

Jacana Retarding Basin Wetlands Rectification Project

Melbourne Water

Growling Grass Frog Management Plan

IS162400_R03 21 November 2016 Q03634





Project Name

Project No:	IS162400
Document Title:	Growling Grass Frog Management Plan
Document No.:	IS162400_R03
Revision:	3
Date:	21 November 2016
Client Name:	Melbourne Water
Client No:	Q03634
Project Manager:	Elliot Hannan
Author:	Alicia Michael
File Name:	J:\IE\Projects\03_Southern\IS162400\02 Documents\04_Ecology\R03 Jacana Wetlands Rectification GGF Management Plan.docx

Jacobs Australia Pty Limited

Floor 11, 452 Flinders Street Melbourne VIC 3000 PO Box 312, Flinders Lane Melbourne VIC 8009 Australia T +61 3 8668 3000 F +61 3 8668 3001 www.jacobs.com

© Copyright 2016 Jacobs Australia Pty Limited. The concepts and information contained in this document are the property of Jacobs. Use or copying of this document in whole or in part without the written permission of Jacobs constitutes an infringement of copyright.

Limitation: This report has been prepared on behalf of, and for the exclusive use of Jacobs' Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

Document history and status

Revision	Date	Description	Ву	Review	Approved
1	18/11/2016	Technical Review	Alicia Michael	Dave Endersby	Elliot Hannan
2	21/11/2016	Client Review	Alicia Michael	Aaron Broadway	



Contents

Execu	tive Summary	1
1.	Introduction	2
1.1	The Project	2
1.2	Study Area	2
1.3	Growling Grass Frog	3
1.4	Purpose of Management Plan	3
1.5	Environmental Outcome	3
2.	Statutory requirements	6
2.1	Relevant legislation	6
2.1.1	Environment Protection and Biodiversity Conservation Act 1999	6
2.1.2	Flora and Fauna Guarantee Act 1988	6
2.1.3	Victorian Advisory Lists of Threatened Species	6
2.1.4	Wildlife Act 1975 and Wildlife Regulation 2002	7
2.1.5	Catchment and Land Protection Act 1994	7
3.	Species Information	8
3.1	General	8
3.2	Status	8
3.3	Habitat	8
3.4	Habitat within the study area	9
3.5	Threats	12
3.5.1	Habitat loss	12
3.5.2	Habitat fragmentation	13
3.5.3	Hydrology and water quality	13
3.5.4	Movement of vehicles and construction machinery	13
3.5.5	Chytrid Fungus	13
3.5.6	Weeds	14
3.5.7	Revegetation activities	14
4.	Management Plan	15
4.1	Pre-construction Activities	15
4.1.1	Permits and approvals	15
4.1.2	Pre-construction survey to determine distribution of Growling Grass Frogs	15
4.1.3	Water quality monitoring	16
4.2	Construction activities	16
4.2.1	Training and induction	16
4.2.2	Timing of Construction	16
4.2.3	Definition of the Works Area	17
4.2.4	General mitigation measures	18
4.2.5	Habitat protection	18
4.2.6	Draining of wetlands	19
4.2.7	Removal of vegetation/habitat features that may support Growling Grass Frog	19



4.2.8	Capture and Relocation protocol	.19
4.2.9	Protocol for the sighting of a Growling Grass Frog within the Works Area	.20
4.2.10	Water quality monitoring	.20
4.3	Post construction activities	.20
4.3.1	Revegetation	.20
4.3.2	Growling Grass Frog Monitoring	.20
4.3.3	Water quality monitoring	.20
5.	Plan Implementation, Reporting and Review	.21
5.1	Key responsibilities	.21
5.2	Performance measures	.21
5.3	Monitoring and Review	.25
5.4	Non-compliance	.25
6.	References	.27



Executive Summary

This Growling Grass Frog Management Plan has been prepared to document mitigation measures to minimise and where possible avoid impacts to the nationally threatened Growling Grass Frog (*Litoria raniformis*) as a result of rectification works at the Jacana Retarding Basin Wetlands (Jacana Wetlands). The Jacana Wetlands are located adjacent to Moonee Ponds Creek System, across both the City of Hume and City of Moreland municipalities.

The Jacana Wetlands are artificial wetlands constructed by Melbourne Water to manage nitrogen levels in local run-off. The wetlands are not currently performing to the required standard. A rectification project is to be completed to bring the wetlands up to Melbourne Water's current standard for constructed wetlands, including improvements to safety, operation and maintainability of the site. In order to allow the works to be completed portions of the wetlands are required to be drained and invasive aquatic vegetation that has colonised the wetlands at the detriment of the original established wetland plant assemblage, replaced.

Works will include the cleaning out of established sediment ponds, construction of permanent access tracks to each of the sediment ponds to enable safe access in the future and removal and reconstruction of a number of structures to enable better control of flows. In addition, a 24 month vegetation management program will be completed to revegetate areas cleared for the works and to improve vegetation composition and density in other areas of the wetland originally established for nutrient uptake and retention and also improve habitat provision for the Growling Grass Frog.

The wetlands support a population of the Growling Grass Frog. This species is listed as Vulnerable under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999, Endangered on the Department of Environment, Land, Water and Planning (DELWP) Victorian Advisory List and listed under the Victorian Flora and Fauna Guarantee Act.

The proposed rectification of the wetlands has the potential to impact the Growling Grass Frog including:

- Loss of adjoining terrestrial habitat as a result of clearance of vegetation and soil excavation
- Death of, or injury to, Growling Grass Frogs through the rectification/sediment removal works
- Contraction or transmission of disease (e.g. Chytrid Fungus) during works

The objective of this Management Plan is to outline mitigation measures to minimise the impacts of the rectification works on the Growling Grass Frog and its habitat. The environmental outcome for the project in respect to the Growling Grass Frog is 'no net loss to the extent and quality of habitat for the Growling Grass Frog as a result of the Jacana Wetlands rectification work'. The Management Plan outlines actions such as monitoring, construction mitigation measures and capture and relocation protocols.

The plan will be implemented over the duration of the project including one year of physical construction works followed by a 24 month vegetation management program followed by a period of monitoring of the Growling Grass Frog population and habitat parameters.

