

Environmental Assessment

Proposed Bayswater Power Station Upgrade

17 February 2006

Prepared for:

Macquarie Generation

Bayswater Power Station

New England Highway, Muswellbrook

Report by:

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HLA Ref: N60310_FinalRPT_17Feb06

CERTIFICATION

Submission of Environmental Assessment (EA)

prepared under the Environmental Planning and Assessment Act 1979
Section 75F

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in respect of	<i>The upgrade of the existing Bayswater Power Station to improve the treatment process for water at the power station.</i>	
project application applicant name applicant address	HLA 18 Warabrook Boulevard Warabrook NSW 2304 Macquarie Generation	
land to be developed lot no., DP/MPS, vol/fol etc proposed project	The proposed project is to be carried out on land described as Lot 16 DP 701496; Lot 6 DP 966589; Lot 2 DP574168; Lot 4 DP 247943; and Lot 2 DP 327372. The land is owned by Macquarie Generation.	
Environmental Assessment	Map(s) attached ✓ an Environmental Assessment (EA) is attached	

Certification

I certify that I have prepared the contents of this Environmental Assessment and to the best of my knowledge it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.

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EXECUTIVE SUMMARY

This Environmental Assessment (EA) has been prepared by HLA-Envirosciences Pty Limited (HLA) on behalf of Macquarie Generation to accompany a project application to the Minister for Planning. Macquarie Generation proposes to undertake improvement works for its existing Water Treatment Plant (WTP) located at Bayswater Power Station, which services both the Bayswater and Liddell Power Stations. The improvements are required to increase the salt removal capacity of the existing system, which will result in improved water conservation, greater efficiencies in power generation and greater generation capacity for both power stations.

The original development consent for Bayswater Power Station was granted by Muswellbrook Shire Council in September 1980. Subsequent alterations and additions to the power station have, however, been granted by the Minister as they were considered to be State significant development. It is argued that Bayswater Power Station as a whole is therefore now considered to be State significant development and that all development that forms part of the operation is also of significance to the State. The Minister has declared the proposed upgrade to Bayswater Power Station as a major project pursuant to the provisions of Part 3A of the Environmental Planning and Assessment Act 1979.

This EA has focused on the key environmental issues of energy, waste, water and air quality impacts. Other environmental issues such as hazards, noise, ecology, and Indigenous Heritage were also assessed. Additionally, a residual environmental risk analysis was conducted for the project to determine the potential residual environmental impacts following the implementation of the mitigation measures proposed in this document.

The assessment determined that the construction phase of the improvement works would have little effect on the environment in terms of water quality, flora, fauna, noise, air quality, waste, soils, land capability, cultural heritage, visual amenity or transport. When operational, the upgraded WTP would result in minimal environmental impacts, which would be similar to those from the current WTP. The greatest potential environmental risk comes from greenhouse gas emissions, which can be effectively offset. The cumulative impact of the project on the environment is considered to be negligible.

The construction phase of the proposed WTP works would result in some 80 construction jobs over an 18 month period and the employment of an additional fifteen personnel supplied by the contractor operating the WTP. The capital investment value of the project is approximately \$50 million. The project would improve the water quality for use in the power stations and subsequent discharge to Lake Liddell and the Hunter River. It would also result in associated competitive electricity supply costs for consumers.

This EA demonstrates that the proposed WTP improvements can be achieved with minimal adverse environmental effect.

ABBREVIATIONS

AR	Alkalinity Reduction Plant
BC	Brine Concentrator
CO ₂ -e/MWh	Tonnes of carbon dioxide equivalent produced per megawatt hour
CWT	Circulating Water Treatment
DDR	Dust Deposition Rate
DEC	Department of Environment and Conservation
DIPNR	Department of Infrastructure Planning and Natural Resources
DMR	Department of Mineral Resources
DoNR	Department of Natural Resources
DoP	Department of Planning
EA	Environmental Assessment
EMS	Environmental Management System
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environment Protection Licence
EPI	Environmental Planning Instrument
EIS	Environmental Impact Statement
GHG	Greenhouse Gas
HLA	HLA–Envirosciences Pty Limited
HRSTS	Hunter River Salinity Trading Scheme
ISO	International Organisation for Standardization
kWh	Kilowatt Hours
LEP	Local Environment Plan
LEP (1985)	Muswellbrook Local Environmental Plan 1985
LGA	Local Government Area
LSP	Lime Softening Plant
ML	Mega litres
PM ₁₀	Particulate Matter with an aerodynamic diameter of less than 10 micrometres
ppm	Parts per million
POEO Act	Protection of the Environment Operations Act 1997
REP	Regional Environment Plan
REP 1989	Hunter Regional Environment Plan 1989
RO	Reverse Osmosis
RTA	Roads and Traffic Authority
SEPP	State Environmental Planning Policy
TDS	Total Dissolved Solids
TSC Act	Threatened Species Conservation Act
TSP	Total Suspended Particulates
WAC	Weak Acid Cation
WTP	Water Treatment Plant

