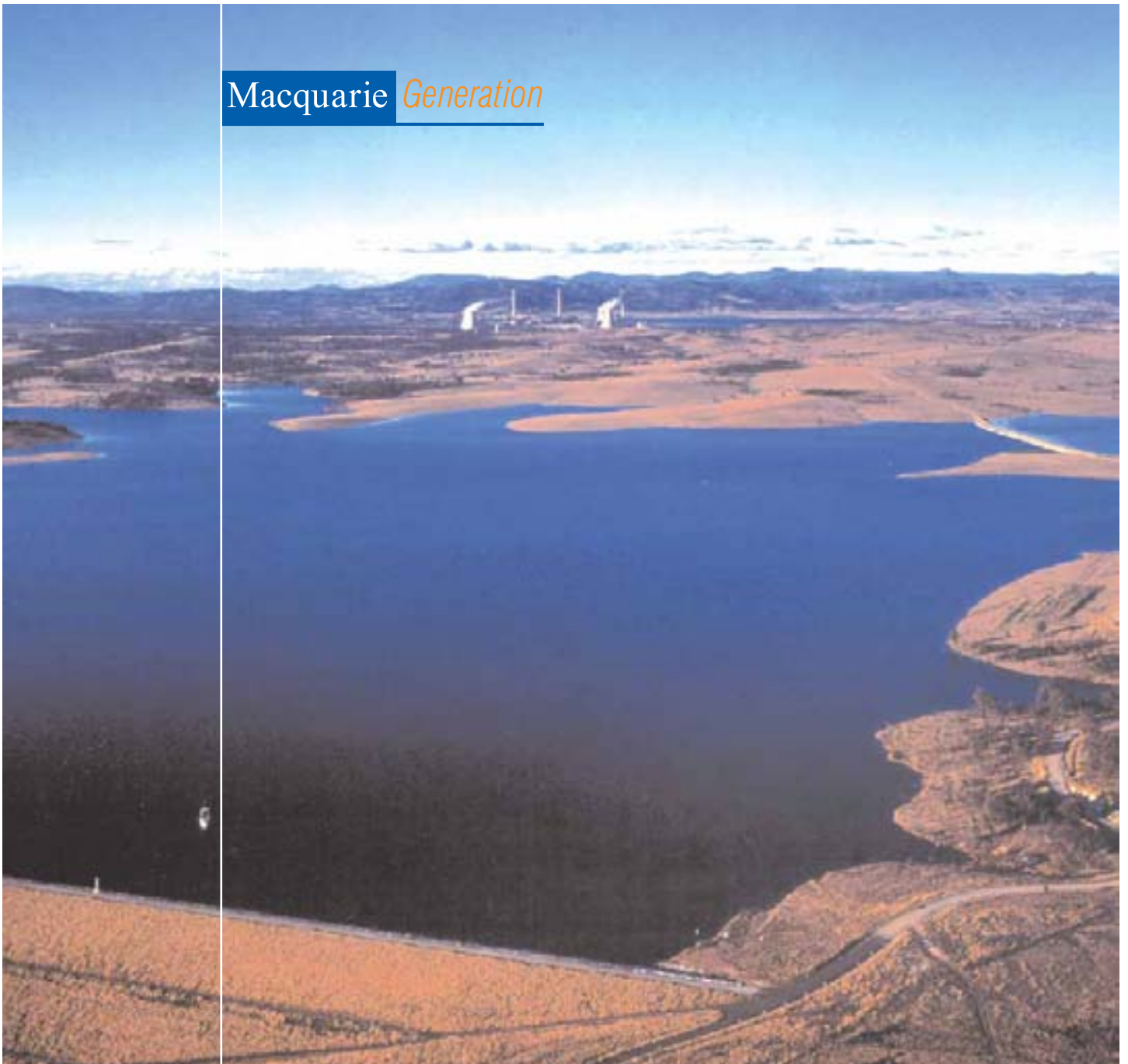


Macquarie *Generation*



Macquarie Generation Hunter River Pump Station Augmentation Environmental Assessment

16 January 2007

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Macquarie Generation Hunter River Pump station Augmentation Environmental Assessment

16 January 2007
Reference 22397
Revision 3

Statement of validity

Submission of Environmental Assessment

Prepared under Part 3A of the *Environmental Planning and Assessment Act 1979*

Environmental assessment prepared by:

Name: Tim Colman, Senior Environmental Planner
Qualifications: *B. Urb. Reg. Plan.*
Address: Connell Wagner Pty Ltd
Level 2, 116 Military Road
Neutral Bay NSW 2089
In respect of: Bayswater Power Station: Hunter River Low Pressure Pump Station
Augmentation

Applicant name: Macquarie Generation
Applicant address: Bayswater Power Station
Private Mail Bag No. 2
Muswellbrook NSW 2333
Proposed development: Construction and operation of a low-pressure pumping station capable of extracting an additional 800 megalitres per day from the Regulated Hunter River at Jerrys Plains, NSW and construction of (approx.) 3.5 km overland dual pipeline from the pumping station to Lake Plashett
Land to be developed: Land generally required for the construction and operation of the proposed pump station and pipeline, as shown in Figure 1.3 (Lot 91 in DP234544, Lot 1 in DP616024, Lot 110 in DP625973)

Environmental assessment: An environmental assessment is attached which addresses all matters listed under Part 3A of the *Environmental Planning and Assessment Act 1979*

Declaration
I certify that I have prepared the contents of this environmental assessment and to the best of my knowledge:

- it contains all available information that is relevant to the environmental assessment of the development to which the environmental assessment relates;
- all the information contained is not, by its presentation or omission of information, false or misleading.

Signature:

Name:

Date:


Tim Colman

16. 1. 07

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List of Abbreviations

ASL	Above Sea Level
CEMP	Construction Environmental Management Plan
DEC	Department of Environment and Conservation
DEH	Department of Environment and Heritage
DLWC	Department of Land and Water Conservation
DNR	Department of Natural Resources
DoP	Department of Planning
EA	Environmental Assessment
EAR	Environmental Assessment Requirements
EMP	Environmental Management Plan
EP&A Act	Environmental Planning and Assessment Act
EPBC Act	Environment Protection and Biodiversity Act (Commonwealth)
EPI	Environmental Planning Instruments
EPL	Environmental Protection Licence
ESCP	Erosion and Sediment Control Plan
FM Act	Fisheries Management Act
HP	High Pressure
HPPS	High Pressure Pumping Station
L _{A10}	Noise levels that are exceeded for 10% of each sample period.
L _{A90}	Noise levels that are exceeded for 90% of each sample period
L _{Aeq}	Equivalent average sound level
L _{Amax}	Maximum Noise level
LEP	Local Environmental Plan
LGA	Local Government Area
LP	Low Pressure
LPSS	Low Pressure Pumping Station
MSDS	Material Safety Data Sheet
NEM	National Electricity Market
NES	National Environmental Significance
NPW Act	National Parks and Wildlife Act
PAD	Potential Archaeological Deposits
POEO Act	Protection of the Environment Operations Act
REPs	Regional Environmental Plans
RFI	Rivers and Foreshore Improvement Act
SEPPs	State Environmental Planning Policies
SWMP	Soil and Water Management Plan
TSC Act	Threatened Species Conservation Act
WA 1912	Water Act 1912
WM Act	Water Management Act

Executive Summary

Introduction

This Environmental Assessment has been prepared by Connell Wagner on behalf of Macquarie Generation to support a Major Projects Application for the augmentation of its Hunter Water Pumping station near Jerry's Plains, NSW (Figure 1.1). All infrastructure required for the proposed augmentation ('The Project') will be located on land owned by Macquarie Generation and within the Singleton Local Government Area. Specific Environmental Assessment Requirements (EARs) for the scope and content of the Environmental Assessment were prescribed by the Director-General on 22nd October 2006 and are addressed in this Environmental Assessment.

Macquarie Generation currently consumes around 60,000 megalitres (ML) of water per year for the operation of the Bayswater and Liddell Power Stations. This water supply is critical to the operation of the two stations. The water is sourced from the Hunter River under a water management licence issued by the Department of Natural Resources (DNR).

The Project involves a new pumping station, dual pipelines and power supply to the pumping station. The additional pumping capacity and new pipelines would be used to transfer water directly to Plashett Dam for temporary storage until required.

The project will not require any variation to the total amount of water that Macquarie Generation is licensed to extract and will conform with the existing requirements of its Water Management Licence and the *Water Management Act 2000*. The project will enable Macquarie Generation to extract its Supplementary water entitlement from larger high flow events in accordance with its Water Management Licence.

This assessment reviews the environmental impacts of increasing the pumping capacity at the Hunter River on the local environment and on the Hunter River flow and water quality.

The development consent process for the Project is subject to Part 3A of the *Environmental Planning and Assessment Act 1979* and requires the consent of the NSW Minister for Planning. A referral to the Commonwealth Minister for the Environment may also be required.

Need and Justification for the Project

The Hunter River is Macquarie Generation's primary source of water that is required for bulk electricity generation at its Bayswater and Liddell Power Stations. This water is used for cooling purposes and is essential to the security of operation of the two coal fired power stations which supply power to consumers in NSW and the National Electricity Market.

Water reforms were recently implemented in NSW and the Hunter Valley via the *Water Management Act 2000* and the Hunter River Water Sharing Plan. The new Act and the Water Sharing Plan issued in 2004 established the way in which water is to be allocated from the Hunter River and the way in which the needs of all water consumers including the environment are to be served.

As a result of these reforms changes were made to Macquarie Generation's Water Management Licence, which now requires the power stations to extract more of their licensed Supplementary water entitlement from high flow events in the river rather than extracting water during lower flow periods. Due to the relatively short duration of these high flows an increased pumping capacity is therefore needed to extract the same volume of water as was extracted before the reforms were implemented. In the circumstance of the current drought the increased pumping capacity will also enable earlier recovery of depleted storage levels using high flow capture.

To enable Macquarie Generation to maintain the same level of certainty of water supply that it had before the water reforms were implemented, the Department of Natural Resources (DNR) issued a

Water Management Licence entitling Macquarie Generation to extract 1,200ML/day from the Hunter River only when certain high flow conditions existed. It is therefore necessary for Macquarie Generation to augment the existing pumping station, which has a pumping capacity of only 450ML/day, to a total capacity of 1,200ML/day.

A range of design options has been considered for the augmentation of the Hunter River water supply system, and additional alternatives have also been reviewed by Macquarie Generation.

Project Description

Existing Facilities

The existing scheme, built in the late 1960s, includes five low-pressure pumps that have capacity to extract up to a maximum of 450 ML/day. However, in practice an average capacity of only 420 ML/day or less may be available due to operational constraints.

Water extracted from the Hunter River via the existing pumping station, is pumped either directly to Macquarie Generation's operating facilities or to Plashett Dam, which serves as off-river storage.

River pondage formed by a rock weir maintains a consistent water levels at the pumps. The low-pressure (LP) pumping station at the Hunter River transfers the extracted water by a pipeline to an open canal. The water then flows via the canal to a high pressure (HP) pumping station that lifts the water to a surge tower structure. The water can then be directed by pipeline to one of three locations, namely Plashett Storage, Bayswater Power Station cooling water make-up dam or Lake Liddell. Substations at the LP and HP pumping stations provide power supply for the pumps. Access to the pumping stations from the New England Highway is via a mostly unsealed road on Macquarie Generation land.

The existing inlet structure at Plashett storage discharges from the existing pipeline to a stilling pond from which it flows into a number of smaller pipes leading down to Plashett storage. Releases from Plashett Dam are directed to the canal and back to the HP pumping station where the water can be pumped to Bayswater Power Station or Lake Liddell.

Proposed Augmentation

The Project involves a number of components including:

- New low-pressure pump station capable of extracting up to 800 ML/day. The intake of the proposed pump station would be built parallel to the Hunter River, on the upstream side and within 100 m of the existing pump station. It will be possible to operate the stations at a range of pumping rates by varying the number of pumps in service.
- Interconnection of the existing and new River pumping stations with shared intake via new screens
- The approximate dimensions of the pump station are 20 m wide by 17 m high.;
- Twin 1.8 m diameter above ground pipeline(s) from the Pumping Station to Plashett Dam;
- Water discharge structure at Plashett Dam;
- Associated power supply works for the new pumping station; and
- Access works.

The Project is directed to enabling Macquarie Generation's access to its licensed water extraction allowance by increasing the proportion of water supply gained from high flow events in the Hunter River. The Project does not involve any change to the operation of the Bayswater or Liddell power stations in terms of their capacity to generate electricity.

The construction activities for the Project would continue for approximately 12 to 18 months from award of contract and will involve:

- Preparation of Contractor's site laydown areas;
- Transportation of materials to the site;
- Excavation for the new pumping station site and substation;
- Construction of footings;
- Construction of main pump station structure and installation of pipes;
- Electrical connection works;
- Land clearing and installation of pipeline(s) and access tracks;
- Pipe support structures across gullies;
- Access and drainage works; and
- Site Restoration.
- Commissioning and performance testing for the new system

The excavation of the northern riverbank would have a width of about 35 metres (along the bank) and extend about 13 metres into the bank, with the height of the wall at the back of the excavation being about 10 metres. The excavation would be to be managed in the context of:

- disturbance to and impact on local platypus population
- potential river bank erosion
- risk of high flows occurring during the construction works.
- placement of coffer dam structure in river to protect excavation from impact of river flows
- impact on vegetation

Statutory Controls and Approvals Process

The Project requires consideration under the following legislation:

- Project Approval under the NSW *Environmental Planning and Assessment Act*;
- Consideration of the requirements of the Commonwealth *Environmental Protection and Biodiversity Conservation Act*;
- Consideration of the provisions of the existing Water Management Licence;
- Various State Environmental Planning Policies, Regional and Local Environmental Plans, other environmental legislation and Bayswater Environmental Protection License.

The NSW Department of Planning (DoP) has indicated that the Project will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Director-General has issued environmental assessment requirements for the Project. The Minister for Planning is the consent authority, and the Project does not require the consent of the local council (Singleton Council).

The Hunter Water Sharing Plan and Water Extraction Licences

The *Water Sharing Plan for the Hunter Regulated River Water Source 2003* aims to: "achieve a healthy, diverse and productive regulated river water source providing sustainable management of the water source for the community, environment, towns, agriculture and industry", and to recognise the significance of the water source to Aboriginal culture.

Macquarie Generation holds a package of licences and approvals under the Water Management Act 2000 to take water directly from the Hunter River catchment and the Barnard River. The Department of Natural Resources (DNR) is the regulatory authority for water management licences. There are a number of different categories of water entitlement under the licence package held by Macquarie Generation:

- **Combined Works and Use Approval** – authorises a diversion capacity of 1,200 ML/day
- **Major Utility Specific Purpose Access Licence**;
- **General Security Access Licence**; and
- **High Security Access Licence** –

These entitlements provide for three categories of water use, each category having relevance to “available water determinations” as made by the Minister under section 59 of the *Water Management Act*, and related to the licensee’s specific allocation of “unit shares”.

- **Supplementary Water Access Licence** – entitles Macquarie Generation to a share of “supplementary” (ie during natural high-flow periods) flows. The entitlement may be accessed once the volume of water measured at the gauging station at Jerrys Plains has reached 1500 ML/day for a continual period not less than 12 hours, prior to the commencement of pumping.

The Project involves no proposed change to the conditions of the licences or the Water Sharing Plan, but aims to increase Macquarie Generation’s pumping capacity to access the approved rate of extraction subject to acceptable environmental impacts. This Environmental Assessment provides the basis for regulators to assess the acceptability of the environmental impacts of an additional pumping capacity of 800 ML/day.

Environmental Assessment

The relevant environmental issues, studies and options in relation to the Project during its construction, operation and decommissioning stages, together with options for their management, are discussed in Chapter 5.

Regional Setting and Topography

The Hunter River Valley in the vicinity of Jerrys Plains, has a subdued topography, located between the more elevated Wollemi Tableland area to the south and the New England Ranges to the north. The Hunter River meanders through the Muswellbrook/Singleton area.

The Hunter River Pumping Station is situated between the tributaries of Saltwater Creek and Parnell Creek, where the river is approximately 70 metres above sea level. Saltwater Creek is a significant sub-catchment located on the northern side of the Hunter River which has been used, through the construction of Plashett Dam, as an off river water storage. The pipeline component of the Project is mostly within the Saltwater Creek catchment. The existing HP pumping station is within the Parnells Creek catchment to the east of the LP pumping station.

The Bayswater and Liddell Power Stations and Lake Liddell are located in the Bayswater Creek catchment. Lake Liddell is situated on Bayswater Creek that flows past Ravensworth village and joins the Hunter River well below the Hunter River pumping station

Climate

The Upper Hunter Region has a temperate inland climate with an annual rainfall of about 650 mm. Temperatures can vary between extremes of -5°C in winter to 45°C in summer.

It is noted that changes in climate characteristics have been identified and for NSW a shift to drier conditions is forecast. The changes could affect the Project site and the catchments that feed the Hunter River. The Australian Government has acknowledged the changing climate conditions and has encouraged businesses to adopt risk management strategies. A further benefit of the Project is therefore to enhance the security of water supply to Macquarie Generation that is fundamental to the existing NSW electricity supply system.

Geology

The geology of the local area comprises predominantly of Permian age Singleton Coal Measures strata, Maitland Group marine sediments and Quaternary period alluvial deposits (gravel, sand, silt and clay). Isolated deposits of basalt may also occur within the general area. Coal measures in the vicinity of the pumping station are unlikely to be exploited due to proximity of the Hunter River and unsuitable characteristics of the local geology.

The gravels found along the Hunter River floodplain have value as construction materials, however, no mining of these gravels is undertaken in the vicinity of the pumping station.

Soils

The soil types of the site relate closely to the geology of the underlying rocks. The soils along the floodplains of the Hunter River are classified as having a low to moderate erodibility. However, due to the soft relatively steep soils, at the proposed site of the new pumping station on the Hunter River, the construction activities have the potential to cause erosion and sedimentation issues. A soil and water management plan, including an erosion and sediment control plan would be prepared, detailing control measures in order to mitigate potential impacts during the Project's construction phase.

Water Resources, Water quality and Site Drainage

The Hunter River has regulated flow that is affected by variations in catchment runoff and controlled releases from the Glenbawn and Glennies Creek Dams. The regulated flow is adjusted by State Water in accordance with water availability and supply demands with the objective to balance provisions of adequate supply to water users while maintaining the health of aquatic systems.

Monitoring of river flows and conductivity of the river water is routinely carried out. Data has shown that flow level is predominantly less than 500ML/day, however high flow periods of above 1,500 ML/day occur and historical records show that it is not uncommon for peak flows to exceed 50,000 ML/Day. It is these short-term high flow peaks that the augmentation project is designed to access.

Macquarie Generation's Water Management Licences include provisions to ensure that the river continues to experience the flushing associated with major rainfall events. Accordingly, supplementary water extraction cannot commence until at least twelve hours into a high flow event, as and when announced by the river's operator, the State Water Corporation of NSW.

Under the conditions of Macquarie Generation's water extraction licence, a high flow event may also be 'deemed' to have been announced when the volume of water passing the gauging station at the Jerrys Plains weir has exceeded 1,500 ML/day for a continuous 12 hour period. The first 12 hours of any high flow event may not be accessed. This first flush is often associated with higher salinity and allowing this water to pass improves the quality of water extracted. It also contributes to the environmental flows necessary to maintain river health.

Macquarie Generation's extraction licence enables pumping to continue during a high flow event as long as the volume of water passing Jerrys Plains weir remains above 1,500 ML/day. Once this volume drops below 1,500 ML/day, pumping must cease.

High Flows

Macquarie Generation has obtained access to the DNR's Integrated Quantity Quality Model (IQQM) to assess the impact of extractions on downstream flows over more than 100 years of recorded river flows, for a 420 ML/day and 1,200ML/day pumping station. The modeled results are best illustrated by the high flow duration curve in Figure 5.1. The curve illustrates clearly that the percentage change in overall downstream peak flow will be negligible, taking into account the increased pumping volumes that will be achieved with the proposed 1,200 ML/day pumping station.

Low Flows

During periods of low flow, Macquarie Generation may extract water only in accordance with the terms of its General Security, High Security and Major Utility Specific Purpose Licences, and in accordance with the Part 9 Water Management Licence. The amounts of water that may be extracted under each licence in a given Water Year are tightly regulated, and are governed by the Share Component held by Macquarie Generation for each licence, respectively. Under the terms of the Licences, water may be extracted subject to conditions and provided that Macquarie Generation does not exceed its entitlement. The Licences contain explicit requirements for the recording and reporting of quantities taken, and do not permit the water allocation account to go into debit.

The proposed augmentation of Macquarie Generation's LP Pumping Station is designed to operate wholly within the terms of its existing water extraction licences and the Water Sharing Plan. No change to the terms or conditions of the licences is proposed, and no change to Macquarie Generation's water

entitlements is proposed. Therefore, during periods of low flows in the Hunter River, the overall change in downstream flow volumes resulting from development of the new pumping station will be negligible or zero.

In-stream Storage Levels

In-stream storage levels are governed by the amount of water in the Hunter River at any given time, and the existing rock weir adjacent to Macquarie Generation's existing LP Pumping Station. Releases into the system, either for supply or for environmental flows, are regulated and are controlled for each user's specific (licenced) allocation, and in accordance with the Water Sharing Plan.

During periods of low flow, the weir acts to maintain a relatively constant level in the weir pond, so that the pumps can operate efficiently to extract Macquarie Generation's water entitlements. Water would continue to be extracted at rates comparable to the existing, and would vary only in accordance with any variations in Macquarie Generation's licence conditions, for example, a change in the allocated Share Component. Notwithstanding such a change (which could occur only within the terms of the Water Sharing Plan), the likely impact on in-stream storage would be minimal and would not be significant.

During periods of high flow, the weir becomes redundant and the depth of the river at the pumps increases considerably. Operation of the pumps would reduce the amount of water in the river only to the extent permitted under the Water Management Licences.

Automatic Trigger Procedures

The volume of water passing the gauging station at Jerrys Plains must exceed 1,500 ML/day for a period of 12 hours prior to the commencement of pumping during a high flow event. Once this 'trigger' has been activated, the Licence permits that at least 50% of the flow immediately upstream of the pumps, assessed on a 12-hourly basis, must be maintained at the gauging station at Jerrys Plains. Pumping must cease if the flow at that gauging station falls below 1500 ML/day. The pumps would incorporate systems to automatically trigger the operation of each individual pump, in order to 'step-up' and 'step-down' the volume and rate of pumping in accordance with the measured flow volume upstream of the pumps, and downstream at Jerrys Plains.

Water Quality

The Hunter River contains significant amounts of naturally occurring salinity, increasing progressively from the upper reaches to the estuarine mouth of the river. Management of the river flows, extraction and discharge arrangements is designed to ensure salinity levels in river flows are kept at an acceptable level. The Hunter River salinity trading scheme has been established to address this issue and requirements for discharges are included in the Bayswater Power Station's Environment Protection Licence.

There is the potential for water quality impacts during construction of the pump station and associated pipeline. Water quality of the Hunter River would be protected through the implementation of a range of measures which will be detailed in the Project Construction Environmental Management Plan (CEMP).

In operation there are no local water quality issues predicted to arise as a result of the Project.

Ecological Issues

The ecological issues have been assessed for the project site and the methodologies, findings and issues are summarised in Chapter 5.

Key ecological issues identified for the proposed project include the occurrence of River Flat Eucalypt Forest, an Endangered Ecological Community listed under the TSC Act, the presence of known platypus habitat at the new pumping station site, clearing for the pipeline route and potential for the pipeline to restrict fauna movements.

The vegetation along the river in the vicinity of the river pumps forms part of the River Flat Eucalypt Forest Community listed under the TSC Act. Mitigation measures to avoid any adverse impacts on the community include locating the pump and construction activities in the area on the river bank that is already heavily disturbed and implementing a long-term management and monitoring program targeting the River Flat Eucalypt Forest.

While the platypus is not listed as a threatened species its status is regarded as vulnerable, as it is dependent on river systems for its survival. A platypus study was conducted which found that the proposed activity is unlikely to have a long-term impact on the local platypus population. However, if construction is commenced during the breeding season, there is a possibility that nesting platypus could be impacted by excavation of the riverbank. Recommendations to mitigate potential impacts include confining the new pump facility and associated construction activities to the heavily disturbed section of bank. It is unlikely that platypus would use this site or frequent the disturbed section of the river once construction works have commenced.

It has been recommended that a long-term management plan and monitoring program targeting the platypus, and the health of the River-flat Eucalypt Forest be developed and implemented prior to commencement of site works. The management plan should be based on an 'adaptive management' approach, with management practices for the site accommodating the results of monitoring.

The Project is unlikely to have an effect on endangered, vulnerable or migratory species in the study area. In addition, assessments have indicated that the Project does not need to be referred to the Federal Environmental Minister under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Heritage Issues

An assessment of Aboriginal heritage values was undertaken for the Project and the findings are summarised in Chapter 5.