Provided that construction and ongoing management and monitoring of the study area is in accordance with recommendations provided in this plan, there is unlikely to be a significant impact to the resident Growling Grass Frog population at the site.



1. Introduction

1.1 The Project

The Jacana Retarding Basin Wetlands (Jacana Wetlands) were constructed in 2003 by Melbourne Water to reduce the nitrogen load in storm water going into the Monee Ponds Creek. They consist of a northern and Southern Wetland on either side of the Western Ring Road. The wetlands are presently not functioning to the standard required. A rectification project has been proposed in order to bring the wetlands up to the standard of the current Melbourne Water's Constructed Wetlands Design Manual.

A concept design of required works for the Jacana Wetlands has been completed for Melbourne Water and in summary includes the reconstruction of inlet weirs and outlet pits and pipes within the existing footprint of the wetland. This includes the following works:

- Northern Wetland
 - Upgrades to the inlet chute (weir).
 - Addition of a flow splitting device added to modify water flow.
 - Two sedimentation ponds to be combined to maximise capture efficiency.
 - Upgrade of outlet pits in the macrophyte area.
 - Adjustments to the macrophyte zone bathymetry

The sedimentation ponds of the northern system will be combined to maximise capture efficiency without expanding its existing boundaries.

- Southern Wetland System
 - Southern bank of diversion pond to be reshaped adjacent to pits to allow for greater access.
 - Replacement of existing outlet pit to wetland.
 - Redesign of the outlet pit to diversion pipe and creek.
 - Adjustments to the macrophyte zone bathymetry.

Essentially the works at both wetland systems are expected to allow for greater control of water flow entering the wetland systems which will allow for:

- Better hydraulic efficiency.
- Increase in sediment cleanout throughout the year.
- Reduction in velocity of water across the macrophyte zone.
- Reduction in detention depth and time within the system to allow for greater vegetation growth.

The sedimentation pond that forms part of the Southern Wetland system will be excavated and reshaped to improve on its efficiency. However the design of the new pond will not extend outside the existing footprint. It is also proposed to improve access to the wetland areas for ongoing maintenance tasks as well as install appropriate signage for community education purposes. Works for access will include stabilisation of areas where regular maintenance is required.

1.2 Study Area

The Jacana Wetlands and immediate surrounds span an area within both the City of Hume (north of the Western Ring Road) and City of Moreland (south of the Western Ring Road) (Figure 1-1 and Figure 1-2). The Jacana Wetlands are located within a linear reserve that follows the existing creek lines of the Moonee Ponds Creek system running north-south. The region in which the systems exist is residential with supporting



recreational and commercial land use. Land abutting the wetlands is mostly used for recreational purposes as it forms part of a low-lying area of the natural drainage line and is subject to inundation.

1.3 Growling Grass Frog

The Nationally significant Growling Grass Frog (*Litoria raniformis*) has been identified within the Jacana Wetland system. This fauna species is protected under the *Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, Victoria's *Flora and Fauna Guarantee (FFG) Act 1988* and on the Advisory List of Threatened Vertebrate Fauna in Victoria. A monitoring study on the Growling Grass Frog in 2013-2014 identified the presence of adult Growling Grass Frog at all three sites surveyed.

1.4 Purpose of Management Plan

The purpose of this management plan is to document mitigation and monitoring measures to ensure that proposed rectification works at the Jacana Wetlands does not detrimentally impact the Growling Grass Frog. In order to achieve this purpose the Plan aims to:

- Develop pre-clearing survey methods to determine the presence of the Growling Grass Frog across the Jacana Wetlands site
- Develop protocols to capture and relocate Growling Grass Frogs located within work areas and immediate surrounds
- Detail measures to ensure that the proposed works do not interfere with breeding activities of the Growling Grass Frog
- Detail measures to protect habitat features and resources for the Growling Grass Frog adjoining the Works Area
- Develop a protocol for re-establishing appropriate habitat for the Growling Grass Frog within work areas, including revegetation and re-instatement of important habitat features such as rocks
- Provide an implementation schedule and monitoring and reporting framework to ensure the effective management of risks to the Growling Grass Frog for the duration of the project

1.5 Environmental outcome

The environmental outcome for the project in respect to the Growling Grass Frog is 'no net loss to the extent and quality of habitat for the Growling Grass Frog as a result of the Jacana Wetlands rectification work'. Provided that construction and ongoing management and monitoring of the study area is in accordance with recommendations provided in this plan, this outcome will be achieved.





Figure 1-1 Jacana Northern Wetland





Figure 1-2 Jacana Southern Wetland

Document No.

2. Statutory requirements

2.1 Relevant legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation* (EPBC) *Act* 1999 details matters of National Environmental Significance (NES) that need to be protected. Threatened species listed under the EPBC Act are a matter of NES. The Growling Grass Frog is listed as Vulnerable under the EPBC Act. Significant impact thresholds assessed under the EPBC Act for the Growling Grass Frog include:

- Habitat degradation in area supporting an important population
- Isolation and fragmentation of important populations.

Due to the fragmentation of habitat for the Growling Grass Frog, any viable population is considered an important population for the persistence and recovery of the species. A viable population is considered one that is not isolated from other populations or waterbodies, such that the opportunity to interact with other nearby populations and has the ability to establish new populations when waterbodies fill and become available (DEWHA, 2009). It is known that populations of Growling Grass Frogs are present upstream of the Jacana Wetlands both within the Yuroke Creek and the Moonee Ponds Creek. As such the population present at Jacana Wetlands is considered viable, and therefore an important population.

As the project will impact on an important population of the Growling Grass Frog the project will require referral under the EPBC Act.

2.1.2 Flora and Fauna Guarantee Act 1988

Flora and Fauna Guarantee (FFG) *Act* 1988 provides a legislative framework for the conservation of biodiversity in Victoria. The FFG Act provides for the listing of threatened species and communities and the preparation of action statements for these species and communities. It also provides a list of potentially threatening processes.

The Growling Grass Frog is listed under the FFG Act.

