEMENT ACTIONS
		• Australian Lungfish – long, dense body with large scales. The eyes of the lungfish are small and the pectoral and pelvic fins are paddle-like. Australian lungfish spawn over a variety of habitats (e.g. woody debris, rocks, boulders and aquatic plants) check and retain any large boulders and woody debris impacted by the works. • Giant Barred Frog – pointed snout and broad lateral band of dark spots. The limbs have dark crossbars and the hind side of the thighs are black with large yellow spots. Nesting occurs on banks that are highly vegetated with overhanging roots, surrounding a flowing stream. 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. Inspections of Six Mile Creek upstream should also be conducted. Individuals and / or eggs identified are to be salvaged. Prevent bank degradation as a result of scouring through management of drawdown rates.
	Construction	Construction is restricted to the Project footprint and immediate surrounding buffer area. Location of stockpiles should not be altered or placed in natural drainage areas. Designated stockpile areas should be accurately communicated to all site personnel. Erect and monitor physical structures around nests (70-100 cm square plastic mesh covers, 10cm grid-size over nests) and key nesting reaches (National Recovery Plan for the white-throated snapping turtle (*Elseya albagula*), 2017). Inundation of nesting banks during the incubation period is avoided wherever feasible (reducing water level fluctuations) (National Recovery Plan for the white-throated snapping turtle (*Elseya albagula*), 2017). Selected logs and branches from the direct impact area should be stored in designated stockpile areas to be used for site rehabilitation. Minimise period of time that the dam is at a dewatered state during construction to prevent fauna fatalities due to complete habitat loss.
	Rehabilitation	Key habitat for species protected under the EPBC Act to be protected and restored. All disturbed land will be rehabilitated to achieve stable and sustainable soil cover and minimise sediment run off. The construction site will also be re-profiled to original or stable contours, re-establishing surface drainage lines and other features. To prevent slumping and erosion, other site specific stabilisation measures may be required. Temporary erosion control measures will be left in place until bare soil has stabilised. Where necessary, rehabilitate nesting banks to ensure adequate sand/loam substrate and no- or low-density vegetation.

RISK	PROJECT PHASE	MANAGEMENT ACTIONS
Fauna fatalities and encounters	Pre-construction	All site personnel are to attend a site induction identifying the threatened fauna species with potential to occur within the direct impact area. The Environmental Representative is responsible for all fauna occurrences. Prevent threatened fauna species from being entrained and injured or trapped by using suitably designed screens, ensuring water velocity at pipe intake is less than the burst swimming speed of fish known from Lake Macdonald and/or monitoring measures implemented to ensure they are functioning correctly. Enable threatened fauna species to move to areas where water will persist for the duration of the Project, for example by lowering water levels slowly during the initial weeks of drawdown.
	Construction	Pre clearing survey and salvage of all EPBC species and eggs within the direct impact area completed by an appropriately qualified person. Implement slow speed limits of 10 km per hour onsite 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. Clearing is not to be carried out without a permit to disturb, issued by the site Environmental Representative. Restrict construction hours to daylight hours, where practicable. Recommended construction hours are in accordance with Section 440R of the *Environmental Protection Act 1994*. Any threatened fauna requiring treatment or care will be recorded by the site Environmental Representative and transferred to a veterinarian or licensed carer. Any impacts to threatened fauna are to be reported to DES within 24 hours of the occurrence. Consider implementing a feeding plan if scarce food resources are determined to be a limiting factor in habitat condition. Regularly monitor the lake for these MNES species to enable a care or relocation response if necessary.
Water quality	Pre-construction	Minimise disturbance and downstream transfer of unconsolidated bed sediments during drawdown, for example by using a pontoon based pump station. Stabilise exposed sediments as soon as possible, for example by seeding the exposed Lake Macdonald bed with non-invasive grasses following initial drawdown. Avoid releases during natural low flow periods, for example undertake drawdown when flows of moderate magnitude commonly occur. Avoid major pulse flow events, for example by using a maximum pumping / discharge rate that will not exceed the bank full width of Six Mile Creek downstream of the dam and/or pumping / discharging over an extended period (e.g. 12 weeks).

RISK	PROJECT PHASE	MANAGEMENT ACTIONS
		Avoid changes to hydrology during the breeding seasons for MNES species known to be in Six Mile Creek downstream of the dam, for example undertake drawdown outside the Mary River cod and Australian lungfish breeding seasons. Environmental flow requirements for successful hatching of clutches are determined (i.e. flows required to produce and maintain nest banks).
	Construction	Implement erosion and sediment control measures in accordance with the International Erosion Control Association (IECA) best practise guidelines. Stormwater collected within the construction areas, and where applicable, diverted into holding/ settlement ponds for treatment and reuse. Establish release criteria for management of 'construction contaminated water'. Base flow entering the construction zone is to be monitored and either held on site for treatment or discharged downstream under certain release criteria to prevent impacts to Six Mile Creek. Minimise sediment tracked offsite by construction vehicles and potentially washed into waterways through the use of wash down bays or similar. Slow flow and reduce erosion in the upper reaches of the lake, for example by using physical barriers (e.g. staggered baffles) at key upstream locations. Monitor key water quality parameters and observe fauna in Lake Macdonald during construction to trigger incidental salvage, or other mitigation measures (e.g. a feeding program), as required.
	Rehabilitation	Stabilise exposed soils by using materials such as mulch, biodegradable matting, geotextile fabrics, and/or soil stabilisation products. Areas impacted by construction activities should be revegetated where appropriate.
Fuel and chemical spills	Construction	Undertake storage and transport of hazardous materials and dangerous goods according to relevant Australian standards, guidelines and legislation, including: • AS4452 The Storage and Handling of Toxic Substances • AS1940 The Storage and Handling of Flammable and Combustible Liquids • AS3780 The Storage and handling of Corrosive Substances • *Dangerous Goods Safety Management Act 2001* • Local council requirements.

RISK	PROJECT PHASE	MANAGEMENT ACTIONS
		Refuelling and maintenance activities should be undertaken in designated bunded areas to minimise the potential for soil and water contamination from these activities. Prepare and implement spill response measures. Provide a readily available and current copy of SDS' for each chemical/product used on site. SDS' will be available on site and available to all site personnel. Provide appropriate signage using HAZCHEM coders that is visible at all times. Signage should also provide contact details for the Environmental Representative and Safety Officer in case of an emergency. Maintain records of the existing inventory, storage location, personnel training, and waste disposal for all chemicals, fuel and dangerous goods used on site. Train all relevant staff in appropriate handling, storage and containment practices for chemicals, fuel and dangerous goods, and spill response procedures. This should also be addressed through a Project induction.
Noise and Vibration	Construction	As far as practicable, general construction activities are to be carried out within daytime hours, 6:30am to 6:30pm Monday to Friday and 6:30am to 4:00pm Saturday. No noise generating construction works will take place on Sundays or public holidays. In general, construction works and consideration of quiet work practices would be carried out in accordance with Australian Standard 2436-1981, Guide to noise control on construction, maintenance and demolition sites (Standards Australia, 1981) Rock breaking, rock hammering and any other activities which result in impulsive or tonal noise generation will only to be conducted during normal operational hours. Where possible, carry out loading and unloading of materials and equipment in areas as far away from noise sensitive areas as possible. Plant and equipment should be selected to minimise noise emission, in-so-far-as possible whilst maintaining efficiency of function. Residential grade mufflers to be fitted and all noise control equipment should be maintained in good order.
Biosecurity control	Construction and rehabilitation	Implement a Biosecurity Management Plan for the Project that is consistent with Seqwater's Water Supply Scheme Pest Management Plan and Catchment Services Biosecurity Operational Plan. Minimise potential spread of aquatic weeds, for example by implementing identification training for all relevant personnel, only relocating aquatic fauna to waterbodies that are already infested with Cabomba, and/or requiring that vehicles, machinery, equipment and temporary infrastructure are subject to weed hygiene protocols. Any plant and equipment brought onto site complies with the Vehicle and Machinery Inspection Procedure. Implement cane toad traps in areas of pooling after the drawdown of the dam has occurred.