1 INTRODUCTION

1.1 Background

Macquarie Generation owns and operates two coal-fired power stations, Bayswater and Liddell, situated between the towns of Singleton and Muswellbrook in the Upper Hunter region of New South Wales. The location of the power stations is shown in **Figure 1**. Together, these power stations supply approximately 40% of the State's electricity and around 13.5% of the National Electricity Market demand for electricity.

Approximately 72,000 megalitres (ML) of cooling water for the Liddell and Bayswater Power Stations is required from the Hunter catchment each year to operate at 80% of full generating capacity. To prevent scaling in the cooling water systems, the naturally occurring salts and solids in the water must be removed before the water is used. A water treatment plant (WTP), which was installed at Bayswater Power Station for this purpose, was designed to remove around 28,000 tonnes of salt per year but is currently operating at a sub-optimal level.

In order to meet current and future electricity generation requirements, improvements to the existing WTP infrastructure are required to increase the salt removal capacity to some 38,200 tonnes per year. Refurbishments and upgrades to the existing plant are also required to optimise the performance of the plant and ensure its efficient operation for the next 30 years.

The original Development Application (ID. 825) for Bayswater Power Station was supported by an Environmental Impact Statement (EIS) that was lodged with Muswellbrook Shire Council in June 1979. Development consent was issued in September 1980, with the power station commencing operations in the mid 1980s.

There are two potential options for the proposed WTP works. Both options involve the refurbishment or replacement of existing equipment to fit within the existing building footprint. Macquarie Generation will not determine the preferred option until the detailed design phase. As such, the environmental assessment will use an 'envelope approach'. This approach will assess the combined impact of the worst-case aspects for each part of the proposed works allowing an assessment to be made of the overall potential worst-case environmental scenario. This approach is accepted by the Department of Planning (DoP).

Macquarie Generation has commissioned HLA-Envirosciences (HLA) to prepare this Environmental Assessment (EA) to support a project application to the Minister for Planning for the proposed upgrade of the Bayswater Power Station to improve the treatment process for water at the power station.

1.2 Statutory Context of this Proposal

The original development consent was granted by Muswellbrook Shire Council in September 1980. Since that time alterations and additions have taken place at Bayswater Power Station: The most recent of these is the Antiene Rail Coal Unloader, which was declared to be State significant development and was granted Development Consent by the Minister.

On this basis, it is evident that the Minister has previously formed the view that Bayswater Power Station is a State significant development. It is therefore argued that all development that forms part of the Bayswater Power Station operation is consequently also development that is of significance to the State.

In light of the recent amendments to the Environmental Planning and Assessment Act (EP&A Act) and the gazettal of State Environmental Planning Policy (Major Projects) 2005 (SEPP 2005), a request was put to DoP asking the Minister to declare that the proposed Bayswater Power Station upgrade is a 'major project' pursuant to the provisions of Part 3A of the EP&A Act.

1.3 Location

Bayswater Power Station is located in the Muswellbrook Local Government Area in New South Wales. The existing components of the WTP are located beneath the cooling towers of Bayswater Power Station. The proposed improvements to the WTP will occur within the footprint of the existing plant, which is shown in yellow on **Figure 2**.

1.4 Purpose of this Environmental Assessment

This EA has been prepared by HLA on behalf of Macquarie Generation to support the project application for the proposed upgrade of the Bayswater Power Station.

The purpose of this EA is to assess the environmental implications of the proposal and to describe the measures Macquarie Generation intends to take to minimise adverse environmental impacts resulting from the proposed works.