The site survey identified one isolated artefact on site. Due to erosion of the site there is low likelihood of sub-surface deposits and there are no identified Potential Archaeological Deposits (PAD) or areas of archaeological sensitivity within the area. Therefore, no further investigations are proposed.

No items of non-indigenous heritage significance were identified during the preliminary site investigations. The Plashett Homestead located about 2.5 kilometres to the west of the river pump station has heritage significance, but will not be impacted by the works.

Visual Impacts

The main aspects of the Project with potential for visual impact include the new pumping station and substation, the pipeline(s) and areas of disturbed ground during construction prior to its restoration.

The Project would be situated in a rural landscape. The visual catchment of the proposed pump station site consists predominantly of grazing land and is traversed by a Main Road No. 213, the Golden Highway. A number of rural residences are also located within the visual catchment. When viewed from the Golden Highway, the bulk of the Project would be obscured by a rise in the landform to the south of the river and partly by tree screening. Aspects such as night lighting can also be designed to reduce visibility of the installation at night-time.

The location of the pipeline(s) above ground is such that they will be visible from the area to the south of the pumping station and may also be visible from the township of Jerrys Plains.

The location of the pipeline route, pump station and control building would be chosen to minimise the extent of tree and shrub removal and to minimise destabilising the banks of the Hunter River. Following completion of the construction works the disturbed areas would be rehabilitated with native and locally endemic species. It is anticipated that this will improve the visual amenity when compared with the pre-

construction condition of the area. Painting of steel structures would use appropriate colour selection to minimise their visibility

Noise and Vibration

The existing and proposed Hunter River pumps are situated within a rural area. Noise impacts arising from the Hunter River water supply augmentation project may relate to construction activities, operation of the pumps and maintenance activities.

The electric powered submersible pumps would not emit a high noise output, and would be located below the level of the floodplain, thus reducing the potential transmission of the noise from the pumps. For these reasons and considering the lack of noise complaints arising from the existing equipment, it is considered that operational noise will not be a significant issue.

Construction works will cause temporary increase in noise levels at the locality, during the construction period of between 12 and 18 months. Due to the distance of the works from the nearest residences and the works timing, impacts would be low. Nevertheless the local community would be notified and a Construction Noise Management Plan would be prepared and implemented during the construction phase.

Owing to the emergent nature of the Project, Macquarie Generation has advised that it may not be possible to limit construction hours and a 24-hour construction schedule may be necessary.

Air Quality

Potential air quality impacts are considered to be minor and restricted to the construction phase of the project. Vehicle and machinery emissions as well as dust from earthworks during construction may temporarily impact the local air quality. However, there are no heavily populated or sensitive areas within proximity of the proposed construction sites. Measures will be implemented to mitigate potential construction impacts on local air quality as outlined in Chapter 5.

In operation the Project would have no impact on air quality.

Waste

A Resource and Waste Management Plan will be prepared. The National Code of Practice and relevant MSDS for products will be adhered to when handling, storing and transporting hazardous materials.

Traffic and Access

Access to the site for construction activities would be from the New England Highway via the existing road network on the Bayswater Power Station site.

Even during the peak construction period of the Project, the traffic volumes are not considered likely to cause any safety or road capacity issues due to the standard of the access roads and the isolated nature of the site. Traffic control measures will be implemented for the construction stage. In operation the Project would generate only minimal traffic.

Safety Issues

During construction and operation of the Project, all personnel coming to the site would be subject to a comprehensive Occupational Health and Safety plan and procedures, implemented either by the contractor (during construction) or by Macquarie Generation (during operation). All construction, operation and maintenance personnel would need to be inducted to the site prior to entering to carry out works, and the plans and procedures would include requirements for monitoring, recording and reporting in terms of OHS performance, and for management of any incidents on the site.

Socio-economic

The Project aims to improve the security of water supply to the Bayswater and Liddell Power Stations thereby improving electricity production during times of drought. The security and reliability of power

supplies is in the interest of all electricity consumers of NSW and the broader National Electricity market. The construction of the new facilities will also provide short-term employment in the range of 30 – 50 people some of whom may come from the local area.

Statement of Commitments

The mitigation measures that are proposed for the Project have been identified in the relevant sections of the EA. A compilation of mitigation measures is provided in Chapter 6 and represents the 'Statement of Commitments' made by Macquarie Generation to meet the requirements of assessment under Part 3A of the EP&A Act.

Conclusion

The primary benefit of the Project is the improved security of water supply to key electricity generation facilities and correspondingly, improved security for electricity generation particularly during extended drought periods.

The Environmental Assessment has identified the components of the augmented Hunter River water supply system and the potential environmental impacts arising from construction and operation of the facilities together with the measures incorporated to mitigate the Project's impacts.

The Environmental Assessment presented in this document indicates that with the incorporation of the mitigation measures described the Project can be implemented in an acceptable manner. The key environmental issues to be managed for the Project include terrestrial and aquatic ecology, erosion, sedimentation and visual impact.

Macquarie Generation has prepared a draft Statement of Commitments to describe how the issues would be managed through the implementation of the Project. Following public exhibition of the Environmental Assessment and its review by DoP together with review of submissions received, a 'preferred project' report would be developed for determination of the Major Projects Application by the DoP.

1. Introduction

This Environmental Assessment has been prepared by Connell Wagner on behalf of Macquarie Generation to support a Major Projects Application for the augmentation of its Hunter Water Pumping station near Jerry's Plains, NSW (Figure 1.1). Specific Environmental Assessment Requirements (EARs) for the scope and content of the Environmental Assessment were prescribed by the Director-General on 22nd October 2006 (see Appendix A) and are addressed in this Environmental Assessment.

Macquarie Generation is a State Owned Corporation that operates the Bayswater and Liddell Power Stations in the Upper Hunter Valley. The two coal fired power stations are located on either side of the New England Highway, approximately 25 kilometres north west of Singleton and can meet approximately 40% of the NSW electricity demand.

Macquarie Generation currently consumes around 60,000 megalitres (ML) of water per annum for the operation of the Bayswater and Liddell Power Stations and this water is critical to the operation of the two stations. This water is sourced from the Hunter River under a water management licence issued by the Department of Natural Resources (DNR).

The water extracted from the Hunter River is pumped to either Plashett Dam, Lake Liddell or direct to Bayswater Power Station. All of the water extracted is used for the operation of the Bayswater and Liddell Power Stations. A comprehensive water management system has been implemented to ensure efficient use of the water, recycling of water and to avoid adverse impacts on water quality of the Hunter River catchment below the Liddell and Bayswater Power Stations.

Constraints in the existing pumping capacity at the Hunter River limit Macquarie Generation's ability to fully access its water supply entitlements particularly those available during periods of high flows in the Hunter River. Accordingly, the augmentation of the Hunter River pumping station has been proposed to improve access to these high flows and thereby improve the security of water supplies for the two stations.

The Hunter River Pump Station augmentation involves a new pumping station, pipeline and power supply. The additional pumping capacity and a new pipeline would be used to transfer water directly to Plashett Dam for storage until required.

The augmentation does not require any variation to the total amount of water extracted but varies the timing of extraction with potential benefits for all water users. This assessment reviews the environmental impacts of increasing the pumping capacity at the Hunter River on the local environment and the Hunter River water quality.

1.1 Project Location

Macquarie Generation's Hunter River pumping station is located in the Upper Hunter Valley approximately 2 km north of Jerrys Plains, as shown in Figure 1.2. It is approximately 20 km south of the town of Muswellbrook and 30 km north-west of Singleton. The project site including the proposed pumping station and pipeline extends from the pumping station on the Hunter River to the Plashett Dam several kilometres to the north.

The new pumping station will be located on the northern bank of the Hunter River immediately upstream of the existing pumping station and slightly downstream of the River's junction with Saltwater Creek (see Plate 1).

The locations of the new pumping station and pipeline are within the Singleton Local Government Area (LGA). The land is zoned 1(a) (rural zone) under the provisions of Singleton Local Environment Plan (LEP) 1996.

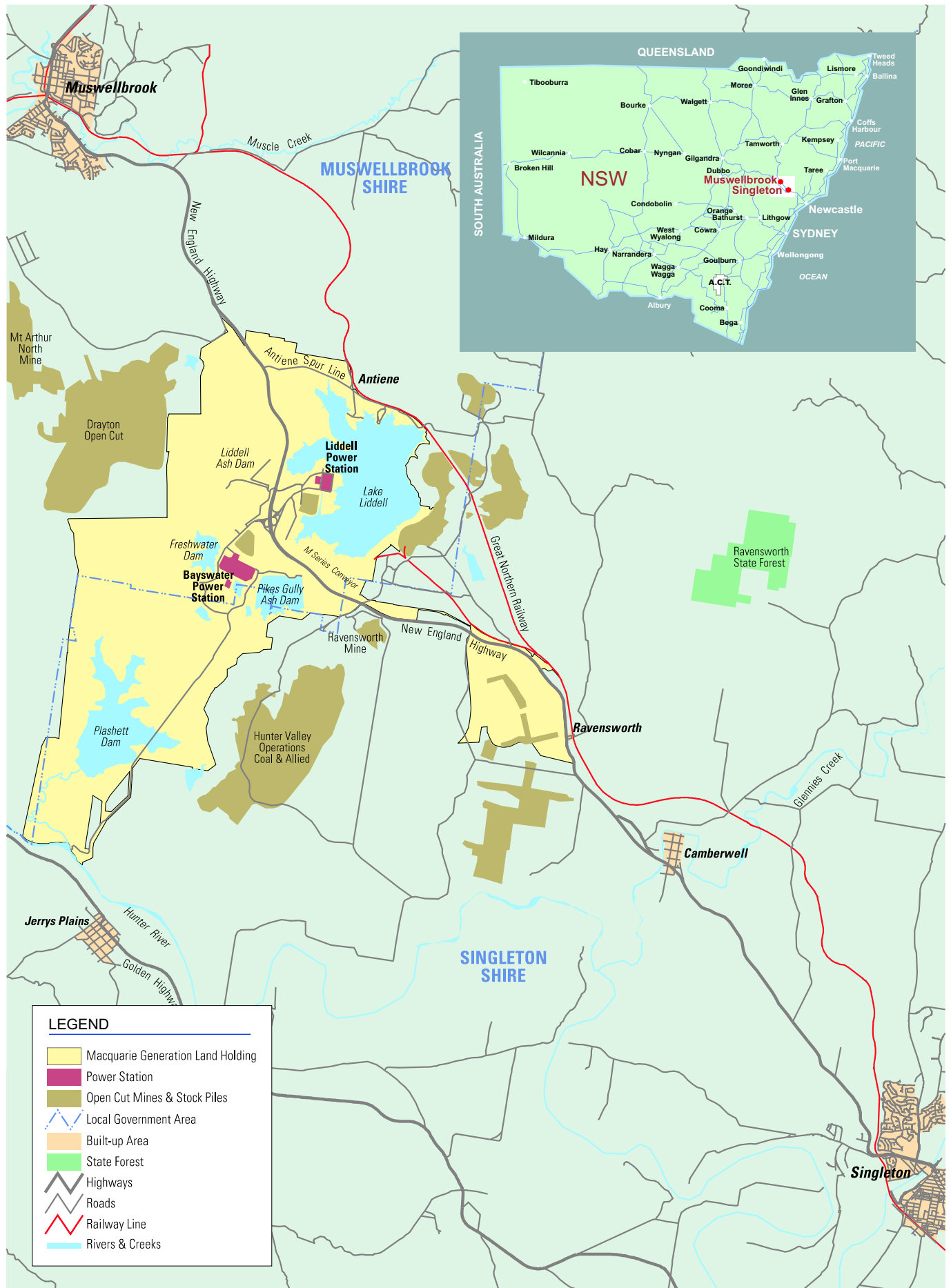


Figure 1.1

Regional Map

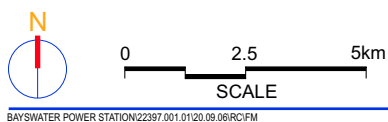




Figure 1.2

Proposed layout pump station



1.2 Land Ownership and Land Use

All infrastructure required for the Augmentation Project will be located on land owned by Macquarie Generation and within the Singleton LGA. The property title details for Macquarie Generation's land holdings relative to the project are shown in Table 1.1 and in Figure 1.3.

Table 1.1 – Details of land title and ownership

Project component	Lot	DP	Landowner	LGA
Pumping Station	91	234544	Macquarie Generation	Singleton
Pipeline	1	616024		
Pipeline and outlet to Plashett storage	110	625973		

The land surrounding the existing pumping station site on the Hunter River is predominantly cleared with some riparian vegetation fringing the river. The land extending from the pump site to Plashett Dam where the proposed pipeline would be located generally consists of cleared grazing land with a relatively small area of native forest and in other places, scattered trees. This land is currently used for cattle grazing. Eucalypt plantations are also located adjacent Plashett storage

The neighbouring land on the south bank of the Hunter River comprises privately owned pastoral lands that are subject to irrigation. As mentioned previously, Jerrys Plains township is located about two kilometres to the south of the proposed pumping station.

1.3 Project Participants

The Project proponent and operator of the Hunter River pumping station is Macquarie Generation. Macquarie Generation is a State Owned Corporation that operates the Bayswater and Liddell coal fired Power Stations in the upper Hunter Valley. These stations have a combined generation capacity of 4,640 megawatts (MW) with the individual station capacity shown below.

- Bayswater Power Station – 2,640 MW (Four 660MW units)
- Liddell Power Station – 2,000 MW (Four 500 MW units)

Macquarie Generation's Mission Statement is provided below:

“Macquarie Generation seeks to become Australia's preferred provider of electrical energy and related products by adding value for its shareholders, customers and the community through the operation of a successful commercial business that supplies reliable and safe products at a competitive cost and in an environmentally sensitive manner”.

Bayswater Power Station has responsibility for maintenance of the Hunter River Pumping Station and, as part of its business operations, has a certified environmental management system and is committed to continual improvement of its environmental performance.

Other key project participants who are directly involved are:

- The Consent Authority for this project is the Minister for Planning acting through the Department of Planning (DoP);
- A project contractor will be appointed to undertake construction works.

Connell Wagner has been engaged by Macquarie Generation to coordinate the environmental impact assessment and to prepare this Environmental Assessment in support of Macquarie Generation's Project Application.

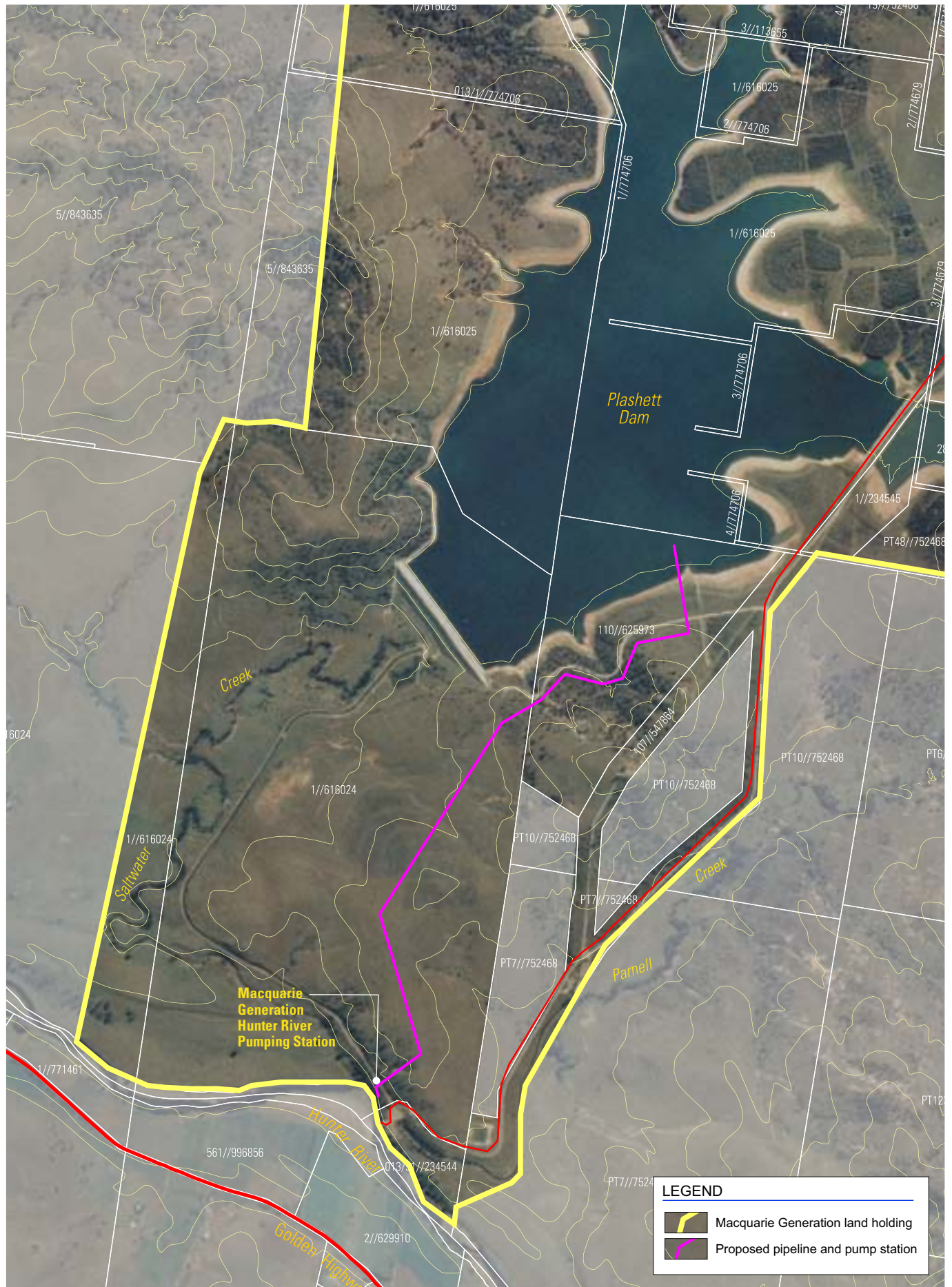
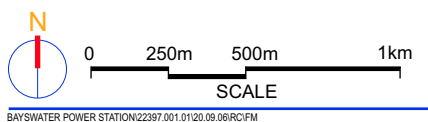


Figure 1.3

Macquarie Generation land holdings



1.4 Stages of the Development Process

The development consent process for the project is subject to Part 3A of the *Environmental Planning and Assessment Act 1979*, and requires the consent of the NSW Minister for Planning. Approval of the Commonwealth Minister for the Environment may also be required.

The following stages of the development process have been completed:

- Macquarie Generation informed DoP of the proposed project details and potential environmental impacts
- Based on Macquarie Generation's advice as to the project description and the DoP's consideration of potential impacts, Environmental Assessment Requirements (EARs) have been issued to Macquarie Generation (see Appendix A).
- Site specific planning and environmental studies have been conducted to address the EARs
- Government agency and community consultation has been commenced by Macquarie Generation as required in the EARs
- This Environmental Assessment has been prepared
- A Major Projects Application has been submitted to DoP together with this Environmental Assessment, which includes a draft Statement of Commitments.

Subject to DoP's acceptance of the Environmental Assessment (EA) it will be publicly exhibited for 30 days. In parallel, the DoP seeks comments on the EA from relevant government agencies including any conditions that the agencies believe should be incorporated in a project approval.

Following the completion of the exhibition period, the DoP undertakes a review of all submissions in the context of its own review of the EA. Where necessary, further information may be sought and the proponent may be asked to modify the project and submit a preferred project report. Once that stage is completed the DoP is able to make a recommendation to the Minister for Planning to grant or refuse consent.

1.5 Structure of this Environmental Assessment

This EA aims to present the relevant planning and environmental assessment matters in a manner that can be read and understood by all potentially interested stakeholders.

The Main Sections of the EA provide a summary of the key matters that need to be addressed by the EA. Supporting specialist studies and associated documentation are provided as Appendices to the EA.

The subsequent sections deal with the following matters:

- Section 2 – Need and Justification for the Project
- Section 3 – Project Description
- Section 4 – Statutory Controls and Approvals Process
- Section 5 – Environmental Assessment
- Section 6 – Statement of Commitments
- Section 7 – Conclusion
- Section 8 – References
- Appendices – EARs, Correspondence, Consultation Details and Specialist Study Reports

2. Need and Justification for the Project

The Hunter River is Macquarie Generation's primary source of water that is required for bulk electricity generation at its Bayswater and Liddell Power Stations. This water is used for cooling purposes and is essential to the security of operation of the two coal fired power stations which supply power to consumers in NSW and the National Electricity Market.

Water reforms were recently implemented in NSW and the Hunter Valley via the *Water Management Act 2000* and the Hunter River Water Sharing Plan. The new Act and the Water Sharing Plan issued in 2004 established the way in which water is to be allocated from the Hunter River and the way in which the needs of all water consumers including the environment are to be served.

As a result of these reforms changes were made to Macquarie Generation's Water Management Licence, which now requires the power stations to extract more of their licensed Supplementary water entitlement from high flow events in the river rather than extracting water during lower flow periods. Due to the relatively short duration of these high flows an increased pumping capacity is therefore needed to extract the same volume of water as was extracted before the reforms were implemented. In the circumstance of the current drought the increased pumping capacity will also enable earlier recovery of depleted storage levels using high flow capture.

To enable Macquarie Generation to maintain the same level of certainty of water supply that it had before the water reforms were implemented, the Department of Natural Resources (DNR) issued a Water Management Licence entitling Macquarie Generation to extract 1,200ML/day from the Hunter River only when certain high flow conditions existed. It is therefore necessary for Macquarie Generation to augment the existing pumping station, which has a pumping capacity of only 450ML/day, to a total capacity of 1,200ML/day.

A range of design options has been considered for the augmentation of the Hunter River water supply system, and additional alternatives have also been reviewed by Macquarie Generation. A summary of the options considered by Macquarie Generation is provided below.

2.1 No Augmentation of the Hunter River Water Supply System

If Macquarie Generation does not proceed with the augmentation of its Hunter River water supply system then it risks interruption to its power generation operations. The electricity produced by the Bayswater and Liddell Power Stations represents about 40% of NSW supply capacity. In addition, its operation in the National Electricity Market (NEM), means that it carries certain contractual obligations in relation to electricity supply. The inability to generate at Bayswater and Liddell Power Stations presents commercial risks to Macquarie Generation and potential power shortages to the NEM and its electricity consumers.

2.2 Augmentation of the Hunter River Water Supply System

The augmentation of the Hunter River water supply system enables access to a larger proportion of the potential water supply available during the high flow periods in the Hunter River. That access improves the potential to extract the annual water supply volumes available under the Licence and reduces the risk of water shortages and associated constraints on generation capacity. Correspondingly the augmentation reduces Macquarie Generation's commercial risk arising from shortfall in water supply.

A range of design options were considered for the augmentation of the Hunter River water supply system as indicated below:

- Pump capacities of between 800 and 1600 ML/day at the river were considered involving various combinations of upgrading of the existing LP pumping station and a new LP pumping

station of 800 ML/day. The current proposal involves the retention of the existing LP pump station and installation of additional 800 ML/day capacity. This option was assessed as the most suitable for Macquarie Generation's requirements and is allowable under the Water Management Licence.

- Two types of pumps were considered, these being submersible pumps and single stage vertical type pumps. The selected design involves submersible pumps.
- A number of pipeline routes and designs were considered. A preferred route has now been identified and the pipeline design has considered both single and dual pipelines. A decision on the form of the pipeline (single or dual) will be made based on project cost and advantages and disadvantages of the respective options.
- Design of the pumping station has addressed the need to keep the intake clear of debris when pumping and to provide access to the area above the pumps during high flows should it be required. Accordingly the design links the water intake of the existing station to the inlet to the new station which has a more effective means of screening the inflows.
- Arrangements for power supply have included consideration of the location of the substation supplying the pumping station.

2.3 Alternative Water Supply Arrangements

As an alternative to the augmentation of the Hunter River water supply system, Macquarie Generation has reviewed a range of other options for augmenting the power station water supplies. Such options have included water supplies obtained by pipeline from locations other than the Hunter River pumps including supply from Glenbawn Dam direct to the upper Hunter power stations, from Glennies Creek Dam and from treated sewage effluent obtained from municipal sewage plants.

While a number of options are currently under consideration these are being considered as longer term and complementary options. Planning for these options is in progress and if suitable, implementation could follow this proposal.

3. Project Description

This section provides a description of the existing water supply infrastructure and the works associated with the construction and operation of the new pumping station, pipeline works at Plashett Dam and associated access and power supplies.

3.1 Existing Facilities

The existing scheme, built in the late 1960s, includes 5 low pressure pumps that have capacity to extract up to a maximum of 450 ML/day. However, in practice an average capacity of only 420 ML/day or less may be available due to operational constraints.

Water extracted by the Hunter River pumps is pumped either directly to Macquarie Generation's operating facilities or to Plashett Dam, which serves as an off-river storage. The existing pumping system components are shown in Figure 3.1 and are listed below.

