ACTEW CORPORATION | ActewAGL Always.

ACTEW working with ActewAGL

Report to SEWPaC: Performance against Fish Management Plan Version 1.

January 2012

Delivered by the Bulk Water Alliance

Abigroup Constructing Australia's Future | ACTEW CORPORATION | GHD | John Holland

securing **water** for life

Contents

List of tables

List of figures

Executive Summary

The construction and operation of the Enlarged Cotter Dam raised environmental issues relating to the management of five threatened native aquatic species. These are:

- Macquarie Perch (Macquaria australasica).
- Trout Cod (Maccullochella macquariensis).
- Murray Cod (Maccullochella peelii).
- Two-spined Blackfish (Gadopsis bispinosus).
- Murray River Crayfish (Euastacus armatus).

In order to minimise threats to threatened aquatic species a series of Fish Management Plans are being prepared by ACTEW. To date two versions of the Fish Management Plan have been completed (total of four). The first version of the Fish Management Plan documented projects which would provide information required by ACTEW for the management of threatened aquatic species. The second Version of the Fish Management Plan provides information, from the projects documented in Version 1, to help protect aquatic communities in the Cotter Reservoir and the Cotter River during the construction and operation of the enlarged Cotter Reservoir.

The overarching objective of the Fish Management Plan is to:

- Ensure that the aquatic communities and habitats of the Cotter Reservoir and Cotter River are maintained or rehabilitated to support native fish and crayfish species.

This objective was developed within the context of the *ACT Aquatic Species and Riparian Zone Conservation Strategy* (ACT Government 2007).

The Fish Management Plans are:

- Designed to prevent or mitigate risks to threatened aquatic fauna and their habitats.
- Scientifically based, using adaptive management.
- Robust in terms of stakeholder involvement, peer review and public transparency.
- Timely and updated on the basis specified in the approval conditions.
- Developed as part of the overall requirements of the Enlarged Cotter Dam.
- Effective in terms of use of resources and expertise whilst at the same time ensuring the protection of threatened species.

This report has been prepared in response to the Department of Sustainability, Environment, Water, Population and Communities' (SEWPaC), formerly Department of Environment, Water, Heritage and the Arts (DEWHA) approval condition:

'The person taking the action must implement the Plan. Every year the person taking the action must submit to the Minister a report covering performance against the Fish Management Plan. The date of the first report must be provided on 19 January 2011, with each subsequent report to be provided 12 months from the date of the previous report'.

The Fish Management Plan Version 1 commitments used in this report to determine performance are documented in Fish Management Plan Version 2. ACTEW's performance against commitments in the first version of the Fish Management Plan is documented in Chapter 3 of this report. This is the same report format used in *Report to SEWPaC: Performance against Fish Management Plan Version 1*, January 2011.

1 Background

1.1 Enlarged Cotter Dam project description

The Enlarged Cotter Dam is one in a suite of major projects currently being undertaken by ACTEW Corporation (ACTEW) to secure the future water supply for the Australian Capital Territory (ACT) and region. These projects are being delivered through the Bulk Water Alliance (BWA), a partnership between ACTEW and ActewAGL, GHD, Abigroup and John Holland Group.

1.1.1 Location

The Enlarged Cotter Dam is being constructed approximately 125 metres (m) downstream of the existing Cotter Dam on the Cotter River approximately 18 kilometres (km) due west of Canberra (refer to Figure 1.1). The Enlarged Cotter Dam is located upstream of the confluence of the Cotter, Paddy's and Murrumbidgee Rivers and is in the vicinity of a range of recreational areas including Cotter Avenue, Cotter Campground, Casuarina Sands.

1.1.2 Construction method

The main dam will be constructed from roller compacted concrete and two additional earth rock-fill saddle dams will be constructed adjacent to the right abutment of the main dam. The main dam will be approximately 80 m high with the saddle dams approximately 12 and 16 m in height. At the conclusion of construction, the storage capacity of the reservoir will increase from 4 gigalitres (GL) to approximately 78 GL, raising ACT's overall storage capacity by a third.

The existing Cotter Dam and an additional 232 hectares (ha) of land will be inundated as a direct result of the Enlarged Cotter Dam construction and filling of the enlarged reservoir. In addition, a further 38 ha of land will be cleared to facilitate construction and ancillary works. The land surrounding the Cotter Dam has areas classified as having both "high and low environmental value" with some areas still significantly impacted by previous forestry plantation activities and severe bushfires in 2003.

