

# Water Management Licence

Environ  
New  
Zealand

Water Management  
Licence issued to  
Earing Energy  
under Part 9,  
Water Act, 1977,  
by Water  
Administration  
Ministerial  
Corporation



# Water Management Licence



Department of Natural Resources

Water Management Licence issued to Earing Energy under Part 9, Water Act, 1977,  
by Water Administration Ministerial Corporation  
Shoalhaven River Catchment

# **WATER MANAGEMENT LICENCE**

**Issued to  
Eraring Energy**

**First Issued 19 January 2001  
Six Month Review 19 July 2001  
Second Issue 10 February 2006**

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<b>REGISTER OF IMPORTANT EVENTS FOR THIS LICENCE</b>	
<b>Date</b>	<b>Action</b>
19 January 2001	First issue of Licence to Eraring Energy
19 July 2001	Statutory six month review of Licence completed
1 November 2002	Licence revised with modifications from six month review
19 January 2006	Statutory five year review of Licence completed
10 February 2006	Second issue of Licence to Eraring Energy

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Water Management Licence  
 First issued on 19 January 2001  
 to Eraring Energy  
 by the Department Natural Resources  
 on behalf of the Water Administration Ministerial Corporation,  
 under Part 9 of the *Water Act 1912* (NSW)

Prepared by Corporate Licensing Unit  
 Department of Natural Resources  
 Penrith, NSW

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# 1 GENERAL

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## 1.1 Objectives

The Water Administration Ministerial Corporation's (Ministerial Corporation) major objective in licensing Eraring Energy is to manage Eraring Energy's access to water resources within the Shoalhaven River catchment in accordance with the principles of ecologically sustainable development described in Section 6 (2) of the *Protection of the Environment Administration Act 1991* (NSW).

1.2 In addition, it is the Ministerial Corporation's intention that this Water Management Licence (Licence) also achieves the following:

1.2.1 defines Eraring Energy's water access rights and obligations in relation to *interchange*<sup>1</sup> of water between Lake Yarrunga and Fitzroy Falls Reservoir;

1.2.2 achieves an appropriate balance, through a process of adaptive management, between Eraring Energy's requirements as a user of water for hydro-electric power generation, and the requirements of the Shoalhaven River catchment for its long-term sustainable health;

1.2.3 provides for a monitoring and reporting regime to enable Eraring Energy to fulfil its licence obligations; and

1.2.4 manages the competing demands of Eraring Energy and other water users in the catchment.

## 1.3 Licensee

This Licence was first issued on 19th January 2001 by the Ministerial Corporation to:

**Eraring Energy**  
**PO Box A2238**  
**SYDNEY SOUTH NSW 1235**

## 1.4 General Conditions

1.4.1 This Licence has effect for a period of 20 years from the last date of issue and for such extended periods as stipulated in Section 190 of the *Water Act 1912* or in subsequent relevant legislation.

1.4.2 Matters relating to the administration of this Licence may be referred to officers of the Department of Natural Resources and Eraring Energy listed in Schedule 1.

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<sup>1</sup> See Glossary in Section 6

- 1.4.3 This Licence and attached Schedules may, notwithstanding the provisions of Section 189 of the *Water Act 1912*, be modified at any time with the written consent of the Managing Director of Eraring Energy and the Executive Director (or a delegate) of the Department of Natural Resources (Schedule 1), having regard to any review that has been conducted under Section 193 of the *Water Act 1912*.
- 1.4.4 The Shoalhaven Pump-Storage Scheme (Schedule 2) is jointly owned by Eraring Energy and the Sydney Catchment Authority. The Sydney Catchment Authority maintains the dams, pipelines, canals and lands associated with the Scheme. Eraring Energy is responsible for maintenance of the electrical and mechanical components of the facilities it operates.
- 1.4.5 Eraring Energy is liable to pay water management charges to the Ministerial Corporation in accordance with the provisions of Section 194 of the *Water Act 1912* (Schedule 4).
- 1.4.6 In the event of an **emergency**<sup>2</sup>, and notwithstanding the provisions of Section 189 of the *Water Act 1912*, Eraring Energy may make a written or telephone request to the Executive Director (Schedule 1) to vary the terms of this Licence for up to seven (7) days at a time.
- 1.4.7 Notwithstanding the provisions of Section 189 of the *Water Act 1912*, the Executive Director (Schedule 1) may approve a temporary variation to the terms of this Licence for a specified time period, or extend any existing variation, upon written application by Eraring Energy.
- 1.4.8 The Department of Natural Resources and Eraring Energy will continue the operation of the Licence Working Group (LWG). Any changes to the membership of the LWG will be as agreed between the parties from time to time and shall only comprise representatives from the Department of Natural Resources and Eraring Energy. The LWG shall determine the frequency and procedure for calling meetings and the manner in which business is to be conducted at those meetings. The role of the LWG will be to consider those issues determined by the parties to be relevant, but shall include licensing issues, water management charges, monitoring and reporting, dispute resolution and areas for joint initiatives.
- 1.4.9 Any dispute arising out of or in relation to this Licence that cannot be resolved to the satisfaction of either Eraring Energy or the Department of Natural Resources by the LWG, may be referred to the Managing Director of Eraring Energy and the Director General of the Department of Natural Resources for consideration within seven (7) days of notification by either party.

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<sup>2</sup> See Glossary in Section 6.

1.4.10 Notwithstanding the provisions of Conditions 1.10 and 1.11 above, the Ministerial Corporation may, at its discretion, undertake any necessary regulatory actions as outlined in Part 9 of the *Water Act 1912*.

**1.4.11 Obtaining Current and Historical Data**

The Department of Natural Resources (Schedule 1) may direct Eraring Energy to provide information that it holds or has commissioned, in the manner, format and timeframe specified, for the purpose of achieving the objectives set out under Section 1 of this Licence, to the Department of Natural Resources. Such information may include, but need not be limited to, the following:

- a. recorded historical pumping and power generation data (water volumes); and
- b. cyanobacterial monitoring data relating to the impact of the Water Management Works on any river, or other water source, affected by Eraring Energy's operations.

## **2 WATER ACCESS**

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### **2.1 Authorised Water Sources**

This Licence authorises Eraring Energy to obtain water from the sources identified in Schedule 2:1, in accordance with the provisions of this Licence.