1.5 The Proponent

Macquarie Generation is a State-owned Corporation that operates the Bayswater and Liddell Power Stations. Electricity produced in these power stations is sold in the wholesale National Electricity Market. The ready supply of coal in the area to fire the power stations has enabled Macquarie Generation to supply electricity reliably and cost-effectively to its customers. Macquarie Generation strives to be competitive in the production, marketing and sale of electricity, and accepts responsibility for environmental protection as an essential part of its business.

2 THE SITE

2.1 Site Description

The subject site is located wholly within the boundary of Macquarie Generation's operations. The WTP is located directly beneath the cooling towers as shown in **Figure 2**. This area has been previously cut and filled, and is dominated by infrastructure for the existing WTP and the power station.

2.2 Land Ownership and Legal Description

Macquarie Generation owns the land that is the subject of the proposed works. The land occupied by the power station comprises the following lots:

- Lot 16 DP 701496;
- Lot 6 DP 966589;
- Lot 2 DP574168;
- Lot 4 DP 247943;
- Lot 2 DP 327372.

These lots are shown in **Figure 3**. One of the two options would involve the construction of four sludge lagoons within the Pikes Gully ash dam, which is located on Lot 10 DP 700554 and Lot 331 DP 752486, which are also owned by Macquarie Generation.

3 STATUTORY PLANNING CONTEXT

3.1 Local Planning

Muswellbrook Local Environmental Plan 1985 (LEP 1985) applies to the land on which the proposed project is located. Under the provisions of LEP 1985, the land is zoned 5(a) - Special Uses "A" Zone.

The objective of the (5a) Special Uses zone is to "recognise existing public land uses and to enable their continued operation, growth, or expansion to accommodate associated, ancillary or otherwise related uses".

The existing principal land use is power generation. The WTP, and therefore the proposed WTP works, are ancillary to this use of the site, and are therefore permissible in the 5(a) Special Uses zone.

3.2 Regional Planning

3.2.1 Hunter Regional Environmental Plan (Heritage) 1989

Hunter Regional Environment Plan (Heritage) 1989 aims to conserve environmental heritage, to promote the appreciation and understanding of the Hunter Region's distinctive variety of cultural heritage items and areas, and to encourage the conservation of the Region's historic townscapes. While the Hunter Regional Environment Plan (Heritage) 1989 applies to land within Muswellbrook Local Government Area, no heritage items listed in the REP would be affected by the proposed project.

3.2.2 Hunter Regional Environmental Plan 1989

Hunter Regional Environmental Plan 1989 (REP 1989) outlines factors to be considered when preparing Local Environment Plans and approving developments. It contains the following goals:

- a) *To promote the balanced development of the region, the improvement of its urban and rural environments and the orderly and economic development and optimum use of its land and other resources, consistent with conservation of natural and man-made features and so as to meet the needs and aspirations of the community;*
- b) *To coordinate activities related to development in the region so there is optimum social and economic benefit to the community; and*
- c) *To continue to strive for a regional planning process that will serve as a framework for identifying priorities for further investigations to be carried out by the Department [of Infrastructure Planning and Natural Resources] and other agencies.*

The proposed project would:

- occur within the footprint of the existing power station development;
- not appreciably increase the environmental impact of the existing operations; and
- would result in important economic benefits to Macquarie Generation and the Hunter Region.

The proposed project is consistent with the goals of REP 1989.

3.3 State Environmental Planning Policies

The following State Environmental Planning Policies (SEPPs) are potentially relevant to the proposed project.

3.3.1 State Environmental Planning Policy (Major Projects) 2005

State Environmental Planning Policy (Major Projects) 2005 (SEPP 2005) was gazetted on 25 May 2005 and replaced all existing provisions related to previously defined State significant development contained in some 35 separate planning instruments, directions and declarations. SEPP 2005 was amended on 1 August 2005. Proposed projects that are listed under SEPP 2005 are known as 'major projects'.

The primary aim of SEPP 2005 is:

To identify development of economic, social or environmental significance to the State or regions of the State so as to provide a consistent and comprehensive assessment and decision making process for that development.

Schedule 1 of SEPP 2005 identifies classes of development that are major projects and includes certain electricity generation facilities. The proposed project is an upgrade of the existing coal-fired electricity generation facility at Bayswater. The proposed upgrade involves works to improve the treatment process for water at the power station, which has a capital investment value of some \$50 million. It therefore falls within the definition of electricity generation under clause 24(a) of Schedule 1, and is consequently a candidate for declaration as a major project as identified by SEPP 2005. Under the provisions of Part 3A of the EP&A Act, the Minister will be the approval authority for the proposed project.