Potentially Threatening Processes, listed under the FFG Act, related to the threatened species considered within this plan, include:

- Alteration to the natural flow regimes of rivers and streams.
- Degradation of native riparian vegetation along Victorian rivers and streams.
- Habitat fragmentation as a threatening process for fauna in Victoria.
- Increase in sediment input into Victorian rivers and streams due to human activities.
- Infection of amphibians with Chytrid Fungus, resulting in the disease, chytridiomycosis.
- Input of toxic substances into Victorian rivers and streams.
- Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing.

Management measures as directed in this plan and the Construction Environmental Management Plan will be implemented to mitigate against the occurrence of these threatening processes.

2.1.3 Victorian Advisory Lists of Threatened Species

The DELWP Victorian Advisory Lists are not a statutory list of threatened species, but rather list species for which conservation management is recommended by DELWP.

There are no legal requirements or consequences that flow from inclusion of a species in these lists. The lists highlight species that have an uncertain future and will require a precautionary approach to maintain a viable future. Some of the species in these lists are also listed as threatened under the FFG Act and EPBC Act.



The Growling Grass Frog is listed Vulnerable on the Advisory List of Threatened Fauna.

2.1.4 Wildlife Act 1975 and Wildlife Regulation 2002

The Wildlife Act establishes procedures for the protection and conservation of wildlife; the prevention of wildlife becoming extinct; and the sustainable use of and access to wildlife and to prohibit and regulate the conduct of persons engaged in activities concerning wildlife.

It is an offence to take, destroy, acquire, capture and handle listed 'protected', 'notable' or 'endangered' wildlife in Victoria without an authorisation under the Wildlife Act. Penalties for offences against listed species are significant and can include fines and / or imprisonment.

Any person employed by the project to undertake surveys for or to handle fauna will need to have a permit to do so under the Wildlife Act.

An authorisation must be obtained under the Wildlife Act to undertake the capture and relocation of the Growling Grass Frog. Two categories of people will be permitted to handle the Growling Grass Frog:

- Qualified Wildlife Specialists who have an appropriate level of skill, training, qualifications and experience in handling wildlife. These will be contractors who are permitted under the Wildlife Act to capture and relocate animals
- Trained Wildlife Handlers that are staff and contractors who are engaged for the construction works and will have been appropriately trained in wildlife handling.

2.1.5 Catchment and Land Protection Act 1994

The CaLP Act defines requirements to:

- Avoid land degradation
- Conserve soil
- Protect water resources
- Eradicate and prevent the spread and establishment of noxious weed and pest animal species

The spread and establishment of noxious weeds and pest animal species is considered a risk of the project to the integrity of populations of threatened species. As such the effective implementation of a pest weed and pest animal control program is considered a crucial component of managing risks to threatened fauna. Further detail as to the management of pest animal and pest plant species will be provided within the Construction Environmental Management Plan.



3. Species Information

3.1 General

The Growling Grass Frog is a large frog, growing to 86mm in length (Figure 3-1). The colour can vary from dull olive to bright emerald green. They are most active in spring and summer, during both day and night and are highly mobile, moving up to 1km in 24 hours (Clemann & Gillespie, 2010). The frogs become largely inactive over winter, hiding under rocks or logs close to wetlands (Heard et. al. 2010).

The breeding season is between September and January. Females lay up to 4000 eggs. Tadpoles typically metamorphose after only 2 or 3 months and can reach sexual maturity within 4 months of metamorphosis (Heard et. al. 2010).



Figure 3-1 Growling Grass Frog at Jacana Wetlands.

3.2 Status

The Growling Grass Frog is listed as Vulnerable under the *Environment Protection and Biodiversity Conservation* (EPBC) Act, Endangered on the Victorian Advisory lists and is listed under the *Flora and Fauna Guarantee* (FFG) Act.

3.3 Habitat

The frog inhabits permanent and ephemeral wetlands, slow flowing sections of river, streams, lakes, swamps and ponds (Clemann & Gillespie, 2010). They forage both on land and in water while floating among aquatic vegetation, consuming invertebrates and small vertebrates. While being a primarily aquatic species, they spend winter in torpor under rocks or logs near the water.

Good quality wetland habitat for this species contains deep permanently or consistently available water (up to 1.5m deep is preferable) that is still or slow moving. The vegetation should comprise of emergent, submergent and floating types. High cover of vegetation as well as rock, logs and patches of bare ground surrounding the wetland offers the greatest chance of ongoing occupancy of a site (Clemann & Gillespie, 2010). Where there are multiple large pools, smaller ponds or damp depressions can aid the dispersal of the frogs.



There are no standard water quality guidelines for the GGF as different populations have been found to exist in a variety of salinity and pH levels (Clemann & Gillespie, 2010).

3.4 Habitat within the study area

The Northern Wetland supports a deep permanent pool. The perimeter is densely vegetated with Common Reed (*Phragmites australis*), Bulrush (*Typha* spp.) and Rushes (*Juncus* spp), with some floating and submerged vegetation including Water Ribbons (*Triglochin procerum*) (Figure 3-2). The Moonee Ponds Creek runs along the eastern edge of the wetland and supports rock habitat and dense stands of Common Reed. During the 2013/2014 surveys, Growling Grass Frogs were observed utilising the rocky habitats within the Moonee Ponds Creek. The Northern Wetlands were assessed as providing low to moderate quality habitat for the Growling Grass Frog (EHP, 2014).

The Southern Wetlands comprises a series of treatment ponds (Figure 3-3). The initial pond is a sediment pond comprising a deep permanent pool with a perimeter of Common Reed, Bulrush and rushes with some floating and submerged vegetation in deeper areas. The secondary and tertiary treatment ponds support a diverse array of emergent, submerged and floating vegetation with a high cover of Water Ribbons. Floating vegetation, such as Water Ribbons, provide suitable calling sites for adult males as well as breeding and egg deposition sites. These areas have been assessed as supporting moderate to high quality habitat for the Growling Grass Frog. Shallow areas of the tertiary treatment pond, particularly the southern extent support dense swards of Common Reed and Bulrush, thus reducing the availability of high quality habitat for the Growling Grass Frog.

The small sediment pond located to the east of the Moonee Ponds Creek, in between the northern and the Southern Wetland is considered to only provide low quality habitat for the Growling Grass Frog. It is separated from the Moonee Ponds Creek and wetlands by a paved bicycle path and a 50 m expanse of mown lawn.