### **2.2 Authorised Works**

2.2.1 Eraring Energy may only interchange water in accordance with the conditions of this Licence and only for the purposes of power generation. Any interchange may only occur using the *Water Management Works*<sup>3</sup> specified in Schedule 2, and between the water sources described in that Schedule.

2.2.2 Eraring Energy must not alter (augment, extend or enlarge) any of the Water Management Works described in Schedule 2, in such a way as to change the capacity of the works to affect the flow, volume or behaviour of water resources, without the prior written approval of the Ministerial Corporation

2.2.3 Notwithstanding Condition 2.2.2, where the Water Management Works described in Schedule 2 are not solely owned by Eraring Energy, Eraring Energy must also obtain the approval of the co-owner of those works prior to any alterations that may change the capacity of the works to affect the flow, volume or behaviour of water.

### **2.3 Water Entitlements**

2.3.1 Eraring Energy is entitled to interchange up to a maximum of 4 021 ML between Lake Yarrunga and Fitzroy Falls Reservoir at any time, consistent with the requirements of this Licence.

2.3.2 Eraring Energy is entitled to interchange up to a maximum of 880 ML between Bendeela Pondage and Lake Yarrunga at any time, consistent with the requirements of this Licence.

2.3.3 Eraring Energy may, under conditions of unusually high power demand or the failure of other generating stations in the State energy network, interchange up to 10 000 ML between Lake Yarrunga and Fitzroy Falls Reservoir, subject to the agreement of the Sydney Catchment Authority and consistent with the requirements of this Licence.

2.4 Eraring Energy must comply with the requirements of the protocol for water movement detailed in Section 3 of this Licence in relation to the interchange of water between Lake Yarrunga and Fitzroy Falls Reservoir.

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<sup>3</sup> See Glossary in Section 6.

- 2.5 Eraring Energy may *divert*<sup>4</sup> water for the purpose of electricity generation from Fitzroy Falls Reservoir to Lake Yarrunga at times when Fitzroy Falls Reservoir is *spilling*<sup>5</sup> to Yarrunga Creek, subject to any environmental flow requirements in Yarrunga Creek<sup>6</sup> and independent of the protocol for water movement (Section 3).
- 2.6 When operating under Condition 2.5 of this Licence, Eraring Energy must advise the Executive Director (Schedule 1) as soon as possible after the operation has occurred.
- 2.7 The Shoalhaven Scheme is also used, at certain times, by the Sydney Catchment Authority to transfer water from the Shoalhaven River catchment to the Hawkesbury-Nepean River catchment, or to transfer water for other water supply asset management purposes. When Eraring Energy operates the pumps for this purpose, it is acting as an agent for the Sydney Catchment Authority. The conditions that apply to the Sydney Catchment Authority's transfer of water through the Shoalhaven Pump-Storage Hydro-Electric System may be subject to other instruments issued by the appropriate authorities<sup>7</sup> to the Sydney Catchment Authority.

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<sup>4</sup> See Glossary in Section 6.

<sup>5</sup> See Glossary in Section 6.

<sup>6</sup> The environmental flow requirements for Yarrunga Creek are specified in the Sydney Catchment Authority's Water Management Licence. It is the responsibility of the Sydney Catchment Authority to release the environmental flows into Yarrunga Creek from Fitzroy Falls Reservoir.

<sup>7</sup> Such instruments may include, but need not be limited to:

- A Water Management Licence;
- An Operating Licence.

## 3 PROTOCOL FOR WATER MOVEMENT

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### 3.1 Protocol during normal operations

- 3.1.1 Water interchanges within the Shoalhaven Pump-Storage Hydro-Electric System (the System) should be managed to minimise the risk of the transfer of all *cyanobacteria*<sup>8</sup> (including those known to be *toxigenic*<sup>9</sup>) within the Scheme.
- 3.1.2 Interchanges of water within the System must be informed by the most recent cyanobacterial data available from all storages in the System.
- 3.1.3 Interchange of water from, or to, any of the Water Management Works that is not expressly required or sanctioned by this Licence, that could harm or damage the biophysical environment, must not be made unless approved in writing by the Ministerial Corporation.
- 3.1.4 No interchange of water (excluding spills) that is otherwise authorised by this Licence is to be made by Eraring Energy if it is likely to cause the levels of cyanobacteria in the receiving waters<sup>10</sup> to exceed the current *guideline*<sup>11</sup> for recreational waters, within 24 hours of the water transfer having been made.
- 3.1.5 The algal limits specified in Condition 3.1.4 are set by the National Health and Medical Research Council of Australia and are endorsed by the Metropolitan/South Coast Regional Algal Coordinating Committee or its current equivalent, or any other criteria advised in writing by the Department of Natural Resources.

### 3.2 Protocol during Black Start Operations

- 3.2.1 In the event that an interchange of water is required for the purposes of *black start*<sup>12</sup> Eraring Energy may undertake power generation independent of the protocol for water interchanges (Section 3) for the period required to enable restoration of the electrical system.
- 3.2.2 Any power generation which occurs under Condition 3.2.1 of this Licence will be under the direction and control of the National Electricity Market Management Company in accordance with the powers given to it *via* the National Electricity Code.

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<sup>8</sup> See Glossary in Section 6.

<sup>9</sup> See Glossary in Section 6.

<sup>10</sup> For the purposes of this Licence, "receiving waters" only includes water storages located on a natural watercourse, such as Fitzroy Falls Reservoir and Lake Yarrunga. Accordingly, Bendeela Pondage is excluded from this definition.

<sup>11</sup> See Glossary in Section 6 for recreational guidelines current as of December 2005

<sup>12</sup> See Glossary in Section 6.

- 3.2.3 In the event of an interchange of water for a black start that exceeds Eraring Energy's entitlement as specified in Condition 2.3.1, Eraring Energy must advise the Department of Natural Resources (Schedule 1) in writing as soon as practically possible that the operation has occurred.

## **4 CYANOBACTERIAL MONITORING**

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4.1 Eraring Energy must comply with the monitoring protocols set out in Schedule 3 of this Licence.

### **4.2 Objective**

The objective of the monitoring program is to ensure, as far as practically possible, that the power generation activities of Eraring Energy do not cause the concentrations of cyanobacteria in the receiving waters to exceed the recreational guidelines established in Condition 3.1.4.