RISK	PROJECT PHASE	MANAGEMENT ACTIONS
		The site Environmental Representative is to monitor introduced plant and fauna species by weekly management audits. The period of time between Project completion and restoration of the Project area should be minimised to prevent loss of soils and weed incursion. Rehabilitate disturbed areas following completion of construction to prevent pest species from becoming established.
Light spill	Construction and Operation	All bright lights should be positioned as close to the ground as practical. Where possible, light shall be shielded so that it is directing toward the ground, minimising light spill towards any surrounding habitat. Utilise lighting that does not attract insects. Use only the minimum amount of lighting needed for safety. Avoid the use of naked bulbs and narrow spectrum bulbs where possible. Use motion sensor lights where possible to only illuminate areas in use.

E1.4.1.1 Monitoring

The effectiveness of management measures detailed throughout this SMP will be monitored through the compilation of incidental, weekly and monthly reporting.

The Site Environmental Representative will regularly review the conservation status of flora and fauna species throughout the duration of the Project by staying up to date with relevant legislation and literature throughout the duration of the Project.

This SMP will be updated as required during the life of the Project to revise mitigation and management measures to reflect any changes to the conservation status of the species identified on site.

Changes to the SMP as a result of actions other than in accordance with a plan provided by the Minister will trigger a variation to the SMP.

E1.5 Reporting

Reporting requirements throughout the implementation of this SMP are listed below:

E1.5.1 Spotter-catcher returns

The following information relates to data to be collected regarding the relocation of fauna which will be submitted to DES as part of the Spotter-catchers returns:

- Fauna species relocated
- Location of capture
- Location of release
- Date of relocation

E1.5.2 Ecological performance auditing

The regulatory authorities associated with environmental matters may conduct inspections of the Project works. The Site Environment Representative will attend these audits.

Internal audits will also be conducted to ensure SMP compliance during the construction and operational phases of the Project including:

- On-site audits
- Audits of contractor's environmental management
- Work area inspections and monitoring

Non-conformances will be documented and addressed with appropriate corrective and preventative actions.

E1.5.3 Non-compliance reporting procedure

Where there is a non-compliance with this SMP, a report must be submitted to DES within 5 business days, the report will outline the type of non-compliance and remedial actions taken to ensure that the matter is resolved.

E1.5.4 Environmental incidents and corrective actions

The following actions should be implemented if flora or fauna species are injured or removed during the Project duration.

If vegetation occurs outside of the approved clearing area:

- Works must immediately cease in the area and DES will be notified within 24 hours of the incident occurring. Works must not proceed until the situation has been assessed and approval to proceed has been issued.
- A Suitably Qualified Person will conduct a search for any injured or orphaned wildlife.
- If native vegetation was cleared/impacted a report will be provided to DES and management measures agreed.

If a native animal is injured or killed on site:

- The Site Environmental Representative must be contacted immediately to capture or organise the possible capture of the animal for transportation to a specialist veterinarian or wildlife carer. The animal must only be handled by a person suitably qualified to do so
- The location of the injured animal will be identified/marked so it can be found again. If the animal is moving, a note will be made of the direction in which it was headed
- The species will be identified.

The type of injury sustained will be identified where possible

E1.6 Resourcing

The following specialist resources are required onsite and offsite to support the implementation of this SMP:

E1.6.1 Onsite resources

Table E1-8 Specialist resources required for SMP implementation

ROLE	MINIMUM QUALIFICATIONS	CONSTRUCTION ACTIVITIES
Ecologist	Minimum of 5 years' experience practising as an ecology professional Tertiary qualification in ecology or similar	Pre dam drawdown salvage of individuals Mark out of protected flora Trunk protection of trees
Fauna spotter-catcher	Have experience with wildlife (theoretical and practical) Hold a rehabilitation permit	Tree clearing Dam drawdown Tree pruning Fauna survey and relocation
Arborist	Australian Qualifications Framework Level 3 qualification in arboriculture, as a minimum.	Tree clearing Tree pruning
Site Environmental Representative	Minimum of 5 years' experience as a practising professional	Throughout construction

E1.6.2 Offsite Resources

CONTACT NAME	CONTACT DETAILS
RSPCA QLD – To report sick, injured or orphaned wildlife	1300 ANIMAL (1300 264 625)
Cooroora Veterinary Clinic (Monday to Friday 7.30am to 5.30pm, Saturday and Sunday 8.30am to 5pm)	(07) 5447 6733
Animal Emergency Centre Noosa (Monday to Friday 6pm to 8am, Weekends 24/7)	(07) 5353 7005
Koala Rescue Queensland (24-hour State-wide Koala emergency service)	0423 618 740 0431 300 729 0466 439 947

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SMEC
Member of the Surbana Jurong Group

local people
global experience

Species Management Program for Species Listed under the Nature Conservation Act 1992

Six Mile Creek Dam Safety Upgrade Project

Reference No. 30031970
Prepared for Seqwater
29 November 2018

SMEC INTERNAL REF. 30031970

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E2.1 Introduction

Six Mile Creek Dam, commonly referred to as Lake Macdonald, is located on the Sunshine Coast in Noosa Shire and is one of two principal raw water sources that supply potable drinking water to the residents of Noosa Shire. Ownership of the dam was transferred from Noosa Council to Seqwater on 1 July 2008. The Project site and its position within the shire are presented in Figure 1.

The dam requires an upgrade to meet modern safety standards and the performance requirements of the Queensland dam safety regulations into the future. The upgrade will allow the dam to better manage severe weather and earthquake events. This includes improving the spillway discharge capacity and earthquake stability while maintaining water supply security. Studies have considered a range of options including decommissioning of the dam, retrofitting of strengthening works and new build options.

The proposed upgrade of Six Mile Creek Dam does not change the scale of the existing water impoundment. The dam's Full Supply Level (FSL) will remain the same post-upgrade and the proposed dam infrastructure will largely occupy the existing footprint. The operation of the upgraded dam will effectively reinstate the existing situation, with some improvement in flow regime anticipated.

In January 2018, a fauna survey and assessment was undertaken by SMEC. The objective of the fauna survey and assessment was to identify key fauna constraints within the impact area. As a result of this survey, it was identified that a Species Management Program (SMP) would be required for tampering with Endangered, Vulnerable and Near Threatened (EVNT) species breeding places that were found within the Project area.

The EVNT species protected under the *Nature Conservation Act 1992* (NC Act) identified on site were:

- Platypus (*Ornithorhynchus anatinus)* – Special Least Concern
- Richmond birdwing *(Ornithoptera richmondia)* – Vulnerable
- Tusked frog *(Adelotus brevis)* – Vulnerable

The intention of this SMP is for the Principal Contractor to refer to it, in conjunction with the draft Environmental Management Plan (EMP), and assist with the incorporation of management actions that will avoid or minimise the immediate and long term impact of tampering with an animal breeding place. Monitoring and reporting requirements will also be established to demonstrate the effective implementation of specific management actions within the SMP. This SMP will need to be revised, finalised and submitted with the relevant forms to DES for approval prior to commencing works.