Figure 3-2 Components of the Jacana Northern Wetland (Spiire, 2015).





Figure 3-3 Components of the Jacana Southern Wetland (Spiire, 2015)

A survey to determine Growling Grass Frog presence across the Jacana Wetlands was completed in November 2016. A number of Growling Grass Frogs were heard calling in a pool directly off the Moonee Ponds Creek and at the southern end of the Northern Wetland system. An individual Growling Grass Frog was heard calling within the Southern Wetland System (Figure 3-4).





Figure 3-4 Results of Growling Grass Frog Survey (November, 2016).

3.5 Threats

The frog was previously widespread across Victoria and south eastern Australia however a combination of habitat loss, fragmentation and barriers to dispersal such as road and urbanisation have led to a decrease in available habitat. Droughts and the introduction of diseases like Chytrid fungus have further added to the population decline of this species (Heard et. al. 2010). Predation from introduced fish and biocides such as herbicides could also be contributing factors, however there is less direct evidence (DSE, 2012).

As there are so few sites with appropriate habitat and connectivity left for this species, all remaining sites are considered to be significant under the EPBC Act and therefore must be protected. Potential threats to the Growling Grass Frog as a result of the proposed works to improve the functioning of the Jacana Wetlands are discussed below.

3.5.1 Habitat loss

In order to complete the proposed works vegetation, existing structures and rock will be removed from the northern and southern extent of the Northern Wetlands and the southern extent of the Southern Wetlands. In



addition the ponds will be drained to allow the works to take place. At the completion of the works all habitat features, will be reinstated. This includes refilling all wetlands, re-establishing rockwork and re-instating vegetation. Revegetation works will incorporate species that provide suitable habitats for the Growling Grass Frog. Highly invasive species, such as Bulrush and Common Reed, that can degrade habitats will not be planted as part of the reinstatement.

3.5.2 Habitat fragmentation

The project will temporarily fragment habitat to the north and south of the Jacana Wetlands. Sections of the wetlands will need to be drained to allow for the rectification works to take place. During the rectification works, construction works will create a physical barrier to dispersal of the Growling Grass Frog from populations to the north of the Jacana Wetlands within both the Moonee Ponds and Yuroke Creek. To mitigate these effects the bulk of the works will be completed during the inactive season for the Growling Grass Frog (April through to August). Should works need to extend outside of the inactive period for the Growling Grass Frog provision will be made for a habitat corridor that allows for the safe dispersal of the Growling Grass Frog throughout the Moonee Ponds Creek habitat corridor.

3.5.3 Hydrology and water quality

The construction works associated with the rectification of the wetlands have the potential:

- To result in increased sedimentation of the Moonee Ponds Creek downstream of the works
- To result in accidental spillage of chemicals from the Works Area into the Moonee Ponds Creek
- To alter the flow of water into the wetland such that it is no longer suitable for the Growling Grass Frog
- To degrade the quality of the water so that it is deleterious to the Growling Grass Frog

To mitigate these risks best practise sediment and erosion controls will be implemented to prevent increased volumes of sediment from entering the Moonee Ponds Creek during the construction works. A program of water quality monitoring will be undertaken prior to, during and for a period following construction to ensure that water quality is not negatively impacted as a result of the proposed works.

The rectification works include the cleaning out of the existing Northern Wetland sediment pond and works to increase the capacity of the sediment pond within the Southern Wetland. The aim of these works is to increase the capture efficiency of sediment of flows through the Moonee Ponds Creek. This should result in improved water quality downstream of the Jacana Wetlands. The works also include deepening sections of the wetland and reducing the velocity of water through the wetland, these measures should improve the quality of the habitat within the Jacana Wetlands for the Growling Grass Frog.

3.5.4 Movement of vehicles and construction machinery

Potential impacts from the proposed works include the direct mortality and injury of frogs through collision with vehicles and construction machinery. This threat also applies to ongoing activities to monitor and maintain the wetlands.

3.5.5 Chytrid Fungus

The movement of personnel, machinery and vehicles, and introduction of equipment and materials to the wetlands may result in the introduction and spread of Chytrid Fungus (*Batrachochytrium dendrobatidis*). Chytrid fungus is highly infectious and commonly results in the death of frogs where contracted. Stringent hygiene protocols must be adhered to, to prevent the introduction and spread of disease to frog populations at the Jacana Wetlands. This is particularly important for those personnel coming into direct contact with frogs.



3.5.6 Weeds

There is a threat of increased high threat weed encroachment as a result of clearing areas of vegetation (native and exotic) to allow for the proposed works, soil disturbance and introduction and spread of weed propagules across the project area from the movement of vehicles, machinery and personnel. In order to successfully breed and hunt, the Growling Grass Frog requires a mix of floating, submergent and emergent vegetation as well as open habitats to allow for hunting. Excessive weed growth can detrimentally alter the vegetation composition so that it does not support suitable habitats for the Growling Grass Frog.

3.5.7 Revegetation activities

It is proposed that a 24 month program of revegetation and vegetation management be undertaken at the completion of the construction program. The aim of this program will be to revegetate the areas disturbed by the works and to improve the composition of vegetation in targeted areas of the wetland to enhance the uptake of nutrients from the wetland and to improve the provision of habitat for the Growling Grass Frog. These works pose a threat to the Growling Grass Frog through direct disturbance and exposure to herbicides toxic to frogs.



4. Management Plan

4.1 **Pre-construction Activities**

4.1.1 Permits and approvals

As detailed in Section 2, the potential impact to the Growling Grass Frog and the implementation of actions to mitigate the potential impact to the Growling Grass Frog trigger the requirement for a range of permit and approvals under various legislation. It will be ensured that the following approvals and permits are secured prior to construction commencing:

- Approval from DEE under the EPBC Act
- Any qualified zoologist engaged to undertake monitoring of the Growling Grass Frog must have a permit to do so under the *Wildlife Act 1975* and ethics approval from an approved body.
- In order to relocate wildlife, including Growling Grass Frogs, during construction an Authorisation under Section 28A of the Wildlife Act 1975 will be required.