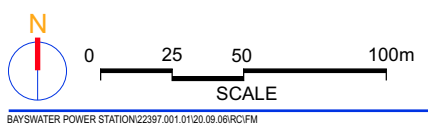
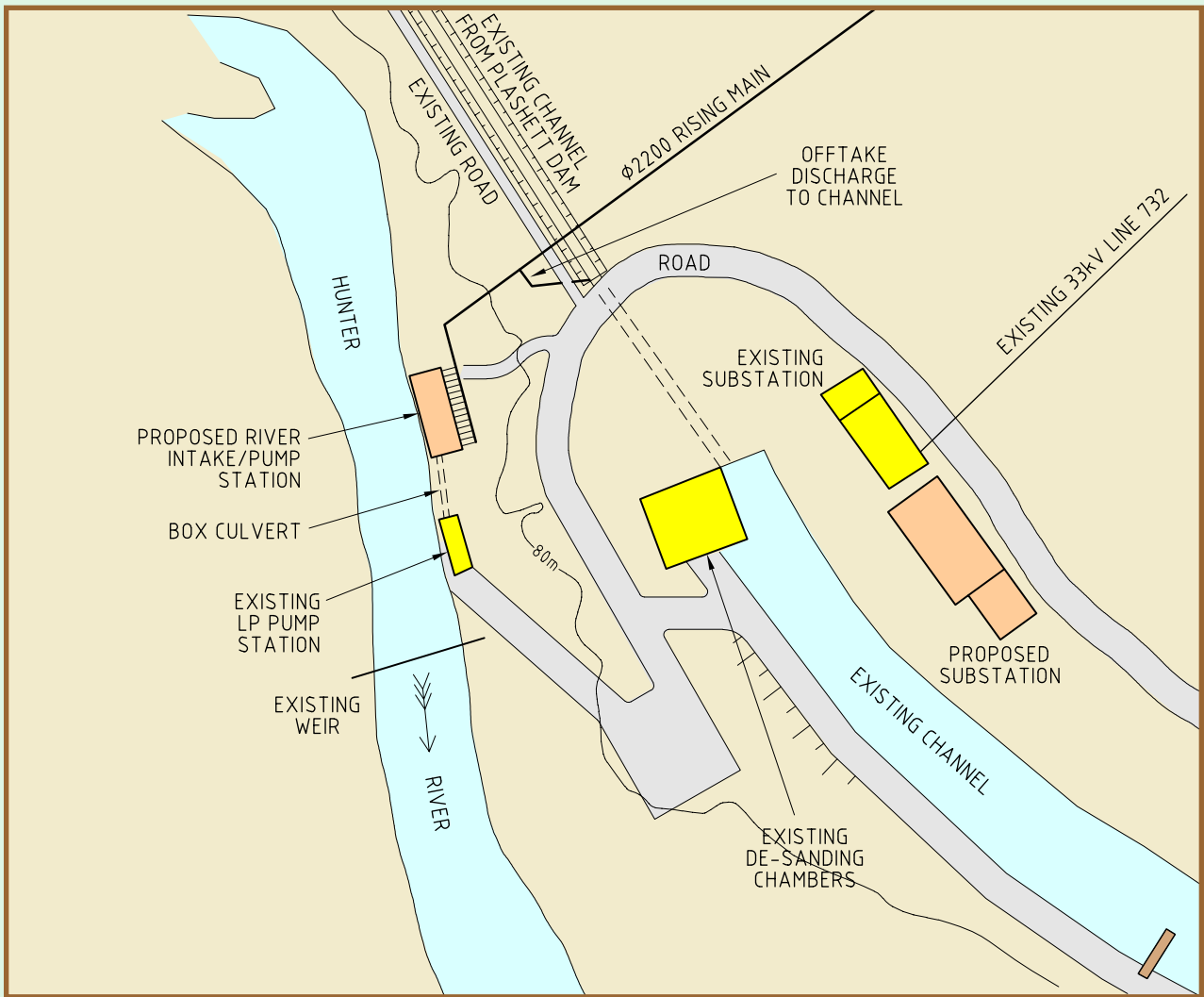
- Low Pressure Pumping Station (LPPS)
- River pondage formed by rock weir with fish ladder on southern side. The pondage maintains water levels at the pumps
- High Pressure Pumping Station (HPPS)
- Canal system between Plashett outlet and the High Pressure pumping station. Water in the canal flows to the east toward the HPPS
- Pipeline that takes water from the HPPS to one of three locations as follows; Plashett Storage, Bayswater Power Station or Lake Liddell
- Plashett storage and associated inlet and outlet structures
- Power supply including overhead line and substations at the LP and HP pumping stations
- 11 km access road (about 7.5km unsealed) from Bayswater Power Station to River Pumps.

The low pressure pumps at the Hunter River transfer the extracted water by a pipeline a distance of several hundred metres to an open canal. The water then flows via the open canal, a distance of 1.7 km to a high pressure pumping station that lifts the water some 90 metres to a point where a surge tower structure is located. The water can then be directed to Lake Liddell by the pipeline or by an off-take to Plashett Dam for storage or to Bayswater Power Station for cooling water make-up. Water directed to Lake Liddell may also pass through a lime softening plant that removes calcium from the water supply to reduce potential fouling of the Liddell Power Station condensers.

Substations at the low pressure and high pressure pump stations provide power supply for the pumps and associated requirements such as lighting. Access to the pumping stations is via an unsealed road on Macquarie Generation land.

The existing inlet structure at Plashett storage originally involved water pumped from the HPPS being discharged to a lined channel. However, water entering cracks in the channel lining caused the undermining of the channel and its subsequent failure. The channel has now been replaced by discharge from the pipeline to a stilling pond and subsequent spilling into a number of smaller pipes leading down to Plashett storage, as shown in Plate 2.

Releases from Plashett Dam are directed to the canal that follows a gentle grade around the slopes on the northern side of the Hunter River, past the LPPS and back to the HPPS where the water can be pumped to Bayswater Power Station or Lake Liddell. A small hydro-electric generator at the outlet from Plashett Dam enables the generation of electricity from the releases. The water level in the canal between the LPPS and HPPS can be maintained at times when both sets of pumps are operating by releases from Plashett. Excess levels may be spilled to Parnells Creek.



Source: Macquarie Generation

Figure 3.1

Project Layout – Pump Station



3.2 Proposed Augmentation

The proposed Low Pressure (LP) Pump Station Augmentation Project (the Project) involves a number of components including:

- New low-pressure pump station capable of extracting up to 800 ML
- Above ground pipeline(s) from Hunter River Pumping Station to Plashett Storage
- Water discharge structure at Plashett Dam
- Associated power supply works
- Access works.

The proposed locations of the new pump station and pipeline are shown in Figure 3.1, while the proposed configuration of the pump station is illustrated schematically in Figure 3.2. The combined capacity of the existing and proposed low pressure pump stations will be 1,200 ML/day. Operation of the overall water supply system, when completed, is illustrated schematically in Figure 3.3.

This Project is directed to securing additional water supply during high flow events in the Hunter River for the current level of operation for Bayswater and Liddell Power Stations. The Project does not involve any change to the operation of the power stations in terms of their capacity to generate electricity or their generation requirements. There are no other proposed changes, implied or otherwise, to the operations or generating capacity of the power stations with respect to this Project.

Details of component parts of the project are provided below.

3.2.1 New low-pressure pump station

The intake of the proposed pump station would be built parallel to the Hunter River with an 80 mm (nominal) trash screen across the face. The station would be sized to house up to 10 submersible pump sets with a total extraction capacity of 800 ML/day. Together with the existing LP pump capacity that would give a total capacity of 1,200 ML/day. It would be possible to operate the stations at a range of pumping rates by varying the number of pumps in service.

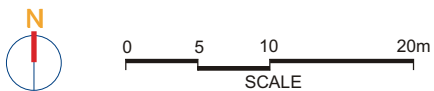
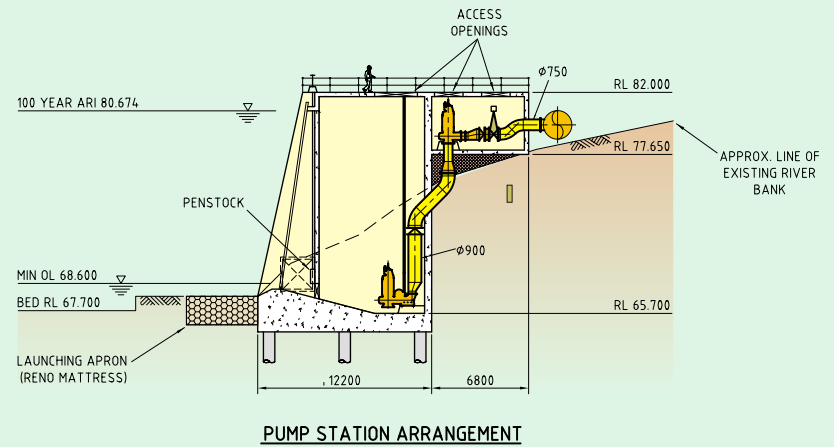
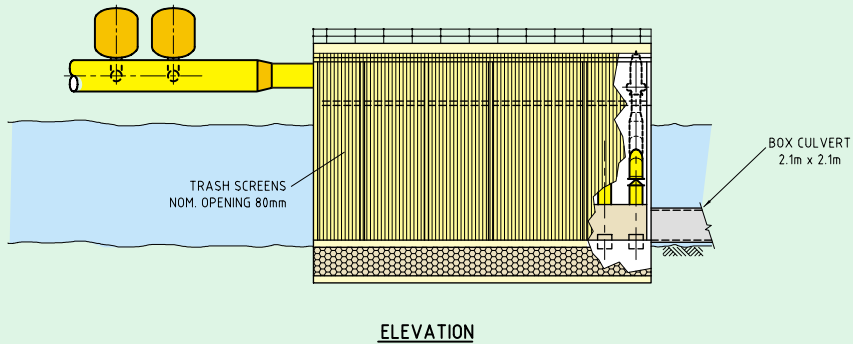
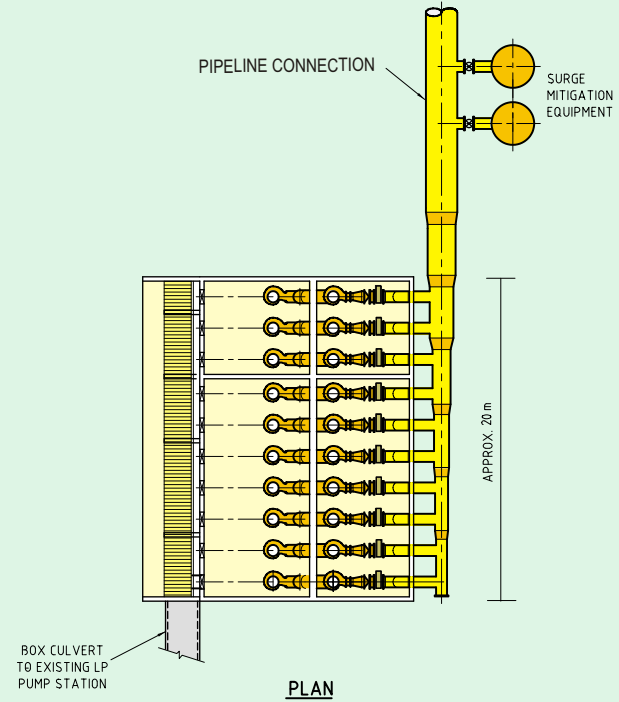
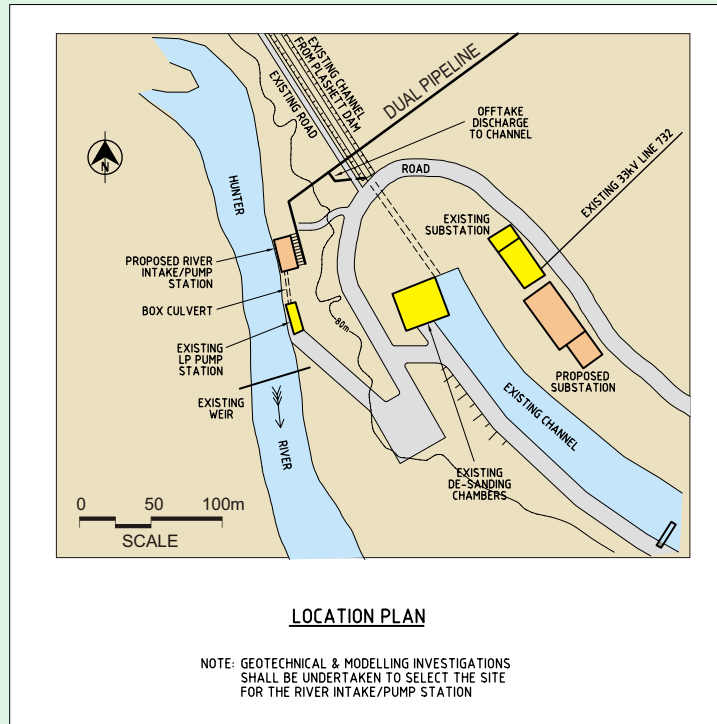
The approximate dimensions of the pump station are 32 m wide by 17 m high. The proposed pump station would be located on the upstream side and within 100 m of the existing pump station with a nominal 2.1 m by 2.1 m box culvert or equivalent pipe providing a link between the two pump stations. Where practicable, the distance between the two pumping stations would be minimised. However, sufficient separation would be necessary to maintain the existing LP station and its intake in an operable condition during construction works, which are likely to include a coffer dam. Further studies may be necessary to define the spacing required between the construction works, and the existing pumping station.

Additional power supply facilities would be required for the new LP pumping station.

3.2.2 Water Supply Pipeline(s)

A single above ground pipeline of nominal external diameter 2,300 mm (or equivalent dual pipelines) would be used to transfer water from the new Hunter River pump station to the discharge point above Plashett storage. The proposed pipeline(s) would have a nominal length of 3,500 m between the new pumping station and a proposed flow discharge structure at Plashett Dam. A permanent gravel access track would be provided over the majority of the pipeline route for installation and long-term maintenance use.

Surge mitigation equipment will be installed at the pumping station to control water hammer and water operating conditions.



Source: Macquarie Generation

Figure 3.2

Pump Station Configuration

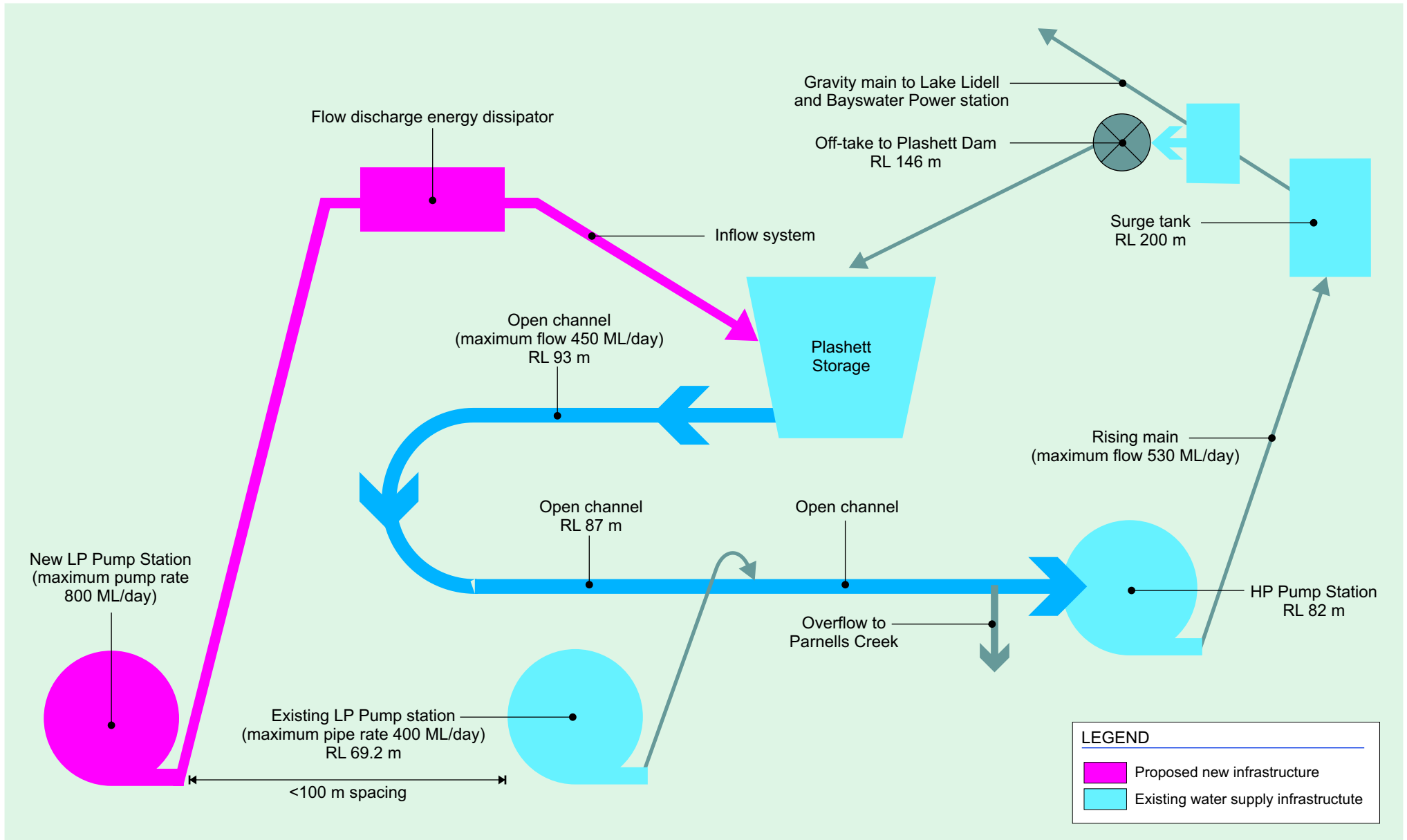


Figure 3.3

Augmented Pumping System Arrangement Schematic Diagram

The current preferred pipeline route (see Figure 3.4) has been chosen so as to minimise, where possible, changes in grade and elevation. From the pump station site, the pipeline would ascend directly to the top of the small hill on the north east side of the existing open canal, to a height of approximately 140 m above sea level. From this point, it would generally follow the contour in a northerly direction towards Plashett storage, then meeting the existing gravel access road and turning towards the north east. At a suitable point (subject to detail design), the pipeline would terminate and an outlet structure would discharge directly into Lake Plashett.

Towards the northern end of the nominal pipeline route, the terrain steepens and the route traverses a number of gullies. The proposal therefore allows for the pipeline to span gullies where necessary, in order to maintain the desired grade and alignment.

3.2.3 Water discharge structure at Plashett Dam

Suitable energy dissipation structures would be installed to allow discharge into Plashett Dam over a range of dam water levels without scouring or damaging the dam embankment. This is likely to involve a stilling basin at the outlet to dissipate the energy of the discharged water or alternative measures to dissipate the energy of the water as it is discharged into Plashett Dam. The discharge structure is likely to be similar to the existing structure as illustrated in Plate 2, which was constructed in mid-2006 to replace the former open concrete channel structure, which had failed

3.2.4 Power supply works

An additional substation and switchroom is proposed just south of the existing substation located above the LP pumping station. The existing 33 kV Line no. 732 may require upgrading to supply the augmented pumping station.

Oil filled transformer(s) would be located within bunds that have been sized to contain the volume of transformer oil should a transformer fail and lose oil. Alternative dry type transformers may be used.

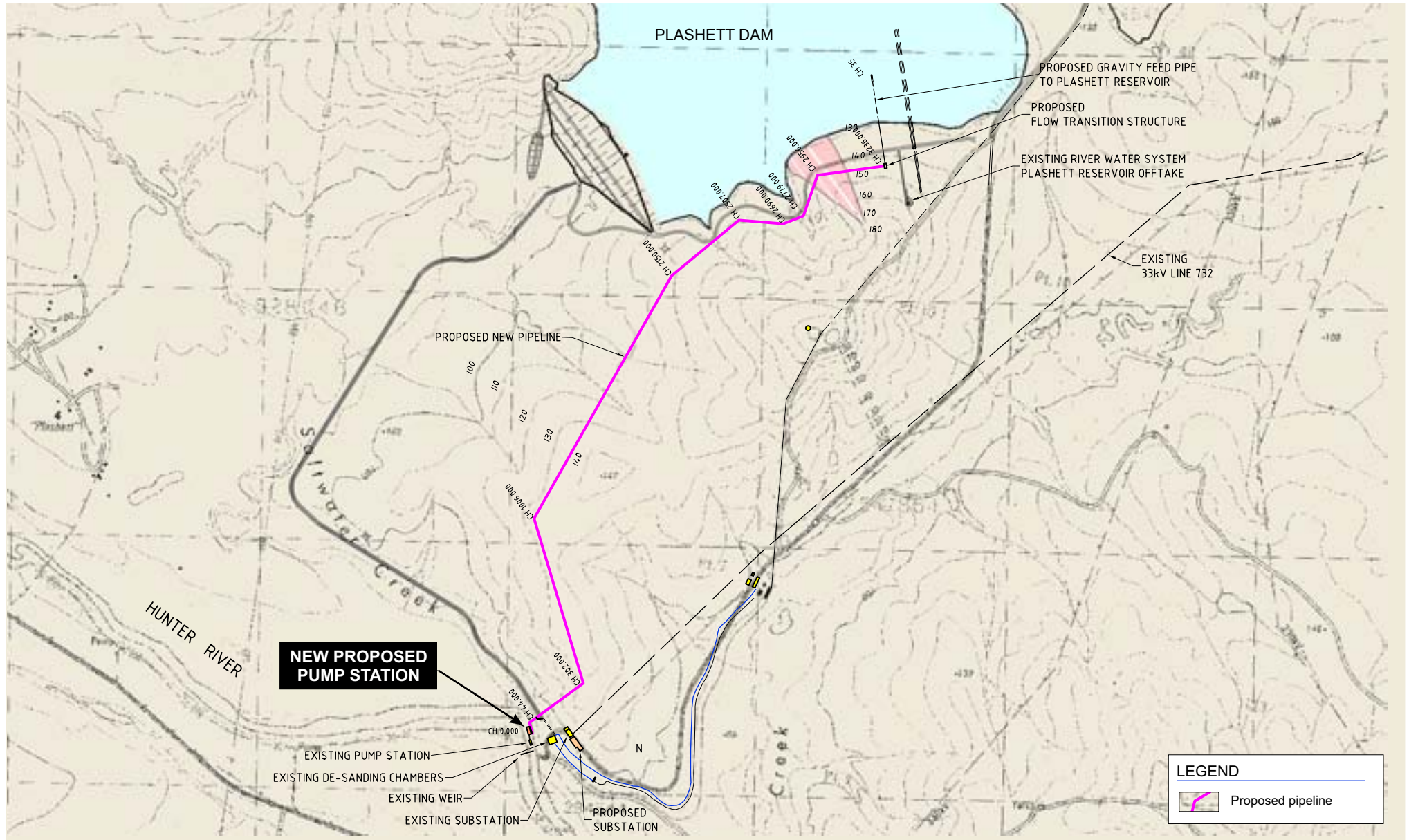
3.3 Construction Activities

The Project is expected to take approximately 12 to 18 months to complete, from award of Contract. Owing to the emergent nature of the Project, Macquarie Generation has advised that it may not be possible to limit construction hours and a 24-hour construction schedule may be necessary. Construction activities for the project would include:

- Preparation of Contractor's site laydown areas
- Transportation of materials to the site
- Excavation for pump site and substation
- Construction of footings
- Construction of main pump station structure and installation of pipes
- Electrical connection works
- Land clearing and installation of pipeline(s) and access tracks
- Pipe support structures across gullies
- Access and drainage works
- Site Restoration
- Commissioning and performance testing.

An indicative site layout for construction works at the pump station site is shown in Figure 3.5. Construction access and laydown areas for the pipeline and Plashett discharge structure are illustrated in Figure 3.6.