1.1.3 Approval process

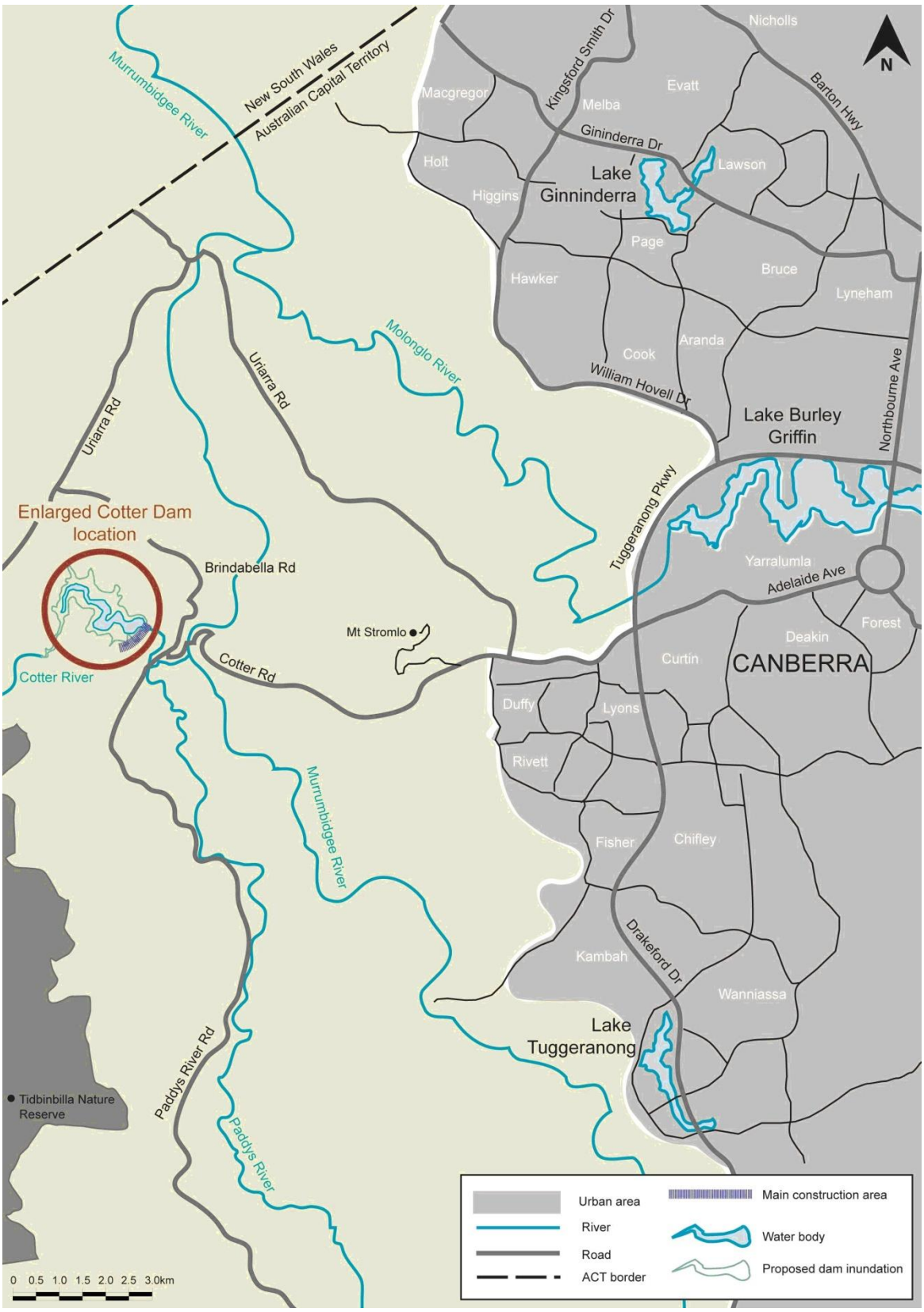
Approval for the construction of the Enlarged Cotter Dam was required under both the Territory *Planning and Development Act 2007* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Territory matters were assessed by the ACT Planning and Land Authority (ACTPLA) through ACTEW's preparation of an Environmental Impact Statement (EIS) and a Development Application (DA). Commonwealth matters were assessed by the former Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) now Department of Sustainability, Environment, Water, Population and Communities' (SEWPaC) through ACTEW's preparation of a Public Environment Report (PER).

Approval of the Enlarged Cotter Dam project has been conditioned by ACTPLA and SEWPaC (formerly DEWHA). Conditions of approval relevant to the Fish Management Plan and the management of threatened native aquatic species are presented the Fish Management Plan Version 2.

This report has been prepared in response to the SEWPaC, formerly (DEWHA) approval condition:

'The person taking the action must implement the Plan. Every year the person taking the action must submit to the Minister a report covering performance against the Fish Management Plan. The date of the first report must be provided on 19 January 2011, with each subsequent report to be provided 12 months from the date of the previous report.'

Figure 1.1 Location of the Enlarged Cotter Dam.



2 Fish Management Plan

2.1 Introduction

The construction and operation of the Enlarged Cotter Dam raises environmental issues relating to the management of five threatened native aquatic species. These are:

- Macquarie Perch *(Macquaria australasica)*.
- Trout Cod *(Maccullochella macquariensis)*.
- Murray Cod *(Maccullochella peelii)*.
- Two-spined Blackfish *(Gadopsis bispinosus)*.
- Murray River Crayfish *(Euastacus armatus)*.

To date two versions (from a total of four) of the Fish Management Plan have been completed. The first version of the Fish Management Plan documented projects which would provide information required by ACTEW for the management of threatened aquatic species. The second Version of the Fish Management Plan provides information, from the projects documented in Version 1, to help protect aquatic communities in the Cotter Reservoir and the Cotter River during the construction and operation of the enlarged Cotter Reservoir. Each of the four reports focuses/ will focus on protection of threatened species during different key program milestones for the Enlarged Cotter Dam as detailed in Table 2.1.