4.1.2 Pre-construction survey to determine distribution of Growling Grass Frogs

Prior to construction commencing a Growling Grass Frog survey will be completed to determine the relative abundance and distribution of the Growling Grass Frog within the project area. The following survey methodology will be implemented and will be repeated annually during the species active period (September through to March) for the duration of the construction program and for three years post construction.

The survey to be completed during the active period will include:

- One day of diurnal survey in accordance with the following methodology:
 - Observers to walk the perimeter of each of the wetland ponds to identify frogs basking on vegetation and to listen for frogs entering the water when alarmed;
 - A visual assessment of the depth, flow and quality of water within the each wetland pond;
 - Record vegetation diversity, structure, composition and percentage of cover;
 - Record availability of hunting and sheltering sites;
 - Record presence of rubbish; and
 - Take a photo at a marked location of each wetland pond to allow for comparison of habitat condition over time.
- A minimum of two nights of nocturnal survey in accordance with the following methodology:
 - Surveys to be completed at Jacana Wetlands as well as at a site north of the wetlands known to support the Growling Grass Frog, on either the Yuroke or Moonee Ponds Creek that feeds into the Jacana Wetlands. This will allow for comparison across years of fluctuations in frog numbers as a result of factors not related to construction activities.
 - Surveys to be conducted on still nights when air temperatures are above 13°C, preferably 24 hours after rainfall;
 - Five minutes of call playback will be completed at the start of the survey at each wetland pond. A count of the number of calling males will be completed; and
 - An active search using hand-held spotlights will then be completed to identify individuals on floating vegetation and around the perimeter of wetlands, including rock habitats and the base of vegetation.
- One night of survey between December and February to search for tadpoles and metamorphlings around the perimeter of each of the wetland ponds.



Appropriate biosecurity protocols will be implemented to prevent the spread of Chytrid Fungus.

4.1.3 Water quality monitoring

A program of water quality monitoring will be commenced prior to construction starting. Water samples will be taken from the Northern and Southern Wetland as well as from an upstream and downstream location. Water quality monitoring will be in accordance with the EPA's reference document, *Sampling and analysis of waters, wastewaters, soils and wastes* (EPA, 2009). At a minimum the following parameters will be measured:

- Turbidity
- Electrical conductivity
- Dissolved oxygen concentration
- pH
- Nutrient and Heavy Metal levels.

4.2 **Construction activities**

4.2.1 Training and induction

All personnel working within the project area will undergo training and induction regarding Growling Grass Frog management procedures as a part of the general site induction prior to commencing work on site. The induction will include:

- A briefing as to the appearance, habitat and significance of the Growling Grass Frog and the importance of the wetland to the species
- Personnel, vehicle and equipment hygiene practices
- Restrictions for the movement of vehicles and machinery along access tracks, where possible, and through the designated entrance and exit point
- Identification of the Works Area and the restriction of activities outside of this area
- Briefing as to the protocol to be followed where a potential Growling Grass Frog is sited within the Construction Area
- Briefing as to monitoring and reporting requirements if protective fencing is damaged

4.2.2 Timing of Construction

One of the key mitigation strategies is the timing of the works to minimise the impact on the breeding success of the Growling Grass Frog (Table 4-1). The works will be staged with works to the Northern and Southern Wetland completed at different times to ensure adequate still water is available at the site to enable the Growling Grass Frog to breed.

Month	Growling Grass Frog Life Stage	Activities within the Northern Wetland	Activities within the Southern Wetland
April 2017	Overwintering	No -activities	Drain Southern Wetlands. Allow a minimum of two weeks for any remaining active Growling Grass Frogs to relocate.
May – Mid- August 2017	Overwintering	No activities	Rectification works to the Southern Wetland

Table 4-1: Timeline for staging of works to minimise impacts to breeding season of the Growling Grass Frog.



Month	Growling Grass Frog Life Stage	Activities within the Northern Wetland	Activities within the Southern Wetland
Mid-August to beginning September	Overwintering	No activities	Reinstate Southern Wetland.
Beginning October	Growling Grass Frog becoming active	Drain 50% of Northern Wetland. Allow a minimum of two weeks for Growling Grass Frogs to relocate.	No activities
November 2017 – March 2018	Growling Grass Frog Active	Rectification works to Northern Wetland	No activities
April 2018	Overwintering	Reinstate Northern Wetlands	Additional vegetation management works
June – October 2018	Overwintering	Additional vegetation management works	Additional vegetation management works
November – March 2019	Growling Grass Frog Active	No activities	No activities
April – October 2019	Overwintering	Additional vegetation management works	Additional vegetation management works

The small sediment pond between the north and the south wetlands to the east of the Moonee Ponds Creek are considered to provide only low quality habitat for the Growling Grass Frog. The area is separated from the wetlands by a paved bicycle path and a 50 m expanse of lawn. The pond provides only low quality habitat for the Growling Grass Frog. The timing of rectification works is not considered critical to this area. Frog exclusion fencing will be erected at the perimeter of the Works Area for the duration of the works to prevent Growling Grass Frogs from entering the Works Area.

4.2.3 Definition of the Works Area

- The clear identification of the boundary of the Works Area is essential for the protection of retained habitat. The extent of the Works Area is to be clearly defined on all site maps and communicated to site personnel.
- No construction vehicles, machinery or equipment, or lay down of materials is permitted outside of these areas, other than in pre-existing hardstand areas.
- The induction of all staff to the site will include a discussion of the sensitivity of the site and the importance of maintaining activities to the designated Works Area.
- Sediment and frog exclusion fencing will be installed at the perimeter of the Works Area for the duration of the works. In order to be frog proof the fence will be:
 - At least 1 m high to prevent frogs jumping over it;
 - There will be no tall vegetation that would facilitate frogs jumping over the top of the fence within a metre of the fence either side;
 - The fence will have a lip or a curve to prevent frogs jumping over the top;
 - The fence will be dug or pegged in so that frogs cannot move underneath the fence;
 - The fence will be made of a shade cloth material, as frogs will be able to climb up any type of mesh fencing.
- In addition temporary fencing will be erected at the perimeter of the Works Area to prevent machinery and vehicles from disturbing any areas outside of the designated Works Area.



4.2.4 General mitigation measures

The following general mitigation measure will be implemented to minimise any impact to the Growling Grass Frog. Additional mitigation measures will be provided within the Construction Environmental Management Plan.