E2.1.1 Proponent and Project Description

Summarised in Table E2-1 are the details of the applicant, terms and timeframes of the works, in accordance with the requirements of the Department of Environment and Science (DES) information sheet – requirements for tampering with a protected animal breeding place in Queensland.

Table E2-1 Applicant details, terms and timeframes of the works

APPLICANT	QUEENSLAND BULK WATER SUPPLY AUTHORITY (TRADING AS SEQWATER) ABN 75 450 239 876 117 BRISBANE STREET, IPSWICH, QLD, 4305; OR PO BOX 328, IPSWICH, QLD 1800 902 294 COMMUNICATIONS@SEQWATER.COM.AU WWW.SEQWATER.COM.AU
ORGANISATIONAL SUMMARY	Seqwater is the Queensland Government statutory authority responsible for providing a safe, secure and cost-effective bulk drinking water supply for 3.1 million people across South East Queensland.
TERM OF APPROVAL	This SMP applies only to the drawdown of the dam and clearing activities that will be undertaken during the construction phase of the Six Mile Creek dam safety upgrade. This program is intended to be valid and in effect for three years after approval is granted by the Department of Environment and Science (DES).
APPROVED PARTIES	*Approved parties will be included in the final SMP*

E2.1.2 Activity details

The Project is the removal of the existing Six Mile Creek Dam and replacement with a new structure to improve the safety and performance of dam to meet current Queensland dam safety regulations (the Project).

The Project sequence will occur as follows:

- Pre-construction works including vegetation clearing, haul road establishment, borrow area and site works area establishment
- Drawdown Lake Macdonald to 89.5 m AHD
- Construct a sheet pile coffer dam and a working platform, including low flow channel at 89.5 m AHD
- Implement aquatic species salvage and relocation
- Demolish spillway and training walls
- Construction of new spillway and outlet works
- Demolish right embankment
- Construct right embankment
- Demolish left embankment
- Construct left embankment
- Construct saddle dam.

Ancillary activities of the Project will include:

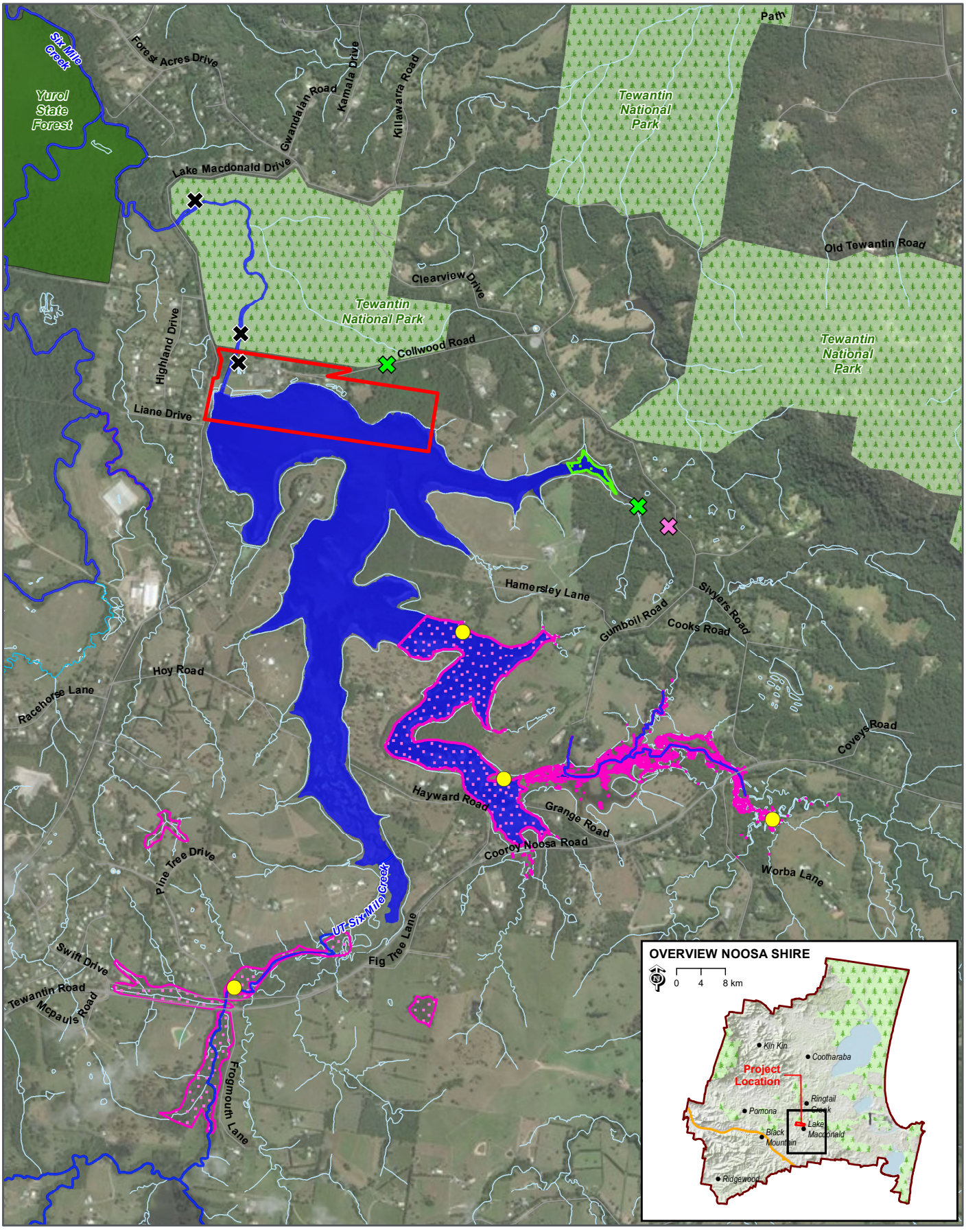
- Establishment of stockpile and spoil areas
- Establishment of lay down areas
- Sourcing water for construction activities
- Sourcing construction materials
- Screening of materials sourced onsite.

Post construction:

- Implementation of weed maintenance, landscaping and revegetation
- Construction and site decommissioning.

FIGURE E-1:
POTENTIAL BREEDING HABITAT AND CONFIRMED RECORDS

Six Mile Creek Dam Safety Upgrade Project



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LEGEND

- Previous record - Platypus
- **Survey Records (identified during site visit)**
- Richmond birdwing butterfly
- Tusked frog
- Watercourse
- Drainage Line
- Six Mile Creek
- Lake Macdonald
- Bruce Highway
- Road (secondary and local)
- Project Area
- Study Area
- Local Governmental Area
- Potential breeding habitat for Platypus
- Potential breeding habitat for Tusked Frog

Protected Areas
- National Parks
- State Forest

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E2.1.4 Scope of Plan

This SMP provides management measures to be implemented during Project works by Seqwater (the Proponent), the Principal Contractor and other sub-contractors and agents relevant to the Project, to avoid and/or mitigate impacts on conservation significant species protected under the NC Act and associated breeding places.