Table 2.1 Updating the Fish Management Plan.

Fish Management Plan Version	Key project milestones	Information sources	Fish Management Program milestones	Due Date
1	EIS Submitted.	Current knowledge.	Identify projects to address knowledge gaps.	Feb 2009
2	Construction period.	• Progress reports for Fish Management Program projects. • Reports for Fish Management Program projects were available. • The Aquatic Flora and Fauna Management Plan. • Associated projects by others. • Input from regulators.	• Establish a Fish Management Program Steering Committee. • Implement all projects identified in Fish Management Plan Version 1. • Use information from Project 1 – Constructed homes for threatened fishes to inform design for constructed shelter habitats. • Lodgement of DA for installation of constructed habitats.	April 2010

Fish Management Plan Version	Key project milestones	Information sources	Fish Management Program milestones	Due Date
3	Filling and operational phase.	• Results and recommendations from Fish Management Program projects. • Results from ongoing monitoring. • Input from regulators. • Documented performance against conditions of approval.	To be determined with Fish Management Program Steering Committee.	Estimated mid 2012
4	Two years after Enlarged Cotter Dam construction completion. Operational phase.	• Results from ongoing monitoring. • Input from regulators.	To be determined with Fish Management Program Steering Committee.	Estimated mid 2014.

The Fish Management Plan reports and their timely delivery form part of both Territory and Commonwealth conditions of approval for the Enlarged Cotter Dam and must be prepared in accordance with legislative requirements.

2.2 Objectives of Fish Management Plan

The overarching objective of the Fish Management Plan is to:

- Ensure that the aquatic communities and habitats of the Cotter Reservoir and Cotter River are maintained or rehabilitated to support native fish and crayfish species.

This objective was developed within the context of the *ACT Aquatic Species and Riparian Zone Conservation Strategy* (ACT Government 2007).

Fish Management Plan (Version 2) focuses on the protection of threatened aquatic species during the construction phase.

The Fish Management Plans are:

- Designed to prevent or mitigate risks to threatened aquatic fauna and their habitats.
- Scientifically based, using adaptive management.
- Robust in terms of stakeholder involvement, peer review and public transparency.
- Timely and updated on the basis specified in the approval conditions.
- Developed as part of the overall requirements of the Enlarged Cotter Dam.
- Effective in terms of use of resources and expertise whilst at the same time ensuring the protection of threatened species.

2.3 Fish Management Projects

The nine projects which are being undertaken or have been undertaken as part of the Fish Management Plan are:

Project 1 – Constructed homes for threatened fishes in the Cotter River Catchment.

This project has been completed and has informed the design and location of the constructed rock reefs within the inundation zone of the enlarged Cotter Reservoir. Main findings of this project are:

- Macquarie Perch have a preference for rock reefs over other constructed habitats (pipes and pipes with grills).
- Macquarie perch stay near the shore and generally within the top 5-10 metres of water. The exception is in summer when they can be found in deeper waters. University of Canberra researchers believe the fish dive to reach cooler waters in summer. Macquarie perch will travel up to 2 kilometres at night (when predation risk is low).
- Macquarie perch (all sizes) use the rock reefs as shelter to escape from predators (cormorants and darters).
- Macquarie perch also use a variety of other 'natural' shelter including reed beds, woody habitat and rocky shores.

Project 2 – Predicted passage of native and alien freshwater fish based on swimming speed performance.

This project is completed and assessed the swimming capacity of native fish. The results of the study were applied in the design of the recently commissioned fish passageway at Pipeline Road river crossing on the Cotter River. This passageway will enable native fish to reach their upstream spawning grounds.

Project 3 – Crayfish ecology.

This project is completed and examined the ecology of Murray River Crayfish in the Cotter River system and made recommendations for improving their habitat. The recommendations of this study are related to catchment management practices outside of ACTEW's area of impact (for Enlarged Cotter Dam construction). As such, the ACT Government has been made aware of these recommendations via the Fish Management Plan Steering Committee.

Project 4 – Epizootic Haematopoietic Necrosis (EHN) virus occurrence.

This project has been completed and identified that the EHN virus was not present in fish samples taken from the existing Cotter reservoir. Therefore mitigation measures to reduce the risk of the virus entering the enlarged reservoir during construction have been implemented. ACTEW and the Bulk water Alliance (BWA) worked closely with EHN virus experts from the University of Sydney to identify appropriate mitigation measures. Measures included treatment of the area between the old and new dam walls to ensure that the area is free of the virus and Redfin perch (a known carrier of EHN); chlorine disinfection was also undertaken on vehicles moving from potentially EHN contaminated areas to areas classified as 'EHN free'.

Project 5 – Research into the establishment of new populations of Macquarie Perch, Trout Cod and Two-spined Blackfish through translocation.

This project is underway and investigates the establishment of other populations of Macquarie Perch, Trout Cod and Two spined Blackfish to supplement populations in the Cotter River. This project is due for completion in early 2012. The ongoing monitoring of translocated populations is part of the ECD Monitoring program.

Project 6 – Management program for alien fish species.

It is expected that alien fish populations will increase in the enlarged Cotter Reservoir and they may impact on threatened native fish. This project will investigate management options for alien fish and is due for

completion mid 2012. This project requires the installation of a trout trap. Discussions with the ACT Government are currently underway to determine requirements for the installation of the trap.