### **4.3 Review of the Cyanobacterial Monitoring Program**

4.3.1 The monitoring program must be reviewed at a minimum of five yearly intervals to assess the effectiveness of the program in meeting its objectives. The results of any such review will be incorporated into the Licence and implemented by Eraring Energy as soon as practically possible.

4.3.2 The monitoring program must also be reviewed at the time of the five yearly review of the licence.

### **4.4 Cyanobacterial Monitoring**

4.4.1 Monitoring for cyanobacteria must be undertaken at least weekly from 1 October to 31 May, and at least monthly from 1 June to 30 September inclusive.

4.4.2 Samples must be collected at the frequency specified in Condition 4.4.1, from sites listed in Schedule 3:1(1) and analysed according to Schedule 3:1(2) and Schedule 3:1(3):

4.4.3 If cyanobacterial levels for a given storage exceed the recreational guidelines described in Condition 3.1.4 between 1 June and 30 September, then weekly monitoring is to be initiated in that storage. Under these circumstances, weekly monitoring must continue until such time as two consecutive weekly results indicate that the cyanobacterial levels for that storage are below the recreational guidelines.

4.4.4 Eraring Energy and the Sydney Catchment Authority may work cooperatively to obtain data on cyanobacterial populations in Fitzroy Falls Reservoir, Bendeela Pondage and Lake Yarrunga. The monitoring protocols in Schedule 3 must be adhered to.

## **5 REPORTING CONDITIONS**

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### **5.1 Regular Reporting to the Department of Natural Resources**

Eraring Energy must provide the results of the cyanobacterial monitoring required by Condition 4.4 of this Licence to the Department of Natural Resources as soon as possible after the results are received by Eraring Energy. Where these results are obtained through a cooperative arrangement with the Sydney Catchment Authority, Eraring Energy may arrange for the Sydney Catchment Authority to send the results directly to the Department.

### **5.2 Reporting to the Regional Algal Coordinating Committee**

Eraring Energy will arrange for results of cyanobacterial monitoring required by Condition 4.4 to be provided to the Regional Algal Coordinating Committee as soon as possible after they are received by Eraring Energy, or no later than by 12 midday the following Thursday. When results are obtained through a cooperative agreement with the Sydney Catchment Authority, Eraring Energy may arrange for the Sydney Catchment Authority to send the results directly to the Regional Algal Coordinating Committee.

### **5.3 Incident Reporting**

Eraring Energy must inform the Department of Natural Resources of any incident that has caused or is likely to cause non-compliance with any of the conditions of this Licence as a result of an accident, equipment failure or any such other causes at the earliest practically possible opportunity.

### **5.4 Annual Compliance Report**

Eraring Energy must, within 60 days of the commencement of each financial year, submit an Annual Compliance Report to the Department of Natural Resources. The Report must be provided in the form of one electronic copy and two hard copies. The Report must include, but not be limited to, the following information:

5.4.1 An introduction, including an overview of Eraring Energy's water management and water movement activities associated with the water sources and Water Management Works listed in Schedule 2;

5.4.2 A scale map depicting the location of all water sources, Water Management Works and sampling sites and the monitoring program at each site included in this Licence (to be tabulated or described separately);

5.4.3 A description of the methodologies used to collect and analyse samples, such as sampling methods, frequency and analytical methods;

5.4.4 Data and graphs for cyanobacterial levels in the relevant storages;

- 5.4.5 A summary of compliance/non-compliance events associated with the requirements of this Licence for the previous 12 months;
- 5.4.6 Any other significant events that may have, or are likely to have, any direct relation to the conditions of the Licence; and
- 5.4.7 Recommendations for any improvements for the following year.

## **5.5 Non-Compliance Reporting**

The Department of Natural Resources (Schedule 1) may direct Eraring Energy to prepare and submit a written report to the Department of Natural Resources regarding any non-compliance event (reported or otherwise) within the time specified in the request. The written report must include, but need not be limited to, the following information:

- 5.5.1 the date, time and location of the event/s or works involved;
- 5.5.2 the cause of the event/s;
- 5.5.3 the nature of the non-compliance and details of any probable or actual harm or damage to the environment, property and public health and safety;
- 5.5.4 any action taken to prevent, control or mitigate the non-compliance; and
- 5.5.5 any action that has been, or will be taken to prevent a recurrence of the non-compliance.

## **5.6 Reporting at times when Fitzroy Falls is spilling to Yarrunga Creek**

Consistent with Condition 2.6 of this Licence, Eraring Energy must advise the Department of Natural Resources (Schedule 1) as soon as possible after the occurrence, when operating under Condition 2.5 of this Licence.

## **5.7 Reporting of Black Start Events**

Consistent with Condition 3.2.3 of this Licence, Eraring Energy must advise the Department of Natural Resources (Schedule 1) as soon as possible after the occurrence, when operating under Condition 3.2.1 of this Licence. This information should include, but need not be limited to, the timing of the diversion; volume of water diverted, amount of power generated and gauging or release data obtained by Eraring Energy from the Sydney Catchment Authority to show that Condition 2.5 has been complied with.