3.3.2 State Environmental Planning Policy No. 11 – Traffic Generating Developments (SEPP 11)

SEPP 11 requires that certain types of development listed in Schedules 1 and 2 of the policy be referred to the Roads and Traffic Authority (RTA) for comment before approval can be given. Part (f) of Schedule 1 relates to buildings for the purposes of industry, and requires consultation with the RTA if the enlargement or extension of an industrial building is or exceeds 20,000 square metres. Part (f) of Schedule 2 requires that if a building for the purposes of industry is enlarged or extended and the gross floor area of that enlargement or extension is or exceeds 5,000 square metres the RTA must be consulted.

The proposed works would occur largely within the existing footprint of the WTP, which has a floor area of some 1,300 square metres, and would not substantially change operational employment levels. The proposed project is therefore not considered to be traffic generating and will not require referral to the RTA.

3.3.3 State Environmental Planning Policy No. 33 - Hazardous and Offensive Development (SEPP 33)

SEPP 33 defines potentially hazardous development as:

“development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing

or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:

*(a) to human health, life or property, or
(b) to the biophysical environment,
and includes a hazardous industry and a hazardous storage establishment”.*

SEPP 33 defines potentially offensive industry as:

“development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment”.

As the proposed project will not change the threshold levels of dangerous goods stored on site, it is not considered to be hazardous or offensive development. SEPP 33 therefore does not apply.

3.3.4 State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44)

The Muswellbrook Local Government Area is subject to the provisions of SEPP 44. The policy requires that an assessment be undertaken to determine whether the subject land constitutes potential koala habitat prior to consent being granted for development.

As the proposed project would occur wholly within the current built footprint of the Bayswater Power Station, the project is not located on land that is potential or core koala habitat. Preparation of a Plan of Management is not required for project approval.

3.3.5 State Environmental Planning Policy No. 55 - Remediation of Land (SEPP 55)

SEPP 55 requires that a consent authority must not consent to the carrying out of any development on land unless it has considered whether the land is contaminated.

The presence of contamination on the site of the proposed project is unlikely as much of the area is covered by a concrete hardstand, any spills in the WTP are cleaned up immediately in accordance with the Environmental Management System for the site, and all chemicals are stored in bunded areas.

The consent authority must also consider if the site is suitable for the proposed project in its current condition. The area downstream of the brine decant basin has been subject to some saline seepage from the basin. This situation was reported formally to the former Department of Infrastructure Planning and Natural Resources (DIPNR; now the Department of Natural Resources or DNR) in the report for the year ending 30 June 2004 in accordance with the Water Management Licence requirements. This report is contained in **Appendix 1**. The Department of Environment and Conservation (DEC) has also been notified.

The long term effect of the decant basin on groundwater in the area will be better determined once the final design of the WTP is known. Macquarie Generation proposes to work toward a

solution with the DEC and the DNR once the decision on the final design is made. The treatment of the existing contamination is likely to include interception of seepage and pumping the captured material back to the decant basin.

3.3.6 State Environmental Planning Policy No. 67 - Macquarie Generation Industrial Development Strategy (SEPP 67)

The purpose of SEPP 67 is to enable energy-intensive industry to be developed within the Macquarie Generation Buffer Land area. Prior to the gazettal of SEPP 67, only developments ancillary to power generation were permitted on the land. As the proposed project relates to activities that are ancillary to the principal use of the land for power generation, the project is permissible under the provisions of LEP 1985, and SEPP 67 does not apply.

3.4 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) provide a framework for environmental planning in NSW. They include provisions to ensure that proposals with the potential to significantly affect the environment are subject to detailed assessment, and provide opportunity for public involvement.

Section 75B (2) of the EP&A Act defines development to which Part 3A applies being:

Major infrastructure or other development that, in the opinion of the Minister, is of State or required environmental planning significance.

Approval is required for the proposed project under Part 3A of the EP&A Act, and the proposed project has been declared by the Minister to be a major project under the Act. The Minister for Planning is the approval authority for the proposed project.

3.4.1 Permissibility

The land to which the proposed project relates is subject to the provisions of LEP 1985. This land is zoned 5(a) Special Uses 'A' under LEP 1985. The existing principal land use is power generation. The WTP and the proposed works are ancillary to this use of the site and, as an upgrade of the existing power generation facility, are permissible with consent.