Project 7 – Food sources for Macquarie Perch and drawdown effects.

This project is examining the food sources available to Macquarie Perch and the impact of fluctuating reservoir levels on these food levels. This project is due for completion in early 2012. Key findings to date are that drawdown affects abundance of food sources; and when reed beds are inaccessible in the Cotter Reservoir (during drawdown) Macquarie perch are able to adjust to changing amounts and availability of different food types.

Project 8 – Investigation of techniques for mapping instream barriers.

This project has been completed and has identified that digital models and geographic information systems (GIS) can be used to help identify physical barriers to fish. However, to identify the exact location of barriers ground truthing is required.

Project 9 – Enlarged Cotter Dam fish monitoring.

The monitoring program has commenced and will provide information to answer specific questions (see below) on the impacts of the Enlarged Cotter Dam on threatened aquatic species. The monitoring program will extend beyond the completion of the Enlarged Cotter Dam's construction. The aims of the monitoring program are:

- Develop and implement a comprehensive field sampling program to assess the potential impacts of the Enlarged Cotter Dam on aquatic vertebrates (primarily fish, but also including piscivorous birds) in the Cotter River Catchment (the existing and enlarged Cotter Reservoirs and the Cotter River below Bendora Dam) answering the following specific questions:
  - Will there be significant changes in the abundance of Macquarie Perch in the Enlarged Cotter Dam (Young-of-Year, juveniles and adults)?
  - Will there be a significant change in annual recruitment in the Macquarie Perch population in the Enlarged Cotter Dam relative to a reference site (Kissop's Flat)?
  - Will there be significant changes in the abundance, distribution and size composition of adult trout in the Enlarged Cotter Dam?
  - What are the levels of predation on Macquarie Perch larvae and juveniles by trout in the Enlarged Cotter Dam and river upstream?
  - Will there be significant changes in the abundance, distribution and species composition of piscivorous birds in the Enlarged Cotter Dam?
  - Will there be significant changes in the abundance and size composition of trout in the Cotter River upstream of the Enlarged Cotter Dam?
  - Will there be a significant increase in the levels of predation on Two-spined Blackfish by trout in the Cotter River upstream of the Enlarged Cotter Dam?
  - Will there be significant changes in the abundance and distribution of the Macquarie Perch population in the Cotter River above and below Vanity's Crossing?
  - Will macrophyte beds re-establish in the Enlarged Cotter Dam?
  - Will translocated Macquarie Perch populations survive the initial translocation procedure and reproduce?
  - Will Two-spined Blackfish establish a reproducing population in the Enlarged Cotter Dam and will they persist in the newly inundated section of the river?

  - Will there be significant changes in the abundance and distribution of Goldfish and Oriental Weatherloach in the Enlarged Cotter Dam?

- Implement monitoring of the proposed alien fish trapping facility on the Cotter River upstream of the Enlarged Cotter Dam (once the trap is constructed).
- Develop specific thresholds for management intervention relevant to the specific questions listed above.

The implementation of these projects and the reporting of findings and recommendations relevant to the protection of threatened aquatic species form part of the Australian Capital Territory (ACT) and Commonwealth conditions of the approval for the Enlarged Cotter Dam project. Accordingly, information on each of these projects, as well as discussion of a range of associated projects and supplementary information sources is presented in Fish Management Plan Version 2.

2.4 Process for update

The Fish Management Plan is designed to be an iterative suite of documents which reflect a growing body of knowledge on threatened aquatic species and appropriate measures to minimise the potential impacts of the construction and operation of the Enlarged Cotter Dam.

Version 1 of the Fish Management Plan was prepared by ActewAGL on behalf of ACTEW during the design phase of the Enlarged Cotter Dam. Version 1 established the basis for the nine research projects by identifying key knowledge gaps. Version 1 of the Fish Management Plan was included as an appendix to the ACT EIS and the Commonwealth referral documentation prepared for the Enlarged Cotter Dam project.

Following the formation of the BWA the responsibility for the management of aquatic species, including preparation of Version 2 of the Fish Management Plan, was passed wholly from ActewAGL to the BWA. Version 2 of the Plan provides an update on research projects providing information to assist in the management of threatened aquatic species. Version 2 includes findings or recommendations that have been provided since Version 1 was produced in February 2009. Version 2 was completed in September 2010.

The responsibility for the preparation of subsequent versions of the Fish Management Plan (Versions 3 and 4) has reverted to ACTEW.

3 Fish Management Plan Version 1 Commitments

The following table presents the commitments in Fish Management Plan Version 1 and documents ACTEW's performance against these commitments.