## 6 GLOSSARY

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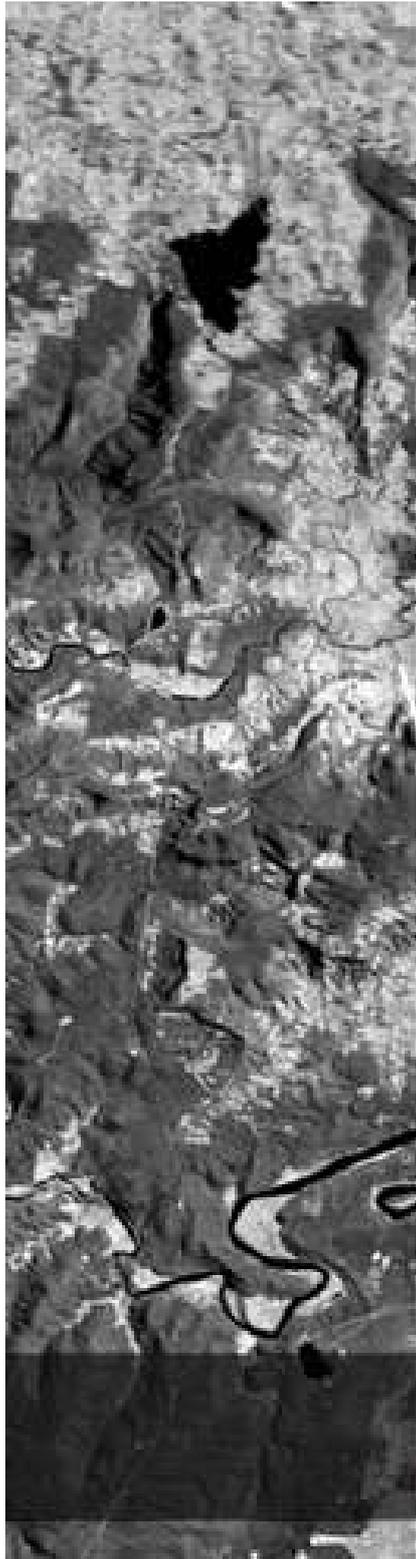
- 6.1 **Black Start** means the provision of power generation in the national interest to the National Electricity Market Management Company in order to restore system operation or the interconnected power system after a partial or complete system shutdown.
- 6.2 **Biovolume** is the total volume of cyanobacterial cells, in mm<sup>3</sup>/L, present in a water sample. The risk of recreational users suffering an allergic reaction to cyanobacteria increases with increasing biovolume.
- 6.3 **Cyanobacteria** are photosynthetic bacteria naturally present in all waterways. They are commonly known as blue green algae. Cyanobacteria can have irritant or allergic effects in some people, and some species are known to be capable of producing highly potent toxins that can damage liver and nerve tissues.
- 6.4 **Divert** means the transfer of water by artificial means from a water source to another water source by a route which differs from the route the water otherwise would have taken.
- 6.5 **Emergency** may include an event that is pending, or an event that has already occurred but could not be reasonably foreseen or scheduled, including occurrences such as:
- major infrastructure failures within the scheme;
  - a water contamination incident that may place Eraring Energy in serious breach of the *Protection of the Environment Operations Act 1997*;
  - cyanobacterial blooms;
  - frequency control and voltage control measures as directed by the National Electricity Market Management Company; or
  - declared disasters or any event considered by the Ministerial Corporation to constitute an actual or potential emergency.
- 6.6 **Guideline** for cyanobacteria is the upper concentration of cyanobacteria, or the maximum biovolume of cyanobacteria, that can be present in a waterway and be unlikely to affect the health of recreational water users. Above this limit, the health risk to recreational users is thought to be unacceptable. Guidelines are constantly being revised and updated as new scientific and medical information becomes available. Refer to the National Health and Medical Research Council's website for up-to-date information.
- 6.7 **Interchange**, for the purpose of this Licence, means the movement, by the works specified in Schedule 2, of water from one water source to another, and the return of that water to the original source.
- 6.8 **Spilling** from Fitzroy Falls Reservoir is defined as water flowing over the spillway caused by stormwater runoff, in accordance with the agreement between the Sydney Catchment Authority and the Department of Environment and Conservation (National Parks and Wildlife Service).

- 6.9 ***Toxigenic*** means those cyanobacteria that are known to be capable of producing toxins. Refer to the Regional Algal Coordinating Committee's Freshwater Algal Contingency Plan for a list of potentially toxic genera and species.
- 6.10 ***Water Management Licence*** means a Licence granted under Part 9 of the *Water Act 1912*.
- 6.11 ***Water Management Works*** means any works within the meaning of Part 2 of the *Water Act 1912*.

## 7 ABBREVIATIONS

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<b>AHD</b>	Australian Height Datum
<b>FSL</b>	Full Supply Level
<b>L</b>	Litre
<b>LWG</b>	Licence Working Group
<b>m</b>	Metre
<b>mm</b>	Millimetre
<b>m/s</b>	Metres per second
<b>mm<sup>3</sup>/L</b>	Cubic millimetres per litre
<b>mL</b>	Millilitre
<b>ML</b>	Megalitre
<b>ML/d</b>	Megalitres per day
<b>m<sup>3</sup>/s</b>	Cubic metres per second
<b>MW</b>	Megawatt
<b>NATA</b>	National Association of Testing Authorities
<b>NSW</b>	New South Wales
<b>µg/L</b>	Micrograms per Litre



# Key Contacts

Schedule  
One



## **SCHEDULE 1      KEY CONTACTS**

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### **S1:1    Department of Natural Resources**

**Manager**

Corporate Licensing Unit  
Department of Natural Resources  
PO Box 651  
PENRITH NSW 2751  
Ph:     (02) 4722 1116  
Fax:     (02) 4722 6463  
email: [clu@dnr.nsw.gov.au](mailto:clu@dnr.nsw.gov.au)

**Executive Director – Water Management**

Department of Natural Resources  
23-33 Bridge St  
PO Box 39, Sydney NSW 2001  
ph: (02) 9228 6111 (switch)  
fax: (02) 9228 6455

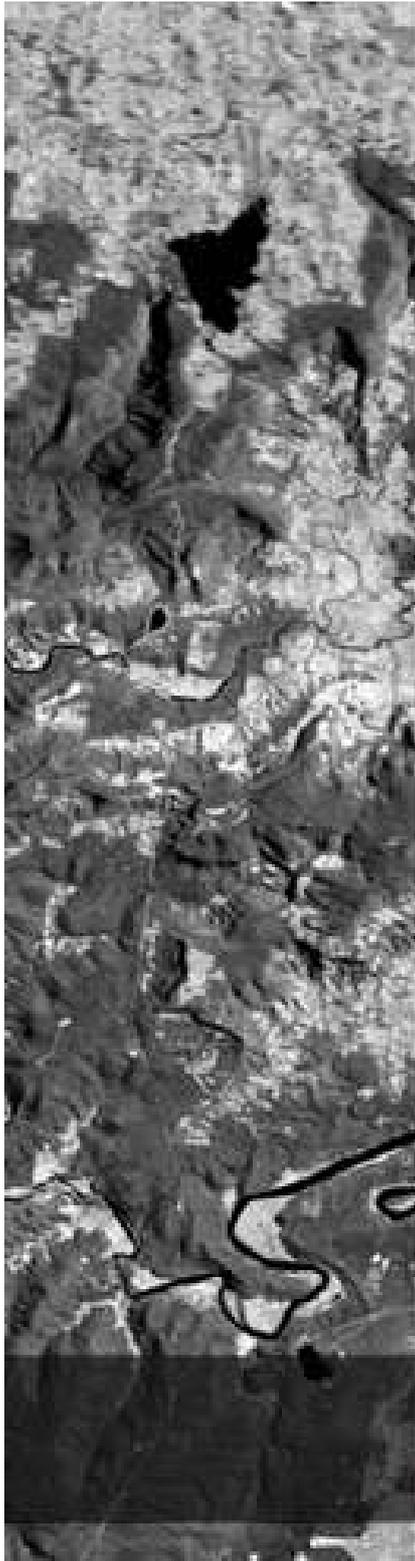
### **S1:2    Eraring Energy**

**Mr Peter Harvey**

Manager Hydro and Wind  
Eraring Energy  
Eraring Power Station  
PO Box 5044  
Dora Creek NSW 2264  
Ph:     (02) 4973 0414  
Fax:     (02) 4973 0710  
Email   peter.harvey@eraring-energy.com.au