3.4.2 State significant development

With the amendment of the EP&A Act on 1 August 2005, the provisions of the EP&A Act relating to State significant development have been repealed.

As discussed in **Section 1.2** and **Section 3.3.1**, the proposed project is deemed to be significant to the State as it qualifies as a major project under the provisions of SEPP 2005 and Part 3A of the EP&A Act. The approval authority for this project is the Minister for Planning.

3.4.3 Designated development

Section 77A of the EP&A Act identifies designated development as development assessed under Part 4 of the Act that is declared by an Environmental Planning Instrument or the EP&A Regulation. As the proposed project will be assessed under Part 3A the designated development provisions of Part 4 of the EP&A Act do not apply.

3.4.4 Integrated development

Integrated development is development (not being complying development) that under section 91 of the EP&A Act requires development consent and approvals from various government agencies. These provisions relate to Part 4 of the Act and therefore do not apply to the proposed project as it will be assessed under Part 3A of the Act.

3.4.5 Other authorisations

Schedule 1 of the POEO Act identifies 'scheduled activities' that are required to be licensed by DEC (formerly the Environment Protection Authority). The power generating facility on the site is subject to an Environment Protection Licence (EPL 779). It is not envisaged that this licence would require variation should the proposed WTP works be approved.

4 CONSULTATION

Various Government agencies were consulted for their requirements during the preparation of this EA. These requirements, and cross references to sections in this document where they are addressed, are summarised below.

4.1 Department of Planning Requirements

Copies of correspondence to and the response from DoP are included in **Appendix 2. Table 1** summarises the requirements for this EA and the sections of the documents where each requirement is addressed.

Table 1: Checklist of DoP Requirements

DoP Key Assessment Requirements	EA Reference
Strategic Planning	
Strategic assessment of the project, including justification of the need, scale, scope and location for the project.	Sections 1.1, 6.1 and 6.2.
Strategic planning consideration of the project and an analysis of the suitability of the proposed site with respect to potential land use conflicts with existing and future surrounding land users	Sections 3 and 7.11
Water Cycle Management	
Assessment of water quality impacts associated with the project, including details of the expected water balance for the site.	Sections 5, 6.3.2, 7.3.2 and Figure 4
Detail how the project will affect groundwater and surface waters.	Section 7.3
Greenhouse Gases	
Greenhouse gas assessment, including quantification of the total volumes and emissions intensities for greenhouse gases produced in association with the project per year.	Sections 7.1.2 and 7.15.6
Appropriate details of each offset option proposed, including implementation measures for each offset option.	Sections 7.1.3 and 7.1.4
Waste Generation and Management	
Detail wastes associated with project, including quantities and qualities of waste, management, minimisation and treatment/disposal methods.	Section 7.2
Classification of wastes that are not to be reused or recycled in accordance with the DEC's <i>Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes</i> .	Section 7.2
General Environmental Risk Analysis	
Identify potential environmental impacts associated with the project (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures.	Sections 7 and 10

4.2 Other Agency Requirements

Muswellbrook Shire Council was originally consulted in March 2004. Council requested supporting documentation that should be submitted with any application to Council. These items are listed in **Table 2**.

The DEC was consulted in May 2005 and DIPNR (Water Resources; now DNR), Muswellbrook Shire Council and the Mine Subsidence Board were consulted in early June 2005 regarding their requirements for the EA. Correspondence from these consultations is included in **Appendix 3**. The issues raised by each of the organisations are summarised in **Table 2** and are discussed in detail in **Section 7**.

Table 2: Issues Raised by Council and Other Government Departments

Government Agency Consulted	Issues to be Addressed in the EA
Muswellbrook Shire Council	Proposed increases in treatment capacities, chemical makeup, treatment methods and disposal methods/locations.
	Details on existing licences and proposed changes to these licences.
	Likely impacts on the environment over and above existing impacts.
DEC	Potential ground water contamination from the brine decant basin.
	Suitability of existing infrastructure that will be retained.
	Impact on discharge offsite.
	Sustainability of the brine decant basin.
Mine Subsidence Board	No issues to be addressed but approval for the erection of the improvements must be sought from the board.
Department of Natural Resources	No response was received.