- All works will be restricted to the designated Works Area throughout the project.
- Where possible all vehicles, machinery and equipment will move along formed access tracks to prevent the spread and establishment of weeds and diseases. Vehicles and machinery will access the Works Area through defined entry and exit points. Additional measures to prevent the spread and establishment of weeds and disease including Chytrid Fungus will be provided within the ConstructionEnvironmental Management Plan. This will include:
 - All equipment, vehicles and personnel clothing including boots will be appropriately cleaned prior to arriving at the works site.
 - A boot wash as well as equipment to disinfect vehicles and machinery will be set up at the entry to the works site for the duration of the project. All personnel, vehicles and machinery will be disinfected before entering the works site.
 - Boot cleaning involves a physical boot wash, then disinfectant wash. Boots will be soaked in a 1% solution of bleach as recommend by Spear *et al* (2004).
 - Vehicle tyres to be brushed (physical disturbance) and then sprayed with a 1% bleach solution prior to entering the site.
 - Vehicles that are not required in close proximity to the wetlands will remain within the car park/hardstand area.
 - It must be ensured that the run-off from the disinfecting area is contained, and not allowed to runoff into the Jacana Wetlands. All disinfectant solution will be captured and disposed of offsite.
- Perimeter frog exclusion fencing will be inspected periodically to ensure it in good condition. Personnel will be encouraged to report any damage to the protective fencing to the Site Officer immediately.
- Sediment and pollutant control measures will be implemented in accordance with Construction Techniques for Sediment Pollution Control (EPA, 1991) and Environmental Guidelines for Major Construction Site (EPA, 1996).
- Construction stockpiles will be contained within bunded areas outside of a 30 m buffer of the Moonee
 Ponds Creek
- Minimise creation of potential habitat, or harbour sites for pest animal during construction including the Red Fox, European Rabbit and European Hare that may predate on or deteriorate habitat for the Growling Grass Frog.
- All waste, particularly food, must be securely stored, preferably off-site, to inhibit any increase in the Red Fox that may predate threatened species.

4.2.5 Habitat protection

- Prior to construction taking place the perimeter of areas of native vegetation to be retained within and in close proximity to the Works Area will be fenced with high visibility bunting or other temporary fencing.
 Fencing will be marked with signs that state 'SENSITIVE ENVIRONMENTAL AREA'. Fencing will allow for the continued use of vegetation and habitat by fauna where possible.
- The induction of all staff to the site will include a discussion of the importance of sensitive environmental areas, and activities which are prohibited from these areas.
- No construction vehicles, machinery or equipment, lay down of materials or unauthorised personnel will be allowed within these areas.



4.2.6 Draining of wetlands

- Draining of the wetlands will be completed at least two weeks prior to any major earthworks or vegetation
 removal taking place to allow frogs to naturally disperse and recolonize adjacent habitats. Draining will take
 place prior to the breeding season commencing to minimise the chance that Growling Grass frog eggs and
 tadpoles are present within areas of the wetland to be impacted.
- Following the minimum two week period for the Growling Grass Frog to relocate, frog exclusion fencing will be erected at the perimeter of the Works Area to prevent the frog from re-entering the Works Area.
- Filters will be used on pump intakes to reduce frog mortality. Measures will be implemented to ensure the concentration of Mosquito Fish within any water retained in sections of the wetland are not increased through the process of draining the wetlands. Where pest fish are required to be euthanized, it will be completed in a humane manner.

4.2.7 Removal of vegetation/habitat features that may support Growling Grass Frog

Where native vegetation is to be cleared the following procedure is to be completed:

- Where possible clearing of habitat will be completed prior to the start of the breeding season in October.
- Where a Growling Grass Frog is identified during the removal of vegetation and habitat features, clearing is to stop in the vicinity. The Frog is to be carefully encouraged to vacate the area or manually removed by a qualified wildlife specialist or trained wildlife handler in accordance with the capture and relocation protocol (Section 4.2.8).
- Cleared vegetation will be inspected for the presence of Growling Grass Frogs prior to being removed offsite.
- Habitat features including logs and rocks will be retained on-site outside of the Works Area and reinstated following construction. Retained habitat features will be placed such that they can continue to be used as habitat by the Growling Grass Frog and not stockpiled, so as not to encourage pest animals.

4.2.8 Capture and Relocation protocol

- Prior to clearing of vegetation, suitable habitat for the release of Growling Grass Frogs will be identified outside of the Works Area. Suitable areas will comprise a similar vegetation cover and level of logs, ground cover and rocks as the site of removal. Release sites will be located within 150 m of the area of vegetation clearance.
- Frogs will be captured by hand by a qualified wildlife specialist or trained wildlife handler. The following protocol will be followed for the handling of Growling Grass Frogs;
 - Footwear will be washed in disinfectant at the beginning and end of clearing activities to prevent the spread and introduction of any diseases
 - Hygiene protocols stipulated within 'Hygiene protocols for the control of diseases in Australian frogs' will be adhered to (DSEWPaC. 2011).
 - Latex gloves will be worn for handling Growling Grass Frogs (a new pair to be used for each frog handled);
- Frogs to be stored in dry, clean plastic containers, at least 20 x 20 cm in size, that are sealable and have adequate ventilation (ie. Holes in the lid to provide air flow). Each frog captured is to be housed in an individual container and kept in a cool place out of direct sunlight until relocated into suitable habitat.
- Frogs are to be released in habitat identified outside of the Works Area within 1 hour of capture. Frogs will be released into favourable micro-habitats including areas containing rocks and dense vegetation around the perimeter of the wetlands. Such sites will be identified prior to the commencement of works.
- Visibly sick and dying individuals will not be relocated. They will be taken to the nearest suitable qualified and experienced veterinarian for further diagnosis and for humane disposal if required.



• Kits will be kept on site that includes appropriate plastic containers and gloves.

4.2.9 Protocol for the sighting of a Growling Grass Frog within the Works Area

In the event that a Growling Grass Frog is identified within the Works Area works will cease immediately and a qualified wildlife specialist or trained wildlife handler contacted. Works may not recommence until the qualified wildlife specialist/trained wildlife handler has identified and relocated the individual and declared that works may recommence.