**SEE ALSO THE DEPARTMENT OF NATURAL RESOURCES WEBSITE TO ACCESS REPORTS AND OTHER INFORMATION RELATED TO THE SHOALHAVEN RIVER CATCHMENT AND THIS LICENCE.**

<http://www.naturalresources.nsw.gov.au>



# Water Sources and Water Management Works

Schedule  
Two

## **SCHEDULE 2            WATER SOURCES AND WATER MANAGEMENT WORKS**

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### **S2:1 Water Sources**

- (1) Eraring Energy uses water sourced from Fitzroy Falls Reservoir Catchment for its hydro-electricity generation activities. The main inflow to the reservoir is Wildes Meadow Creek. It interchanges this water between Fitzroy Falls Reservoir, Bendeela Pondage and Lake Yarrunga.

### **S2:2 Description of Water Management Works Operated by Eraring Energy**

- (1) This Licence applies to the interchange of water by Eraring Energy between the artificial water sources of Lake Yarrunga and Fitzroy Falls Reservoir for the purpose of hydro-electricity generation. The reservoirs are located in the Shoalhaven River catchment.

- (2) **Clarification of Terminology**

For the purposes of this Licence, the Shoalhaven Scheme as a whole will be referred to as “Shoalhaven Scheme”. The Shoalhaven Scheme comprises the storages of Lake Yarrunga, Bendeela Pondage, Fitzroy Falls Reservoir and Wingecarribee Reservoir and all infrastructure associated with these storages (Figure 1). The pumping/power generation section of the Shoalhaven Scheme will be termed “Shoalhaven Pump-Storage Hydro-Electric System”. The individual components of the Shoalhaven Pump-Storage Hydro-Electric System are identified in Section S2:3 of this Licence.

- (3) **Description of the Shoalhaven Pump-Storage Hydro-Electric System**

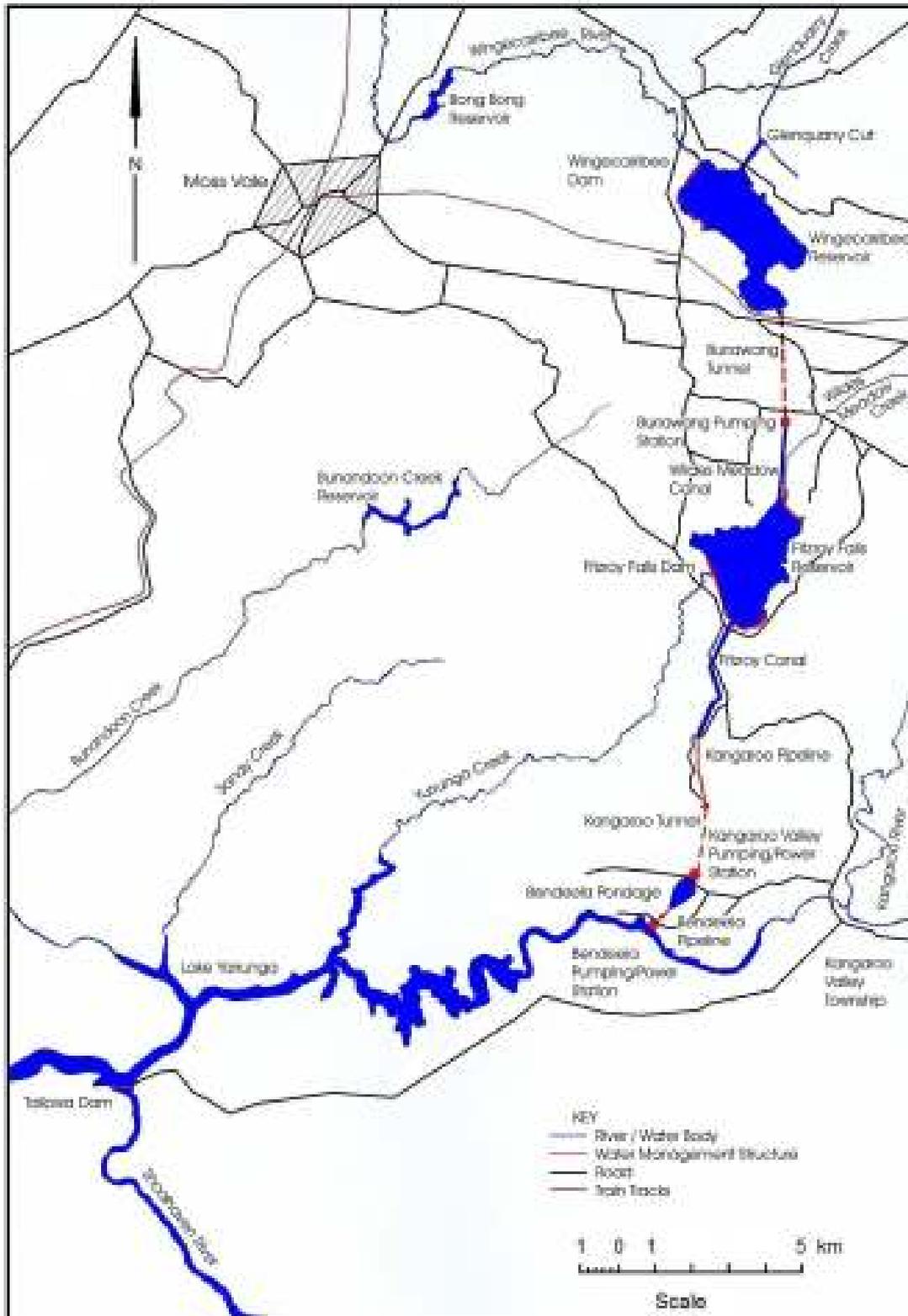
The Shoalhaven Pump-Storage Hydro-Electric System is part of the larger Shoalhaven Scheme. The Shoalhaven Scheme has been constructed partly for the purpose of water transfer between the Shoalhaven River catchment and the Hawkesbury Nepean River catchment, and partly for the purpose of hydro-electric power generation.