4.3 Community Consultation

Community consultation was undertaken through the Macquarie Generation Community Consultative Committee (CCC). The potential improvements to the WTP were first raised at the meeting held on 18 May 2005, with subsequent discussions held over the next three quarterly meetings (held in August and November of 2005 and February 2006).

The issues raised at the CCC meetings, and the sections of this EA in which these matters are addressed, are listed below:

- Water quality (**Section 7.3**);
- Justification for the proposal (**Sections 1.1, 6.1 and 6.2**);
- The amount of water used and treated by the power station (**Sections 1.1, 5 and 6**); and
- General discussions about desalination as a water treatment process.

5 EXISTING DEVELOPMENT

Existing infrastructure at the Bayswater site includes the coal-fired power station and its ancillary facilities. These include coal and water supply systems, fly ash collection and disposal systems, site drainage works, sewage treatment works, a water treatment plant, demineralising plants, condensate polishing plants, settling basins and oil/water separators.

Details of the existing infrastructure and operations on the site are outlined in the Environmental Impact Statement for the Bayswater Power Station prepared by the Electricity Commission of New South Wales in 1979.

A flow chart showing the interrelationship of the components of the existing water management system at Bayswater Power Station is shown in **Figure 4**. The WTP component comprises three treatment processes and waste disposal. These processes and the disposal system, as described in Elcom 1987 and Connell Wagner PPI 2004, are outlined below.

5.1 Lime Softening Plant

The lime softening plant (LSP) consists of two Boby Graver reactivator clarifiers that remove calcium and some magnesium from the Hunter River water that is used to maintain water levels in Lake Liddell.

5.2 Circulating Water Treatment Plant

Four circulating water treatment plants (CWT) are arranged in pairs. Each pair of plant provides side stream treatment of the water from two interconnected cooling tower basins. The plants control the quality of the circulating water to prevent the formation of scale and corrosion in the cooling water system. Each CWT consists of pre-treatment equipment that feeds two reverse osmosis (RO) trains with a maximum design feed capacity of 8.7 ML/d and an alkalinity reduction (AR) plant with a maximum feed capacity of 38 ML/d. The RO and AR plants recover 82% and 98% of feed water respectively, which is then recirculated back to the cooling towers.

The AR plants include six suspended solid sand filter units and four weak acid cation (WAC) units that remove calcium hardness. The AR plants were decommissioned in 1994 because of downstream process problems in the Brine Concentrator Plant. This decommissioning did not compromise the performance of the WTP as the RO trains had sufficient capacity to remove the hardness from the cooling water. The addition of sulphuric acid in the cooling towers was, however, subsequently required in order to achieve pH correction.

The RO trains utilise the differential rates of diffusion of water and ions through a semi-permeable membrane to remove total dissolved solids (TDS). Recovered water is recirculated to the cooling towers. As the cellulose acetate membranes used in the RO trains are becoming increasingly difficult to obtain, the long term viability of the current system cannot be assured.

5.3 Brine Concentrator Units

Two brine concentrator (BC) units recover water from the CWT plant waste. The BCs reduce the final volume of concentrated brine and enable recovery of 95% of the BC feed water, resulting in a decrease in the final volume of waste from the WTP. The water recovered from this process is recycled for use in the boilers via the demineralising WTP or is used as cooling water make-up. The system was designed to treat 6.6 ML/day.

5.4 Waste Disposal System

BC waste is disposed of in the Brine Decant Basin, which has a total capacity to store 900 ML of waste brine. The dam currently holds 475 ML of brine.

Waste sludge from the LSP is gravity fed to five nearby lagoons. When full, each lagoon is dried out by natural evaporation and the solid waste is disposed of in Bayswater Power Station's ash dam. The LSP sludge lagoons also receive waste from the RO pre-treatment clarifiers and dual media filters in the CWT. The supernatant water from these lagoons is recirculated back to the LSP clarifiers.

6 PROPOSED PROJECT

6.1 Overview of the Project

Water supplies for Bayswater Power Station come from the Hunter River and Lake Liddell. Salt and solids occurring naturally in the water must be removed prior to the use of the water in the power station cooling system.

The existing WTP installed at Bayswater Power Station currently removes around 13,000 tonnes of salt per year. The removal capacity is well below design and is inadequate for current and projected electricity generation. Macquarie Generation is therefore proposing improvements to the existing plant to increase water treatment capacity and to optimise plant performance. It is proposed to have the upgraded WTP operational by the end of 2007 following a construction period of 18 months.