4.2.10 Water quality monitoring

A program to monitor water quality is to be established at the preconstruction phase. Fortnightly water quality monitoring will be completed for the period of construction, upstream and downstream of the Works Area. If water quality results deteriorate below that recorded during pre-construction monitoring downstream from the construction zone, and are not consistent with results upstream of the construction zone, an investigation into the source of the issue will be undertaken immediately. Where the issue is related to construction works the problem will be rectified immediately upon identification.

4.3 **Post construction activities**

4.3.1 Revegetation

Any vegetation that is removed or disturbed as part of the works will be replaced with flora species appropriate to the local Ecological Vegetation Class (EVC), with an emphasis on species and habitat conditions preferred by Growling Grass Frog.

- This will include a diversity of emergent, submerged and floating (particularly *Potamogeton* spp.) species. Plantings will not include Bulrush and Common Reed.
- Riparian areas will be planted with low growing shrubs, sedges and grasses.
- Terrestrial shelter sites will be provided in the form of rock piles, rock mattresses and logs.
- A program of weed control will be implemented to ensure excessive weed growth does not result in a reduction in the quality of habitat available to the Growling Grass Frog. Weed removal techniques, particularly herbicides, will be closely controlled to ensure they are not detrimental to the Growling Grass Frog.

The success of the vegetation management program will be monitored for a period of three years to ensure adequate cover of floating, submerged and emergent species is achieved and weed levels suppressed. Where monitoring finds vegetation cover to be lacking or composition of species inappropriate rectification works will be undertaken.

4.3.2 Growling Grass Frog Monitoring

Following the completion of the construction program, monitoring of the frog population will continue for a minimum of two years in accordance with the protocol described in Section 4.1.2. The results of the monitoring will inform decisions as to the success of revegetation and reinstatement of the wetlands and habitat features to the continued survival of the Growling Grass Frog at the Jacana Wetlands.

4.3.3 Water quality monitoring

Water quality monitoring will be undertaken every three months for a minimum of two years following the completion of construction. If water quality results deteriorate below that that recorded during pre-construction monitoring within the wetlands or downstream of the wetland, that is inconsistent with results upstream of the Works Area, an investigation into the cause of the problem will be undertaken. Weekly monitoring will be undertaken until the water quality parameters are back to pre-construction levels.



5. Plan Implementation, Reporting and Review

5.1 Key responsibilities

Responsibilities for the implementation of this Growling Grass Frog Management Plan are documented in the table below (Table 5-1). The Management Plan will require approval by DEE prior to implementation.

Table 5-1 Responsibilities for implementation

Action	Responsibility	
Pre-construction actions – Section 4.1	Melbourne Water	
Construction actions – Section 4.2	Melbourne Water/ Contractor	
Post construction actions – Section 4.3	Melbourne Water	

5.2 Performance measures

In order for the management of the Growling Grass Frog to be effective throughout the life of the project the successful implementation of the measures described within this Management Plan must be monitored against performance targets. Performance targets for the mitigation measures described within this Management Plan are provided in Table 5-2.



• Table 5-2 Performance targets for measures to be implemented as part of the Growling Grass Frog Management Plan.

Section of the plan	Action	Description	Location	Delegated Responsibility	Performance Target	Monitoring and Reporting Required	
Pre-construction							
4.1.1	Permits and approvals	Obtain permits and approvals to enable works to proceed within Growling Grass Frog habitat.	Within the Works Area	Melbourne Water Project Manager	All permits and approvals obtained and associated conditions adhered to.	As per conditions of permits and approvals.	
4.1.2	Pre-construction survey to determine distribution of Growling Grass Frogs	Undertake Growling Grass Frog survey.	Proposed Works Area as well as sites upstream along the Yuroke Creek.	Ecologist	Growling Grass Frog survey completed prior to construction commencing.	Results to be reported within Flora and Fauna Project report. Location of Growling Grass Frogs to be mapped.	
4.1.3	Water quality monitoring	Undertake water quality monitoring	Upstream, downstream and within the Works Area.	Melbourne Water Project Manager	Water quality monitoring program commenced prior to construction	Results to be adequately recorded and reported to enable auditing.	
Construction	1						
4.2.1	Training and induction	All site personnel to be inducted to the site including being informed of the Growling Grass Frog Management Plan	Works Area	Construction Manager	All personnel inducted to site and aware of requirements of the Growling Grass Frog Management Plan	Management to record attendance and satisfactory completion of site personnel to induction program	
4.2.2	Timing of construction	Construction activities to be staged so as to minimise the impact on the breeding success of the Growling Grass Frog.	Works Area	Construction Manager	No works to occur outside the timelines specified in Table 4-1.	Site officer to monitor areas of habitat during prohibited times to ensure no construction or clearance occurring during prohibited times.	
4.2.3	Definition of the Works Area	Boundary of Works Area to be clearly defined	Works Area	Construction Manager	Sites maps must clearly define Works Area boundary. All personnel to know where the boundary of the Works Area is located.	Site maps to clearly show the construction boundary.	
4.2.4	General mitigation measures	Mitigation measures to be implemented to minimise	Works Area	Construction Manager	No increase in the extent and type of pest animals, pest plants	Expanded mitigation measures and monitoring requirements to	