The Shoalhaven Pump-Storage Hydro-Electric System, which is operated and maintained by Eraring Energy, includes the Bendeela and Kangaroo Valley Power Stations. When the power stations are operating, they interchange water between the Fitzroy Falls Reservoir and the Kangaroo River arm of Lake Yarrunga, via Bendeela Pondage. The three artificial water storages are located in the Shoalhaven River catchment.

Due to water level constraints specified in the Eraring Energy/ Sydney Catchment Authority agreement for the operation of the scheme, up to 4 021 ML can normally be interchanged between Fitzroy Falls Reservoir and Lake Yarrunga in a cycle of electricity generation and pumping. The duration of the cycle is typically one week.

- (4) Eraring Energy utilises the part of the Shoalhaven Scheme between Lake Yarrunga and Fitzroy Falls Reservoir (in this Licence termed the Shoalhaven Pump-Storage Hydro-Electric System – refer Schedule 2:2(2) of this Licence), indicated in Figure 1.

**Figure 1 – The Shoalhaven Scheme.** The extent of Shoalhaven Pump-Storage Hydro-Electric System used by Eraring Energy is between Fitzroy Falls Dam and Lake Yarrunga, and includes the structures that interconnect the two.



## **S2:3 Details of Water Management Works**

- (1) The following works comprise all of the Water Management Works authorised for use by Eraring Energy under this Licence.

### **Shoalhaven Pump-Storage Hydro-Electric System**

Bendeela Pipeline  
Bendeela Pondage  
Bendeela Pumping/Power Station  
Fitzroy Canal  
Kangaroo Pipeline  
Kangaroo Tunnel & Shaft  
Kangaroo Valley Pumping/Power Station

- (2) The Sydney Catchment Authority also uses the above Water Management Works for transfer of water from Lake Yarrunga to Wingecarribee Dam to augment Sydney's Water supply during times of drought. The use of these works by the Sydney Catchment Authority for transfer of water will be addressed by the Water Management Licence issued to the Sydney Catchment Authority.
- (3) When Eraring Energy operates the Shoalhaven Pump-Storage Hydro-Electric System to transfer water to the Hawkesbury-Nepean River catchment, it does so as an agent of the Sydney Catchment Authority.
- (4) The following tables provide the technical specifications, locations, storage capacities and other information for each of the Water Management Works authorised by this Licence.

<b>Bendeela Pipeline</b>	
Description:	A single pipeline connecting Bendeela Pumping and Power Station with Bendeela Pondage. A surge tank is provided near the mid-point of the line to limit the range of transient pressure variations in the pipeline.
Location:	<ul style="list-style-type: none"> <li>GR 681 534 (bottom) to 686 537 (top) Bundanoon (8928-1-S) 1:25,000 topographic map sheet</li> </ul>
Capacity:	85 m <sup>3</sup> /s maximum
Velocity:	8.2 m/s maximum
Surge tank:	Type: Steel Height: 31.1 m Diameter: 9.1 m.
Outside diameter of lines:	3,680 mm below surge tank; 3,990 mm above surge tank.

<b>Bendeela Pondage</b>			
Description:	An earth and rockfill gravity dam. Located adjacent to Jack's Corner Road in Kangaroo Valley. Used for the storage and diversion of urban water supply and hydro-electric power generation.		
Location:	<ul style="list-style-type: none"> <li>Lot 1, DP 534476; Lots B, C and D DP 103399; Lots 1 and 4 DP 777406; Lot 24 DP 751262.</li> <li>GR 689 543 – Bundanoon (8928-1-S) 1:25,000 topographic map sheet</li> </ul>		
Wall Height/Crest Length:	Height of dam crest above lowest foundation is 15.2 m. Length of dam crest is 2,118 m.		
Spillway:	An uncontrolled overfall crested spillway, located at the southern end of the pondage.		
Storage Capacity:	<b>FSL (AHD)</b>	<b>Total Capacity</b>	<b>Operating Capacity</b>
	182.83 m	1,200 ML	920 ML
Outlet Works:	Nil		
Diversion Works:	Up to 2,460 ML/d pump diversion to Fitzroy Falls Dam (via Kangaroo Valley Pumping/ Power Station; Kangaroo Tunnel, Shaft and Pipeline; and Fitzroy Canal).		
Other Details:	Shoalhaven City Council obtains potable water supply for Kangaroo Valley township from the pondage. Eraring Energy can divert up to 3015 ML/d to Bendeela Power Station		

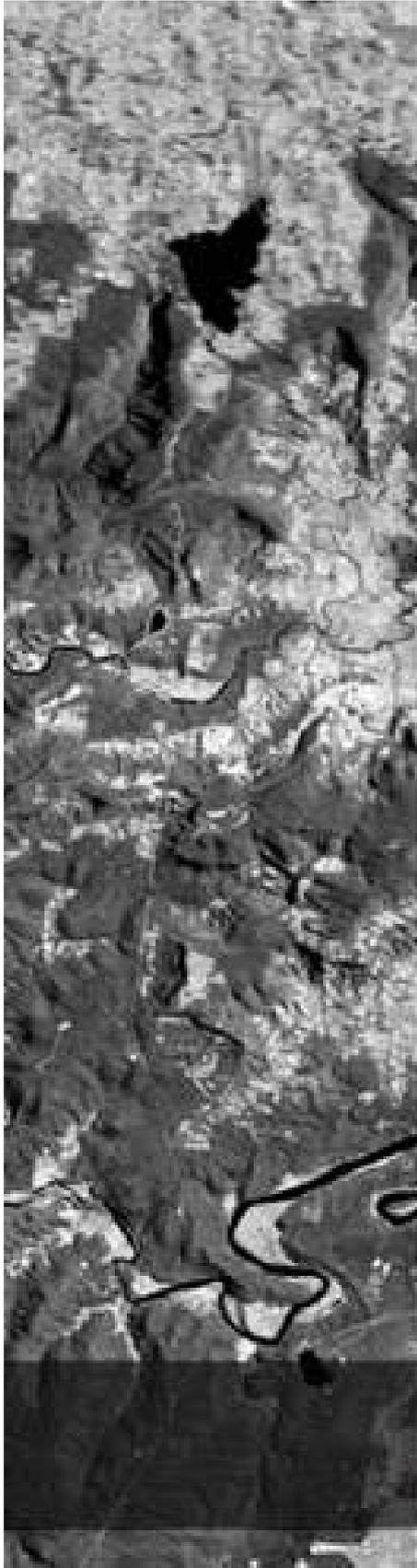
<b>Bendeela Pumping/Power Station</b>	
Description:	A concrete surface station housed at the bottom of a cylindrical reinforced concrete substructure. Located on the right bank of the Kangaroo River on the upper reaches of Lake Yarrunga. Used to pump water to Bendeela Pondage, with water returning to Lake Yarrunga during hydro-electric power generation.
Location:	<ul style="list-style-type: none"> <li>GR 680 534 – Bundanoon (8928-1-S) 1:25,000 topographic map sheet</li> </ul>
Rated pumping capacity:	56.6 m <sup>3</sup> /s (two units); or 28.3 m <sup>3</sup> /s per unit at 132 m head.
Rated generating capacity:	80 MW; or 41 MW per unit at 116 m head.
Machines:	Two vertical axis reversible Francis pump/turbine units.
Valves	2.2 m diameter butterfly pump/turbine valves

