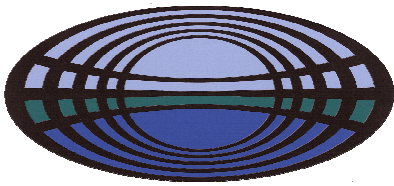


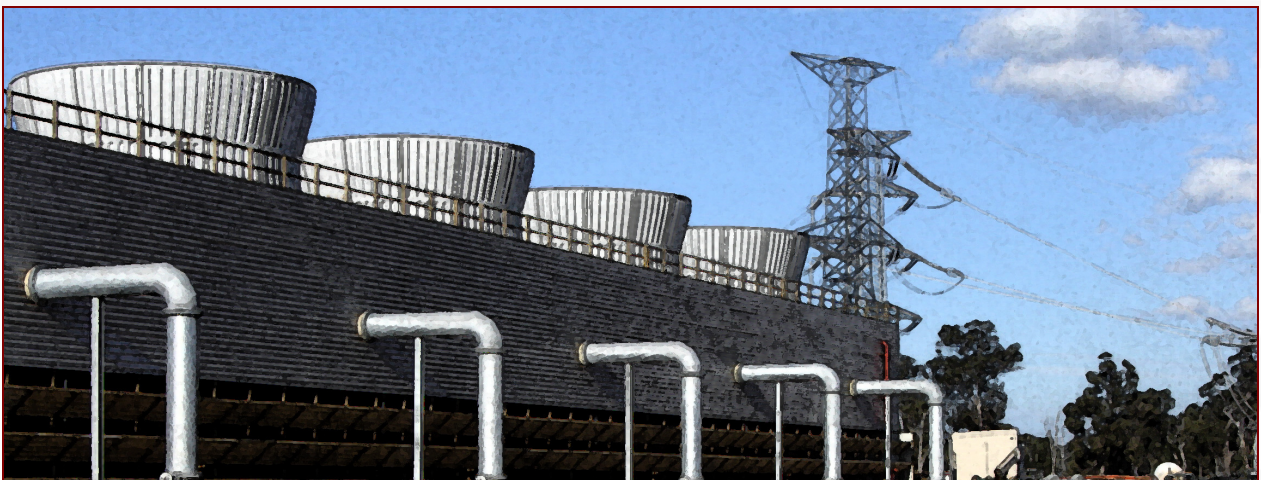
THE GRIFFIN GROUP



strategen

Bluewaters Power Station Phase III and IV Expansion

**Operation Environmental
Management Plan**



Prepared for
Griffin Power 3 Pty Ltd
by Strategen

July 2009

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July 2009

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Client: Griffin Power 3 Pty Ltd

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BLUEWATERS POWER STATION PHASE III AND IV EXPANSION

OPERATION ENVIRONMENTAL MANAGEMENT PLAN

1. INTRODUCTION

1.1 BACKGROUND

Griffin Power 3 Pty Ltd (Griffin Power) is proposing to expand the Bluewaters Power Station facility at Collie by constructing and operating Bluewaters Phases III and IV (the Proposal). Each phase of the Proposal consists of one 229 MW (gross output) base-load coal-fired generating unit, located within the Coolangatta Estate approximately 4.5 km from the eastern edge of Collie, Western Australia. Bluewaters Phases III and IV will be located adjacent to Bluewaters Phase I and II power stations (each 229 MW) and all four phases of the power station will share infrastructure. A marine outfall and pipeline will be constructed to dispose of cooling blowdown water if other preferred options are not made available. The regional location and power station layout are shown in Figure 1.1 and Figure 1.2 respectively.

The Bluewaters Power Station has been designed for expansion in modular phases in order to grow with the demands of the Western Australian electricity market. It is envisaged that the Bluewaters Phase III and IV expansion will be approved for construction and operation under Part IV of the *Environmental Protection Act 1986* (EP Act) and under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Proposal involves a range of potential environmental impacts requiring management to meet the objectives of the approval of the Proposal.

1.2 PURPOSE OF DOCUMENT

This document has been prepared as a compilation of specific management plans to be implemented during operation of the power station. Key management actions from this document form commitments made in the Public Environmental Review, which are expected to be included as conditions in the Ministerial statement to be issued approving implementation of the proposal.

The management plans contained in this Operation Environmental Management Plan apply to various aspects of operation of the Proposal, in terms of the two components: the generator units and the marine outfall. The applicability of each plan to these components is set out in Table 1.1.