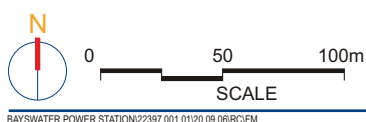
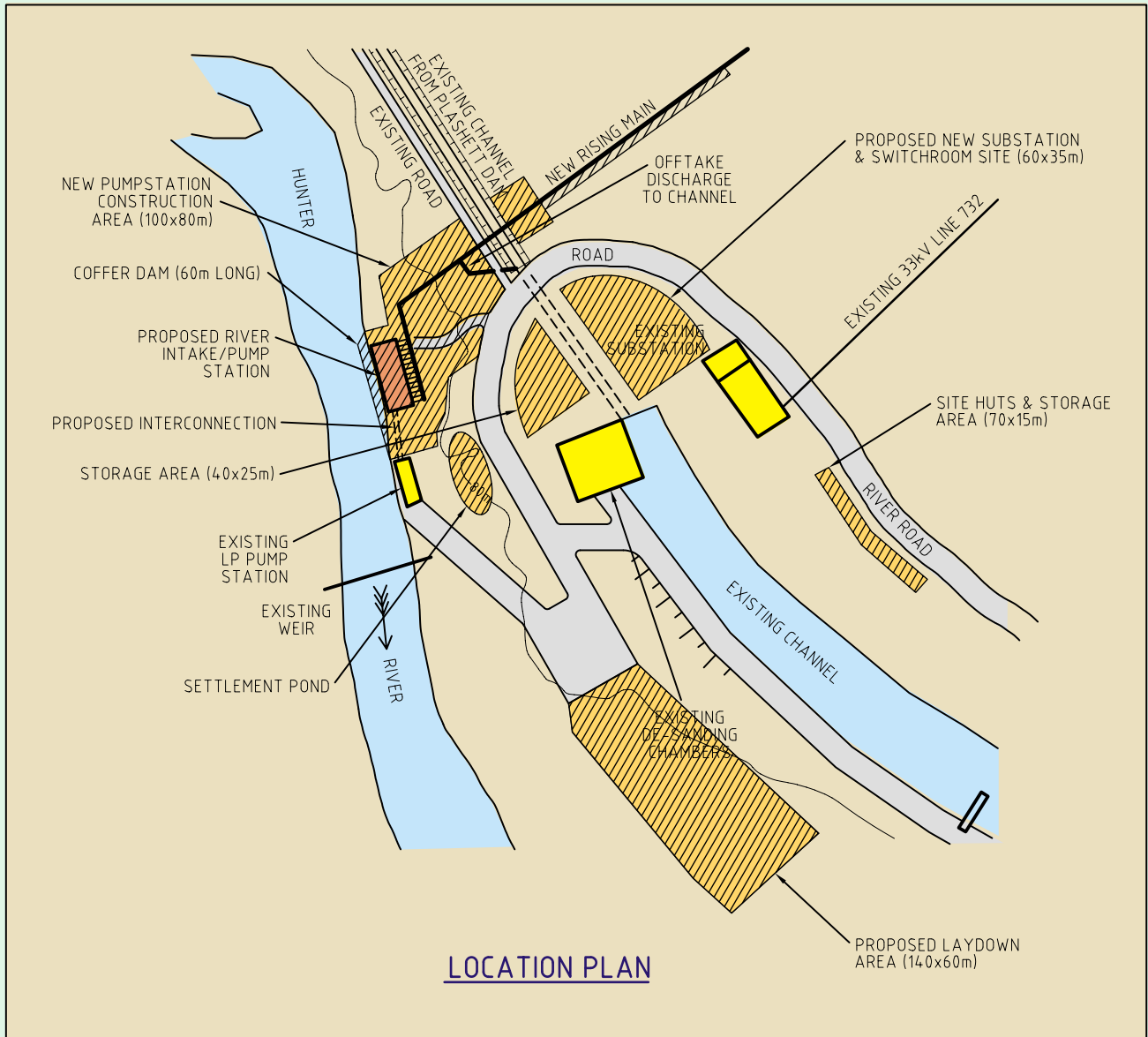
Indicative average workforce numbers at any time during construction of the project would be in the range of 30 – 50 employees for the construction. Actual numbers would vary according to the contractor's equipment and construction techniques.



Source: Macquarie Generation

Figure 3.4

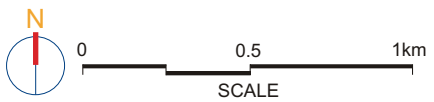
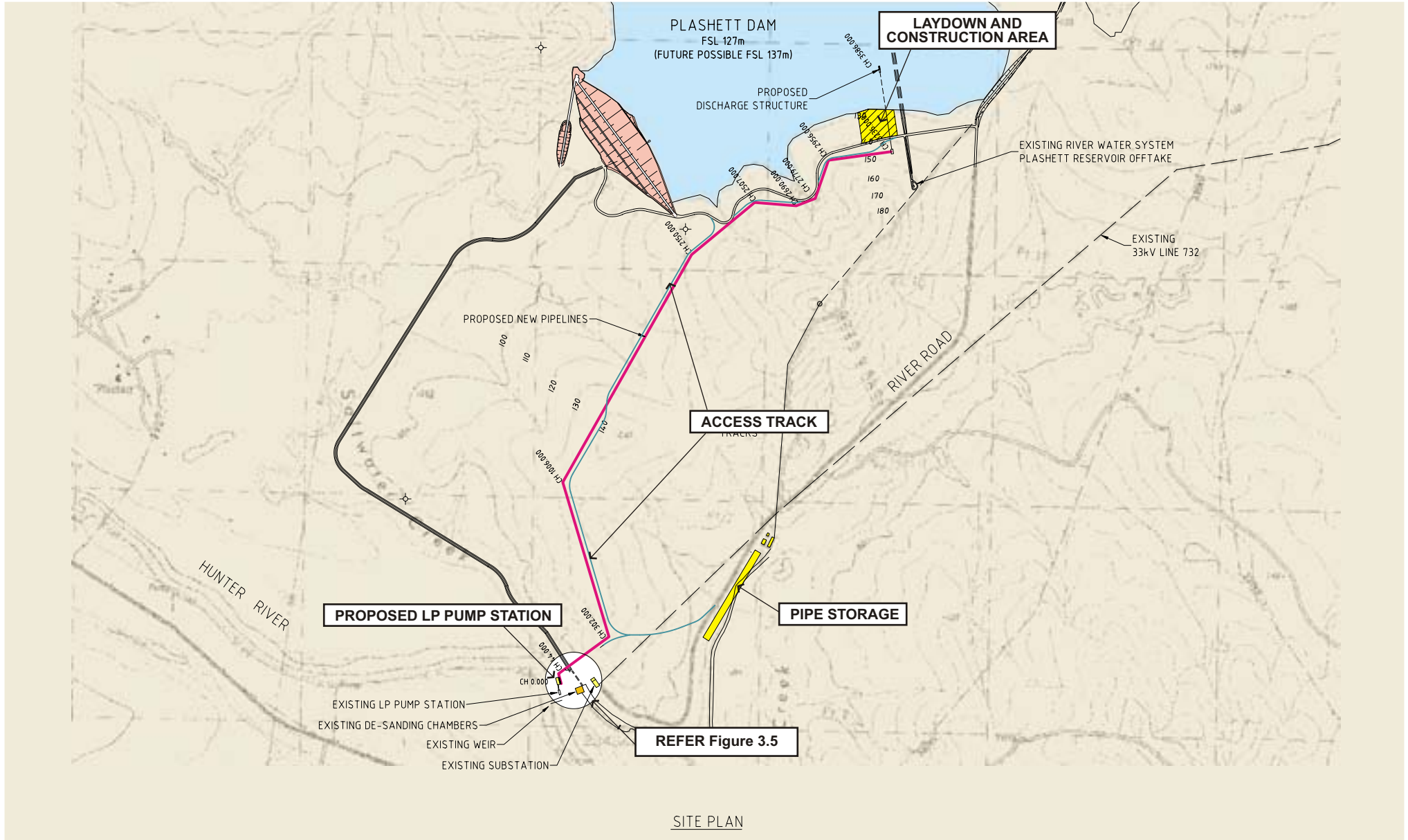
Site Plan and Preferred Pipeline Option



Source: Macquarie Generation

Figure 3.5

Proposed Pump Station Construction Site Layout



Source: Macquarie Generation

Figure 3.6

Overall Site Plan - Construction Sites and Access

3.3.1 Transportation of plant and materials

Materials to be transported to site will include the items in the Table below(indicative quantities only).

Table 3.1 – Estimate of Plant and Materials to be transported to Site

Component Item / Material	No of Items	Unit Weight tonnes	Comment
New LP Pumping Station			
Submersible LP pumps	20	7 each	10 sets of 2 pumps
Valve gear	20	0.75 each	2 valves per pump set
Flowmeters	10	0.50	
Stop Logs	8 sets	8/set	
Surge mitigation	2	6 t each	
Screens	8 sets	6/set	
Steelwork	1 set	45	
Concrete (Pumphouse)	2,300m ³		
Reinforcing steel			Included in Concrete
Pipeline and supporting structures			
2300 mm diameter (or equivalent 2 x 1700 mm) Steel Pipe sections, (unit length 12 m)	290	20	3500 metres pipeline length
Concrete (m ³) footings	1,000		25 m span
Other pipe sections	1 set	20	Local to pump station
Discharge structure to Plashett Storage			
Concrete	1 set	1,500	Design by Contractor
Steelwork	1 set	50	
Substation and Overhead Line Works			
Transformers	2	40 each	Single heaviest load
Switchgear	1 set	-	
Access Track			
Road base and gravel, 3 m width			3,000 metres

3.3.2 Excavation of LP Pumping Station Site

The excavation of the northern bank of the Hunter River for the new LP pumping station would need to be managed in the context of:

- potential river bank erosion
- risk of high flows occurring during the construction works.
- placement of coffer dam structure in river
- disturbance to and impact on local platypus population (see section 5.7)
- impact on vegetation (see section 5.7)

Prior to any detail design and construction work commencing, modelling of the new pump station intake and the Hunter River would be undertaken to verify pump station performance and minimise impact in the Hunter River.

The excavation would have a width of about 24 metres (along the river bank) and extend about 13 metres into the river bank with the high wall at the back of the excavation being of the order of 10 metres (in excess of 10 metres with allowance for batter). The volume of material excavated would be approximately 1,750 m³ and may include gravels and rock material.

The proposed excavation for the pumping station would need to be undertaken with a barrier to protect the excavation from the impact of river flows. This may involve a coffer dam that would be maintained for the duration of the vulnerable works.

The excavated material may be used at the site of the pumping station to form a platform above the station that could be used for parking maintenance vehicles including a large crane that would be required to install and remove the submersible pumps.

3.3.3 Construction of the Pipeline(s)

The new pipeline (single nominal 2.3 m external diameter or dual 1.7 m nominal external diameters) would be cement lined, steel pipe following the general route as shown in Figure 3.4. The pipeline(s) would be sized for up to 800 ML/day flow. A new gravel access track will be constructed along the majority of the pipeline route to provide access for construction of concrete foundation anchors, installation of the pipes and for long-term maintenance. As shown in Figure 3.7, some re-grading or small amounts of cut and fill along the pipeline route would be required, to provide a more stable, level surface.

The proposed construction method allows for a nominal 500mm ground clearance beneath the pipe(s), in 12 m spans between concrete anchor blocks that would be embedded in the ground (see Figure 3.7). This clearance would enable suitable fauna passage and would not inhibit runoff. A similar approach would be adopted where the pipes cross gullies, with the pipes anchored on either side as shown in Figure 3.7. For spans greater than 12 m (ie the length of one pipe section), gully crossings may require some form of centre support, or welded sections of pipe which could span up to 30 m.

3.3.4 Construction of the inlet flow structures at Plashett Storage

An energy dissipation structure would be constructed at Plashett Dam to allow discharge of up to 800 ML/day over a range of dam surface levels without damage to the dam banks or subsurface areas.

The design and construction details of the inlet flow structures would be prepared during the detail design phases of the Contractor's works.

3.3.5 Construction of power supply facilities

Existing transmission line No. 732 may require upgrading depending on the final pump selection and power requirements at the new pump station. A new substation and switchroom would be required to service the new pump station. These facilities would be built above the 1:100 year flood level near the existing substation and switchroom.

3.3.6 Commissioning of new pumping station

Once construction works have been completed including power supply connection and testing, the new power station would be ready for commissioning.

However, the timing of commissioning trials would be dependent upon Hunter River flow levels and Water Management Licence conditions. It may be possible to undertake incremental testing of parts of the new pumping station during periods when Hunter River flow levels do not allow the full operation of the station.

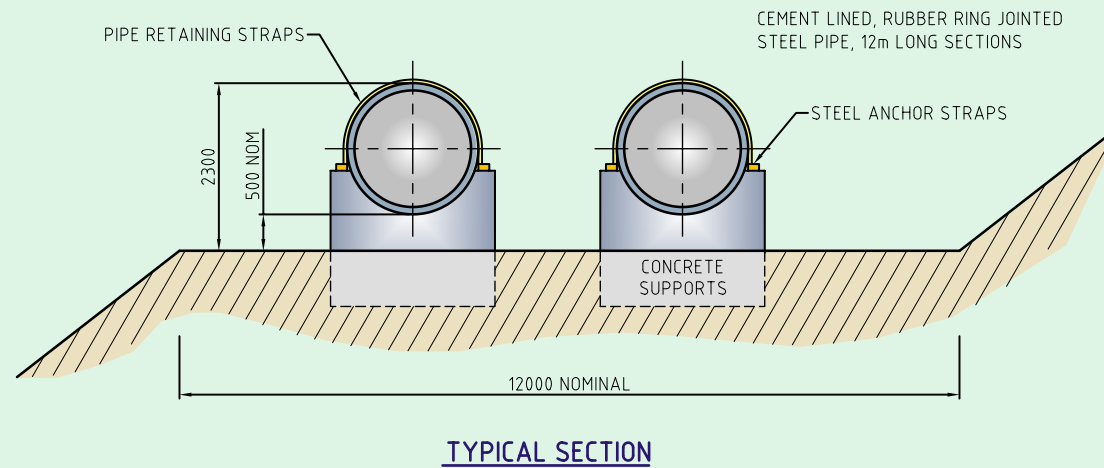
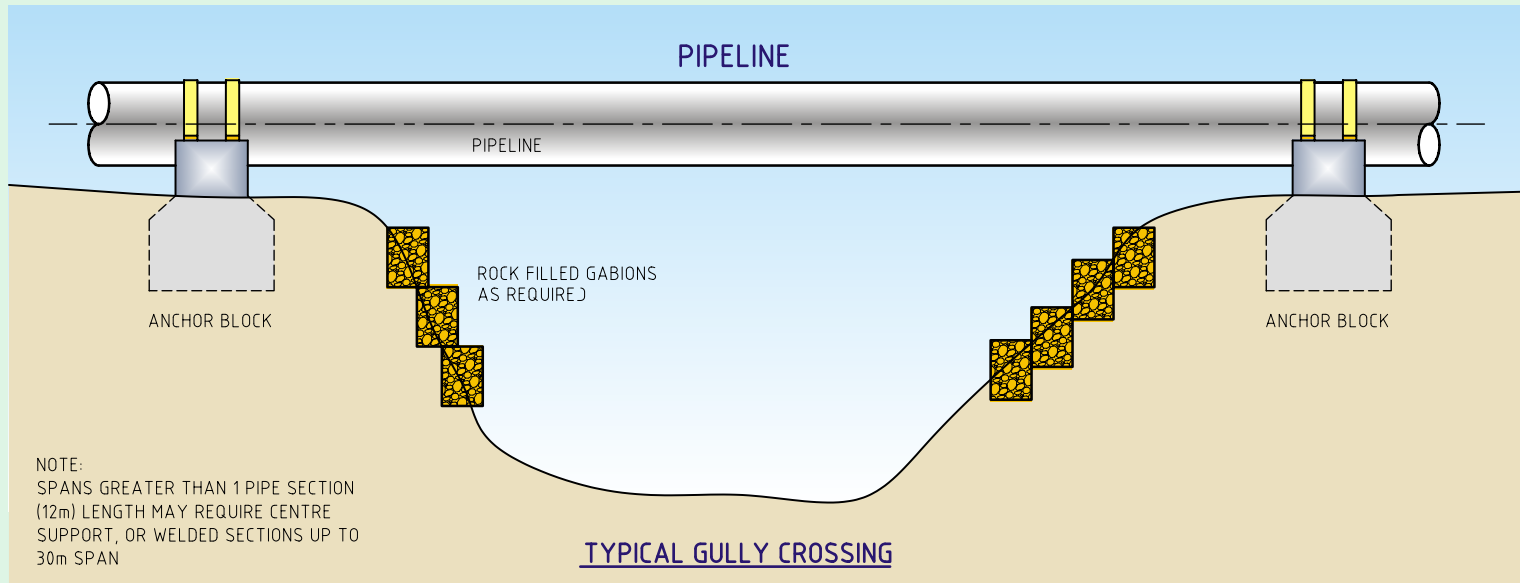


Figure 3.7

Typical Sections for Twin 1.8m Pipes

3.3.7 Operation of the new pumping station

The new pumping station would be used in conjunction with the existing pumping station to supply Macquarie Generation's water requirements in accordance with its operational needs and Water Management Licence conditions. The pumping facilities would not operate continuously and the full operation of all pumps would occur infrequently due to the prevailing low flow conditions in the Hunter River.

3.3.8 Site Restoration

The restoration of disturbed areas would be undertaken progressively as works at the respective locations are completed. The restoration would aim to quickly stabilise the ground surface such that erosion of topsoil does not occur and to assist re-establishment of vegetation cover. In addition, weed control would be applied to avoid the disturbed areas hosting concentrations of weed species. Where practicable habitat for insects and reptiles would be provided.

4. Statutory Controls and Approvals Process

4.1 Introduction

The proposed augmentation of the Hunter River Pumping System requires planning approval under the Environmental Planning and Assessment (EP&A) Act. In addition, it requires consideration of a range of other environmental legislation including the Commonwealth's Environmental Protection and Biodiversity (EPBC) Act. This chapter of the Environmental Assessment (EA) describes the relevant statutory planning instruments and their application to the proposed augmentation. It also outlines the extent of consultation undertaken and proposed.

Macquarie Generation's water entitlements from the Hunter River are governed by its licences under the *Water Management Act 2000* (WM Act), and by the *Water Sharing Plan for the Hunter Regulated River Water Source 2003* (the Water Sharing Plan).

While the EP&A Act sets out the requirements for statutory approvals associated with planning, construction and operation of the Project, the WM Act and the Water Sharing Plan govern Macquarie Generation's day-to-day operations in respect of the extraction and use of water from the Hunter River. An approval under the EP&A Act does not alter Macquarie Generation's obligations under the WM Act, or change any aspect of its licence/s or entitlements to regulated water supplies.

The relevant requirements of the EP&A Act and the WM Act are discussed in detail in the following sections of this report.

Macquarie Generation's Environmental Policy (March, 2005) includes the following objective:

"...to comply with all applicable legal requirements and other requirements to which the organisation subscribes, in a commercially effective way, which is consistent with community expectations."

As part of the Major Projects Application process, Macquarie Generation has provided a Statement of Commitments that addresses the measures to be incorporated in the project to achieve compliance with the relevant statutory matters arising from the proposed augmentation.

4.2 Key Planning Considerations

The proposed augmentation of the Hunter River water supply system requires consideration of the following planning instruments:

- Development Consent under the NSW Environmental Planning and Assessment Act;
- Consideration of the requirements of the Commonwealth Environmental Protection and Biodiversity Conservation Act;
- Consideration of the provisions of the Water Management Licence under the Water Act 1912;
- Various State Environmental Planning Policies, Regional and Local Environmental Plans and other environmental legislation.

4.3 NSW Environmental Assessment Process

4.3.1 Part 3A of the Environmental Planning and Assessment Act 1979

Preliminary discussions with the NSW Department of Planning (DoP) have indicated that the Project will be assessed under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). An overview of the project approval process under Part 3A is provided in section 1.4.

The EP&A Act is supplemented by a number of Environmental Planning Instruments (EPI) including:

- State Environmental Planning Policies (SEPPs)
- Regional Environmental Plans (REPs)
- Local Environmental Plans (LEPs)
- Other planning policies and guidelines.

EPI's of relevance to the Project are discussed in the following sections.

4.3.2 Singleton Local Environmental Plan 1996

Land affected by the Project is subject to the zoning controls administered by Singleton Council under the Singleton LEP 1996. The land is zoned 1(a) Rural under the LEP. The Council's objectives for the 1(a) Rural zone as listed under clause 16 of the LEP are listed in the table below:

Table 4.1 Land use zone objectives

Objective	Relevance to Project
To protect and conserve agricultural land and to encourage continuing viable and sustainable agricultural land use	The project will not limit the use of Macquarie Generation's land for grazing purposes. The Water Management Licence provides for maintenance of flows in the Hunter River and the higher extraction rates are only permitted during high river flows. This provision protects the interests of irrigators lower in the Hunter Valley.
To promote the protection and preservation of natural ecological systems and processes	The project has assessed potential impacts on the ecological values of the locality and incorporates a range of measures to mitigate the impacts. The Water Management Licence provides for maintenance of adequate flows in the Hunter River to protect the aquatic/riparian ecology.
To allow mining where environmental impacts do not exceed acceptable limits and the land is satisfactorily rehabilitated after mining	No mining activities will be affected. The Howick open cut mine occurs to the east of the site. No mining occurs in the area immediately to the west, but coal measures are present, although steeply dipping in places.
To maintain the scenic amenity and landscape quality of the area	Works related to the project will as far as practicable be sited so as to reduce impact on scenic amenity and landscape quality. Following completion of the construction works the disturbed areas (ie. working width) would be rehabilitated with native and locally endemic species robust to local climatic conditions. Mitigation will include screening with trees and painting of structures to blend in with the surrounding vegetated landscape.
To provide for the proper and co-ordinated use of rivers and water catchment areas	The Water Management Licence and Water Access Licences include provisions to allow utility water supply while maintaining flows in the Hunter River. Higher extraction rates are only permitted during high river flows.
To promote provision of roads that are compatible with the nature and intensity of development and the character of the area	The project will not impact any public roads. A new access track will be installed along the pipeline route.

The Project's status under Part 3A of the EP&A Act means that the land use zoning and consent provisions of the LEP will have no statutory effect, as the Minister for Planning will be the consent authority for the purposes of the assessment under Part 3A. However, the zoning of the land remains relevant in so far as it reflects the underlying intent for the use of the land. In the circumstances, it is considered that this Proposal is not inconsistent with, and presents no potential conflict with the zone objectives as listed above. Further, Macquarie Generation's proposal is not considered to restrict or

constrain the future use of the land for the purposes intended by Singleton Council in the 1(a) Rural zone.

4.4 Other Licences and Statutory Approvals

Other statutory approvals that may be required or relevant to the Project include:

- The existing Water Management Licence, dated 11 December 2000 and administered by the Department of Natural Resources (the Project involves no change or proposed change to the conditions of this licence); and
- Environmental Protection Licence (EPL), which may be required under *the Protection of the Environment Operations Act 1997*, subject to consultation with the Department of Environment and Conservation.

Under Part 3A of the EP&A Act a number of the requirements for individual approvals under other NSW legislation are no longer required, as follows:

- *Heritage Act 1977* – approvals under Part 4 or excavation permits under section 139
- *National Parks and Wildlife Act 1974* – permits under section 87 or consent under section 90
- *Threatened Species Conservation Act 1995* – permits under sections 201, 205 or 219
- *Fisheries Management Act 1994* and *Fisheries Management Amendment Act 1997*
- *Native Vegetation Act 2003* – authorisation referred to in section 12 of the Act (or under any Act to be repealed by the Act) to clear native vegetation.
- *Water Management Act 2000* – water use approval under section 89, a water management approval under section 90 or an activity approval under section 91
- *Rivers and Foreshores Improvement Act 1948* – permit under Part 3A.

4.4.1 Protection of the Environment Operations Act

Bayswater and Liddell Power Stations hold Environment Protection Licences under the Protection of the Environment Operations Act. The Bayswater Licence addresses the Power Station facilities and operations but does not specifically address the Hunter River Pumping Station and does not show it on its Plan of facilities subject to the Licence and its conditions.

4.4.2 Rivers and Foreshores Improvement Act 1948

As referred to above, no approval is required under the RFI Act, given the Project's Part 3A status. However, the objectives of the legislation remain relevant to the Project, and under the RFI Act a person must not excavate or remove material from a protected land, or do anything which obstructs or detrimentally affects the flow of protected waters, without a permit from DoP and/or DNR.

In this context, "protected waters" include rivers or lakes into or from which a river flows. "Protected lands" include the bank, shore or beds of protected waters and land that is not more than 40 metres from the top of the bank or shore of protected waters. The proposed development requires excavation of protected lands and this aspect will be assessed under Part 3A of the EP&A Act as part of DoP's review and assessment of the Major Projects Application.

4.4.3 Fisheries Management Act 1994

Section 220ZZ of the Fisheries Management Act relates to significant effect on threatened species, populations, or ecological communities or their habitats. As referred to above, no approval is required under the Fisheries Management Act, given the Project's Part 3A status. However, an ecological assessment carried out for this project (see Appendix B) concluded that none of the listed threatened aquatic fauna species have been recorded, or are expected to occur in the project area. The need to incorporate sediment controls to prevent sediment entering watercourses has been identified and would be incorporated into the Project Environmental Management Plan (EMP). In addition, controls

would be incorporated to protect a Platypus population identified in the vicinity of the proposed pumping station.

4.4.4 National Parks and Wildlife Act 1974

The NPW Act includes matters relating to Aboriginal heritage and to flora and fauna.

As referred to above, no approval is required under the NPW Act, given the Project's Part 3A status. However, ecology remains a key issue in this assessment. A flora and fauna assessment has been undertaken and details are provided in Appendix B and summarised in Section 5.7. The Major Projects Application is likely to be referred to DEC for consideration of the acceptability of the project's impacts.