6.2 Need for the Development

The main role of the WTP is to remove salts from cooling water to prevent scaling in the cooling water system. NSW Water Reforms have restricted the amount of water available for use by Macquarie Generation both in its power generation processes and for blowdown of Lake Liddell to the Hunter River. Additionally, the amount of blowdown from the cooling towers has increased due to operational constraints of the WTP. Together, these factors have resulted in an increase in salt concentrations in Lake Liddell over time.

Until recently, the salt content of Lake Liddell has been managed by discharges from the lake to the Hunter River, reducing the mass of salt in the lake. The opportunities for these discharges have been reduced by recent weather conditions, changes to the Hunter River Salinity Trading Scheme (HRSTS) and the introduction of the Water Sharing Plan for the Hunter Regulated River Water Source. As a result, water quality in Lake Liddell has declined as conductivity levels have increased. This has negatively affected the operation of the power stations.

The performance of the BCs has been adversely affected by the marginal design capacity of the plant. In addition, inadequate design of parts of the BCs is affecting plant availability. These issues have significantly reduced the performance of the plant, which now has an availability of only some 57%.

The proposed improvements would have the following effects:

- Improved environmental benefits through reduced discharges of saline water to the Hunter River;
- Improved efficiency of water use at Bayswater and Liddell Power Stations;
- Greater certainty of generating capacity and efficiency from Bayswater and Liddell Power Stations through:
 - d) Reduced scaling of heat exchanger surfaces, with resultant improvements in power generating efficiencies at both stations; and
 - e) Greater certainty of the two power station's ability to generate approximately 40% of the State's electricity.

6.3 Proposed Project

The purpose of the proposal by Macquarie Generation is to increase the salt removal capacity of the existing WTP from the current performance of around 13,000 tonnes per year and the current design capacity of 28,000 tonnes per year to an effective removal capacity of approximately 38,200 tonnes of salt removed per year. This will provide optimum plant performance for the next thirty years.

6.3.1 Approach

There are two potential options for the proposed WTP works. Both options involve the refurbishment or replacement of existing equipment in the plant to fit essentially within the existing building footprint. Both options address the current operational difficulties associated with the LSP, the AR plant, the RO plants and the BC units.

As the preferred option will not be selected until the detailed design phase, this environmental assessment will use an ‘envelope approach’. This approach will assess the combined impact of the worst-case aspects for each of the potential component parts of the proposed works; that is, the lime softening plant, circulating water treatment plant, brine concentrator units and waste brine disposal system.

This approach will allow assessment of the overall potential worst-case scenario for the project. Assessment agencies can therefore be satisfied that the impacts of the proposed project are well understood and will be adequately covered by any approval based on this information, regardless of the final design of the project.

6.3.2 Proposed project components

The components of the two potential options for the WTP works are outlined in **Table 3**.

Table 3: WTP Improvement Options

OPTION 1	OPTION 2
Lime Softening Plant	
<ul style="list-style-type: none"> • The upgraded LSP would treat Hunter River water, which would then be fed to Lake Liddell. The upgraded plant would result in consistent softening and alkalinity reductions, and would also result in a gradual reduction of TDS in Lake Liddell. • Refurbishment of the hydrated lime feed system. This would involve the installation of a new feeder, a new solution preparation tank with mixer, and new dosing pumps. • Upgrade of the lime dosing equipment through the replacement of dosing pumps, lime slurry tanks and the lime feeder to allow continuous recirculation of water, which would prevent the lines from becoming clogged. • Installation of an acid dosing system that would consist of a bulk acid storage tank and acid dosing pumps. • Installation of a new polymer dosing system in the existing clarifiers. 	<ul style="list-style-type: none"> • Minor changes would be made to lime dosing and storage equipment. • Installation of an acid dosing system, which would require the installation of a 60,000 litre bulk acid storage tank in a suitably bunded area.