Table 1.1 Applicability of management plans to project components

Management Plan	Section No	Power Station Generator Units	Marine Outfall & Pipeline
Air Quality Management Plan	Section 4	Yes	No
Noise Management Plan	Section 5	Yes	No
Water Supply Management Plan	Section 6	Yes	No
Water Resource Protection Management Plan	Section 7	Yes	No
Hazardous Materials Management Plan	Section 8	Yes	No
Waste Management Plan	Section 9	Yes	No
Ash Management Plan	Section 10	Yes	No
Saline Wastewater Disposal Management Plan	Section 11	Yes	Yes

Figure 1.1 Regional location

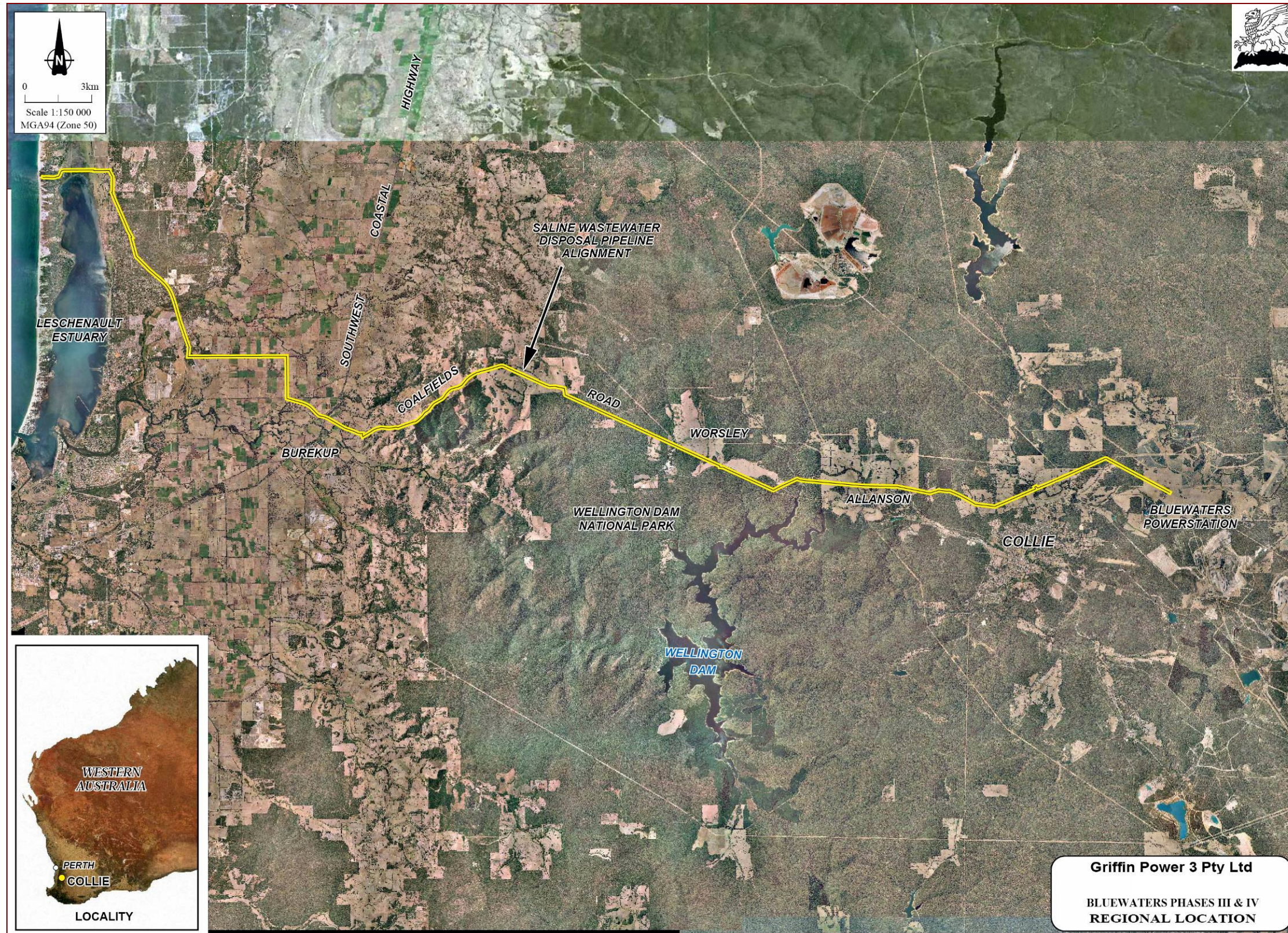
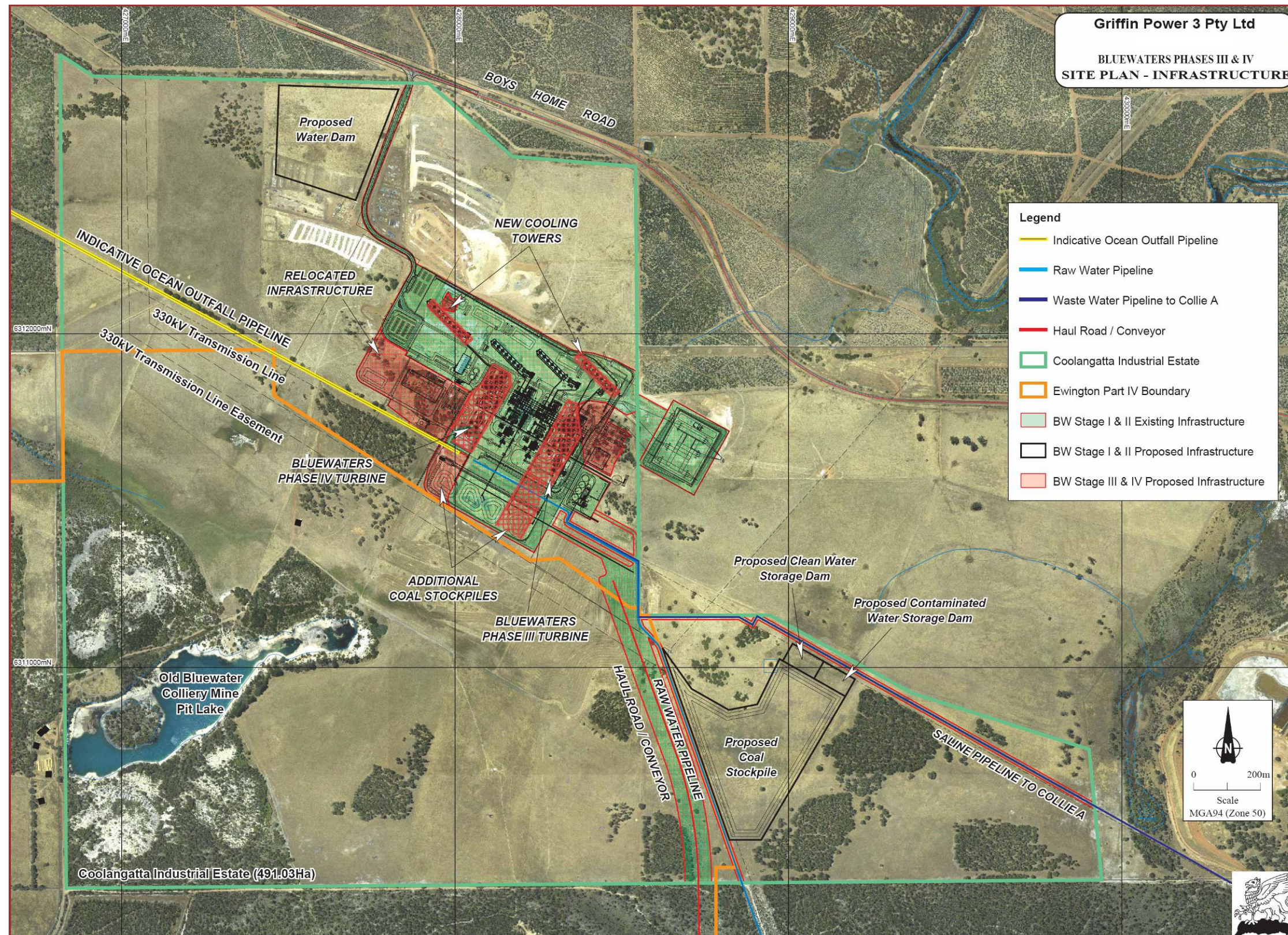


Figure 1.2 Site plan



2. IMPLEMENTATION

2.1 PUBLIC COMPLAINTS

Where any public complaints are received with respect to any environmental issues associated with the operations of the Bluewaters Phase III and IV expansion, they will be managed by Griffin Power. Griffin Power will record and investigate all public complaints and will take all reasonable and practicable measures to avoid further grievances.