An Indigenous Heritage assessment has been undertaken and the findings are provided in Appendix C and summarised in Section 5.8.

4.4.5 Threatened Species Conservation Act 1995

The Threatened Species Conservation Act, 2002 sets out matters that must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats. As referred to above, no approval is required under the TSC Act, given the Project's Part 3A status. However, the ecological assessment referred to above addresses the relevant matters under the TSC Act and those matters are reported in Appendix B. The assessment includes 'seven part tests' of significance for threatened species. The findings are summarised in Section 5.7.

4.4.6 Heritage Act 1977

As referred to above, no approval is required under the Heritage Act, given the Project's Part 3A status. The Heritage Act addresses matters relating to non-indigenous heritage. No relevant items have been identified for the project site.

Non-indigenous Heritage issues are addressed in Section 5.9.

4.4.7 Native Vegetation Act 2003

Native vegetation (trees, shrubs and grasses) are protected through the Native Vegetation Act, 2003 which includes requirements in respect of clearing of native vegetation. As referred to above, no approval is required under the Native Vegetation Act, given the Project's Part 3A status.

A survey of the site's flora values has been undertaken to identify species potentially affected by site disturbance and the total area of disturbance. The assessment of the area's native vegetation status is provided in Appendix B and summarised in Section 5.7.

Proposed clearing of vegetation is associated with the new LP pumping station and pipeline route. Most of the clearing and earthworks would be undertaken in areas that have been subject to varying degrees of disturbance, and most of these areas now have a high proportion of exotic grasses.

DoP, as part of the Major Projects Application review process, will review the project assessment, the identified potential impacts on native vegetation and the proposed controls.

4.4.8 State Environmental Planning Policy (SEPP) 44 – Koala Habitat Protection

SEPP44 encourages the conservation and management of koala habitats, to ensure permanent free-living koala populations will be maintained over their present range. The policy applies to 107 local government areas including Singleton, and therefore applies to the project area. It particularly relates to land that has an area greater than one hectare and contains koala feed tree species.

The ecological assessment carried out for this project (Appendix B) concluded that the study area contains no potential or core koala habitat, and therefore that no further assessment is required under SEPP 44 (Section 5.7).

4.5 The Hunter Water Sharing Plan

On 1 July 2004, the *Water Sharing Plan for the Hunter Regulated River Water Source 2003* commenced. Under the Plan, the Hunter Regulated River Water Source covers the area between the banks of all rivers, from the upstream limits of Glenbawn Dam and Glennies Creek Dam water storages to the downstream estuary of the Hunter River. The vision for this Plan as stated in Clause 10 is *"to achieve a healthy, diverse and productive regulated river water source providing sustainable management of the water source for the community, environment, towns, agriculture and industry"*, and to recognise the significance of the water source to Aboriginal culture.

The objectives of the Plan (Clause 11) include:

- the maintenance and protection of natural flows, water quality, estuarine processes and habitats
- recognition of priority for traditional water rights of Aboriginal people
- maintenance of a highly reliable supply of water to towns, and
- maintenance of a highly reliable supply of water to the major utility access licence.

Macquarie Generation's water management licence to extract water from the Hunter Regulated River was reassessed following the introduction of the Water Sharing Plan. This resulted in the issuing of a Part 9 Water Management Licence, Water Access Licences and a Combined Works and Use Approval.

4.6 Water Extraction Licencing

Macquarie Generation holds a Licence under the Water Management Act 2000 to take water directly from the Hunter River catchment and the Barnard River, a tributary of the Manning River, via the Barnard Scheme. The licence also enables Macquarie Generation to supply water to other water users, however this option has not been used.

The Department of Natural Resources (DNR) is the regulatory authority for water management licences.

Macquarie Generation's water entitlements are formalised under a package of licences and approvals under the WM Act, as follows.

- **Combined Works and Use Approval** – for water supply works and water use.

This approval authorises Macquarie Generation to construct and use the existing low pressure pumping station (current installed maximum pumping capacity 450 ML/day). However, this approval also authorises a diversion capacity of 1,200ML/day *"...subject to approval for environmental impacts of expansion capacity of water management works, in-river storage and pumped diversion of water."* This report seeks to fulfil this requirement.

- **Major Utility Specific Purpose Access Licence;**
- **General Security Access Licence;** and
- **High Security Access Licence**

These entitlements provide for three categories of water use, each category having relevance to "available water determinations" as made by the Minister under section 59 of the WM Act. Macquarie Generation is allocated a specific number of "unit shares", which regulate the Corporation's share of the available water under the determinations as made by the Minister. Approximately 50% of Macquarie Generation's water needs are met through these three entitlements.

- **Supplementary Water Access Licence –**

A further category of entitlement, which allows Macquarie Generation a share of “supplementary” (ie during natural high-flow periods) flows. Approximately 50% of the Corporation’s water needs are met through this source. The entitlement may be accessed after announcement of a high flow event by the river’s operator, State Water Corporation, or once the volume of water measured at the gauging station at Jerrys Plains has reached 1500 ML/day for a continual period not less than 12 hours, prior to the commencement of pumping (referred to in the licence as a ‘deemed’ announcement).

“Unregulated” water (ie the Barnard River and certain parts of the Hunter catchment) is not subject to a water sharing plan and remains subject to a Water Management Licence issued under Part 9 of the *Water Act 1912* (WA 1912). The WA 1912 has been repealed by the WM Act 2000, however the Part 9 Licence is covered by savings provisions under the WM Act, and until all of Macquarie Generation’s licences are consolidated into one overall licence, the Part 9 Water Management Licences will continue to apply.

Macquarie Generation’s listed water management works under Schedule 1 of the Part 9 Water Management Licence include:

- Liddell Cooling Water Dam (total capacity 150,000 ML),
- Plashett Dam (total capacity of 65,000 ML and operational capacity of 63,000 ML)
- The Barnard Scheme (is able to transfer 20,000 ML/year of water from the Manning River Catchment to the Hunter River Catchment at a point above Glenbawn Dam)

Water extraction allowances for the Hunter Regulated River under the Water Access Licences are shown in Table 4.2:

Table 4.2 Macquarie Generation water extraction allowances

Access Licence Category	Share Component [†]	Extraction times/ rates/ circumstances (* Subject to conditions)
Major Utility	36,000 ML/year	Water may be taken at any time or rate *
High Security	1754 unit shares	Water may be taken at any time or rate *
General Security	2307 unit shares	Water may be taken at any time or rate *
Supplementary Water	36,000 unit shares	Water may be taken at those times when the Minister announces that supplementary water is available, at such rate as the Minister announces *

[†]Share Component: *the share component of an access licence as defined in section 56(1) of the WM Act 2000 and any right to take water under the Water Act 1912 that gives rise to share component of an access licence under the WM Act 2000 (Definition quoted from Water Sharing Plan)*

The Project involves no proposed change to the conditions of the licences or the Water Sharing Plan, but aims to increase the pumping capacity to access the approved rate of extraction subject to acceptable environmental impacts. This Environmental Assessment provides the basis for regulators to assess the acceptability of the environmental impacts of increasing the pumping capacity by 800 ML/day, to a total of 1,200 ML/day.

A detailed description and discussion of the effect of the proposed new pumping regime on river flows is provided in chapter 5.

Hunter River Salinity Trading Scheme

The Hunter River Salinity Trading Scheme is a licensing scheme managed by the NSW Department of Environment and Conservation (DEC) under the *Protection of the Environment Operations Act 1997*. The scheme enables regulated discharges of saline water to the Hunter River catchment above

Singleton, from mines and power stations, while minimising impacts on irrigation, other water users, and on the aquatic ecosystems of the Hunter River catchment. During high flows, each participant in the Scheme is entitled to discharge a share of the total allowable discharge according to the number of salt credits they hold. Credits may be traded between participants to ensure that saline water is being managed in the most cost-effective way.

Macquarie Generation is a participant in the Hunter River Salinity Trading Scheme and holds 238 credits. Under Condition E1 of its Environment Protection Licence, Macquarie Generation is authorised to discharge saline water into the Hunter River Catchment in accordance with the POEO (Hunter River Salinity Trading Scheme) Regulation 2002. Such discharges are released from Liddell Dam via a monitored Licensed Discharge Point. No recent discharges have occurred due to the extended drought conditions and mostly low river flow conditions.

The augmentation of the Hunter River pumping station does not involve discharges to the Hunter River and the requirements of the Scheme are not applicable to this development.

It is noted that increased extraction during periods of high flow will reduce the river flow volume passing the Jerrys Plains Station. The impact on the potential for downstream participants in the Salinity Trading Scheme to discharge at such times has not been assessed.

4.7 Commonwealth Environmental Assessment Process

4.7.1 Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) governs the Commonwealth Environmental Assessment process and provides protection for matters of National Environmental Significance (NES). Potential impacts associated with the development of the Project have been assessed against these matters of NES, and no negative adverse impacts have been identified. Referral under Section 68 of the EPBC Act to the Commonwealth Minister for the Environment and Heritage is therefore not necessary.

4.8 Consultations

The environmental assessment requirements under Part 3A of the Environmental Planning & Assessment Act 1979 specify that the proponent must undertake an appropriate and justified level of consultation with the following parties during the preparation of the Environmental Assessment:

- NSW Department of Environment & Conservation;
- NSW Department of Natural Resources;
- Singleton and Muswellbrook Shire Councils; and
- The local community

The Act further requires that the Environmental Assessment must clearly indicate issues raised by stakeholders during consultation and how those matters have been addressed in the Environmental Assessment.

4.8.1 Proposed process

Macquarie Generation will complete stakeholder consultation through the following process:

- Consultative meetings with the above nominated parties to outline the proposed augmentation project, to provide stakeholders with detailed maps and information and gather feedback. This feedback will be considered in the final design of the project. A report summarising feedback will be made available to the Department of Planning and placed on the Macquarie Generation website. (For details see the schedule below)

- Consultation briefing for Macquarie Generation's Community Consultative Committee which includes members of the local community. This group normally meets quarterly but they will be offered a briefing.
- Display of the Environmental Assessment at Singleton Council for a period of 30 days (commencing approx February 9 2007).
- A communications program consisting of advertising in the Singleton Argus during the display period and information on the Macquarie Generation website. The program will direct interested members of the public to an information hotline (02-4968 7491) and email address (info@macgen.com.au) available 9.00am-5.00pm on business days.

4.8.2 Proposed schedule

The following indicative schedule indicates the dates on which consultation will occur, subject to the agreement of stakeholders:

Table 4.3 Indicative Consultation Schedule

Date	Stakeholder	Stakeholder's representatives	Consultation team	Venue
Week commencing 12/2/07	Singleton Shire Council	Cr Fred Harvison (Mayor)	John Neely; project team	Singleton Shire Council
Week commencing 12/2/07	Muswellbrook Shire Council	Cr John Colvin (Mayor)	John Neely; project team	Muswellbrook Shire Council
Week commencing 12/2/07	Hunter Water Users Association	Arthur Burns President	John Neely; project team	To be determined
Week commencing 12/2/07	Hunter-Central Rivers Catchment Management Authority	W.E.J. Paradise (Chairman) & board members	John Neely; project team	To be determined
Week commencing 12/2/07	Department of Natural Resources	Richard Sheldrake (Director-General); Kim Alvarez (Assistant Director-General)	John Neely; project team	DNR Sydney
Week commencing 12/2/07	Department of Environment & Conservation	Mitch Bennett, head, Regional Operations Unit, Hunter Environment Protection & Regulation Division	John Neely; project team	DEC Sydney
Week commencing 12/2/07	Identified landholders	n/a	John Neely; project team	TBA
Week commencing 12/2/07	Macquarie Generation Community Consultative Committee	Muswellbrook Council Cr Jennifer Lecky Cr Malcolm Ogg Mr Chris Gidney Muswellbrook Community Mr John Morris Singleton Council Cr Fred Harvison Singleton Community Mr Peter Brennan	John Neely, Manager Bayswater Power Station; Mr Peter Sewell, Manager Liddell Power Station; Mr Rob Cooper	Singleton or Muswellbrook

4.8.3 Outline of stakeholder information

Information will be provided to stakeholders that highlight the following material:

- The project will be located on land owned by Macquarie Generation and within the Singleton Local Government area.
- The assessment reviews the environmental impacts of increasing the pumping capacity at the Hunter River on the local environment impacted by project works and for the Hunter River flow and water quality.
- The development consent process for the project is subject to Part 3A of the *Environment Planning and Assessment Act 1979* and requires the consent of the NSW Minister for Planning. A referral to the Commonwealth Minister for the Environment may also be required.
- The construction activities for the project will continue 12 to 18 months from award of the contract and will involve:
 - preparation of contractors site laydown area
 - transportation of materials
 - excavation for the new pumping station
 - construction of main pump stations and installation of pipes
 - land clearing
 - site restoration

The excavation would be managed in the context of:

- disturbance to an impact on local platypus population
- potential river bank erosion
- risk of high flows occurring during the construction works
- placement of coffer dam structure in river to protect extraction from impact of river flows impact on vegetation.

The project requires consideration under the following legislation:

- Project approval under the NSW *Environment Planning and Assessment Act*.
- Consideration of the requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act*.
- Consideration of the provision of the existing water management licence.
- Various state environmental planning policies, regional and local environmental plans, other environmental legislation and Bayswater Environmental Protection Licence.

The Minister for Planning is the consent authority.

5. Environmental Assessment

5.1 Introduction

This section of the Environmental Assessment provides a review of the relevant environmental issues presented by the project for its construction, operation and decommissioning stages, the studies undertaken and the options considered to mitigate the project's impacts. Where specific studies have been undertaken to support the Environmental Assessment they are provided as appendices to this report as follows:

- Appendix B – Flora and Fauna Assessment (incorporating Platypus Study)
- Appendix C – Archaeological Assessment

5.2 Regional Setting and Topography

The Hunter River Valley in the vicinity of Jerrys Plains is generally a subdued topographic element located between the more elevated Wollemi Tableland area to the south and the New England Ranges to the north. Mount Arthur, located about 10 km to the north is an exception and has a height of about 400 metres above the surrounding land.

The Hunter River is a relatively mature river that meanders through the Muswellbrook/Singleton area. The level of the river is about 70 metres (ASL) at the Hunter River Pumping Station. Elsewhere the floodplain varies in elevation by up to 100m with generally gentle slopes. The Hunter River Pumping Station is situated between the tributaries of Saltwater Creek and Parnell Creek, which are respectively west and east of the LP Pumping Station.

Saltwater Creek is a significant sub-catchment located on the northern side of the Hunter River which has been used, through the construction of Plashett Dam, as an off river water storage. The proposed pipeline component of the augmentation project is mostly within the Saltwater Creek catchment. The existing HP pump station is within the Parnells Creek catchment to the east of the LP pumping station.

The Bayswater and Liddell Power Stations and Lake Liddell are located in the Bayswater Creek catchment. Lake Liddell is situated on Bayswater Creek that flows past Ravensworth village and joins the Hunter River well downstream from the Hunter River pumping station

5.3 Climate

The Upper Hunter Region has a temperate inland climate with an annual rainfall of about 650 mm. Temperatures can vary between extremes of -5°C in winter to 45°C in summer. Table 5.1 provides a summary of key representative climate data obtained from the Bureau of Meteorology website.

Table 5.1 Climate Data for Jerrys Plains (Source: modified from Bureau of Meteorology)

Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year Ave.	years
Mean daily max temp ° C	31.8	30.9	29	25.3	21.2	17.9	17.3	19.4	22.8	26.2	29.3	31.4	25	92
Mean daily min temp ° C	17.1	17.1	15	10.8	7.4	5.2	3.7	4.4	6.9	10.2	13.1	15.7	10	92
Mean monthly rainfall (mm)	78.2	71.7	58.2	44.7	41.3	45.3	44.3	36.6	41.3	51.9	58.2	67.3	639	118
Mean no. of raindays	7.9	7.3	7.3	6.3	6.6	7.3	7	7	6.6	7.5	7.6	7.5	86	118
Highest daily rainfall (mm)	97.3	140	132	86.6	99.1	191	137	65.3	67.3	68.6	67.1	108	191	118

It is noted that changes in climate characteristics have been identified and for NSW a shift to drier conditions is forecast. The Australian Government in conjunction with assessments by CSIRO has published climate change scenarios for NSW for low and high global warming circumstances. Based on the scenarios, NSW is likely to become warmer with more hot days and fewer cold nights. Little change in annual rainfall is predicted but higher evaporative demand could lead to less run-off. Droughts are likely to become more frequent and more severe with greater fire risk.

The changes could effect the project site and the catchments that feed the Hunter River. As a result of recent drier conditions the storages of Glenbawn and Glennies Creek Dams are below 40% of full capacity. The Australian Government has acknowledged the changing climate conditions and has encouraged businesses to adopt risk management strategies.

The augmentation project can be regarded as a risk management option adopted by Macquarie Generation to enhance the security of its water supplies.

5.4 Geology

The 1:100,000 Hunter Coalfield Regional Geological Map indicates that the geology of the local area is comprised predominantly of:

- Permian age Singleton Coal Measures strata (specifically the lower part of the Wittingham Coal Measures) (sandstone, shale, mudstone, conglomerate and various coal seams)
- Maitland Group marine sediments – covers much of the area of the Plashett Dam storage
- Quaternary period alluvial deposits (gravel, sand, silt and clay) present along the Hunter River floodplain.

Isolated deposits of basalt may also occur within the general area.

Construction of the pump station would be likely to encounter alluvial soil deposits close to the river and residual soil and weathered coal measures strata. Construction of the pipeline will cross areas of coal measures strata and the underlying marine Maitland Group strata that will mainly be present for the northern part of the pipeline route. A moderate degree of lithological variation can be expected along the 3,500 metre pipeline route.

A range of issues related to site geology will require further investigation prior to construction proceeding including:

- Geotechnical study to identify the transition between areas of alluvial and residual deposits
- Identification of groundwater conditions
- Assessment of potential for bank erosion, stability and protection
- Identification of areas with erodible/unstable hillside conditions
- Identification of suitable bearing strata for pipeline structures and potential variations in subgrade strength that may lead to differential movement between pipeline support structures.

5.4.1 Mineral Resources (Coal, Gravel)

Coal resources are extensive throughout the Hunter Valley and the power station infrastructure has been mostly located off the coal measures strata so as not to limit the potential for coal extraction.

Large open cut mines (Howick and Mt Arthur open cut mines) occur more than 5 km to the north east and north west of the Hunter River Pumping Station. While coal measures are present in the vicinity of the pumping station they are likely to have limited economic potential due to the proximity to the Hunter River and unsuitable characteristics of the local geological structures and sporadic igneous intrusions. This is borne out by the fact that the pumping site location has not been a target for intensive coal exploration.

The gravels found along the Hunter River flood plain can also have value as construction materials. No mining of these gravels is undertaken in the vicinity of the pumping station.

5.5 Soils

5.5.1 Description of Soils

The 1:250,000 Soil Landscape Map for Singleton indicates that the soils in the local area are dominated by yellow soloths of the Liddell soil landscape. Along the floodplains of the Hunter River and its tributaries the alluvial soils are Chernozems of low to moderate erodibility. In the Project area the soils immediately north of the Hunter River floodplain are black earths and grey clays. The area of the Plashett storage and surrounding lands are on the Bayswater soil landscape, predominantly Yellow Solodic soils with alluvial soils (brown loamy sand to sandy clay) in drainage areas. Areas of outcrop of basic igneous rocks will give rise to darker and clayey soils.

5.5.2 Erosion and Sedimentation

In the vicinity of the proposed pump station location the banks of the Hunter River are generally soft and relatively steep. Construction activities on the banks of the Hunter River have the potential to create erosion and sedimentation problems including degradation of the riverbank and increased sediment load in the river.

In addition, soils associated with the marine strata often show considerable potential for erosion and particularly at the inlet to Plashett storage, the design will take account of this potential.

A series of mitigation measures will be developed and incorporated in the construction phase to minimise potential impacts related to erosion and sedimentation. Such measures include:

- A Soil and Water Management Plan (SWMP) including an Erosion and Sediment Control Plan (ESCP) will be prepared which will describe detailed control measures and management strategies for potential erosion and sedimentation control during construction
- If required, a coffer dam will be constructed around the river bank excavation area prior to commencement of excavation, to ensure that the construction area is kept dry and that sediments from the work site do not enter the river
- No spoil will be stored adjacent to existing waterways or drainage lines
- Surface flows will be diverted around any areas of disturbed ground or soil stockpiles
- Sediment fences and other similar measures, such as control berms, will be constructed downstream of all disturbed areas to minimise the influx of sediment and other pollutants into local waterways
- Stability of reinstated creek banks will depend largely on the compaction of the backfill. A series of rehabilitation techniques will be employed as necessary to ensure the ongoing stability of the banks of the Hunter River and less drainage lines for the Saltwater Creek catchment. These techniques will be detailed in the construction contractor's rehabilitation plan.

5.6 Water Resources, Water Quality and Site Drainage

5.6.1 Hydrology

The Hunter River has regulated flow that is affected by variations in catchment runoff and releases from the Glenbawn and Glennies Creek Dams. Releases from Glenbawn Dam occur above Muswellbrook and contribute to the flow past the Hunter River pumping station. Releases from Glennies Creek Dam enter the Hunter River below the Hunter River pumping station at a point south of Camberwell.

The regulated Hunter River flow regime is designed to provide supply to major water users and to maintain the health of aquatic systems. Salinity of flows is an important consideration for management of releases from dams and constraints on water extractions.

Monitoring of river flow levels and conductivity of the river water (used as an indicator of salinity) has been undertaken for the Hunter River (Liddell) monitoring station [DLWC Station GS210083] since at least September 1969. Flow data collected over this time shows that flow levels peak regularly and that peak flows commonly exceed 30,000 ML/day. Since 1969, there have been a large number of peaks in excess of 50,000 ML/day, and at least six occasions when the flow volume has exceeded 100,000 ML/day.

Peak flows are of relatively short duration, when viewed against the more regular low flow conditions. It is the relatively short term peaks in flow levels that the augmentation project has been designed to access.

The Project has been developed to augment the existing pumping capacity to enable an increased rate of extraction from the Hunter River under high river flow conditions. Macquarie Generation's existing water licences held with DNR detail the flow conditions under which it is allowed to extract water from the river.

Macquarie Generation's Water Management Licence includes provision to ensure that the river continues to experience the flushing associated with major rainfall events. Accordingly, supplementary water extraction by Macquarie Generation cannot commence until at least twelve hours into a high flow event, defined as flow of $\geq 1,500$ ML/day at the Jerrys Plains weir gauging station. The first flush is often associated with higher salinity and allowing this water to pass also improves the quality of water extracted. Supplementary water extraction must also cease when the flow over the Jerrys Plains weir falls below 1,500 ML/day.

Effect on Downstream Flows

High Flows

Under the Combined Works and Use Approval, Macquarie Generation is entitled to extract up to 1,200 ML/day, subject to environmental approval. This extraction volume can only be achieved during periods of high river flow. In most cases river flow volumes are less than 1000 ML/day. High flows are generally experienced only after significant rain events, which have in recent times been of relatively short duration.

Macquarie Generation has obtained access to the DNR's Integrated Quality/Quantity Model (IQQM) to assess the impact on overall daily downstream flow volumes of a 1,200ML/day pumping station compared with the existing station, which has an average pumping capacity of 420 ML/day (maximum capacity is 450 ML/day). High flow events during this period have been modelled, and the comparative impact is depicted in Figure 5.1 which shows the flow duration curves downstream of Macquarie Generation's river pumping facility with the existing pumps at average capacity and the station capacity increased to 1,200ML/day. The curves illustrate clearly, for all high-flow events, that the percentage change in overall downstream daily flow would be negligible, taking into account the increased pumping volumes that will be achieved with the proposed 1,200ML/day pumping station.

It must be noted that the graph in Figure 5.1 is based on Macquarie Generation's existing water extraction entitlements including the Supplementary Water Access Licence, under which most peak flows will be accessed.