<b>Fitzroy Canal</b>	
Description:	Single channel, shotcrete or concrete lined where required but nominally unlined through sandstone strata. Situated on a plateau at an elevation of about 660 m.
Location:	<ul style="list-style-type: none"> <li>GR 692 587 (bottom) to 701 622 (top) Bundanoon (8928-1-S) 1:25,000 topographic map sheet</li> </ul>
Length of canal:	4070 m.
Capacity:	85 m <sup>3</sup> /s maximum in Phase II generation.
Velocity:	1.5 m/s maximum.
Depth of flow:	8.6 m maximum near control structure. 6.2 m maximum at reservoir.

<b>Kangaroo Pipeline</b>	
Description:	Single line link between Fitzroy Canal and Kangaroo Shaft.
Location:	<ul style="list-style-type: none"> <li>GR 694 563 (bottom) to 692 587 (top) Bundanoon (8928-1-S) 1:25,000 topographic map sheet</li> </ul>
Capacity:	42 m <sup>3</sup> /s maximum.
Velocity:	5.7 m/s maximum.
Surge tank:	Type: Steel Height: 37 m Diameter: 13.3 m.
Diameter:	3,100 mm.

<b>Kangaroo Tunnel &amp; Shaft</b>	
Description:	Link between Kangaroo Valley Pumping and Power Station and Kangaroo Pipeline. Tunnel and Shaft are fully steel lined pressure conduits.
Location:	<ul style="list-style-type: none"> <li>GR 691 546 (bottom) to 694 563 (top) Bundanoon (8928-1-S) 1:25,000 topographic map sheet</li> </ul>
Section:	Circular – 2,640 mm diameter.
Capacity:	42 m <sup>3</sup> /s maximum.
Velocity:	7.7 m/s maximum.

<b>Kangaroo Valley Pumping/Power Station</b>	
Description:	Located at the northern end of Bendeela Pondage and pumps water from the Pondage to Fitzroy Falls Reservoir. Electricity is generated with water returned from the Reservoir to the Pondage. The station includes a Control Room for the operation of the Scheme.
Location:	<ul style="list-style-type: none"> <li>GR 691 546 – Bundanoon (8928-1-S) 1:25,000 topographic map sheet</li> </ul>
Rated pumping capacity:	28.3 m <sup>3</sup> /s (two units).
Rated generating capacity:	160 MW.
Machines:	Two vertical axis Francis Turbines with two-stage underhung pumps.
Valves:	Spherical valves, 1.4 m diameter for pump valve and 1.6 m diameter for the turbine valve.