The purpose of this SMP is to:

- Assess the threats to native animal breeding places resulting from the Project activity
- Incorporate management actions to avoid or minimise immediate and long term impacts of removing or altering an animal breeding place
- Set monitoring requirements that demonstrate the effective implementation of management actions discussed in the SMP to produce intended results.

Variations to the SMP

Once the SMP has been approved by DES, any revisions will require re-submission and approval.

For any revision to the approved SMP, DES will require 20 business days for review and consideration of the revised SMP. During this time, works must be conducted in accordance with the original SMP, unless mitigation measures are required immediately. Once approved, the revised SMP will supersede the original SMP.

E2.1.5 Legislation and Regulatory Framework

Seqwater is obligated to comply with all relevant environmental legislation. The legislation applied throughout this report is summarised below.

Nature Conservation Act 1992

The NC Act is administered by DES and provides the framework for the declaration and management of protected areas, and protection of wildlife listed under the *Nature Conservation (Wildlife) Regulation 2006*. The NC Act, s 71 describes the classes of wildlife to which the Act applies as:

(a) protected wildlife, that is—
  (i) extinct in the wild wildlife; and
  (ii) endangered wildlife; and
  (iii) vulnerable wildlife; and
  (iv) near threatened wildlife; and
  (v) least concern wildlife; and
(b) international wildlife; and
(c) prohibited wildlife.

Nature Conservation (Wildlife) Regulation 2006

The *Nature Conservation (Wildlife) Regulation 2006* prescribes particular species in accordance with the categories set out in the Act.

It is an offence to 'take' protected wildlife without a license, permit or other authority (s 320 of the *Nature Conservation (Wildlife Management) Regulation 2006*). It is also an offence for a person, without a reasonable excuse, tamper with an animal breeding place that is being used by a protected animal to incubate or rear the animal's offspring (s 332, *Nature Conservation (Wildlife Management) Regulation 2006*).

DES are responsible for administering the NC Act.

The works associated with the Project have the potential to impact animal breeding places. For any activity that will have an impact on EVNT (or relevant special least concern) species breeding places, a SMP for the impacted species is required. Animal breeding places are classified as obvious structures such as bird nests, hollows, as well as reptile and amphibian habitat, where breeding takes place.

E2.2 Site assessment

E2.2.1 Desktop assessment

A desktop assessment was conducted to understand mapped vegetation communities, potential habitat for threatened fauna species, and confirmed records in the Project area. Desktop searches were conducted in October 2017, before the field survey and were subsequently reviewed on 27 August 2018 to account for changes in species listings over this time. The initial desktop searches identified species to target in the field survey and included a review of the following sources:

- Department of the Environment and Energy's Protected Matters Search Tool (10 km), which provides lists of Matters of National Environmental Significance (MNES) under the EPBC Act based on predictive modelling
- DES Wildlife Online Database (10 km), which provides record-based lists of Endangered, Vulnerable or Near Threatened (EVNT) species listed under the NC Act
- DES' Species Profile Search
- Atlas of Living Australia, including HERBRECs data, which provides records of flora and fauna species, including threatened species
- Department of Natural Resources, Mines and Energy's (DNRME) remnant vegetation mapping (Version 10.1), including essential habitat mapping
- Published literature and research papers
- Previous studies of the Lake Macdonald area including the Project's Initial Advice Statement.

E2.2.2 Suitably qualified person

The animal breeding places survey was coordinated and lead by Dr David Sharpe who has more than 20 years' experience as a fauna ecologist. David meets the criteria for a suitably qualified and experienced person as required by the Information sheet: Species Management Program, Requirements for tampering with an animal breeding place in Queensland, by satisfying the following:

- An ecological consultant with experience in conducting surveys for animal breeding places – Dr Sharpe has approximately 23 years of experience as an ecological consultant
- A person who possesses a degree in natural science or similar with experience in conducting surveys for animal breeding places – Dr Sharpe holds a Bachelor of Applied Science (first class honours) and a PhD in Squirrel glider ecology. He has conducted many fauna surveys over the past 20 years, including specific animal breeding places surveys for the purpose of SMPs and Fauna Management Plans for major infrastructure projects.

E2.2.3 Survey results

A total of three mapped Regional Ecosystems (RE) were identified during field surveys within the Project impact area. The vegetation communities that were identified within the survey area are consistent with the mapped remnant RE's. Regional Ecosystem 12.3.2 which occurs along Six Mile Creek compliments habitat where tusked frogs and platypus are likely to be found. The description of all REs found within the direct impact area are summarised in Table E2-2.

A field survey did not identify any Richmond birdwing butterfly vines (*Pararistolochia praevenosa*) within the Project area, therefore suggesting that the species may be feeding on blooming flora species rather than breeding within the direct impact area.

During the field survey, fallen logs were observed at a moderate density across the forested sites, averaging one log per 25m radius. No fallen logs were observed at the wetland sites. Similarly, leaf litter cover ranged from 50-90% and generally has a depth of 5cm in the forested sites, including Six Mile Creek and Tewantin National Park, while the wetland sites have minimal to no leaf litter.

Table E2-2 Currently mapped Regional Ecosystems within the construction footprint

REGIONAL ECOSYSTEM ID	REGIONAL ECOSYSTEM VEGETATION MANAGEMENT STATUS	REGIONAL ECOSYSTEM DESCRIPTION
12.3.2	Of concern	*Eucalyptus grandis +/- E. microcorys, Lophostemon confertus* tall open forest with vine forest understorey ('wet sclerophyll'). Patches of *Eucalyptus pilularis* sometimes present especially in vicinity of sedimentary rocks (e.g. around Palmwoods). Fringing streams and in narrow gullies in high rainfall areas. (BVG1M: 8a)
12.9-10.1	Of concern	Tall open forest. Canopy species include *Eucalyptus resinifera, E. grandis, E. robusta, Corymbia intermedia +/- E. microcorys, Melaleuca quinquenervia, Syncarpia glomulifera subsp. glomulifera* and *Lophostemon confertus*. Occurs on Cainozoic and Mesozoic sediments. (BVG1M: 8a)
12.9-10.17	Least concern	Open forest to woodland complex generally with a variety of stringybarks, grey gums, ironbarks and in some areas spotted gum. Canopy trees include *Eucalyptus siderophloia, E. propinqua* or *E. major, E. acmenoides* or *E. portuensis, E. carnea* and/or *E. microcorys* and/or *Corymbia citriodora subsp. variegata.* Other species that may be present locally include *Corymbia intermedia, C. trachyphloia, Eucalyptus tereticornis, E. biturbinata, E. moluccana, E. longirostrata, E. fibrosa subsp. fibrosa* and *Angophora leiocarpa. Lophostemon confertus* or Whipstick *Lophostemon confertus* often present in gullies and as a sub-canopy or understorey tree. Mixed understorey of grasses, shrubs and ferns. Hills and ranges of Cainozoic and Mesozoic sediments. (BVG1M: 9a)

E2.3 Species information and impacts

The field survey completed in January 2018, identified three species protected under the NC Act within the impact area, namely:

- Platypus (*Ornithorhynchus anatinus*) – Special Least Concern
- Richmond birdwing (*Ornithoptera richmondia*) – Vulnerable
- Tusked frog (*Adelotus brevis*) – Vulnerable

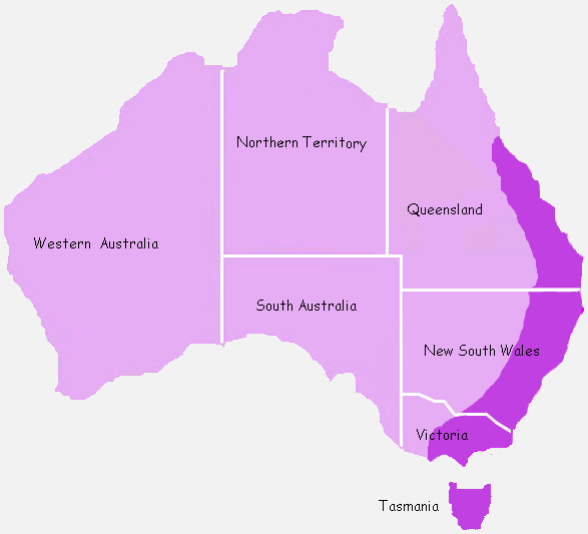
This section provides a summary of the status, ecology, population dynamics and potential impacts of the project on each of these three species.