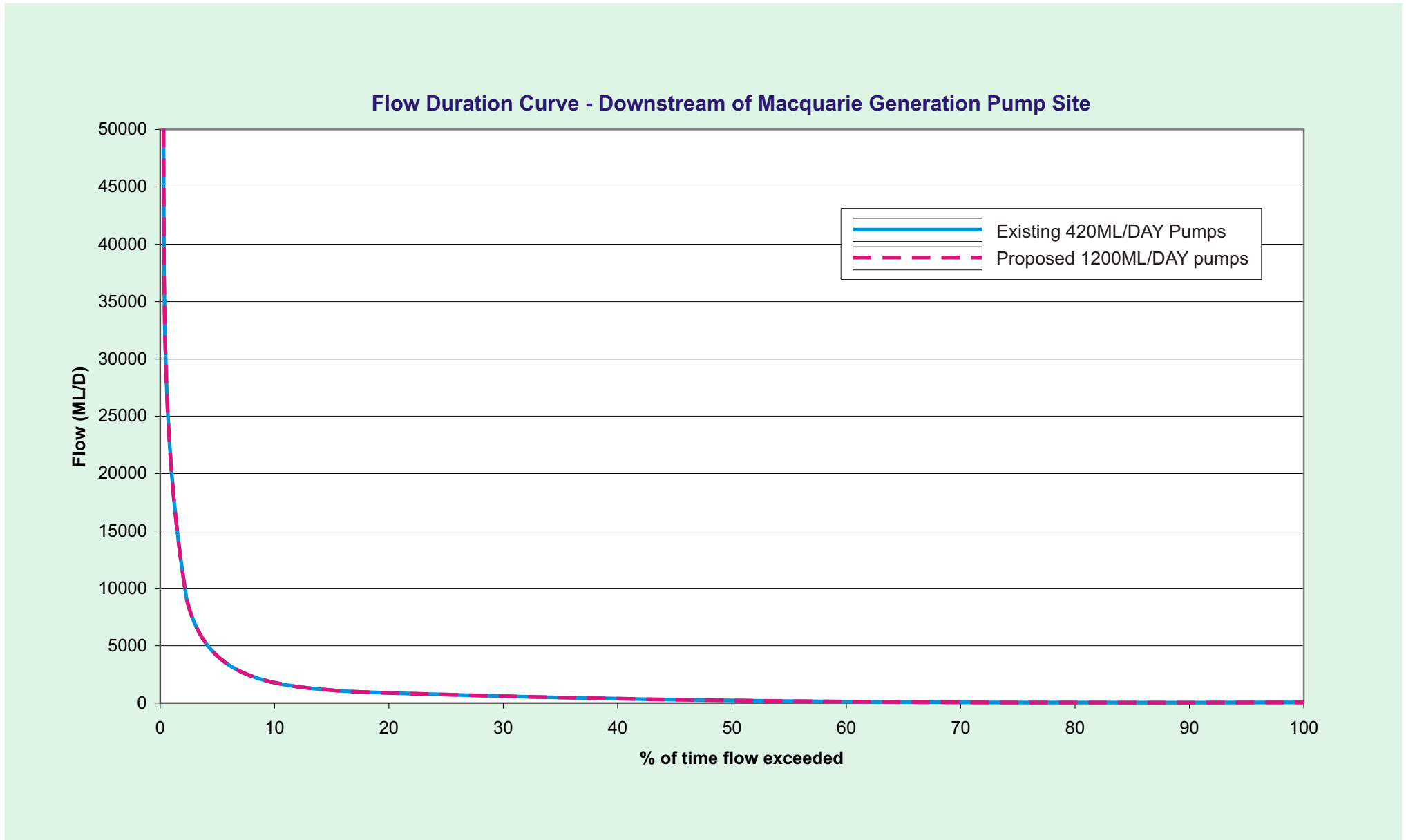


Figure 5.1

Flow Duration Curve

Source: Bewsher Consulting 2006

Low Flows

During periods of low flow, Macquarie Generation may extract water only in accordance with the terms of its General Security, High Security and Major Utility Specific Purpose Licences, and in accordance with the Part 9 Water Management Licence. The amounts of water that may be extracted under each licence in a given Water Year are tightly regulated, and are governed by the Share Component held by Macquarie Generation for each licence, respectively. Under the terms of the General Security, High Security and Major Utility Specific Purpose Licences, water may be extracted at any time and at any rate, subject to conditions and provided that Macquarie Generation does not exceed its entitlement. The Licences contain explicit requirements for the recording and reporting of quantities taken, and do not permit the water allocation account to go into debit. Macquarie Generation must notify State Water as to the timing and rate of extraction, to enable the river operator to cater for other users and minimum environmental flows.

The proposed augmentation of Macquarie Generation's LP Pumping Station is designed to operate wholly within the terms of its existing water extraction licences and the Water Sharing Plan. No change to the terms or conditions of the licences is proposed, and no change to Macquarie Generation's water entitlements is proposed. Therefore, during periods of low flows in the Hunter River, the overall change in downstream flow volumes resulting from development of the new pumping station will be negligible or zero.

In-Stream Storage Levels

In-stream storage levels are governed by the amount of water in the Hunter River at any given time, and the existing rock weir adjacent to Macquarie Generation's existing LP Pumping Station. Water enters the regulated river either from natural rainfall and runoff, or through releases from Glenbawn Dam. Water is released from Glenbawn Dam to supply downstream users including Macquarie Generation, and for environmental flows. Releases are regulated and are controlled for each user's specific (licenced) allocation, and in accordance with the Water Sharing Plan. Under the proposal, no change is proposed to the rock weir, or to the shape, form or configuration of the weir pond.

During periods of low flow, the weir acts to maintain a relatively constant level in the weir pond, so that the pumps can operate efficiently to extract Macquarie Generation's water entitlements. During periods of high flow, the weir becomes redundant and the depth of the river at the pumps increases considerably.

As discussed above, the proposed 1,200 ML/day pumping capacity would only be utilised during high flow periods. During periods of low flow, water will continue to be extracted at rates comparable to the existing, and would vary only in accordance with any variations in Macquarie Generation's licence conditions, for example, a change in the allocated Share Component. Notwithstanding such a change (which could occur only within the terms of the Water Sharing Plan), the likely impact on in-stream storage would be minimal and would not be significant.

Automatic Trigger Procedures

As governed by the terms of the Supplementary Water Access Licence, the volume of water passing the gauging station at Jerrys Plains must exceed 1500 ML/day for a period of 12 hours prior to the commencement of pumping during a high flow event. Once this 'trigger' has been activated, the Licence permits that at least 50% of the flow immediately upstream of the pumps, assessed on a 12-hourly basis, must be maintained at the gauging station at Jerrys Plains. Pumping must cease if the flow at that gauging station falls below 1500 ML/day.

Macquarie Generation is also required, under the Supplementary licence rules, to maintain comprehensive records in respect of the times and dates when pumping has occurred, and the rates at which water is being pumped. These records must be (and are) reported to the relevant agencies and included in all annual reports and compliance reports.

The proposed pumping station is therefore designed to operate within these parameters. The pumps would incorporate systems to automatically trigger the operation of each individual pump, in order to 'step-up' and 'step-down' the volume and rate of pumping in accordance with the measured flow volume upstream of the pumps, and downstream at Jerrys Plains. The pumps would be programmed and automated to ensure that the conditions of the licence are met, and to ensure that records can be effectively and accurately compiled. Operating systems would also incorporate emergency procedures to ensure that the pumps can be manually over-ridden at any time, and to ensure that licence conditions are not breached.

The pumps have been designed to comply with the conditions of Macquarie Generation's water extraction licences and the Water Sharing Plan. Macquarie Generation does not propose to extract any more water than it does currently; rather it seeks to use the proposed pumps to ensure it can extract its full entitlement under the licences and the Water Sharing rules. In its preparation, which involved input from a broad range of interests, the Water Sharing Plan has contemplated the impacts of the rules on the river system, which includes Macquarie Generation's entitlement to 50% of the high flows as discussed. The proposal does not include any new infrastructure or activities that are outside or contrary to the spirit of the rules.

5.6.2 Water Quality

The regulated Hunter River shows a general increase in salinity downstream. Local variations to the trend can occur due to variation in salinity in inflows depending on differences in catchments and salinity of surface flows. In general runoff from coal measures and marine strata is more saline than runoff from the Wollemi Sandstone catchment.

The Water Management Licences include limits on extraction rates to ensure adequate flows in the river below Jerrys Plains. Management of Hunter River flows and arrangements for extraction and discharges to the river are designed to ensure acceptable salinity levels in river flows. The salinity trading scheme has been established to address this issue and requirements for discharges are included in the Bayswater Power Station's Protection of the Environment Operations Act Licence.

There is the potential for water quality impacts during construction of the pump station and associated pipeline. Water quality of the Hunter River would be protected through the implementation of a range of erosion and sediment controls for earthworks and site restoration and other measures to protect against oil, fuel or chemical spills from construction machinery and materials. These measures will be detailed in the Project Construction Environmental Management Plan (CEMP).

In operation there are no local water quality issues predicted to occur as a result of the pump station. As the water to be drawn from the river is not to be used for drinking without further treatment or recreational purposes there would be no restriction on pumping if there was high turbidity or elevation of any other water quality parameters.

5.6.3 Conclusions and Mitigation Measures

Macquarie Generation's Water Management Licence has been developed to enable the necessary water supplies to be extracted for the power generation requirements while allowing for availability of water and protecting the river's ecological values and needs of other users. The licences, and the Water Sharing Plan, were prepared in anticipation of the proposed 1,200ML/day pumping capacity and it is therefore accepted that the potential impact of the larger pumps on downstream flows and downstream river health, was taken into account when considering the terms of the licences. Macquarie Generation has established a comprehensive process for managing its water supply function in accordance with the licence requirements.

5.7 Ecological Issues

5.7.1 Introduction

The Project extends from the Hunter River and its river bank environments along 3.5 km of pipeline easement on ridges and various sloping ground to the Plashett Storage. The study area has been greatly modified since European settlement due to extensive clearing and the construction of Bayswater Power Station and its associated infrastructure, including Plashett Dam and the existing river intake and pump station.

Potential impacts on ecological values of the project area have been assessed by specialists and a report on findings is provided as Appendix B. The findings of the ecological assessment are summarised below.

Two main ecological issues associated with the proposed Hunter River LP River Pump Augmentation were identified. These include the occurrence of River Flat Eucalypt Forest, an Endangered Ecological Community listed under the TSC Act, and the presence of known platypus habitat within the project area.

5.7.2 Methodology

Database reviews (including the Atlas of NSW Wildlife and the National Protected Matters Database), flora and fauna surveys, koala habitat assessment and a platypus study, were undertaken for the project area and its surrounds during July 2006 to identify threatened species and endangered populations recorded in the local area. The aim of the field surveys was to maximise the detection of threatened fauna species occurring within the study area. The field survey methodology for the flora and fauna assessment was developed in accordance with *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft DEC (2004)*.

5.7.3 Terrestrial Ecology

Vegetation within the study area consists of predominantly regenerating indigenous vegetation with remnant vegetation generally restricted to the riparian corridor along the Hunter River, and Open Woodland to the south of Plashett Dam.

The proposed pipeline route passes mainly through cleared grassland and partly through remnant woodland.

Potential impacts on terrestrial flora and fauna species and their habitats would be reduced through implementation of the following key mitigation measures:

- Retaining existing trees where possible to maintain current foraging and roosting areas for common fauna and connectivity of existing fauna movement corridors
- Rehabilitation and revegetation (representing ground cover, understorey and tree canopy) along the pipeline route following construction of the Project
- Preparation of a Vegetation Management Plan detailing restoration works, including weed management and re-establishment of native understorey species along the Hunter River.

Threatened Species

A search of the DEC Atlas of NSW Wildlife database revealed 12 threatened flora species listed on the *Threatened Species Conservation Act 1995* (TSC Act) have been recorded within 15 km of the study area and nine of these species are also listed under the (Commonwealth) *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). No threatened plant species were recorded in the study area, nor are any expected to occur.

A review of the Department of Environment and Heritage's (DEH's) Protected Matters Report for a 10 km radius around the study area revealed Weeping Myall - Coobah - Scrub Wilga Shrubland of the

Hunter Valley and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. These two ecological communities, listed as 'endangered' and 'critically endangered' under the EPBC Act, have the potential to occur within the study area. None of the vegetation communities recorded in the study area are considered to qualify as either of these two ecological communities.

A search of the DEC Atlas of NSW Wildlife database revealed that 22 threatened fauna species listed on the TSC Act have been recorded within 10 km of the study area. Six of these species are also listed on the EPBC Act. A search of DEH's Protected Matters Search Tool revealed a further eight species listed on the EPBC Act are considered likely occurrences within 15 km of the study area. Threatened species listed under the TSC Act likely to occur within the study area have been assessed in terms of whether they inhabit the study area, and if so, whether and to what extent the Project is likely to have an impact on species or populations. This assessment is summarised in the following sections.

River Flat Eucalypt Forest

The vegetation fringing the river in the vicinity of the pump station, forms part of the Endangered Ecological Community River Flat Eucalypt Forest listed under the TSC Act.

Mitigation measures to avoid the adverse impact on the River Flat Eucalypt Forest include:

- Relocating the new pump facility and construction activities to the heavily disturbed section of the river bank
- Development of a long-term management plan and monitoring program targeting the health of the River Flat Eucalypt Forest, be developed and implemented prior to commencement of site works in conjunction with platypus studies at this locality.

Koala Habitat Assessment

No Koala feed tree species listed on Schedule 2 of SEPP 44 were recorded in the study area and no scratches indicating Koala activity were recorded during habitat searches undertaken in the study area. Database searches revealed the nearest recent record occurs approximately 35 km to the north-west of the study area. Based on the above, it is considered unlikely that the study area contains Koala habitat.

5.7.4 Aquatic Ecology

Fish species recorded in the study area include Australian Bass, Long-finned Eel, Gudgeons, Bully Mullet, Smelt and Freshwater Herring. Very high numbers of large carp (*Cyprinus carpio*) were observed in the river, particularly between the pump pool and the gauging weir downstream. No threatened fish species listed on the FM Act are known to occur in the study area, nor are any expected to occur.

Potential impacts arising from the Project include:

- Removal of river bank habitat within the pump station site
- Disturbance of river bank habitat adjoining to the pump station site
- Downstream transportation of sediment during construction process
- Changes to downstream flow regime of river
- Interference with the operation of the fishway, particularly during breeding season. Flood/high rainfall events are a cue for spawning. Extraction of high water flows may interfere with spawning cues.
- Destruction of platypus resting and nesting burrows
- Mortality to platypus present in nesting burrows, ie lactating females with young

During construction there is the potential for impacts on the aquatic environment due to disturbance around the riverbank. However, environmental management measures for erosion and sedimentation control would be employed to protect aquatic habitats. In addition, no oil or other chemicals would be stored on the stream bank below maximum stream height to minimise the potential for contamination of the river and in accordance with the recommendations of Grant (2006).

Threatened Species

A fish survey of the weir pool by Bishop (1995) did not record any threatened species. A search of the BioNet database revealed the only threatened species recorded in the Upper Hunter is the Silver Perch (*Bidyanus bidyanus*). This species occurs in Lake Glenbawn and Lake St. Clair and its occurrence is the result of stocking by NSW Fisheries. No threatened fish species are considered likely to occur in the study area and have therefore not been considered further in this assessment.

Platypus

While the platypus is not listed on the TSC Act or the EPBC Act, the status of the platypus is regarded as 'common but vulnerable' according to Grant (1991). Grant (1991) states that despite being common throughout much of its range, the platypus must be considered vulnerable as it is dependent on river systems for its survival.

Platypus have been recorded in the Muswellbrook-Singleton section of the Hunter River since at least the early 1980s but are probably not present in high numbers. Platypus has been recorded occurring in the Bayswater Hunter River pump station weir pool from 1984 to 2006.

Dr Tom Grant (University of New South Wales), a recognised expert in Platypus biology, was engaged to undertake a specialist platypus study for this Project (see Appendix B). During the study, approximately three kilometres of river were investigated from a kayak paddled upstream and three kilometres downstream to the Jerrys Plains gauging weir. Availability of consolidated earth banks suitable for burrowing was noted. Banks were surveyed for the presence of entrances to platypus burrows.

The main findings of the study showed that the proposed activity is considered unlikely to have a long-term impact on the Hunter River platypus population occurring in the Muswellbrook-Singleton area. Within the constraints of the Water Licence, the Water Sharing Plan and project design it was assessed as unlikely that extraction of water from high flows in the river would significantly impact on the local platypus population.

However, during construction there is a possibility that the disturbance of the river bank may impact on platypus nesting and breeding, if construction works are commenced during the nesting season, which occurs from approximately mid-September until mid-March. Once a construction site is established, normal behaviour patterns suggest that the platypus would avoid the area of disturbance. Provided that construction activities are contained, they would pose minimal risk to the animals' ongoing survival outside the immediate zone of disturbance. Therefore, if construction were to commence outside the nesting season (ie between March and September), the Project would be unlikely to have an adverse impact on the local platypus population. Further to this, if the proposed pump station is confined to the heavily disturbed section of the river bank immediately upstream of the existing structure, it would be less likely to have an adverse impact. Observations in the weir pond indicate that platypus are most likely to establish their nests and burrows in that section of the river that is fringed by overhanging trees, where the banks are more stable and better protected.

Recommendations to mitigate potential impacts on the local platypus population include:

- Confining the new pump facility and associated construction activities to the heavily disturbed section of bank immediately upstream of the existing structure
- Commencing construction work prior to mid-September to avoid any impacts on the breeding activity of the local platypus population, or
- Removing and temporarily relocating animals from the affected area prior to commencement of construction and prior to the commencement of the nesting season.

Because of the emergent nature of the Project, it may not be possible to commence construction outside of the platypus nesting season. If this occurs therefore, it is recommended that animals in the

weir pond be identified, captured and temporarily relocated to a suitable controlled environment until such a time as they can be safely returned to the river.

Key Threatening Processes

The TSC Act and *Fisheries Management Act 1994* (FM Act) list key threatening processes (KTP) relevant to this study. A 'key threatening process' is defined as 'a process that threatens, or that may threaten, the survival or evolutionary development of a species, population or ecological community.'

The proposed installation of a new pump facility in the Hunter River constitutes a threatening process under the TSC Act (Schedule 3) and FM Act (Schedule 6), as follows:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands (TSC Act)
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams (FM Act).

Instream structures that modify natural flow include dams, weirs, canals, navigation locks, floodgates, culverts, flow regulators, levee banks, erosion control structures and causeways. Mechanisms that alter natural flow regimes include the operation of the above structures as well as water extraction, pumping and diversion, and sand and gravel extraction.

The extraction of water is governed by the conditions of Macquarie Generation's water licence, which specifies the requirement for certain flow levels to be maintained downstream of the pump station. As the proposed water extraction would be in accordance with the existing licence it is permissible and no major impacts are expected.

5.7.5 EPBC Act Issues

Under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), an action which is considered likely to have a significant impact on a matter of National Environmental Significance (NES) must be referred to the Federal Environment Minister for approval. The EPBC Act Policy Statement 1.1 *Significant Impact Guidelines* provide guidance on determining whether an action has, will have, or is likely to have a significant impact on an NES matter.

Threatened and migratory species listed on the EPBC Act that are known, or considered likely, to occur in the study area have been assessed under the 'administrative guidelines' of the Act to determine whether the proposal is likely to constitute a controlled action.

No threatened flora species listed under the EPBC Act are considered likely to occur within the study area.

Threatened and migratory species that are known, or considered likely, to occur in the study area are listed in Table 5.2:

Table 5.2 Threatened and migratory species likely to occur in the study area

Category	Species
Endangered	Regent Honeyeater Swift Parrot
Vulnerable	Large-eared Pied Bat Grey-Headed Flying Fox
Migratory	White-throated Needletail Regent Honeyeater

The Project is unlikely to have a significant impact on endangered species. The assessment (Appendix B) determined there would not be a significant change or possibility that the Project would:

- Lead to a long-term decrease in the size of a population
- Reduce the area of occupancy of the species
- Fragment an existing population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of a population
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat
- Interfere with the recovery of the species.

The Project is unlikely to have a significant impact on vulnerable species. The assessment determined there is not a real change or possibility that the Project would:

- Lead to a long-term decrease in the size of an important population of a species
- Reduce the area of occupancy of an important population
- Fragment an existing important population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of an important population
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- Introduce disease that may cause the species to decline
- Interfere substantially with the recovery of the species.

The Project is unlikely to have a significant impact on migratory species. The assessment determined there is not a real change or possibility that the Project would:

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species
- Result in invasive species that are harmful to a migratory species becoming established in an area of important habitat of the migratory species
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species

The assessment found that it is unlikely that the proposed activity will have a significant impact on any matter of national environmental significance, including nationally listed threatened species. DEH referral is not required for the proposed activity.

5.7.6 Mitigation Measures

The following mitigation measures would be implemented to avoid impacts on terrestrial and aquatic ecology:

- The new pumping station will be located as close as practicable to the heavily disturbed section of bank immediately upstream of the existing LP pumping station
- Water pumped from the coffer dam should be diverted to settling pond(s) before returning the water to the river, downstream of the weir to prevent sedimentation within the weir pool
- Undertake excavation for the new LP pumping station in conjunction with a platypus management plan to avoid any impacts on the breeding activity of the local platypus population (see section 5.7.4 above)

- Install overpass structures, such as earth bridges, at strategic points along the pipeline route to allow fauna to cross over the pipeline structure
- Provide habitat niches for insects (which in turn provide food resource for vertebrate species) by distributing any cleared vegetation along the pipeline
- Ensure the pipeline design avoids hollow-bearing trees
- Clear only the minimum area of vegetation, to minimise soil erosion and removal/modification of flora and fauna habitat
- Maximise the retention of food resources, particularly sap-feeding trees and understorey species such as wattles
- Retain hollow-bearing trees and recruitment (juvenile) trees
- Where felling of hollow-bearing trees is required, engage a suitably qualified ecologist to undertake a pre-clearance survey 24 to 48 hours prior to felling to ensure gliders are not present within any of the hollows
- Engage an ecologist to inspect felled trees for injured fauna. Handle carefully any shocked, immature or injured fauna
- No equipment, machinery or vehicles to be placed or left within the drip line of trees
- Detail erosion and sediment control measures in the Environmental Management Plan (EMP)
- Develop a Site Rehabilitation and Weed Management Plan prior to commencement of on-site works. It is anticipated that this Plan would be in force for a minimum period of one to two years following completion of works to ensure the work site has been successfully rehabilitated
- Undertake post-construction rehabilitation of the study area using locally indigenous species
- Compensate for native vegetation loss resulting from the pipeline by replanting at a ratio of two to one for each plant lost. This should result in a net increase in vegetation biomass and thus habitat
- Stockpile all topsoil (ie the first 10 centimetres of the soil profile) and store separately from subsoil in areas designated stockpiles
- Progressively rehabilitate exposed soil areas throughout the construction period
- Progressively re-lay stockpiled spoil, topsoil and vegetation in the order that work progresses
- Establish sandbags, linear silt fencing, or other suitable material between disturbed surfaces and aquatic or riparian habitats, to capture any sediment mobilised during wet weather
- Maintain silt fences until the site has been revegetated, stabilised and is no longer prone to erosion
- Inspect and maintain (re-erect, desilt etc) erosion/siltation control devices weekly and after rainfall event

Management Plan and Monitoring Program

It is recommended that a long-term management plan and monitoring program targeting the platypus, functionality of the fishway and the health of the River-flat Eucalypt Forest be developed and implemented prior to commencement of site works. The management plan should be based on an 'adaptive management' approach, with management practices for the site accommodating the results of monitoring.

5.8 Indigenous Heritage

An assessment of the Aboriginal Heritage values for the Project site was undertaken by McCardle Cultural Heritage (see Appendix C).

As part of the assessment, an archaeological survey of the study area was conducted by dividing the area into six survey units based on broad landform elements. Three people, including an archaeologist and two representatives of indigenous groups, placed approximately 10 to 12 metres apart surveyed each area on foot. The area was surveyed from the Hunter River along the pipeline route to the south-eastern shore of Plashett Dam. The survey strategy was based on levels of vegetation cover and focused on areas of high ground surface visibility and exposures (erosion features, creek banks and tracks). It included surveying the adjacent stream banks, and hill slopes and investigation of each of

the landforms within a 30m corridor spanning the proposed pipeline route centreline, which has been surveyed and pegged. An additional survey covered an area of up to 50 metres distance from the existing pump station along the northern bank of the Hunter River.

One isolated artefact, an indurated mudstone flake, was found during the surveys, 100 m east of the Hunter River, south of the proposed pipeline route. The artefact was located on the surface in an area with several stones and rocks also scattered on the surface. In general, site disturbance is not extensive, being limited to those factors associated with agricultural land use. Due to erosion of the site the likelihood of sub-surface deposits is considered to be low.

'Potential Archaeological Deposit (PAD)' and 'area(s) of archaeological sensitivity' refer to areas that are likely to contain sub-surface cultural deposits. There are no identified PADs within the study area due to past disturbances by farming activities and land clearing, and lack of sites. No further investigations (ie subsurface) are required.

Due to the level of disturbance across the study area and limited sites identified, subsurface investigations cannot be justified and a Section 87 Permit is not required.

The isolated artefact would not be impacted upon by the proposed pipeline and as such a Section 90 Consent to Destroy is not justified.

The following mitigation measures would be implemented to reduce the potential impacts on indigenous heritage:

- Ensure that all staff, contractors and others involved in construction and maintenance related activities are made aware of the statutory legislation protecting sites and places of significance
- No development works will occur within 20 metres of the isolated artefact and it will be fenced off
- If a site is uncovered during construction, works will immediately cease in that vicinity to avoid any potential damage/disturbance to the artefact/relic of interest and the construction contractor will notify the nominated Macquarie Generation Environment Officer immediately to arrange for a DEC officer to attend the site
- Appropriate 'rescue-record' measures will be implemented in accordance with appropriate guidelines under the National Parks and Wildlife Act 1974 and the advice received from DEC where a site is uncovered during works.