Table 3.1 Fish Management Plan Version 1 commitments

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
Executive Summary, page vi	ACTEW will provide sufficient information (documented in the Fish Management Plan and associated management plans) on how it proposes to protect the threatened fish species during the construction, filling and operational phases of the Enlarged Cotter Dam.	ACTEW has been working closely with the University of Canberra, to ensure protection of threatened fish species. Measures to protect fish during the construction phase are documented in Version 2 of the Fish Management Plan. Protection measures during filling and operational phases will be documented in subsequent versions of the Fish Management Plan.	Version Two of the Fish Management Plan was submitted to and endorsed by relevant stakeholders in May 2010. Following incorporation of stakeholder comments the Plan was finalised in September 2010. Versions three and four will be submitted at the end of the construction phase and two years following end of construction respectively, as per approval conditions.
Section 1.3, page 3	Version 2 of the Fish Management Plan will be produced at the start of construction and will incorporate: • Results from a range of projects (currently being completed), designed to fill knowledge gaps. • Changes needed if the range of projects is unable to provide suitable results for the management of threatened fish species in the Enlarged Cotter Dam. • Results of ongoing monitoring (by ACTEW, ActewAGL, Ecowise Environmental, TAMS,	Version 2 of the Fish Management Plan was submitted in line with conditions of approval in consultation with the Fish Management Program Steering Committee and covers the Enlarged Cotter Dam construction period.	Version Two of the Fish Management Plan was submitted to and endorsed by relevant stakeholders in May 2010. Following incorporation of stakeholder comments the Plan was finalised in September 2010.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	University of Canberra and a number of other organisations). • Input on Version 1 from regulators and stakeholders.		
Section 1.3, page 3	Version 3 of the Fish Management Plan will be produced at the commencement of filling and operational phases and will incorporate: • Results from a range of projects (currently being completed), designed to fill knowledge gaps. • Changes needed if the range of projects is unable to provide suitable results for the adaptive management of threatened fish species in the Enlarged Cotter Dam. • Results of ongoing monitoring (by ACTEW, ActewAGL, Ecowise Environmental, TAMS, University of Canberra and a number of other organisations). • Input on Version 2 from regulators and stakeholders.	Version 3 of the Fish Management Plan will be submitted in accordance with conditions of approval.	Version Three will be submitted at the end of construction; as per approval conditions.
Section 1.3, page 3	Version 4 of the Fish Management Plan will be produced two years into the filling and operations phases and will incorporate: • Results of ongoing monitoring (by ACTEW, ActewAGL, Ecowise Environmental, TAMS, University of Canberra and a number of other organisations). • Input on Version 3 from regulators and stakeholders.	Version 4 of the Fish Management Plan will be submitted in accordance with conditions of approval.	Version Four will be submitted two years following end of construction; as per approval conditions.
Table 2, Section 3.3, pages 19-28	The projects detailed in the Fish Management Program will address those knowledge gaps directly related to the construction of the	Knowledge gaps related to the construction of the Enlarged Cotter Dam will be addressed by the projects identified in the	Nine research projects were identified in FMP V1. These projects are underway or completed and are filling

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	Enlarged Cotter Dam.	Fish Management Program.	knowledge gaps.
Section 3.3, page 28	On most projects, consultation and collaboration will be undertaken with the ACT Research and Planning Unit of PCL.	ACTEW maintains communication with ACT Research and Planning Unit of PCL via the Fish Management Program Steering Committee.	Consultation with the Fish Management Program Steering Committee will be ongoing.
Section 4.1.4, page 44	Actions detailed in the Fish Management Plan are to be in accordance with National Recovery Plans for Trout Cod and Macquarie Perch (when available).	ACTEW will work with their Fish Advisor and the Fish Management Program Steering Committee to meet these commitments.	Consultation with the Fish Advisor and Fish Management Program Steering Committee will be ongoing.
Section 4.2.1, page 47	Actions detailed in the Fish Management Plan are to be in accordance with *The Aquatic Species and Riparian Zone Conservation Strategy: Action Plan 29*.		
Section 4.2.2, page 47	Actions detailed in the Fish Management Plan are to be in accordance with the fish management plan prepared by the ACT Conservator under the ACT *Fisheries Act 2000.*		
Section 5.3, page 51	Provision of artificial shelter habitat for adult fish whilst the reservoir fills and the reedbeds establish.	The construction of rock reef shelter habitat is underway, with approximately 6 kilometres completed at to date. Habitat has been designed by the Fish Management Program team in consultation with ACTEW and the University of Canberra. Fish habitat will be provided in the form of constructed rock reef habitat and insitu structural wood. Habitat provision has been endorsed by the FMP Steering Committee.	Constructed shelter habitat (rocks reefs) will be installed by the Bulk Water Alliance prior to the completion of the construction phase.
Section 5.3, page 51	Provision of artificial shelter habitat for adult fish suitable when the reservoir is drawn	The construction of rock reef shelter habitat is underway, with approximately 6 kilometres	Constructed shelter habitat (rocks reefs) will be installed