E2.3.1 Platypus (*Ornithorhynchus anatinus*)

General species information is presented in Table E2-3 including status, species description, habitat, feeding and lifecycle.

Table E2-3 Platypus species description

SCIENTIFIC NAME	*ORNITHORHYNCHUS ANATINUS*
COMMON NAME	Platypus
STATUS	NCA special least concern
DESCRIPTION	Platypus in Queensland are smaller than those found in Victoria and Tasmania. Males typically weigh 1.2 – 2.4 kg with 0.6 m in length and females average 0.6 -1.2 kg and measure 0.4 m in length. The platypus has a streamlined furry body with a broad tail, shaped like a paddle, and a duck-like bill (Serena and Williams, 2010). The ear and eye are both located in a muscular groove at either side of the head, pinching shut when diving. The bill feet and tail of the platypus is covered by smooth, suede like texture with a fleshy and pliable surrounding (Serena and Williams, 2010). The tail is covered by coarse hair in order to sustain the wear and tear of pushing soil when digging a burrow. Generally, platypus are dark brown on their back with a creamy under colour.  *Tasmania, platypus eating worm, n.d photograph, viewed 31 July 2018, https://www.sbs.com.au/yourlanguage/cantonese/en/audiotrack/health-news-platypus-milk-may-help-fight-superbugs*
HABITAT	Platypus inhabit a range of flowing and still freshwater bodies from sea level, to elevations of more than 1600 m. This species primarily resides along the eastern and south-eastern coast of mainland Australia from Glenelg River Catchment in Victoria to as far north as Cooktown in Queensland (Serena and Williams, 2010). In Queensland,

	platypus occupy around a third of reliably flowing river basins, which is a significantly lower distribution than Victoria and New South Wales. It is suggested that crocodile predation and severe flooding within tropical North Queensland contributes to their distributional limit (Serena and Williams, 2010). The ideal habitat for platypus includes permanent water surrounding stable earthen banks, held by the roots of native, overhanging riparian vegetation. Woody debris and cobbled substrates are preferred habitat features for the platypus as they often house small invertebrates on which the platypus feed (Platypus SPOT, 2018).  *Ornithorhynchus anatinus, n.d photograph, viewed 31 July 2018, <https://qv.wikipedia.org/wiki/Platypus>*
FEEDING	Platypus only feed in the water, finding their prey by searching within shallow pools, submerged logs and digging under banks (Serena and Williams, 2010). Platypus dive whilst foraging, using their bill to detect and seize prey. The platypus will not chew and swallow their food underwater, instead they will store their prey in their cheek pouches and eat once they have returned to the surface. Research suggests that platypus primarily feed at night (Serena and Williams, 2010). Their diet is dominated by insects, specifically fly larvae, water beetles, larval mayflies, damselflies and dragonflies. They also often feed on freshwater shrimp, snails, pea shell mussels and worms. The ability for the platypus to prey on fish is limited by their lack of true teeth.
LIFE CYCLE	Platypus lay a clutch of 1-3 white, leathery shelled eggs approximately 2-3 weeks after mating. The eggs are then incubated underground for a further 10 days by the female before hatching (Serena and Williams, 2010). Juvenile platypus will develop inside their burrow for 3-4 months after hatching, nourished by the female's milk. When platypus emerge from their burrow, they are fully furred, co-ordinated and approximately 80% of their adult length (Serena and Williams, 2010).

Project impacts:

The Project will result in the temporary disturbance and loss of potential habitat for the platypus. Potential impacts to this species include:

- Direct mortality during vegetation clearing
- Mortality of young in burrows due to a decline in water quality and altered flow regimes

- Loss of habitat through direct removal and decline in water quality

Construction and drawdowns within the Project area will result in the removal of potential breeding habitat for the Platypus.

Potential impacts to the platypus are expected to be localised and minimal provided that the mitigation and management measures contained within Table E2-6 are adhered to. The Project is unlikely to result in impacts on the regional and State wide population of the platypus, given the small area of habitat present within the proposed Project area.

E2.3.2 Richmond Birdwing Butterfly *(Ornithoptera richmondia)*

General species information is presented in including status, species description, habitat, feeding and lifecycle.

Table E2-4 Richmond birdwing butterfly species description

SCIENTIFIC NAME	*ORNITHOPTERA RICHMONDIA*
COMMON NAME	Richmond Birdwing
STATUS	NCA Vulnerable
DESCRIPTION	Known as one of Australia's largest butterflies, the Richmond birdwing has a wingspan of up to 15 cm. The males and females are sexually dimorphic, with males displaying velvety green and black on the upper side of their wings and vivid blue, green and gold patches on the hindwings and underside (Common and Waterhouse, 1981). In contrast, females are dark grey or brown with white and yellow patches displayed on the upper and underside of their wings. Males and females have a green stripe on the thorax and distinctive red patches at the base of the wing (Sands and Scott, 1996). Richmond birdwing butterfly larvae can grow up to 70 mm in length, varying in colour, including white, black and grey with prominent fleshy spines (Braby, 2000).  *Roberts. A.,(2009)* Endangered Richmond Birdwing Butterfly*, n.d photograph, viewed 31 July 2018,* http://www.abc.net.au/news/2009-04-21/endangered-richmond-birdwing-butterfly/6229488
HABITAT	Richmond birdwing butterflies are found in subtropical rainforest, where the larval host Richmond birdwing vine and mountain aristolochia grow (Common and Waterhouse, 1981). Generally, the Richmond birdwing vine occurs below 600 m above sea level on basaltic slopes, creeks and banks or volcanic alluvial soils near watercourses. The mountain aristolochia vine occurs more than 800m above sea level (Sands and Scott, 1997). Previously the Richmond birdwing occurred in high numbers from Maryborough, south-