5.9 Non-indigenous Heritage

No items considered likely to be of non-indigenous heritage significance were identified during the preliminary site investigations. A search of the relevant local and state government heritage registers would be undertaken as part of the EA investigations.

The Plashett Homestead located about 2.5 kilometres to the west of the river pump station has heritage significance, but will not be impacted by the works.

The primary mitigation measure proposed for the preservation of non-indigenous heritage items is avoidance. In addition, the following mitigation measures are proposed:

- Should any item be encountered during pipeline construction that is considered to be of heritage value, all work will cease immediately. The construction contractor's Environment Manager would be notified immediately who would then be responsible to make appropriate arrangements for a representative from the NSW Heritage Office or other suitably qualified person to be consulted.
- All site personnel would be made aware of the proximity of any identified non-indigenous heritage items.

5.10 Visual Impacts

The main aspects of the Project with potential for visual impact include:

- The new pumping station on the northern bank of the Hunter River
- The substation for the new pumping station
- The additional pipeline(s) from the new pump station to the top of the ridge on the eastern side of Plashett Dam
- Areas of disturbed ground during construction prior to its restoration.

The Hunter River Pump Station and pipeline are situated in an area of rural landscape.

The location of the pipeline is such that it would be visible from the area to the south of the pumping station if it is constructed above ground and may be visible from the township of Jerrys Plains.

The precise location of the new pumping station is yet to be confirmed, however it would be located on the northern side of the river upstream (within 100m) of the existing pump station. The northern side of the river is characterised by a steep bank and moderate cover of trees and shrubs. Items of visual prominence include the existing pump station, former siltation basin and transformer yard.

The new pumping station will have its base below the level of the floodplain and a height of about 17 metres. It will have a width of about 20 metres along the river. Due to the entrenched nature of the pumping station its visibility will be reduced. Its visibility can be further reduced by attention to painting of structures on the top of the pumping station and for the concrete building. Aspects such as lighting can also be designed to reduce visibility of the installation at night time. Provision of floodlights is generally required for conduct of inspection and maintenance at night time when required.

The visual catchment of the proposed pump station site consists predominantly of grazing land and is traversed by a Main Road No. 213, the Golden Highway. A number of rural residences are also located within the visual catchment. When viewed from the Golden Highway, the bulk of the proposed pump station would be obscured by a rise in the landform to the south of the river.

The following mitigation measures are proposed:

- Construction of the pump station, control building and pipeline would be undertaken in a staged and timely manner to minimise impact on local visual amenity
- The location of the pipeline route, pump station and control building will be chosen to minimise the extent of tree and shrub removal and to minimise destabilising the banks of the Hunter River
- Following completion of the construction works the disturbed areas (ie. working width) would be rehabilitated with native and locally endemic species robust to local climatic conditions. It is anticipated that this will improve the visual amenity when compared with the pre-construction condition of the area. As part of the construction works where appropriate, undesirable species such as willows previously identified by the Department of Natural Resources shall be removed
- Painting of steel structures would be undertaken to minimise their visibility.

5.11 Noise and Vibration

The location of the Hunter River Pumping Station augmentation project is within a rural area. The township of Jerrys Plains is about 2 km to the south east and rural residences are scattered sparsely throughout the countryside. Apart from the usual stock, domestic and agricultural plant and equipment noise present in the rural setting, noise sources include traffic on the Golden Highway (Broke to Denman), mining equipment at distance and irrigation pumps and sprays along the river plain opposite the pumping station.

Noise impacts arising from the Hunter River water supply augmentation project may relate to:

- Construction activities
- Operation of the pumps when flow conditions suit and extraction is permissible
- Maintenance activities, as required. These would generally be of a short term nature.

5.11.1 Operational noise impacts

The existing and proposed Hunter River pumps that will supply water to Macquarie Generation are electrically operated and submerged below the water. In addition the location of the proposed pumping station is within a river course that is entrenched in the flood plain. The operation of the pumps below water levels associated with high flows and below the level of the surrounding floodplain would combine to reduce the potential of transmission of the noise of the pumps. For these reasons, the operation of the pumps is unlikely to contribute significant noise to the surrounding environment. Other noise sources associated with the pumping facility are the electrical equipment including transformers and circuit breakers. Such equipment contributes minor noise that would be effectively mitigated by the distances to rural residences at this site.

At the existing pump station the ambient noise levels are also influenced by the river flowing over the weir which is likely to be a maximum at times of high river flows. The high flows also correspond with the time that the full capacity of the Hunter River pumping station can be used. It is possible that the noise of the pumps would be difficult to distinguish from the sound of the river flow at periods of high flow. The operation of the augmented pumping station at full capacity is likely to be infrequent, given the relatively infrequent nature of high flow events.

The nearest residences to the Hunter River pumping station are located over a kilometre to the south and south west. The Project would not significantly affect the noise environment during operation and would not be audible at the nearest residences.

For the reasons mentioned above and with the recognition of the lack of noise complaints arising from the existing equipment it is considered that operational noise would not be a significant issue for the augmented pumping station.

5.11.2 Construction noise impacts

Owing to the emergent nature of the Project, Macquarie Generation has advised that it may not be possible to limit construction hours and a 24-hour construction schedule may be necessary. The construction of the new facilities may produce a temporary increase in noise levels at the locality. This would include the noise from excavations, clearing using earthmoving equipment and the operation of cranes, trucks and various smaller machinery. The total duration of construction for the pumping station and pipeline is likely to be approximately 18 months. The associated pipeline construction is spread over some 3.5 km at greater distances from potentially affected residences. The absence of any noise-sensitive land uses within one kilometre of the pump station and pipeline locations indicates that noise and vibration is not likely to be a key issue during construction.

Typical noise levels for construction equipment are listed in Table 5.3.

Table 5.3 Sound Pressure Levels for Typical Plant Items

Item	Typical Plant Type	Typical Maximum Noise Level at 7 m (dBA)
Excavator	30 tonne	85
Rock Breaker	Large	101
Jackhammer	-	88
Tipper	15 tonne	84
Concrete Saw	-	95

Item	Typical Plant Type	Typical Maximum Noise Level at 7 m (dBA)
Concrete Mixer	-	89
Flat Bed Truck	28 tonne	80
Piling Rig	Bored	84
Crane	Hydraulic	85
Asphalt Paver	-	88
Front End Loader	Komatsu	87
Vibratory Roller	Smooth Drum	87
Tamping Machine	-	96
Hand Tools	-	79

Measurements of the ambient daytime noise levels at three locations surrounding the proposed development are shown in Table 5.4. The data obtained indicates significant traffic noise associated with vehicle movements on the Golden Highway. Construction noise impacts would be temporary, and with appropriate mitigation are unlikely to be a significant cause of annoyance to surrounding residents.

Table 5.4 - Ambient noise levels at nearest residence locations to pumping station

Site	Date	Time	L _{Aeq}	L _{A10}	L _{A90}	L _{Amax}	Comment
1	18/08/06	13.10	67.1	70.1	45.6	87.3	Traffic 39 cars, 6 trucks, two motorbikes, birds and plane
1	21/08/06	10.06	64.4	65.4	33.4	88.2	Traffic 27 cars, 2 trucks, animals
2	18/08/06	13.30	57.3	59.8	42.4	73.3	Traffic on highway (100m), birds
2	21/08/06	10.25	57.2	61.4	36.8	70.9	Traffic on highway (100m), birds
3	18/08/06	13.53	52.8	55.6	43.8	71.7	Low traffic and on highway (200m), birds
3	21/08/06	10.46	45.4	46.8	32.6	65.6	Traffic on highway (200m) birds, dog and tractor in distance

Site 1 – Golden Highway, Dalara property front gate (1.1 km south east of the existing pumping station)

Site 2 – 10 metres north west of first residence on Eilerslie entrance road (about 1.2 km south west of the existing pumping station)

Site 3 – Corner of Pearse and Pagan Street, Jerrys Plains

Note: Noise levels were measured at the times shown for a period of 15 minutes.

Noise assessment criteria

The DEC's Industrial Noise Policy (INP 2000) provides recommended amenity criteria for residences in rural areas that are exposed to 'industrial' noise sources.

Table 5.5 Amenity Criteria – Recommended L_{Aeq} noise levels from industrial noise sources in rural areas

Type of Receiver	Time of Day	Recommended L _{Aeq} * noise level dB(A)	
		Acceptable	Recommended Maximum
Residence	Day	50	55
	Evening	45	50
	Night	40	45

* L_{Aeq}: the "Equivalent Continuous Noise Level", sometimes also described as the "energy-averaged noise level", representing the cumulative effects of all noise events occurring in one day.

Tables 5.4 and 5.5 indicate that ambient daytime noise levels measured at residences were above the amenity criteria for locations 1 and 2.

As part of the project implementation, measures to mitigate construction noise for potentially sensitive receivers would include:

- Notifications to the local community prior to the commencement of construction activities indicating timing of works, type of activities, hours of duration and contact number for complaints
- Equipment with low noise emission to be used wherever possible
- A Construction Noise Management Plan would be prepared and implemented during the construction phase by the construction contractor.

With implementation of these measures, and taking into account the distance between the proposed work site and the nearest residences, construction noise impacts are not considered likely to be significant.

Vibration may occur associated with construction works and the operation of the pumps. However, vibration is not expected to be experienced by any nearby residents during construction, due to the distance from the works to the nearest residences.

5.12 Air Quality

Potential air quality impacts are considered to be minor and restricted to the construction phase of the project. Vehicle and machinery emissions during construction may temporarily impact the local air quality. However, there are no heavily populated or sensitive areas within proximity of the proposed construction sites. In operation the Project would not have any impact on air quality.

The following measures would be implemented to mitigate potential impacts on local air quality during construction of the project.

- Provide 'all weather' surfaces on construction haul routes and establish and enforce appropriate vehicle speed limits
- All vehicle loads entering and departing construction areas to be covered
- Exposed stockpiles and unsealed construction areas would be sprayed with water from watering carts as appropriate, or stabilised with seeding and planting
- Vehicles and machinery would be regularly serviced and maintained to optimum working conditions to minimise potential emissions
- Works will cease when wind speeds exceed 10m/s and where dust generation cannot be effectively minimised, until adequate controls can be implemented or until such weather conditions abate
- Vehicles will be confined to work areas to prevent any inadvertent encroachment or otherwise into exposed and stripped areas of ground
- All emission controls used on vehicles and construction equipment would comply with relevant DEC standards as provided under Section 124 of the Protection of the Environment Operations Act.

5.13 Waste

The following measures would be implemented to mitigate potential impacts from waste generated during construction and operation of the Project.

- Preparation of a Resource and Waste Management Plan
- Handling, storage and transport of all hazardous materials and waste would be in accordance with the National Code of Practice and the relevant Material Safety Data Sheets (MSDS) for the product

- Any wastes would be classified correctly in accordance with the *Environmental Guidelines: Assessment, Classification & Management of Liquid and Non-liquid Wastes*, produced by the EPA in July 1999 (the Waste Guidelines) to accurately identify management, transportation and disposal requirements.

5.14 Traffic and Access

5.14.1 Construction traffic

Access to the site for construction activities would be from the New England Highway via the existing road network on the Bayswater Power Station site. Traffic on the road would include construction staff and long and heavy vehicles used to transport equipment and materials to the site. Plant and equipment would include earthmoving plant and one or more cranes, pipes, pumps, transformers and valves. Materials would include gravel, concrete, steel and various form work.

Even during the peak construction period of the Project, the traffic volumes are not considered likely to cause any safety or road capacity issues due to the standard of the access roads and the isolated nature of the site.

Note that the following vehicle movement estimates and construction equipment listing are preliminary only and may vary as a result of geotechnical investigations, environmental factors, detailed design requirements and economic considerations.

Table 5.6 Estimated Construction Traffic

Total estimated vehicle movements <i>(Estimated for the 16-18 month site works period)</i>	Daily average	Total
Heavy truck (semi-trailer/low-loader, cement trucks & cranes)	6.25	2500
Light vehicle (cars, utilities & 4-wheel drives)	10	4000

The estimated average and total construction traffic volumes shown in Table 5.6 are not considered to be high. The river access road between Bayswater Power Station and the Hunter River pump site is on privately owned land (Macquarie Generation), and carries very small volumes of traffic under normal daily circumstances. Therefore, construction traffic would have almost exclusive use of the road during the construction period and there would be no impact on other traffic. The predicted volumes are small enough to have no noticeable impact on traffic flows on the New England Highway, from where all construction vehicles would enter the site.

The existing river access road between the power station and the Hunter River is mostly unsealed, and is likely to deteriorate during construction due to the effect of the increased traffic, particularly from heavy vehicles. In particular, this road would be vulnerable should there be periods of wet weather during construction. The cost of upgrading and sealing this road prior to construction would be prohibitive, given that the road would revert to its current low traffic volumes after construction. Therefore, it is considered that the most cost-effective approach would be to assign a maintenance team to the road, to ensure that the gravel surface is maintained to a suitable standard for the duration of construction.

5.14.2 Traffic during operation

In operation the Project would generate only minimal traffic. Visits to the pump station would be required for inspections, minor servicing or maintenance. These would generally involve light vehicles or light trucks, and would be of short duration. Traffic to and from the pump station during normal operations and maintenance is unlikely to have a significant impact, either in terms of noise or other environmental issues, or in terms of damage to the river access road.

5.15 Safety Issues

The project could present a range of safety issues relating to:

- Physical safety, particularly during construction
- Traffic movements
- Electrical equipment
- Bushfire risk
- Flooding/drowning

The Bayswater Power Station is operated by Macquarie Generation in accordance within a strict Occupational Health and Safety (OHS) policy and procedures. All persons entering the site must undertake an OHS induction prior to working on site, and the induction covers all of the potential risks and safety issues that could potentially arise.

Currently, the OHS procedures apply only to the Power Station itself. However, during construction of the proposed pump station and pipeline, the Contractor would prepare a comprehensive OHS plan and safe working procedures, applying to all construction personnel and covering all potential risks and safety issues that might arise on the site, including (but not limited to) those issues listed above. All construction personnel would be inducted prior to commencement of work.

Following completion of construction and during normal pump station operations, the operation and maintenance activities would be carried out by Macquarie Generation personnel who would be inducted to the site, and subject to Macquarie Generation's OHS plans and procedures.

5.16 Socio-economic

The Project aims to improve the security of water supply and hence Bayswater and Liddell Power Stations' electricity production during times of drought. The security and reliability of power supplies is in the interest of all electricity consumers of NSW. The construction of the new facilities will also provide short-term employment in the range of 30 – 50 people.

The capital cost of the augmentation project is of the order of \$50 million and is considered as commercially justifiable by Macquarie Generation.

5.17 Environmental Risk Analysis

The Director General's environmental assessment requirements include a general environmental risk analysis, to ensure that all potential environmental issues are captured and assessed, and management options identified. The following table represents a summary of the risk analysis carried out for the Project, and demonstrates that all relevant issues have been identified and assessed in terms of the Project's potential environmental issues, and that potential impacts can be effectively managed through the mitigation options that have been recommended.

Table 5.7 Environmental Risk Analysis

Aspect	Risk	Likelihood	Consequence	Management Options
Power Station water supply security	Inadequate water supply security for Bayswater and Liddell Power Station operations	Moderate to high during extended drought conditions	<ul style="list-style-type: none"> Up to 40% of State's electricity generation constrained. Not meet contractual obligations to NEM 	Improve water supply arrangements to obtain necessary supplies without adversely affecting other water users or the riverine environment
River Flow regime	Change to Hunter River flow regime below pumping station that adversely impacts other users	Low - Not able to change flow regime other than permitted by Water Management Licence.	Nil	Macquarie Generation protocols to ensure pumping is managed according to Licence allowances and rules
Water Quality, Off site impact	Extraction of low salinity water results in low flows below pumping station with increased salinity	Additional pumping only during high flows and within Licence regime	Minor, insignificant.	Macquarie Generation protocols to ensure pumping is managed according to Licence allowances and rules
Water quality Sediment to river during Cofferd Dam construction	Works to build Cofferd Dam around riverbank works site contributes sediment to River	Moderate but temporary impact.	Sediment in flow would cause increased turbidity downstream.	<ul style="list-style-type: none"> Screening of works during formation of coffer dam Alternative to earth wall construction. Filter curtains can limit suspended sediment transfer if flow is not too strong

Aspect	Risk	Likelihood	Consequence	Management Options
Water Quality Sediment to river from construction works in river bank	Uncontrolled construction works within and adjacent river lead to significant river bank erosion and sediment to River	Low due to the need to separate works from River flows for safety and to prevent erosion and sedimentation	Minor, at worst, the small area to be worked could add only a small amount of sediment compared to normal river load.	Coffer Dam will limit transfer of sediment from works within the river bank to the river itself.
Aquatic ecology Platypus	River bank works disturb platypus population with individual deaths or interruption to breeding cycle	High, without controls.	Adverse impact on local platypus population if no controls applied	<ul style="list-style-type: none"> • If necessary, timing of works to minimise potential for impact • Assessment and investigation of river bank prior to commencing works • If necessary, arrange temporary relocation of resident population • Maintain barriers from site during works
Aquatic ecology Native Fish	Augmentation of river has adverse effect on movement of fish	Low – No change is proposed for weir and pond in river	Nil	<ul style="list-style-type: none"> • Extent of works limited to river bank and coffer dam site • Weir monitored during works to ensure that no changes have occurred and weir still enables fish passage
Terrestrial ecology Vegetation clearing	Excessive clearing of native vegetation particularly along pipeline route	Moderate, if no controls	Low – Loss of native vegetation	<ul style="list-style-type: none"> • Route selection to address identified sensitive vegetation • Set boundaries for clearing and identify limits for working. • Use of native plantings to screen pipeline

Aspect	Risk	Likelihood	Consequence	Management Options
Terrestrial ecology Habitat disturbance	Disturbance to habitat including nests, burrows and rock outcrops particularly for pipeline route.	Moderate, if no controls	Low – if controls incorporated	<ul style="list-style-type: none"> Route selection to address identified critical habitat Areas to be cleared to be reviewed prior to clearance and where necessary, a specialist to arrange relocation of affected species
Terrestrial ecology Fauna corridors	The pipeline structure could create a barrier to movement of fauna	Low for most species due to pipeline being elevated off ground and bridging of creeks	Low for species present at this location. Some restriction but there will be ways for fauna to pass the pipeline	<ul style="list-style-type: none"> Ensure design considers extent of restriction in relation to species present and allows crossings
Indigenous heritage	Works disturb indigenous heritage	Possible	Low	<ul style="list-style-type: none"> Survey previously undertaken Earthworks to be monitored Work to stop if indigenous artefacts encountered
Non-indigenous heritage	Works disturb non-indigenous heritage	Possible	Low	<ul style="list-style-type: none"> Earthworks to be monitored Work to stop if non-indigenous artefacts encountered
Noise Impact Construction	Noise of construction works impacts surrounding community	Low	Low	<ul style="list-style-type: none"> Construction a temporary impact Residences are distant from site of works
Noise Impact Pump operation	Operation of pumps adversely affects the acoustic amenity at surrounding residences	Low	Low	<ul style="list-style-type: none"> Pumps are located underwater Pumps only operate during high flows Noise levels for electrically operated pumps is low Residences are distant from pumping station

Aspect	Risk	Likelihood	Consequence	Management Options
Dust from construction works	Earthworks leave bare ground and stockpiles that result in significant dust	Moderate, without controls	Low	<ul style="list-style-type: none"> Erosion control and dust prevention measures to be incorporated in EMP
Visual Impact Pumping Station	New pumping station has significant visual impact	Low	Low	<ul style="list-style-type: none"> Low location in river bank will limit visibility from many points
Visual Impact Pipeline	New pipeline has significant visual impact	Moderate, without controls	Low	<ul style="list-style-type: none"> Pipeline has potential to be visible but visibility can be mitigated Colour scheme to reduce visibility Tree screening to minimise visibility
Construction traffic	Construction traffic adversely impacts local traffic movements.	Low	Low	<ul style="list-style-type: none"> Access to the site via the New England Highway and by the Macquarie Generation River Road Traffic management plan for River Road
Water quality Oil spills	Oil spill from failed oil filled transformer to River	Low due to bunding of transformers	Low	<ul style="list-style-type: none"> Transformers located in suitable sized bunds
Water quality Spills during construction	Fuel, oil or chemical spill into River during construction	Low	Low	<ul style="list-style-type: none"> Storage sites contained Contingency plan in place in event of spill Adequate handling procedures
Discharge to Plashett Dam	The scouring or undermining of the dam embankment at the discharge outlet at Plashett Dam	Low provided the discharge outlet is designed with an energy dissipater and effective erosion controls of pipeline between dissipater and storage	Low with controls in place	<ul style="list-style-type: none"> Adequate sized dissipater Suitable design of pipeline between dissipater and Plashett Dam Monitoring of discharges to Plashett Dam

6. Statement of Commitments

This Section of the Environmental Assessment states the commitments made by Macquarie Generation to ensure that the impacts of implementing the augmentation project are acceptable.

Subject to the incorporation of the mitigation measures identified in Table 6.1, the augmentation of the Hunter River Pumping Station project can be implemented with acceptable impacts to the environment as indicated in Section 5.

Table 6.1 – Statement of Commitments

Issue or Section No.	Commitment
Administrative Condition - Compliance	<p>Macquarie Generation will notify in writing the Director-General, Relevant Government Departments and Singleton Council of the start of the Project's Construction and Operation. Such notification must be provided at least four weeks before the relevant start date unless otherwise agreed to by the Director-General.</p> <p>Macquarie Generation will bring to the Director-General's attention any matter that may require further assessment by the Director-General.</p> <p>Macquarie Generation will comply with any requirements of the Director-General arising from the Director-General's assessment of:</p> <ul style="list-style-type: none"> (a) any reports, plans or correspondence that are submitted to satisfy the Conditions of Approval; and (b) the implementation of any actions or measures contained in such reports, plans or correspondence.
Administrative Condition – Pre Construction Compliance Report	<p>Macquarie Generation will submit a Pre-Construction Compliance Report to the Director-General at least two weeks before Construction commences (or within any other time agreed to by the Director-General).</p> <p>The Pre-Construction Compliance Report will include:</p> <ul style="list-style-type: none"> (a) details of how the Conditions of Approval required to be addressed before Construction were complied with; (b) the time when each relevant Condition of Approval was complied with, including dates of submission of any required reports and/or approval dates; and (c) details of any approvals or licences required to be issued by Relevant Government Departments before Construction commences.
Administrative Condition – Pre Operation Compliance Report	<p>Macquarie Generation will submit a Pre-Operation Compliance Report to the Director-General at least two weeks before Operation commences (or within any other time agreed to by the Director-General).</p> <p>The Pre-Operation Compliance Report must include:</p> <ul style="list-style-type: none"> (a) details of how the Conditions of Approval required to be addressed before Operation were complied with; (b) the time when each relevant Condition of Approval was complied with, including dates of submission of any required reports and/or approval dates; and (c) details of any approvals or licences issued by Relevant Government Departments for the Project's Operation.

Issue or Section No.	Commitment
<p>Administrative Condition – Construction Compliance Reports</p>	<p>Macquarie Generation will provide the Director-General, Singleton Council and any other government department nominated by the Director-General with Construction Compliance Reports. The environmental management representative (EMR) must review the Construction Compliance Reports before they are submitted to the Director-General and bring to the Director-General's attention any shortcomings.</p> <p>The first Construction Compliance Report will report on the first six months of Construction and be submitted a maximum six weeks after expiry of that period (or at any other time interval agreed to by the Director General). The second, and subsequent, Construction Compliance Reports will be submitted at maximum intervals of six months from the date of submission of the first Construction Compliance Report (or at any other time interval agreed to by the Director General) for the duration of Construction.</p> <p>The Construction Compliance Reports will include information on:</p> <ul style="list-style-type: none"> (a) compliance with the CEMP and the Conditions of Approval; (b) compliance with any approvals or licences issued by Relevant Government Departments for Construction; (c) the implementation and effectiveness of environmental controls. The assessment of effectiveness will be based on a comparison of actual impacts against performance criteria identified in the CEMP; (d) environmental monitoring results, presented as a results summary and analysis; (e) the number and details of any complaints, including a summary of main areas of complaint, action taken, response given and intended strategies to reduce recurring complaints; (f) details of any review and amendments to the CEMP resulting from Construction during the reporting period; and (g) any other matter relating to compliance with the Conditions of Approval or as requested by the Director-General. <p>The Construction Compliance Reports will be made publicly available.</p>
<p>Environmental Impact Audits- Environmental Impact Audit Report - Construction</p>	<p>An Environmental Impact Audit Report - Construction will be prepared by Macquarie Generation and submitted to the Director-General a maximum three months after Construction is complete (or at any other time interval agreed to by the Director-General). The Environmental Impact Audit Report – Construction will also be submitted to other government departments upon the request of the Director-General.</p> <p>The Environmental Impact Audit Report – Construction will:</p> <ul style="list-style-type: none"> (a) identify the major environmental controls used during Construction and assess their effectiveness; (b) summarise the main environmental management plans and processes implemented during Construction and assess their effectiveness; (c) identify any innovations in Construction methodology used to improve environmental management; and (d) discuss the lessons learnt during Construction, including recommendations for future Projects.