Section of the plan	Action	Description	Location	Delegated Responsibility	Performance Target	Monitoring and Reporting Required
		impact to Growling Grass Frog and its habitat, including biosecurity, sediment, erosion, pollution and pest animal and plant controls.			and diseases within and adjacent to the Works Area. No decrease in water quality parameters below EPA standards.	be detailed within the Construction Environmental Management Plan.
4.2.5	Habitat protection	Temporary fencing to be installed at the perimeter of Works Area to prevent any impact to habitat outside of the designated Works Areas.	Works Area	Construction Manager	No habitat outside of the designated Works Area is to be impacted.	Construction Manager to monitor fencing and areas of habitat to ensure fencing is adequate and habitat outside of the Works Area is not impacted.
4.2.6	Draining of wetlands	Draining of wetlands to occur as per the protocol specified in section 4.2.6	Works Area	Construction Manager	No draining of wetland to occur during the breeding season of the Growling Grass Frog, beginning November through to end of March.	Construction Manager to enforce timelines for draining and commencement of works.
					No works to be completed within wetlands until at least two weeks after draining is completed.	
4.2.7	Removal of vegetation/habitat features that may support Growling Grass Frog.	Removal of vegetation/habitat features to be completed as per habitat protocol specified in section 4.2.7.	Works Area	Construction Manager	No net reduction in log/rock habitat across the Jacana wetlands.Construction Manager to cleared habitat features placed such that they co provide suitable habitat Growling Grass Frogs to be relocated as per protocol specified in section 4.2.8.Construction Manager to cleared habitat features placed such that they co provide suitable habitat Growling Grass Frog.	
4.2.8	Capture and Relocation protocol	All captured fauna to be released into areas of identified habitat. Or where injured transferred to a vet	Where fauna captured within the Works Area.	Trained Wildlife Handler	All Growling Grass Frogs captured released into the designated area or transferred to a wildlife carer if injured.	Results to be adequately recorded and reported to enable auditing.
4.2.9	Sighting of a Growling Grass Frog within the Works Area	Where a Growling Grass Frog is sited within the Works Area the protocol as described within section 4.2.9 is to be implemented.	Within the Works Area.	All site personnel	All sightings of Growling Grass Frog are reported and managed so that injury and death of Growling Grass Frogs is minimised.	Any sighting of a Growling Grass Frog within the Works Area must be immediately reported to the Construction Manager The capture and released of any Growling Grass Frog will be



Section of the plan	Action	Description	Location	Delegated Responsibility	Performance Target	Monitoring and Reporting Required
						reported to enable auditing.
4.2.10	Water quality monitoring	Undertake water quality monitoring	Upstream, downstream and within the Works Area.	Construction Manager	No decrease in water quality parameters below those recorded pre-construction.	Results to be adequately recorded and reported to enable auditing.
Post-constru	iction					
4.3.1	Growling Grass Frog Monitoring	Undertake a Growling Grass Frog survey as per the protocol in Section 4.1.2 during the active season of the Growling Grass frog for a minimum of two years post construction.	Within the Jacana Wetlands and control site identified north of Wetlands.	Melbourne Water Project Manager	No decrease in Growling Grass Frog presence across the Jacana Wetlands.	Results to be adequately recorded and reported to enable auditing.
4.3.2	Water Quality Monitoring	Undertake water quality monitoring	Upstream, downstream and within the construction Works Area.	Melbourne Water Project Manager	No decrease in water quality parameters below those recorded pre-construction	Results to be adequately recorded and reported to enable auditing.
4.3.3	Revegetation	All areas of vegetation disturbed during the construction works to be reinstated.	Works Area	Melbourne Water Project Manager	Provision of habitat for Growling Grass Frog including water quality and cover of floating, submergent and emergent vegetation to be equal to or better than that present prior to the works.	Success of revegetation to be monitored and unsuccessful areas reinstated.



5.3 Monitoring and Review

To ensure the requirements of the Management Plan have been implemented and reached the required performance target the monitoring activities described within Table 5-3 will be undertaken.

Table 5-3 Monitoring schedule

Type of Monitoring	Frequency	Monitoring Activity	Delegated Responsibility
Construction mitigation implementation	Daily for sites where construction is currently underwayInspection of work area to ensure that all mitigation measures within this plan are being adhered too, and operating effectively		Construction Manager or Site Environmental Officer
Growling Grass Frog presence	Annually including pre- construction, during construction and for two years following construction	Growling Grass Frog surveys	Melbourne Water Project Manager
Water Quality	Fortnightly during construction and every three months for a period of two years following construction.	Water quality monitoring upstream, downstream and within the Jacana Wetlands	Melbourne Water Project Manager
Revegetation success	Annually for three years following construction.	Assess success of revegetation including weed cover and cover and diversity of floating, submergent and emergent vegetation.	Melbourne Water Project Manager

5.4 Non-compliance

Where a 'non-compliance' is identified through monitoring or otherwise reported it will be documented as per the process set out in the Construction Environmental Management Plan. The following steps will be undertaken where a non-compliance is identified:

- Where the non-compliance is identified and reported by someone other than the Construction Manager or Site Environmental Officer, a site inspection of the affected area will be completed by the Construction Manager or the Site Environmental Officer
- Further investigation will be completed to determine the possible causes for the non-compliance
- Relevant personnel including if necessary DELWP and/or DEE representatives will be contacted
- An agreed corrective action will be determined
- The action will be implemented to rectify the problem.

Actions undertaken to rectify the problem may include the following:

- A new or revised procedure is established and implemented
- Additional training is provided to the relevant personnel
- Additional inspections are implemented

The actions required to correct the non-compliance and the successful implementation of these actions will be documented as per the process set out in the Construction Environmental Management Plan.



Where a non-compliance results in significant changes to the implementation of this Growling Grass Frog Management Plan, DELWP and DEE will be consulted.



6. References

Clemann, N. & Gillespie, G. 2012 National Recovery Plan for the Southern Bell Frog *Litoria raniformis*. Department of Sustainability and Environment, Melbourne.

DEH. 2006. Threat Abatement Plan – Infection of amphibians with chytrid fungus resulting in chytridimycosis. Department of Environment and Heritage. Canberra, ACT.

DSEWPaC, (2011). *Hygiene protocols for the control of diseases in Australian frogs.* Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Ecology and Heritage Partners, (2014). *Growling Grass Frog Risk Mitigation Strategy for Jacana RB Wetland Rectification*. EHP Melbourne.

EPA 1991. Construction Techniques for Sediment Pollution Control. Published document prepared by the Victorian Environment Protection Authority, Victoria.

EPA 1996. Environmental Guidelines for Major Construction Sites. Published document prepared by the Victorian Environmental Protection Authority (EPA).

Gates Foale, C. 2014. Re: Growling Grass Frog mitigation strategy for Jacana RB Wetland Rectification. Ecology and Heritage Partners.

Heard, G., Scroggie, M. & Clemann, N. 2010. Guidelines for managing the endangered Growling Grass Frog in urbanising landscapes. ARI, Heidelberg.

Spiire, 2015. Jacana Wetlands Rectification Concept Design Report. Report prepared for the Melbourne Water Corporation.