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	down greater than 1.5 m (from FSL).	completed at to date. Shelter habitat has been designed by the Fish Management Program team in consultation with ACTEW and the University of Canberra. Fish habitat will be provided in the form of constructed rock reef habitat and insitu structural wood. Habitat provision has been endorsed by the FMP Steering Committee.	by the Bulk Water Alliance prior to the completion of the construction phase.
Section 5.3, page 51	Survey of potential fish habitat structures at a range of depth transects before the reservoir fills to identify the need for artificial habitats across the full drawdown range.	Survey has been undertaken by Fish Management Program team in consultation with Biosis and the University of Canberra.	Survey completed and presented to FMP Steering Committee. The survey documents the insitu woody shelter habitat.
Section 5.3, page 52	Investigate measures to provide shelter, or to mitigate cormorant predation including potential management solutions prior to the reservoir filling.	Habitat has been designed by the BWA in consultation with ACTEW and the University of Canberra. Measures to monitor changes in the distribution and abundance of cormorants are included in the scope for Project 9 – Enlarged Cotter Dam fish monitoring.	Constructed shelter habitat (rocks reefs) will be installed prior to the completion of the construction phase. Monitoring of cormorants will be ongoing as required.
Section 5.3, page 52	Investigate the impacts of the Enlarged Cotter Dam on Two-spined Blackfish breeding.	Spawning habitat enhancements and recruitment of Two-spined Blackfish within Bendora Reservoir were investigated as part of Project 1 - Constructed homes for threatened fishes. Monitoring of potential Enlarged Cotter Dam impacts are included in scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Project 1 has been completed. Monitoring of Two-spined Blackfish recruitment will be ongoing as required.
Table 4, Section 6.6, page 69			
Monitoring	Continue monitoring water quantity and quality in Cotter Reservoir and provide this	Monitoring will be in accordance with ACTEW's Licence To Take Water.	Monitoring will be ongoing as required by regulators.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	information on a regular basis to ACTEW, TAMS and ActewAGL.		
	Continue to monitor nutrient concentrations and algal numbers in Cotter Reservoir and provide this information on a regular basis to ACTEW and ActewAGL.	Monitoring will be in accordance with ACTEW's Licence To Take Water.	Monitoring will be ongoing as required by regulators.
	Continue monitoring the recovery of the catchment and provide this information on a regular basis to TAMS, ACTEW and ActewAGL.	Monitoring will be in accordance with ACTEW's Licence To Take Water.	Monitoring will be ongoing as required by regulators.
	Continue to monitor fish numbers in Cotter Reservoir and the Cotter River upstream of the reservoir and provide this information to TAMS.	Monitoring is included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Monitoring will be ongoing as required.
	Occasionally monitor storm events to estimate sediment transport.	Monitoring will be in accordance with ACTEW's Licence To Take Water.	Monitoring will be ongoing as required by regulators.
	Continue to monitor the presence of Macquarie Perch and reproductive success upstream of Vanity's Crossing.	Monitoring is included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Monitoring will be ongoing as required.
	Monitor annual recruitment or spawning in the Macquarie Perch population.	Monitoring is included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Monitoring will be ongoing as required.
	Monitor potential adverse water-quality changes (DO and pH) in the water trapped between the two dam walls (if overlapping construction and filling phases).	Monitoring will be in accordance with ACTEW's Licence To Take Water.	Monitoring will be ongoing as required by regulators.
	Monitor fishing use of the Cotter River between Bendora and Cotter Reservoir.	The responsibility for this commitment will be discussed with the ACT Government.	Discussions ongoing.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	Regularly monitor food resources available to fish.	ACTEW will undertake monitoring in accordance with recommendations of Project 7 – Food sources for Macquarie Perch and drawdown effects.	Monitoring to be as recommended. Project 7 due for completion early 2012.
	Continue to monitor adult Macquarie Perch in wet-well.	The design of the intake structure for the enlarged Cotter Reservoir will prohibit the entrainment of adult Macquarie Perch, therefore monitoring of the wet well is not required.	No further action.
	Monitor alien fish numbers in reservoir and river immediately upstream.	Monitoring is included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Monitoring will be ongoing as required.
	Monitor cormorant activity during spawning events.	Monitoring has been conducted by the University of Canberra as part of the Cormorant predation of Macquarie Perch project. This involved monitoring of cormorant activity during spawning events.	The cormorant predation study has been completed. Cormorant monitoring conducted as part of Project 9 and will be ongoing as required.
Operating Regime	Continue to use the ACT Environmental Flows Technical Advisory Group to determine the quantity and temperature of releases from Bendora Reservoir, including flushing flows.	ACTEW will operate the enlarged reservoir in accordance with their operating licence, including the provision of stipulated environmental flows and drawdown limits. The quantity and quality of environmental flows required in the Cotter River Catchment will continue to be determined by the ACT EPA.	Appropriate management of water resources will be ongoing and in accordance with Licence conditions.
	Ensure that releases from Bendora Reservoir have a temperature similar to that of river water during the Macquarie Perch spawning season (mid-October to mid-November).		