# Cyanobacterial Monitoring Manual

Schedule  
Three

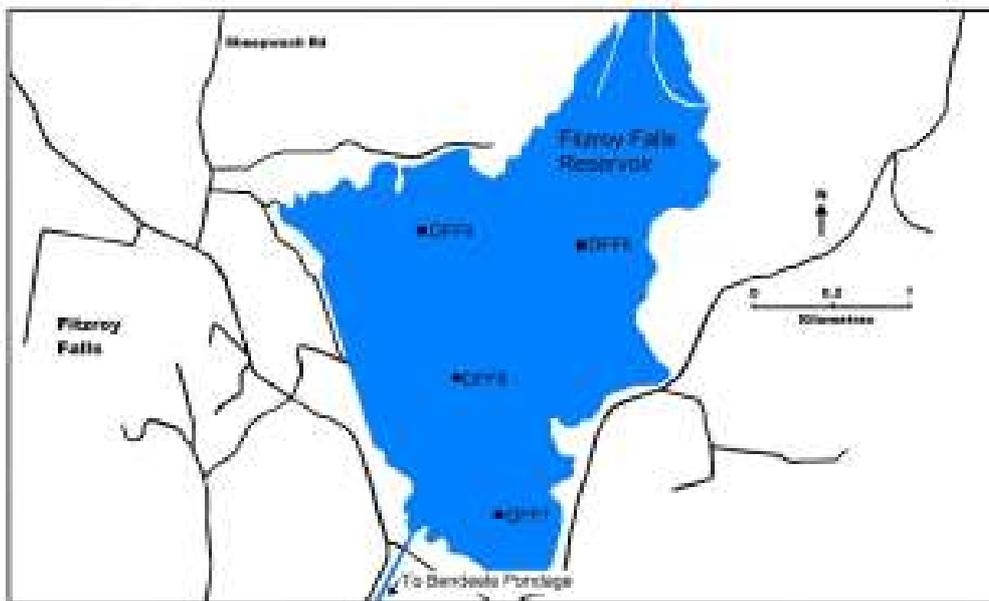
## **SCHEDULE 3            CYANOBACTERIAL MONITORING PROTOCOL**

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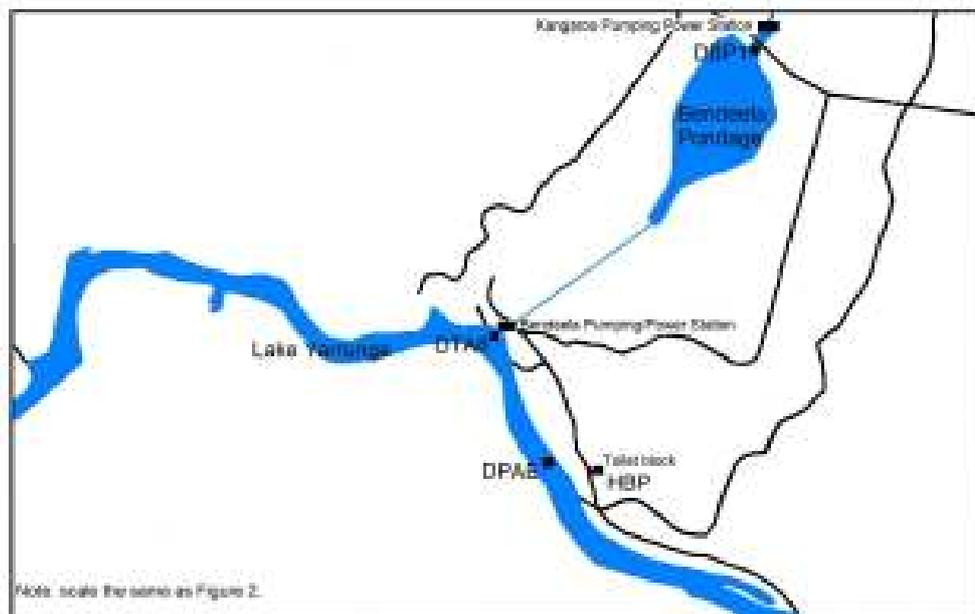
### **S3:1 Monitoring Protocol**

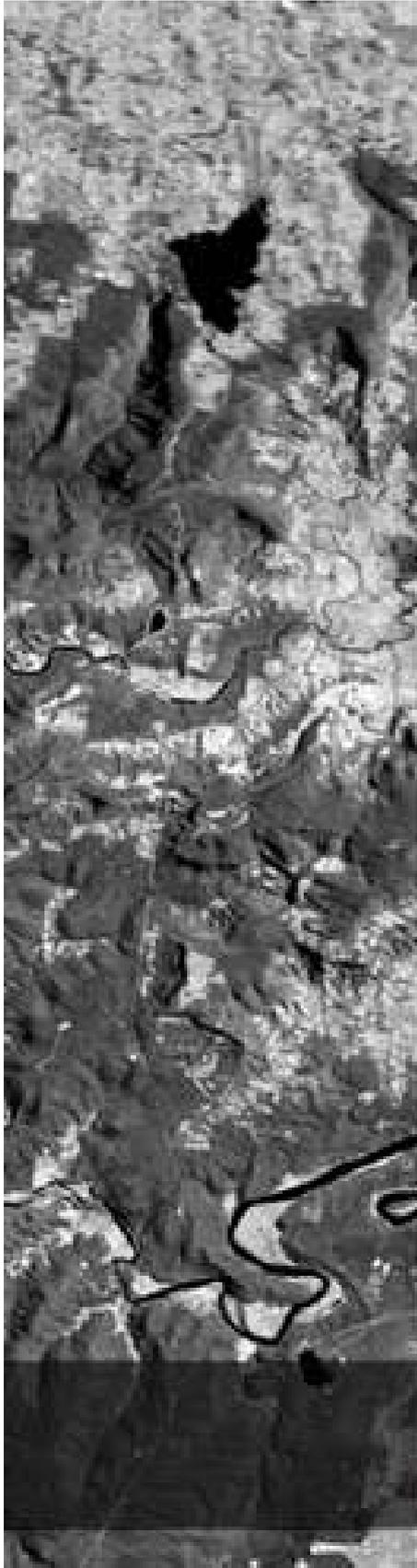
- (1) Sampling will be undertaken in accordance with NATA accredited Australian standards at selected sites listed below:
  - (a) Fitzroy Falls Reservoir: a horizontal composite of four samples taken at DFF6, DFF7, DFF8 and DFF9 (Figure 2);
  - (b) Bendeela Pondage: water samples taken below the surface at site DBP1 (Figure 3); and
  - (c) Lake Yarrunga: water samples taken below the surface at sites DTA8 (inside Bendeela Power Station boom) and PAE (Bendeela Camping Area) (Figure 3).
- (2) Analyses should be undertaken by a laboratory that is NATA accredited for freshwater cyanobacterial enumeration, biovolume and microcystin analysis.
- (3) Testing must include:
  - (a) total cyanobacteria, with known toxin producers reported;
  - (b) total biovolume of all cyanobacterial species (mm<sup>3</sup>/L);
  - (c) species count (cells/mL); and
  - (d) microcystin toxin (µg/L).
- (4) Appropriate quality assurance and quality control must be maintained. These should include as a minimum:
  - (a) a sampling program that includes field duplicates and blanks; and
  - (b) a laboratory program that includes verification of algal identification and analysis through both inter- and intra- laboratory comparisons.

**Figure 2. Cyanobacterial sampling sites in Fitzroy Falls Reservoir.**



**Figure 3. Cyanobacterial sampling sites in Bendeela Pondage and Lake Yarrunga.**





# Licence Fees and Management Charges

Schedule  
Four

## **SCHEDULE 4 LICENCE FEES AND MANAGEMENT CHARGES**

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Part 9 of the *Water Act 1912* contains provisions for the Ministerial Corporation to recover costs in managing this Licence.

### **S4:1 Licence Fee**

The Licence Fee covers the actual costs incurred by the Ministerial Corporation in dealing with the application for the Licence. The Fee is determined by the Minister for Natural Resources before the Licence is issued.

### **S4:2 Water Management Charges**

Water Management Charges are the ongoing costs incurred by the Ministerial Corporation in managing the Licence. The costs associated with Licence management activities are likely to vary from year to year, with higher costs being incurred in years when reviews and / or special studies or investigations are carried out.

Cost-recoverable activities related to managing the Licence are likely to include (but need not be limited to):

- (1) **Reviews:**
  - statutory licence reviews every five (5) years); and
  - other reviews if required.
- (2) **Monitoring and Studies:**
  - audit and compliance monitoring; and
  - biophysical monitoring.
- (3) **Administration:**
  - annual reporting • auditing;
  - general day to day administration of the licence;
  - other water resources management functions; and
  - determining water management charges.