OPTION 1	OPTION 2
Circulating Water Treatment Plant	
<ul style="list-style-type: none"> • Reinstatement of the AR function and three of the four WAC units from each AR plant. These units would require new rubber lining and replacement of the existing under-drain collector. • Installation of a 2.7m high de-carbonator tower down-stream of the WAC units to remove the carbon dioxide that is a by-product of the WAC process. The tower would be located on framework over the existing dual media filter clear water sump. • Installation of a new set of transfer pumps in the filtered water pump in order to pump filtered effluent to the WAC units. • Reinstatement of the soda ash dosing system. • Installation of an acid dosing system in the feed to the de-carbonator to be used in the event that excess alkalinity is discharged from the WAC unit. • Replacement of piping and valves associated with the gravity filter. • Installation of a facility for caustic dosing and contingent dosing of antiscalant on the discharge of the existing RO cartridge filter supply pumps. • Installation of a new high efficiency RO unit after the RO stage. This would increase water recovery to 95% and reduce the wastewater volume from the current 7.8 ML/day to between 1.9 and 2.3 ML/day. The existing solids water separation system would be retained. • The permeate would be directed to the existing RO flush water tank, and from there would overflow to the circulating water basin. The permeate produced would have a TDS of approximately 40 – 60 parts per million (ppm) compared with the existing concentration of 400 - 450 ppm. 	<ul style="list-style-type: none"> • The AR plants would be returned to service and a clarification step would be added prior to the suspended solids filters. The installation of the clarification step would ensure efficient suspended solids removal; failure of this step in the current WTP led to the decommissioning of the AR plants. Processed water from the AR plant would provide feed for the RO plant. Excess process water would be recirculated to the main cooling towers. • Installation of new membranes within the existing RO plant. • Replacement of the RO chemical dosing system. • The media in the dual media filters would be changed to a mono sand bed, providing better filtration efficiency.
Brine Concentrator Units	
<ul style="list-style-type: none"> • Removal of one of the two BCs from service and modification of the remaining BC to take RO reject. • 5% of the BC holding pond would be sectioned off for RO reject to ensure that the RO reject and the BC feed do not mix. This would ensure that the BC stream would be free from hardness, eliminating the need for further chemical treatment. 	<ul style="list-style-type: none"> • Upgrade of the two BC units and installation of a third BC for optimal concentration capacity. A new flood box distribution system would be installed for each existing brine concentrator to eliminate blockages in the brine recirculation system. • Installation of new pre-heaters and de-aerators.
Waste Brine Disposal System	
<ul style="list-style-type: none"> • The final waste brine disposal process would consist of feeding the BC waste to a mechanical vapour recompression crystalliser. This would produce approximately 0.2 ML/day of a 55% solids slurry for disposal in the existing decant basin through the existing pipe network. • Four sludge lagoons would be constructed in 	<ul style="list-style-type: none"> • A mechanical vapour recompression brine crystalliser is proposed to concentrate waste brine from the BC plant. It would produce a pumpable slurry that would be directed to the existing brine decant basin. The volume of water in the waste stream from the decant basin will be reduced from around 75% in the waste from the existing BC plant to 37% from the

OPTION 1	OPTION 2
<p>the Pikes Gully ash dam to receive sludge from the CWT lime-soda clarifier plants. The location of the proposed sludge lagoons is shown in Figure 5.</p>	<p>crystalliser.</p>

6.3.3 Site preparation

The Bayswater Power Station site was extensively cut and filled during its construction. As a result, only minor site preparation would be required for the proposed improvements. Many items of plant would be placed directly onto existing hardstand areas. While there are some new pieces of equipment, such as the BCs and crystalliser, that would require trenching for footings, minimal site preparation would be required.

6.3.4 Environmental management

Macquarie Generation operates under an Environmental Management System (EMS) that is certified to the international standard ISO 14001:2004 – Environmental Management Systems - Requirements with Guidance for Use. The EMS includes the requirement to assess plant modifications and apply appropriate environmental management processes. The EMS would therefore cover the operation of the WTP following completion of the proposed works.

The chosen contractor would be required to develop an Environmental Management Plan (EMP) for the construction of the proposed works in accordance with the requirements of Macquarie Generation’s *Standard Requirements for Work at Site* and the *Contractor Environmental Management Plan Guidelines and Assessment Checklist*. These documents are contained in **Appendix 4**.

6.3.5 Hours of operation

Construction would generally be carried out during normal working hours (7am to 6pm) Monday to Friday. Approval in writing would be sought from the Director-General for work required outside these times. Following completion of the proposed works, the plant would resume its current 24 hours a day, seven days a week operations.

6.3.6 Workforce requirements

A maximum workforce of approximately 80 personnel would be required for the construction phase, which would extend over a period of 18 months. The operation of the upgraded WTP would require an additional fifteen personnel, which would be supplied by the contractor operating the WTP.