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	Minimise drawdown during Macquarie Perch spawning season (Oct-Dec).		
Construction Environmental Management	Require all consultants undertaking activities in catchment to have EMPs for their activities.	All consultants will undertake activities in accordance with BWA environmental management requirements.	Ongoing for the duration of the construction phase.
	Require all consultants to have necessary approvals (such as a waterways permit) in place.	All consultants will have necessary approvals and permits in place.	Ongoing for the duration of the construction phase.
	Require all consultants to notify the BWA of their activities in the catchment. Also require that key personnel are trained in mitigation measures to reduce the chance of introducing contaminants into Cotter Reservoir.	All consultants will undertake activities in accordance with BWA environmental management requirements.	Ongoing for the duration of the construction phase.
	Ensure that no water from below the existing dam wall is used for construction purposes, and ensure that the space between the old and the new dams is thoroughly dried out prior to commissioning the new dam.	Procedures for the management of the area between the new and existing dam walls and onsite water use, to minimise the risk of the EHN virus entering the existing or enlarged Cotter Reservoir, are documented in the CEMP and Aquatic Flora and Fauna Management Plan.	Ongoing for the duration of the construction phase.
	Ensure that appropriate measures are employed to eliminate the possibility of transferring biological material from the river section between the old and the new walls in the new reservoir. This will require fish eradication techniques (e.g. drying, poisoning, netting etc).	Procedures for the management of the area between the new and existing dam walls, to minimise the risk of the EHN virus entering the enlarged Cotter Reservoir, are documented in the CEMP and Aquatic Flora and Fauna Management Plan.	Ongoing for the duration of the construction phase.
Shelter Habitat	Use the findings of Project 1 to provide additional information specifically on the suitability of some form of artificial habitat as a replacement for the current macrophyte	Suitable constructed habitats (rock reefs) have been identified with the use of information from Project 1 – Constructed homes for threatened fishes.	Constructed shelter habitat (rocks reefs) will be installed prior to the completion of the construction phase.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	beds.		
	Survey Enlarged Cotter Dam basin to determine whether suitable shelter habitats, especially boulder, cobble and rock areas, and timber, will be submerged down to maximum operating level.	Survey has been undertaken by Biosis in consultation with the Fish Management Program team and the University of Canberra.	Survey was completed in September 2010 and presented to the FMP Steering Committee.
	Examine the possibility of providing additional edge-boulder habitat (for juvenile and sub-adult Macquarie Perch), within the new dam.	Rough surfaces on the final quarry and surfaces of saddle dams along with the provision of rock reefs will provide suitable juvenile and sub-adult Macquarie Perch habitat.	No treatment will be undertaken on rough surfaces as rough surfaces can provide shelter habitat for fish.
	Examine the possibility of providing additional boulder habitat (for juvenile, sub-adult and adult Macquarie Perch), within the quarry site for the Enlarged Cotter Dam (which will be within the flooded area of the Enlarged Cotter Dam).	Rough surfaces in the quarry site will provide some suitable fish habitat. Constructed rock reef habitat has been installed within the quarry.	No treatment will be undertaken on rough surfaces as rough surfaces can provide shelter habitat for fish. Rock reef has been placed in the quarry.
	Seek to maximise amounts of submerged timber at all depths.	Timber within the inundation zone will be left in situ unless it poses a risk to water quality.	Native hardwood to be kept in inundation zone, unless it poses a risk to water quality.
Fish Passage	Use the findings of Project 2 to provide additional information specifically on improving the passage of fish (particularly Macquarie Perch) along the Cotter River upstream of the Enlarged Cotter Dam.	Project 2 - Predicted passage of native and alien freshwater fish based on swimming speed performance recommends that the existing pipe culvert at Pipeline Road Crossing be modified to reduce flow velocity and allow passage by Macquarie Perch. Project 2 also recommends that the requirement to provide fish passage at Burkes Creek Crossing be investigated. Repairs to Vanity's Crossing have been undertaken by the ACT Government.	The provision of fish passage at Vanity's and Pipeline Road Crossings has been completed. The provision of a fish passage through Burkes Creek Crossing will be investigated in the first half of 2012.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
		ACTEW has provided fish passage through Pipeline Road Crossing.	
	Use the findings of Project 8 to reduce or eliminate remaining instream barriers (if any).	Project 8 – Investigation of techniques for mapping instream barriers has been completed.	This project has identified tools that will help identify the location of barriers to fish. Ground truthing to identify the exact location of these barriers is however still required.
	Provide uninterrupted passage at any problem barriers, either by modifying stream bed structure or building fishways.	Project 2 - Predicted passage of native and alien freshwater fish based on swimming speed performance recommends that the existing pipe culvert at Pipeline Road Crossing be modified to reduce flow velocity and allow passage by Macquarie Perch. Project 2 also recommends that the requirement to provide fish passage at Burkes Creek Crossing be investigated. Repairs to Vanity's Crossing have been undertaken by the ACT Government. ACTEW has provided fish passage through Pipeline Road Crossing. Further investigations on the location of natural barriers to be undertaken.	The provision of fish passage through Vanity's and Pipeline Road Crossings has been completed. The provision of a fish passage through Burkes Creek Crossing will be investigated in the first half of 2012. Investigation of natural barriers will take place in the first half of 2012.
Crayfish	Use the findings of Project 3 to provide additional information specifically on improving of the Cotter River downstream of the Enlarged Cotter Dam for crayfish.	Project 3 - Crayfish ecology recommends that flows be investigated to improve the quality and availability of Murray River Crayfish habitat.	The investigation and modification of environmental flows will be ongoing. ACTEW will provide flows in accordance with Licence conditions.
Design	Investigate screening to prevent fish access	The design of the intake structure has	No further action.