	eastern Queensland to Grafton in north-eastern New South Wales (Pyper, 2001). However, the breeding distribution is now restricted to patches from Kin Kin to the Glasshouse mountains and as far west as Kenilworth. In the south, the population is now restricted between Ormeau and Wardell in New South Wales (Pyper, 2001).  *Richmond Birdwing Butterfly, n.d photograph, viewed 31 July 2018, http://wildlife.org.au/richmond-birdwing-butterfly/*
FEEDING	Adult Richmond birdwing butterflies feed on nectar and flowers from many native plants including native frangipani, pavetta, black bean and lilly pillies, along with multiple exotic flowers. Typically, this species prefers white and red blooms in comparison to other coloured flowers (Sands, 2008). The larvae feed primarily on two vine species – lowland Richmond birdwing vine and mountain aristolochia. These species of vine have been cultivated in order to assist in recovery of breeding habits for the butterfly (Sands, 2008).
LIFE CYCLE	The female Richmond birdwing butterfly can travel up to 30 km after mating to find her specific breeding plants, lowland Richmond birdwing vine and mountain aristolochia. Once the female has located her preferred vine, she will use her sensors on her front legs to choose the healthiest leaf on the vine to lay up to 100 eggs. The eggs will generally hatch within 13 days (O'Carroll, 2013). After hatching, larvae will begin to feed on the vine leaves. In order to grow, the caterpillar must complete up to 6 moults, each labelled an instar. Once the final instar is completed the larvae is ready to pupate (O'Carroll, 2013). Once fully grown, the larvae will create a silk pad to attach itself to a leaf. A hormone release initiates the transformation from larvae to pupa, and furthermore, the transformation from pupa to adult (O'Carroll, 2013). These transformation stages can be vastly effected by changes in temperature. Within warmer climates, this transformation can take 28 days, however in colder climates, this process can take up to 250 days. Adult individuals generally have a lifespan of 4 – 6 weeks (O'Carroll, 2013).

Project impacts:

The Project will result in the temporary disturbance and loss of potential habitat for the Richmond birdwing butterfly. Potential impacts to this species include:

- Direct mortality during vegetation clearing

- Mortality of larvae present on vegetation to be cleared
- Introduction of dutchman's pipe vine which is toxic to the larvae but is difficult to distinguish from the preferred species
- Loss of habitat through direct removal.

Construction and vegetation removal within the project area may result in the removal of potential feeding habitat for the Richmond birdwing butterfly.

Potential impacts to the Richmond birdwing butterfly will be localised and are expected to be minimal provided that the mitigation and management measures outlined in Table E2-6 are adhered to. The Project is unlikely to result in impacts on the regional and State wide population of the Richmond birdwing butterfly, given the small area of habitat present within the proposed Project area and the absence of suitable host plants during the field assessment.

E2.3.3 Tusked frog (*Adelotus brevis*)

E2.1 General species information is presented in including status, species description, habitat, feeding and lifecycle.

Table E2-5 Tusked frog species description

SCIENTIFIC NAME	*ADELOTUS BREVIS*
COMMON NAME	Tusked frog
STATUS	NCA Vulnerable
DESCRIPTION	The tusked frog is a medium sized terrestrial frog, growing up to 40 mm in size. The skin on the upper side of the frog is rough and the colouration is dark brown, grey or beige, with mottled darker patches. On the head, a butterfly shaped patch is present, starting between the eyes (Hines, 2012). The ventral surface of the frog is smooth and mottled white and grey. The groin and hind side of the calves are red and black (Meyer et al. 2001). Adult males are often larger than the females, and the male's head is also broader and flatter. The defining feature of the tusked frog, which both the males and females display, is the paired tusks located at the front of the lower jaw, however this can only be viewed when the mouth is open (Robinson, 1993).  *Kriger, K., (2008), Tusked Frog, n.d photograph, viewed 31 July 2018, https://calphotos.berkeley.edu/cgi/img_query?enlarge=1111+1111+1111+7489*
HABITAT	In Queensland, the tusked frog's distribution occurs in the Clarke range and then from Shoalwater Bay to Moss Vale in mid-eastern New South Wales (Hines et al, 1999). Individuals have also been found in Blackland Tableland and Carnarvon Gorge (Hines et

	al, 2004). The tusked frog typically inhabits wet eucalypt forest, rainforest and occasionally dry eucalypt forest. Individuals are often found in close proximity to breeding habitats such as slow moving sections of streams and stagnant ponds (Cogger, 2000). A number of records have also been listed surrounding dams and garden ponds in urban and peri-urban areas (Hines, 2012).  *Hines, H., (2002), Targeted Species Survey Guidelines, n.d photograph, viewed 31 July 2018, https://www.qld.gov.au/environment/assets/documents/plants-animals/biodiversity/tusked-frog.pdf*
FEEDING	Tusked frogs feed primarily on arthropods, such as beetles (Kastsikaros and Shine, 2007). Research has also discovered a difference in diets between male and female individuals. Males are known to feed in muddy substrates close to the water's edge on molluscs and a broader taxonomic range of prey (Kastsikaros and Shine, 2007). In contrast, females feed in dryer microhabitats where arthropods are likely to be more abundant.
LIFE CYCLE	This species is found breeding in ponds and streams. Males will call to attract a female from a number of locations, including under rocks, logs and other debris, within dense vegetation and shallow burrows (Kastsikaros and Shine, 2007). Breeding generally occurs between the warmer months of September and April, and eggs are laid as a foamy mass on the surface of permanent ponds, stream pools, water-filled crayfish holes or cattle tracks (Australian Museum, 2018). Once tadpoles hatch, they can reach a total length of 3.5 cm and are dark brown in colour, occasionally with a cream patch on the snout. Tadpoles will take around two months to develop into frogs (Australian Museum, 2018).

Temporary Disturbance:

The Project will result in the temporary disturbance and loss of potential habitat for the tusked frog. Potential impacts to this species include:

- Direct mortality during vegetation clearing and drawdown procedures
- Mortality of larvae due to a decline in water quality and altered flow regimes
- Competition with generalist frog species as a result of habitat modification
- Predation by the cane toad (*Rhinella marina*).

Construction and drawdown activities within the project area will result in the removal of potential breeding habitat for the tusked frog.

Potential impacts to the tusked frog will be localised and are expected to be minimal provided that the mitigation and management measures provided in Table E2-6 are adhered to. The Project is unlikely to result in impacts on the regional and State wide population of the Tusked frog, given the small area of habitat present within the proposed Project area and the adaptability of the species.

E2.4 Mitigation management

The upgrade of Six Mile Creek Dam, presents a number of risks and threats associated with the design and construction phases of the Project. The risks and threats are particularly important to the survival of the threatened fauna found within the direct impact area.

The specific mitigation and management measures for each risk and the species that it is applicable to are listed below in Table E2-6.

Table E2-6 Mitigation and management actions for species listed under the Nature Conservation Act 1992

SPECIES IMPACTED	RISK	PROJECT PHASE	MITIGATION AND MANAGEMENT ACTIONS
Platypus (*Ornithorhynchus anatinus)* Tusked frog *(Adelotus brevis)*	Freshwater habitat loss	Design	Reduce bank degradation, riparian vegetation loss and habitat loss by facilitating a drawdown program that mimics the natural flow regime of Six Mile Creek to the greatest extent possible. Plan a drawdown program outside of platypus breeding season (August to October) and the tusked frog breeding season (October to December). Where possible, construction on creek and dam banks with dense overhanging riparian vegetation should be avoided to retain suitable breeding places. Design and implement erosion and sediment control in Six Mile Creek downstream of the dam where necessary.
		Pre-construction	No bank disturbance should be undertaken until a suitably qualified person has checked the banks for threatened fauna and fauna burrows or tusked frog individuals in the direct construction area. Inspections of Six Mile Creek upstream should also be conducted. Individuals and / or eggs identified are to be salvaged. Within the site induction, site personnel should be educated on how to recognise the physical attributes of platypus, platypus burrows and tusked frogs to STOP, MANAGE and NOTIFY when encountered. Manage drawdown rates to allow platypus to relocate in response to changed conditions and, if confirmed as present, monitor platypus response and condition. Prevent bank degradation as a result of scouring through management of drawdown rates.
		Construction	Construction is restricted to the Project footprint and immediate surrounding buffer area. Prevent disturbance of breeding places, where possible, for example by installing fencing with no go signage around breeding places (e.g. drainage line on Collwood Road) to prevent direct construction impacts. Location of stockpiles should not be altered or placed in natural drainage areas. If exposed for a long period of time, cover stockpiles. Designated stockpile areas should be accurately communicated to all site personnel.