Issue or Section No.	Commitment
<p>Environmental Impact Audits- Environmental Impact Audit Report - Operation</p>	<p>An Environmental Impact Audit Report - Operation will be submitted by Macquarie Generation to the Director-General a maximum 24 months after the Project begins Operation and at any additional periods that the Director-General may require. The Environmental Impact Audit Report - Operation must also be submitted to other government departments upon the request of the Director-General.</p> <p>The Environmental Impact Audit Report - Operation will:</p> <ul style="list-style-type: none"> (a) be certified by an independent person at the Proponent's expense. The certifier must be advised to the Director-General before the Environmental Impact Audit Report – Operation is prepared; (b) compare the Operation impact predictions made in the EA, Submissions Report and any supplementary studies with the actual impacts; (c) assess the effectiveness of implemented mitigation measures and safeguards; (d) assess compliance with the systems for operation maintenance and monitoring; (e) discuss the results of consultation with the local community particularly any feedback or complaints; and (f) be made publicly available.
<p>Environmental Management – Construction Environmental Management Plan</p>	<p>A Construction Environmental Management Plan (CEMP) will be prepared by Macquarie Generation and implemented in accordance with all relevant Acts and Regulations. Macquarie Generation will obtain the Director-General's Approval for the CEMP before Construction commences or within any other time agreed to by the Director-General. The CEMP must be reviewed by the EMR before Macquarie Generation seeks the Director-General's approval for the CEMP. The EMR must bring to the Director-General's attention any shortcomings.</p> <p>Macquarie Generation will ensure that the mitigation measures identified in this EA are incorporated into the CEMP or the relevant Sub Plan.</p> <p>The CEMP will be prepared in accordance with the Department's publication entitled Guideline for the Preparation of Environmental Management Plans (2004).</p>
<p>Environmental Management – Operation Environmental Management Plan</p>	<p>An Operation Environmental Management Plan (OEMP) will be prepared by Macquarie Generation and implemented in accordance with these Conditions and all relevant Acts and Regulations. Macquarie Generation will obtain the approval of the Director-General for the OEMP before Operation commences or within any other time agreed to by the Director-General.</p> <p>Macquarie Generation will ensure that the mitigation measures identified in this EA are incorporated into the OEMP or the relevant Sub Plan.</p> <p>The OEMP must be prepared in accordance with the Department's publication entitled Guideline for the Preparation of Environmental Management Plans (2004).</p>

Issue or Section No.	Commitment
<p>Environmental Management – Environmental Management Representative</p>	<p>Macquarie Generation will request the Director-General's Approval for the appointment of an Environmental Management Representative (EMR) at least eight weeks before Construction commences (or within any other time agreed to by the Director-General). In its request Macquarie Generation will provide the following information, the:</p> <ul style="list-style-type: none"> (a) qualifications and experience of the EMR including demonstration of general compliance with relevant Australian Standards for environmental auditors; (b) authority and independence (from the Proponent or its contractors) of the EMR including details of the Proponent's internal reporting structure; and (c) resourcing of the EMR role. The EMR will be available: <ul style="list-style-type: none"> (i) for sufficient time to undertake the EMR role. This timing shall be agreed between Macquarie Generation and the EMR and advised to the Director-General in the request for approval; (ii) at any other time requested by the Director-General; (iii) during any Construction activities identified in the CEMP to require the EMR's attendance; and (iv) for the duration of Construction. <p>The Director-General may at any time immediately revoke the approval of an EMR appointment by providing written notice to Macquarie Generation. Interim arrangements for EMR responsibility following the revocation must be agreed in writing between the Director-General and Macquarie Generation.</p> <p>The Director-General may at any time conduct an audit of any actions undertaken by the EMR.</p> <p>Macquarie Generation will:</p> <ul style="list-style-type: none"> (a) facilitate and assist the Director-General in any such audit; and (b) include in the conditions of the EMR's appointment the need to facilitate and assist the Director-General in any such audit. <p>The EMR is authorised to:</p> <ul style="list-style-type: none"> (a) consider and advise the Director-General and Macquarie Generation on matters specified in the Conditions of Approval and compliance with such; (b) determine whether work falls within the definition of Construction where clarification is requested by Macquarie Generation; (c) review the CEMP; (d) periodically monitor Macquarie Generation's activities to evaluate compliance with the CEMP. Periodic monitoring must involve site inspections of active work sites at least fortnightly; (e) provide a written report to Macquarie Generation of any non-compliance with the CEMP observed or identified by the EMR. Non compliance must be managed as identified in the CEMP;

Issue or Section No.	Commitment
	<p>(f) issue a recommendation to Macquarie Generation to stop work immediately if in the view of the EMR an unacceptable impact on the environment is occurring or is likely to occur. The stop work recommendation may be limited to specific activities causing an impact if the EMR can easily identify those activities. The EMR may also recommend that Macquarie Generation initiate reasonable actions to avoid or minimise adverse impacts;</p> <p>(g) review corrective and preventative actions to monitor the implementation of recommendations made from audits and site inspections;</p> <p>(h) certify that minor revisions to the CEMP are consistent with the approved CEMP; and</p> <p>(i) provide regular (as agreed with the Director-General) reports to the Director-General on matters relevant to carrying out the EMR role including notifying the Director-General of any stop work recommendations.</p> <p>The EMR must immediately advise Macquarie Generation and the Director-General of any incidents relevant to these Conditions resulting from Construction that were not dealt with expediently or adequately by Macquarie Generation.</p>
<p>Community and Consultation - Advice of Construction Activities</p>	<p>Macquarie Generation will ensure that the local community and businesses are advised of Construction activities that could cause disruption. Methods to disseminate this information will be identified in the CEMP. Information to be provided will include:</p> <p>(a) details of any traffic disruptions and controls;</p> <p>(b) construction of temporary detours; and</p> <p>(c) work approved to be undertaken outside standard Construction hours, in particular noisy works, before such works are undertaken.</p>
<p>Community and Consultation – Complaints Management</p>	<p>Prior to the commencement of Construction, Macquarie Generation will ensure that the following is available for the construction and operation period:</p> <p>(a) a postal address to which written complaints may be sent;</p> <p>(b) an e-mail address to which electronic complaints may be transmitted; and</p> <p>(c) a 24-hour telephone contact line.</p> <p>Macquarie Generation will keep a legible record of all complaints received in an up-to-date Complaints Register. The Complaints Register will record, but not necessarily be limited to:</p> <p>(a) the date and time, where relevant, of the complaint;</p> <p>(b) the means by which the complaint was made (telephone, mail or e-mail);</p> <p>(c) any personal details of the complainant that were provided, or if no details were provided, a note to that effect;</p> <p>(d) the nature of the complaint;</p> <p>(e) any action(s) taken by Macquarie Generation in relation to the complaint, including any follow-up contact with the complainant; and</p> <p>(f) if no action was taken by Macquarie Generation in relation to the complaint, the reason(s) why no action was taken.</p> <p>The Complaints Register will be made available for inspection on request of the Director-General. The record of a complaint must be kept for at least four years after the complaint was made.</p>

Issue or Section No.	Commitment
<p>Flora and Fauna Management Sub Plan</p>	<p>A Flora and Fauna Management Sub Plan will be prepared by Macquarie Generation as a sub plan of the CEMP. This sub plan will include:</p> <ul style="list-style-type: none"> (a) plans showing terrestrial vegetation communities; important flora and fauna habitat areas; locations where threatened species, populations or ecological communities were recorded; and areas to be cleared. The plans must also identify vegetation adjoining the Project where this contains important habitat areas and/or threatened species, populations or ecological communities; (b) methods to manage impacts on flora and fauna species (terrestrial and aquatic) and their habitat which may be directly or indirectly affected by the Project. These will include: <ul style="list-style-type: none"> (i) procedures for vegetation clearing, soil management and managing other habitat damage during Construction; (ii) methods to protect vegetation both retained within, and also adjoining, the Project from damage during Construction; (iii) a habitat tree management program including fauna recovery procedures and habitat maintenance (e.g. relocating hollows or installing nesting boxes); (iv) where possible, and where consistent with DEC or DPI requirements, strategies for re-using in rehabilitation works individuals of any threatened plant species that would be otherwise be destroyed by the Project; (v) performance criteria against which to measure the success of the methods (c) rehabilitation details including: <ul style="list-style-type: none"> (i) identification of locally native species to be used in rehabilitation and landscaping works, including flora species suitable as a food resource for threatened fauna species; (ii) methods to remediate affected aquatic habitats; (iii) the source of all seed or tube stock to be used in rehabilitation and landscaping works including the identification of seed sources within the Project. Seed of locally native species within the Project will be collected before Construction commences to provide seed stock for revegetation; (iv) methods to re-use topsoil (and where relevant subsoils) and cleared vegetation; (v) measures for the management and maintenance of all preserved, planted and rehabilitated vegetation; (d) a Weed Management Strategy including: <ul style="list-style-type: none"> (i) identification of weeds within the Project and adjoining areas; (ii) methods to treat and re-use weed infested topsoil; (iii) strategies to control the spread of weeds during Construction; (e) a program for reporting on the effectiveness of flora and fauna management measures against the identified performance criteria. Management methods must be reviewed where found to be ineffective; (f) the mitigation measures in Chapter 5 of the EA.

Issue or Section No.	Commitment
Cultural Heritage Sub Plan	A Cultural Heritage Management Sub Plan will be prepared by Macquarie Generation as part of the CEMP. The sub plan must incorporate the mitigation measures identified in Chapter 5 of the EA.
Non Indigenous Object	In the event that a non-indigenous heritage item is uncovered during Construction, all work in the vicinity of the object will cease and Macquarie Generation will contact the NSW Heritage Council to determine an appropriate course of action prior to the re-commencement of work in the vicinity of the item.
Soil and Water Management Sub Plan	<p>As part of the CEMP, a Soil and Water Management Sub Plan will be prepared by Macquarie Generation in consultation with Relevant Government Departments and Singleton Council. The Sub Plan will:</p> <ul style="list-style-type: none"> (a) where relevant, be consistent with the RTA's Guidelines for the Control of Erosion and Sedimentation in Roadworks; (b) identify the Construction activities that could cause soil erosion or discharge sediment or water pollutants from the site; (c) describe management methods to minimise soil erosion or discharge of sediment or water pollutants from the site including a strategy to minimise the area of bare surfaces during Construction; (d) describe the location and capacity of erosion and sediment control measures; (e) identify the timing and conditions under which Construction stage controls will be decommissioned; (f) include the mitigation measures in Chapter 5 of the EA, including measures to minimise dust from disturbed areas; (f) include contingency plans to be implemented for events such as fuel spills; and (g) identify how the effectiveness of the sediment and erosion control system will be monitored, reviewed and updated. <p>Construction</p> <p>An appropriately skilled Engineer or soil scientist will be consulted according to the Soil and Water Management Sub Plan to:</p> <ul style="list-style-type: none"> (a) undertake inspections of temporary and permanent erosion and sedimentation control devices; (b) ensure that the most appropriate controls are being implemented; (c) check that controls are being maintained in an efficient condition; and (d) check that controls meet the requirements of any relevant approval and/or licence condition. <p>The results of these inspections and any follow-up actions will be reported in the Construction Compliance Reports.</p>
Greenhouse and Energy Management Strategy	A <i>Greenhouse and Energy Management Strategy</i> will be prepared by Macquarie Generation prior to construction commencing, to ensure the efficient use of any non-renewable <i>resources</i> for Construction and Operation and where practicable, minimised.

Issue or Section No.	Commitment
Construction Traffic Management Sub Plan	<p>As part of the CEMP, a Construction Traffic and Transport Management Sub Plan will be prepared by Macquarie Generation. The sub plan will:</p> <ul style="list-style-type: none"> (a) Include the mitigation measures outlined in Chapter 5 of the EA; (b) identify designated transport routes for heavy vehicles to the Development Site; (c) include measures to minimise traffic disruption through Singleton and along the New England Highway; (d) include measures to minimise disturbance from traffic noise; (e) include measures to manage Construction traffic to ensure the safety of: <ul style="list-style-type: none"> (i) livestock and limit disruption to livestock movement; (ii) school children and limit disruption to school bus timetables; and (f) include a community information program to inform the community of any traffic disruptions resulting from the construction program.
Road Dilapidation	<p>Macquarie Generation will maintain the access road on its property in a safe condition during the construction phase. Any damage resulting from construction traffic, except that resulting from normal wear and tear, is to be repaired at Macquarie Generation's cost.</p>
Bushfire Risk Management Sub Plan	<p>As part of the Construction and Operation EMPs, Macquarie Generation will prepare a Bushfire Risk Management Sub Plan based on the guidelines Planning for Bushfire Protection (RFS, 2001 or its latest edition). The sub plan will include:</p> <ul style="list-style-type: none"> (a) details of the bushfire hazards and risks associated with the Development; (b) mitigation measures including contingency plans; (c) include the mitigation measures in Chapter 5 of the EA. (d) procedures and programs for liaison and regular drills with the Local Rural Fire Service; and (d) procedures for regular fire prevention inspections by the Local Rural Fire Service and implementation of any recommendations.
Waste Management and Re-use Sub Plan	<p>As part of the CEMP and OEMP, Macquarie Generation will prepare a Waste Management and Re-use Sub Plan to address the management of wastes during the Construction and Operation stages respectively in accordance with the NSW Government's Waste Reduction and Purchasing Policy. The Sub Plan will identify requirements for:</p> <ul style="list-style-type: none"> (a) the application of the waste minimisation hierarchy principles of avoid/reduce/reuse/recycle/dispose; (b) waste handling and storage; (c) disposal of wastes. Specific details must be provided for cleared vegetation, contaminated materials, glass, metals and plastics, hydrocarbons (lubricants and fuels) and sanitary wastes; and (d) any waste material that is unable to be re-used, re-processed or recycled must be disposed at a facility approved to receive that type of waste; and will include the mitigation measures in Chapter 5.
	<p>Macquarie Generation's project design is based on the layout shown in Figures 3.2 to 3.7 and the project description in Chapter 3 of the EA. Actual project design may vary slightly dependent on the final site conditions and equipment specification. The final design will be subject to Consent Authority review as part of the Construction Certificate Application process.</p>
	<p>Macquarie Generation will require the design of the substation to incorporate provision for containment of any oil spillage or leakage from the transformer(s) including secondary containment.</p>
	<p>Macquarie Generation will require the design of the LP Pumping Station to incorporate containment of oil that complies with relevant standards.</p>

Issue or Section No.	Commitment
	The site access from public roads will be via the Bayswater Power Station River Road. The existing lockable gate will be maintained at the entrance point.
	In the case of areas of oil or fuel storage on-site, Macquarie Generation will provide sufficient containment to contain any spillage that may occur at the location. Such sites will be monitored periodically for integrity of containment and adequacy of handling procedures. For the substation, containment measures will also include a secondary containment pond down-slope of the substation.
	In consultation with the neighbouring landowners and Jerrys Plains community, during construction selected tree planting may be undertaken by Macquarie Generation to reduce the visibility of certain elements of the project. The preferred types of plants for screening will be local native varieties.
	If a noise nuisance is reported after the pumping station is commissioned, Macquarie Generation will review the nature of the noise impact and assess the potential sources. If necessary, testing will be conducted to confirm that equipment performance is in accordance with the required noise specification.
	If the pumping station operation is resulting in noise in excess of the DEC requirements for the relevant receivers, then Macquarie Generation will vary operation of the pumping station to achieve noise compliance.
5.5.2	A Soil and Water Management Plan (SWMP) including an Erosion and Sediment Control Plan (ESCP) will be prepared which will describe detailed control measures and management strategies for potential erosion and sedimentation control during construction
5.5.2	No spoil will be stored adjacent to existing waterways or drainage lines
5.5.2	Surface flows will be diverted around and areas of disturbed ground or soil stockpiles
5.5.2	Sediment fences and other similar measures, such as control berms, will be constructed downstream of all disturbed areas to minimise the influx of sediment and other pollutants into local waterways
5.5.2	Rehabilitation techniques will be employed as necessary to ensure the ongoing stability of the banks of the Hunter River and less drainage lines for the Saltwater Creek catchment. These techniques will be detailed in the construction contractor's rehabilitation plan
5.7.3	Existing trees will be retained where possible to maintain current foraging and roosting areas for common fauna and connectivity of existing fauna movement corridors
5.7.3	Vegetation along the pipeline route will be rehabilitated and revegetated (representing ground cover, understorey and tree canopy) following construction of the Project
5.7.3	A Vegetation Management Plan will be prepared detailing restoration works, including weed management and re-establishment of native understorey species along the Hunter River
5.6.1	Excavation of the banks within 10 metres of the stream and to stream level should be carried out with light equipment and inspected to prevent the killing of any platypus in residence at the time excavations commence
5.6.1	Explosions and blasting should be avoided if possible
5.7.4	No oil or other chemicals should be stored on the stream bank below maximum stream height to minimise the potential for contamination of the river
5.6.2	The Project Construction Environmental Management Plan (CEMP) will detail measures to protect the water quality of the Hunter River

Issue or Section No.	Commitment
5.10	The construction of the pump station, control building and pipeline would be undertaken in a staged and timely manner to minimise impact on local visual amenity
5.10	The location of the pipeline route, pump station and control building will be chosen to minimise the extent of tree and shrub removal and to minimise destabilising the banks of the Hunter River
5.10	Following completion of the construction works, the disturbed areas (ie. working width) will be rehabilitated with native and locally endemic species robust to local climatic conditions. It is anticipated that this will improve the visual amenity when compared with the pre-construction condition of the area
5.10	Painting of steel structures would be undertaken to minimise their visibility
5.12	Provide 'all weather' surfaces on construction haul routes and establish and enforce appropriate vehicle speed limits
5.12	All vehicle loads entering and departing construction areas will be covered
5.12	Exposed stockpiles and unsealed construction areas will be sprayed with water from watering carts as appropriate, or stabilised with seeding and planting
5.12	Vehicles and machinery will be regularly serviced and maintained to optimum working conditions to minimise potential emissions
5.12	Works will cease when wind speeds exceed 10m/s and where dust generation cannot be effectively minimised, until adequate controls can be implemented or until such weather conditions abate.
5.12	Vehicles will be confined to work areas to prevent any inadvertent encroachment or otherwise into exposed and stripped areas of ground
5.12	All emission controls used on vehicles and construction equipment would comply with relevant DEC standards as provided under Section 124 of the Protection of the Environment Operations Act
5.11	Equipment with low noise emission to be used, if required, wherever possible
5.11	A Construction Noise Management Plan would be prepared and implemented during the construction phase by the construction contractor
5.11	Noise control in the vicinity of the Hunter River may be required during construction. Temporary noise controls, if required, would be detailed in the Noise Management Plan
5.8	If an item of indigenous cultural heritage is uncovered during construction, work in the affected area will cease immediately so as to avoid any potential damage/disturbance to the artefact/relic of interest
5.8	In the event of an indigenous find, the construction contractor is to notify the nominated Macquarie Generation Environment Officer immediately to arrange for a DEC officer to attend the site
5.8	Appropriate 'rescue-record' measures would be implemented for uncovered indigenous heritage, in accordance with appropriate guidelines under the National Parks and Wildlife Act 1974 and the advice received from DEC
5.9	Should any item be encountered during pipeline construction that is considered to be of (non-indigenous) heritage value, all work will cease immediately. The construction contractor's Environment Manager would be notified immediately who would then be responsible to make appropriate arrangements for a representative from the NSW Heritage Office or other suitably qualified person to be consulted
5.9	All site personnel would be made aware of the proximity of any identified items of indigenous or non-indigenous cultural heritage significance
5.13	A Resource and Waste Management Plan will be prepared

Issue or Section No.	Commitment
5.13	Handling, storage and transport of all hazardous materials and waste shall be in accordance with the National Code of Practice and the relevant Material Safety Data Sheets (MSDS) for the product
5.13	Any wastes will be classified correctly in accordance with the Environmental Guidelines: Assessment, Classification & Management of Liquid and Non-liquid Wastes, produced by the EPA in July 1999 (the Waste Guidelines) to accurately identify management, transportation and disposal requirements
5.6.3	Establish a comprehensive protocols to ensure pumping is managed in accordance to Licence allowances and rules
5.7.3	Develop and implement a long-term management plan and monitoring program targeting the health of the River Flat Eucalypt Forest prior to commencement of site works, in conjunction with platypus studies at this locality.
5.8	Ensure that all staff, contractors and others involved in construction and maintenance related activities are made aware of the statutory legislation protecting sites and places of significance
5.8	No development works will occur within 20 metres of the isolated indigenous artefact found on site, and it will be fenced off
5.7.6	The new pumping station will be located as close as practicable to the heavily disturbed section of bank immediately upstream of the existing LP pumping station
5.7.6	Water pumped from the coffer dam should be diverted to settling pond(s) before returning the water to the river, downstream of the weir to prevent sedimentation within the weir pool
5.7.6	Undertake excavation for the new LP pumping station in conjunction with a platypus management plan to avoid any impacts on the breeding activity of the local platypus population
5.7.6	Pumping station excavation to occur during the period of mid-March to mid-September or following relocation of local platypus population
5.7.6	Where there is insufficient ground clearance to allow fauna passage, install over- or underpass structures, such as earth bridges or tunnels, at strategic points along the pipeline route to allow fauna to cross over the pipeline structure
5.7.6	Provide habitat niches for insects (which in turn provide food resource for vertebrate species) by distributing any cleared vegetation along the pipeline
5.7.6	Ensure the pipeline design avoids hollow-bearing trees
5.7.6	Clear only the minimum area of vegetation, to minimise soil erosion and removal/modification of flora and fauna habitat
5.7.6	Maximise the retention of food resources, particularly sap-feeding trees and understorey species such as wattles
5.7.6	Retain hollow-bearing trees and recruitment (juvenile) trees
5.7.6	Where felling of hollow-bearing trees is required, engage a suitably qualified ecologist to undertake a pre-clearance survey 24 to 48 hours prior to felling to ensure gliders are not present within any of the hollows
5.7.6	Engage an ecologist is to inspect felled trees for injured fauna. Handle carefully any shocked, immature or injured fauna
5.7.6	No equipment, machinery or vehicles to be placed or left within the drip line of trees
5.7.6	Detail erosion and sediment control measures in the Environmental Management Plan (EMP)
5.7.6	Develop a Site Rehabilitation and Weed Management Plan prior to commencement of on-site works. It is anticipated that this Plan would be in force for a minimum period of one to two years following completion of works to ensure the work site has been successfully rehabilitated

Issue or Section No.	Commitment
5.7.6	Undertake post-construction rehabilitation of the study area using locally indigenous species
5.7.6	Compensate for native vegetation loss resulting from the pipeline by replanting at a ratio of two to one for each plant lost. This should result in a net increase in vegetation biomass and thus habitat
5.7.6	Stockpile all topsoil (ie the first 10 centimetres of the soil profile) and store separately from subsoil in areas designated stockpiles
5.7.6	Progressively rehabilitate exposed soil areas throughout the construction period
5.7.6	Progressively re-lay stockpiled spoil, topsoil and vegetation in the order that work progresses
5.7.6	Establish sandbags, linear silt fencing, or other suitable material between disturbed surfaces and aquatic or riparian habitats, to capture any sediment mobilised during wet weather
5.7.6	Maintain silt fences until the site has been revegetated, stabilised and is no longer prone to erosion
5.7.6	Inspect and maintain (re-erect, de-silt etc) erosion/siltation control devices weekly and after rainfall event

7. Conclusion

The Environmental Assessment has identified the components of the augmented Hunter River water supply system and the potential environmental impacts arising from construction and operation of the facilities.

The augmentation project has been proposed by Macquarie Generation to improve the security of water supplies for its operating power stations. The Project has been designed to provide improved access to high flows in the Hunter River, and does not involve any change to Macquarie Generation's operations, or to its water entitlements as specified in the Water Extraction Licences.

It has been demonstrated that the increased pumping capacity can be achieved without any discernible long-term impact on downstream flow volumes in the Hunter River, and therefore without any impact on the overall health of the river system.

The Environmental Assessment presented in this document indicates that with the incorporation of the mitigation measures described the Project can be implemented in an acceptable manner.

Macquarie Generation has prepared a draft Statement of Commitments to describe how the issues would be managed through the implementation of the Project.

In addition the preparation and implementation of Construction Environmental Management Sub-plans by the construction contractor(s) is required.

The primary benefit of the Project is the improved security of water supply to the electricity generation facilities and correspondingly, improved security for electricity generation particularly during extended drought periods.

an environmental risk analysis has been carried out and the key environmental issues identified to be managed for the Project include:

- Terrestrial and aquatic ecology
- Erosion and sedimentation
- Visual impact.

This report has demonstrated that the Project can be managed effectively without resulting in any significant adverse impacts on the environment.