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
	or entrainment in intake structure.	mitigated this risk.	
Stakeholder Management	Require close consultation between ACT government agencies, ACTEW and ActewAGL, to recognise additional risks due to lack of sufficient information.	The Fish Management Program Steering Committee meets regularly to guide the provision of mitigation strategies for the protection of threatened native aquatic species. Organisations represented on the Steering Committee are SEWPaC, the ACT Government, the ACT EPA, the University of Canberra, ACTEW and the BWA. The Community Engagement and Stakeholder Management Team will keep the ACT community informed of fish management activities.	Consultation with the Fish Management Program Steering Committee will be ongoing.
	Ensure frequent meetings between fish management personnel and design/construction team members to discuss fish management requirements.		
	Have regular stakeholder assessments of management requirements.		
	Liaise with ACT Government to promote a program of public education about the various risks.		
	Involve relevant stakeholders including ACTEW, ActewAGL, the ACT Government and the ACT community.		
Translocation	Continue to translocate Macquarie Perch, Trout Cod and Two-spined Blackfish to other potentially suitable habitats and monitor populations(s) in new habitat(s).	Project 5 - Research into the establishment of new populations of Macquarie Perch, Trout Cod and Two-spined Blackfish through translocation is currently underway. This project involves the continued translocation of threatened species and their monitoring.	Project 5 will be completed early 2012. Ongoing monitoring of translocated populations forms part of the ongoing ECD Monitoring Program (Project 9).
Fish Management Plan and adaptive management	Review Fish Management Plan on a regular basis; for example, at end of design phase, at end of construction phase and then at intervals of once every two years for the filling and operational phases.	Update of the Fish Management Plan has been developed in accordance with Territory and Commonwealth conditions of approval. This process will be overseen by the Fish Management Program Steering Committee.	Version Two of the Fish Management Plan was submitted to and endorsed by relevant stakeholders in May 2010. Versions three and four will

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
			be submitted following the construction phase and two years after construction respectively, as per approval conditions.
	Require peer reviews of information collection and monitoring.	Peer reviews will be conducted as required.	Peer review will be ongoing.
	Ensure substantial areas of suitable spawning habitats are available at all storage levels.	Repairs to Vanity's Crossing have been undertaken by the ACT Government. ACTEW has provided fish passage through Pipeline Road Crossing. The removal of these fish barriers provides access to suitable spawning habitat for threatened fish species. Further investigations on the location of natural barriers to be undertaken.	The provision of fish passage through Vanity's and Pipeline Road Crossings has been completed. The provision of a fish passage through Burkes Creek Crossing will be investigated in the first half of 2012. Investigation of natural barriers will take place in the first half of 2012.
	Use findings of each of the Fish Management Plan projects to inform actions.	The results of the Fish Management Program and associated projects will be used to inform the adaptive management approach and will be guided by the Fish Management Program Steering Committee.	Adoption of recommendations will be undertaken in consultation with the Fish Management Program Steering Committee.
	Audit, review and update Fish Management Plan	The audit, review and update of the Fish Management Plan will be in accordance with Territory and Commonwealth conditions of approval and will be overseen by the Fish Management Program Steering Committee.	Version Two of the Fish Management Plan was submitted to and endorsed by relevant stakeholders in May 2010. Versions three and four will be submitted in line with

Fish Management Plan reference	Commitment	ACTEW action to meet commitment	Delivery
			approval conditions.
Predation	Investigate levels of Trout predation and what life stages of threatened fish are most affected.	Included in the scope of Project 9 – Enlarged Cotter Dam fish monitoring.	Monitoring will be ongoing as required.
	Investigate control techniques to reduce impacts of predation (barriers, trapping etc).	The design and siting of the alien fish management structure (fish trap) will be finalised as part of the scope of Project 6 – Alien fish management.	Project 6 is expected to be completed by mid of 2012.
	Investigate temporary and permanent provision of artificial cover during spawning events.	Project 9 - Enlarged Cotter Dam fish monitoring will determine the need for artificial cover based on Macquarie Perch and cormorant behaviours.	Monitoring from Project 9 will be ongoing as required. Results from monitoring to determine need for action.
	Investigate temporary bird management options to mitigate predation during spawning events.	Monitoring has been conducted by the University of Canberra as part of the Cormorant predation of Macquarie Perch project. This involved monitoring of cormorant activity during spawning events. .	The cormorant predation study has been completed. Management options to reduce predation on fish by cormorants will be decided in consultation with the Fish Management Program Steering Committee.
Spawning Habitat	Investigate whether Two-spined Blackfish will breed in reservoir habitats.	The spawning behaviour of Two-spined Blackfish in Bendora Reservoir was investigated as part of Project 1 - Constructed homes for threatened fishes.	Project 1 has been completed.
	Investigate provision of artificial spawning habitats for Two-spined Blackfish.	The spawning habitat requirements for Two-spined Blackfish, including their use of spawning tubes was included in the scope of Project 1 - Constructed homes for threatened fishes.	Project 1 has been completed.

4 References

ACT Government 2007, *Ribbons of Life: ACT Aquatic Species and Riparian Zone Conservation Strategy*, Action Plan No. 29 Department of Territory and Municipal Services, Canberra.

ACTEW Corporation [ACTEW] 2010, *Enlarged Cotter Dam Fish Management Plan – Version 2.*

ActewAGL 2009, *Enlarged Cotter Dam Fish Management Plan,* report to ACTEW Corporation Ltd, Canberra.

Bulk Water Alliance 2011, Report to SEWPaC: Performance against Fish Management Plan Version 1.