SPECIES IMPACTED	RISK	PROJECT PHASE	MITIGATION AND MANAGEMENT ACTIONS
			If any burrows are identified, implement a 3 m x 3 m exclusion zone with flagging tape until approval to impact the burrow has been granted by the suitably qualified person. Selected logs and branches from the direct impact area should be stored in designated stockpile areas to be used for site rehabilitation. Minimise period of time that the dam is at a dewatered state during construction to prevent fauna fatalities due to complete habitat loss.
		Rehabilitation	All disturbed land will be rehabilitated to achieve stable and sustainable soil cover and minimise sediment run off. The construction site will also be re-profiled to original or stable contours, re-establishing surface drainage lines and other features. To prevent slumping and erosion, other site specific stabilisation measures may be required. Temporary erosion control measures will be left in place until bare soil has stabilised.
Platypus (*Ornithorhynchus anatinus)* Tusked Frog *(Adelotus brevis)* Richmond Birdwing (*Ornithoptera richmondia*)	Fauna fatalities and encounters	Pre-construction	All site personnel are to attend a site induction identifying the threatened fauna species with potential to occur within the direct impact area. The site induction should include: • Physical attributes such as bubbles rising to the surface of the water and a quick re-surface of a dark brown object approximately the size of a forearm to assist in platypus identification • Platypus burrows can be identified as a neat hole, approximately 25cm wide, in the banks of a creek/dam with overhanging vegetation. • Tusked frogs are identified by their black and dark brown blotches, a pointed ventral snout, 40 mm long and red colouring on the thighs and groin. • Richmond birdwing butterflies are most commonly identified by their size, with a wingspan of up to 16cm. Males have a distinctive iridescent green with black spots and females are brown with extensive white, cream and yellow markings on the hindwing. • The Environmental Representative is responsible for all fauna occurrences
		Construction	Pre-clearing survey and salvage of all platypus and tusked frog individuals and eggs within the direct impact area completed by an appropriately qualified person. Implement slow speed limits of 10km per hour onsite 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.

SPECIES IMPACTED	RISK	PROJECT PHASE	MITIGATION AND MANAGEMENT ACTIONS
			Restrict construction hours to daylight hours, where practicable. Recommended construction hours are in accordance with Section 440R of the *Environmental Protection Act 1994*. Clearing is not to be carried out without a permit to disturb, issued by the site Environmental Representative. Any threatened fauna requiring treatment or care will be recorded by the site Environmental Representative and transferred to a veterinarian or licensed carer. Any impacts to threatened fauna are to be reported to DES within 24 hours of the occurrence.
Platypus (*Ornithorhynchus anatinus)* Tusked Frog *(Adelotus brevis)*	Water quality	Construction	Implement erosion and sediment control measures in accordance with the International Erosion Control Association (IECA) best practise guidelines. Stormwater collected within the construction areas, and where applicable, diverted into holding/ settlement ponds for treatment and reuse. Establish release criteria for management of 'construction contaminated water'. Base flow entering the construction zone is to be monitored and either held on site for treatment or discharged downstream under certain release criteria to prevent impacts to Six Mile Creek. Minimise sediment tracked offsite by construction vehicles and potentially washed into waterways through the use of wash down bays or similar. Water quality monitoring performed by qualified personnel.
		Rehabilitation	Stabilise exposed soils by using materials such as mulch, biodegradable matting, geotextile fabrics, and/or soil stabilisation products. Areas impacted by construction activities revegetated where appropriate.
Platypus (*Ornithorhynchus anatinus)* Tusked Frog *(Adelotus brevis)* Richmond Birdwing *(Ornithoptera richmondia)*	Fuel and chemical spills	Construction	Undertake storage and transport of hazardous materials and dangerous goods according to relevant Australian standards, guidelines and legislation, including: • AS4452 The Storage and Handling of Toxic Substances • AS1940 The Storage and Handling of Flammable and Combustible Liquids • AS3780 The Storage and handling of Corrosive Substances • *Dangerous Goods Safety Management Act 2001* • Local council requirements. Refuelling and maintenance activities should be undertaken in designated bunded areas to minimise the

SPECIES IMPACTED	RISK	PROJECT PHASE	MITIGATION AND MANAGEMENT ACTIONS
			potential for soil and water contamination from these activities. Prepare and implement spill response measures. Provide a readily available and current copy of SDS' for each chemical/product used on site. SDS' will be available on site and available to all site personnel. Provide appropriate signage using HAZCHEM coders that is visible at all times. Signage should also provide contact details for the Environmental Representative and Safety Officer in case of an emergency. Maintain records of the existing inventory, storage location, personnel training, and waste disposal for all chemicals, fuel and dangerous goods used on site. Train all relevant staff in appropriate handling, storage and containment practices for chemicals, fuel and dangerous goods, and spill response procedures. This should also be addressed through a project induction.
Platypus (*Ornithorhynchus anatinus)* Tusked Frog *(Adelotus brevis)* Richmond Birdwing *(Ornithoptera richmondia)*	Noise and Vibration	Design	Appropriate selection of construction processes/methods and equipment that minimises the generation of noise would be further considered during the development of the Project schedule.
		Pre – construction	Regularly educate workers and contractors (such as during tool box/pre-start meetings) to maximise awareness of Project noise goals and nuisance noise generating activities, and encourage minimisation of these activities, including: • Unnecessary or overuse of PA devices or horns • Use of compression air brakes adjacent to sensitive areas • Shouting and swearing at shift start/end • Efficient material handling procedures to reduce unnecessary loud banging sounds.
		Construction	As far as practicable, general construction activities are to be carried out within daytime hours, 6:30am to 6:30pm Monday to Friday and 6:30am to 4:00pm Saturday. No noise generating construction works will take place on Sundays or public holidays. Rock breaking, rock hammering and any other activities which result in impulsive or tonal noise generation will only to be conducted during daytime hours. In general, construction works and consideration of quiet work practices would be carried out in accordance with Australian Standard 2436-1981, Guide to noise control on construction, maintenance and demolition sites (Standards Australia, 1981). Plant and equipment should be selected to minimise noise emission, in-so-far-as possible whilst maintaining efficiency of function.

SPECIES IMPACTED	RISK	PROJECT PHASE	MITIGATION AND MANAGEMENT ACTIONS
			Residential grade mufflers to be fitted and all noise control equipment should be maintained in good order.
Tusked Frog (*Adelotus brevis*) Richmond Birdwing (*Ornithoptera richmondia*)	Terrestrial habitat loss and fragmentation	Design	Habitat loss is to be reduced through the consolidation of Project infrastructure to minimise the Project footprint. Locate infrastructure, laydown areas and construction access sites within areas of previous disturbance, wherever possible, to minimise vegetation removal.
		Pre-construction	Plans detailing the staging of works, areas to be retained, significant areas of exclusion, and other relevant issues will be provided by the site Environmental Representative to the Construction Manager and Clearing Contractor before any site preparation activities are undertaken in the proposed construction area. All areas to be cleared will be clearly identified on the ground by the site Environmental Representative before any site preparation activities commence. Areas to be retained will therefore be clearly identified and no unauthorised access permitted. As construction activities may impact on retained vegetation it is important to ensure sediment fencing is in place before site preparation and other earthworks begin. Before any site preparation operations begin, the site Environmental Representative will undertake an inspection of all sediment fencing. A pre-clearing survey is to be completed to identify if any Richmond birdwing butterfly vines are present within the direct impact area. If the vine is present, it is to be relocated by a suitably qualified ecologist.
		Construction	Vegetation clearing is to be staged, allowing fauna to move into adjacent habitats on their own accord. Trees considered suitable for retention must be identified. Within the vicinity of retained trees, the following activities will not be permitted: • Storage and mixing of materials • Vehicle parking • Liquid disposal • Machinery repairs and/or refuelling • Construction of site office or shed • Combustion of any material • Stockpiling • Any filling or excavation including trench line, topsoil skimming and/or surface excavation, unless otherwise approved by the Construction Manager • Unauthorised pesticide, herbicide or chemical applications.

SPECIES IMPACTED	RISK	PROJECT PHASE	MITIGATION AND MANAGEMENT ACTIONS
			All activities in areas adjacent to vegetation to be retained are to be conducted in a manner that minimises damage to the vegetation. Contractor to provide fences and/or trunk girdles to prevent unintended physical damage to the root system, trunk or canopy of native vegetation identified for retention, which may be impacted upon by clearing works. All works carried out on either foliage or root systems of trees in consultation with a qualified arboriculturist. All works to adhere to the *Australian Standards (AS) 4373 – 1996 (Pruning of Amenity Trees)*. The subject trees are not to be topped nor lopped. Spur climbing of any tree to be pruned should be avoided.
		Rehabilitation	The period of time between Project completion and restoration of the Project area should be minimised to prevent loss of soils and weed incursion. All disturbed land will be rehabilitated to achieve stable and sustainable cover of native vegetation. Original stockpile materials will be respread across the site in the following order: subsoil, topsoil, rock and vegetation.
Tusked Frog (*Adelotus brevis*) Richmond Birdwing (*Ornithoptera richmondia*)	Pest and weed management	Construction and Rehabilitation.	Implement a Biosecurity Management Plan for the Project that is consistent with Seqwater's Water Supply Scheme Pest Management Plan and Catchment Services Biosecurity Operational Plan. All new site vehicles will be cleaned to reduce weed spread and establishment incidences. The site Environmental Representative is to monitor introduced plant and fauna species by weekly management audits. Weed infested topsoil will be disposed of or treated and stored away from native vegetation. Implement cane toad traps in areas of pooling after the drawdown of the dam has occurred. Rehabilitate disturbed areas following completion of construction to prevent pest species from becoming established.
Platypus (*Ornithorhynchus anatinus)* Tusked Frog *(Adelotus brevis)* Richmond	Light spill	Construction and Operation	All bright lights should be positioned as close to the ground as practical. Where possible, light shall be shielded so that it is directing toward the ground, minimising light spill towards any surrounding habitat. Utilise lighting that does not attract insects. Use only the minimum amount of lighting needed for safety.

SPECIES IMPACTED	RISK	PROJECT PHASE	MITIGATION AND MANAGEMENT ACTIONS
Birdwing *(Ornithoptera richmondia)*			Avoid the use of naked bulbs and narrow spectrum bulbs where possible. Use motion sensor lights where possible to only illuminate areas in use.

E2.4.1.1 Monitoring

The effectiveness of management measures detailed throughout this SMP will be monitored through the compilation of incidental, weekly and monthly reporting.

The Site Environmental Representative will regularly review the conservation status of flora and fauna species throughout the duration of the Project by staying up to date with relevant legislation and literature.

This SMP will be updated as required during the life of the Project to revise mitigation and management measures to reflect any changes to the conservation status of the species identified on site.

Changes to the SMP as a result of actions, other than in accordance with a plan provided by the Minister, will trigger a variation to the SMP.

E2.5 Reporting

Reporting requirements throughout the implementation of this SMP are listed below:

E2.5.1 Spotter-catcher returns

The following information relates to data to be collected regarding the relocation of fauna which will be submitted to DES as part of the Spotter-catchers returns:

- Fauna species relocated
- Location of capture
- Location of release
- Date of relocation.

E2.5.2 Ecological performance auditing

The regulatory authorities associated with environmental matters may conduct inspections of the Project works. The Site Environmental Representative will attend these audits.

Internal audits will also be conducted to ensure SMP compliance during the construction and operational phases of the Project including:

- On-site audits
- Audits of contractor's environmental management
- Work area inspections and monitoring.

Non-conformances will be documented and addressed with appropriate corrective and preventative actions.

E2.5.3 Non-compliance reporting procedure

Where there is a non-compliance with this SMP, a report must be submitted to DES within 5 business days, the report will outline the type of non-compliance and remedial actions taken to ensure that the matter is resolved.

E2.5.4 Environmental Incidents and Corrective Actions

The following actions should be implemented if fauna species are injured or removed during the Project duration.

If vegetation impacts occur outside of the approved clearing area:

- Works must immediately cease in the area and DES will be notified within 24 hours of the incident occurring Works must not proceed until the situation has been assessed and approval to proceed has been issued
- A Suitably Qualified Person will conduct a search for any injured or orphaned wildlife
- If native vegetation was cleared/impacted a report will be provided to DES and management measures agreed.

If a native animal is injured or killed on site:

- The Site Environmental Representative must be contacted immediately to capture or organise the possible capture of the animal for transportation to a specialist veterinarian or wildlife carer. The animal must only be handled by a person suitably qualified to do so
- The location of the injured animal will be identified/marked so it can be found again. If the animal is moving, a note will be made of the direction in which it was headed
- The species will be identified
- The type of injury sustained will be identified where possible.

E2.6 Resourcing

The following specialist resources are required onsite and offsite to support the implementation of this SMP:

E2.6.1 Onsite Resources

Table E2-7 Specialist resources required for SMP implementation

ROLE	MINIMUM QUALIFICATIONS	CONSTRUCTION ACTIVITIES
Ecologist	Minimum of 5 years' experience practising as an ecology professional Tertiary qualification in ecology or similar	Pre dam drawdown salvage of individuals Mark out of protected flora Trunk protection of trees
Fauna Spotter-catcher	Have experience with wildlife (theoretical and practical) Hold a rehabilitation permit	Tree clearing Dam drawdown Tree pruning Fauna survey and relocation
Arborist	Australian Qualifications Framework Level 3 qualification in arboriculture, as a minimum.	Tree clearing Tree pruning
Site Environmental Representative	Minimum of 5 years' experience as a practising professional	Throughout construction

E2.6.2 Offsite Resources

CONTACT NAME	CONTACT DETAILS
RSPCA QLD – To report sick, injured or orphaned wildlife	1300 ANIMAL (1300 264 625)
Cooroora Veterinary Clinic (Monday to Friday 7.30am to 5.30pm, Saturday and Sunday 8.30am to 5pm)	(07) 5447 6733
Animal Emergency Centre Noosa (Monday to Friday 6pm to 8am, Weekends 24/7)	(07) 5353 7005
Koala Rescue Queensland (24-hour State-wide Koala emergency service)	0423 618 740 0431 300 729 0466 439 947

E2.7 References

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