All public complaints and the responsive actions made by Griffin Power will be reported in the annual compliance report required under the conditions of the Ministerial Statement.

2.2 TRAINING AND AWARENESS

The Power Station Manager will be responsible for ensuring that environmental training and awareness programs are provided to all operations personnel. Specific attention will be made to incident management and reporting, use of plant and equipment, water management and conservation, dust and noise control, and complaints management.

Operations personnel will be required to participate in an induction program so that an acceptable level of environmental awareness is achieved prior to work commencing. This induction program will be directed to assist in minimising any on-site and off-site environmental problems. The Power Station Manager will maintain a record on site of environmental training undertaken for all employees, detailing the type and purpose of the training.

2.3 INCIDENT REPORTING

All environmental hazards or incidents will be recorded in the on-site incident report system, investigated, remediated if necessary and reported as required, including within any required compliance reports.

2.4 ROLES AND RESPONSIBILITIES

The Power Station Manager will be responsible for implementation and maintenance of this Operation Environmental Management Plan by all personnel working on the site.

The site Environmental Manager will be responsible for implementation of commitments to meet the requirements under this Operation Environmental Management Plan.

3. REPORTING AND REVIEW

3.1 COMPLIANCE REPORTING

Griffin Power will report on its compliance with the Ministerial Statement and conformance with environmental management plans as required by the conditions in that statement.

Griffin Power will report on compliance with any Environmental Licences in accordance with the conditions attached to those licences.

Unless otherwise specified within this plan, Griffin Power will provide an Environmental Incident Report to the Department of Environment and Conservation (DEC) within seven days of becoming aware of an environmental incident, including details of:

- the date, time and reason for the incident
- the period over which the incident occurred
- the cause, nature and extent of the incident over that period and potential or known environmental consequences
- corrective action taken or planned to mitigate adverse environmental consequences if appropriate
- corrective actions taken or planned to prevent a recurrence of the incident, if appropriate, including a timeline for implementation.

3.2 DOCUMENT REVIEW

Griffin Power will review and revise this management plan:

- on a three-yearly basis
- if there are major changes to the project or its operations
- in response to issues raised by the DEC
- in response to issues raised through the Community Liaison Committee
- in response to any incident which results in a failure to meet to meet any of the commitments of this plan
- changes to Environmental Licence targets.

Due to the relationship between this management plan and the Ministerial Statement, any changes to the management measures described in the plan must remain consistent with the requirements of the Statement. Additionally, the Audit Branch of the DEC must be notified of any relevant changes to the plan and the audit table for the Statement updated as appropriate.

This Management Plan will be audited and reviewed and a performance assessment conducted in accordance with the conditions of the Ministerial Statement.

4. AIR QUALITY MANAGEMENT PLAN

This plan applies to operation of the power station generating units component of the Proposal.

The environmental impacts of the Proposal include the discharge of flue gas air emissions, and ENVIRON Australia Pty Ltd undertook an air dispersion modelling study and screening health risk assessment to support the environmental impact assessment (ENVIRON 2009). The health risk assessment was peer reviewed by Toxikos (2009).

Dust will be generated during operation of the Proposal, with the major dust sources being related to coal and fly ash handling, storage. The coal and fly ash stockpiles do not form part of the Proposal, and their management has not been addressed in this plan.

4.1 ENVIRONMENTAL RISKS

Flue gas will be emitted to the atmosphere via two stacks, approximately 150 m high, replacing the Bluewaters I and II stacks and shared between the four generator units. The nature of atmospheric emissions from the Proposal will be similar to other coal fired power stations in that they are comprised primarily of products of combustion such as:

- carbon dioxide
- sulphur dioxide
- oxides of nitrogen
- carbon monoxide
- particulate matter
- low levels of volatile organic compounds and fluorides
- trace amounts of heavy metals, polycyclic aromatic hydrocarbons, and possibly persistent organic pollutants such as dioxins and furans.

Other significant sources of NO_x, CO, SO₂ and particulate matter in the Collie region are:

- Collie Power Station
- Muja Power Station
- Worsley Alumina Refinery
- open-cut mines in the area, being a source of particulates.

The cumulative impact of these substances may impact sensitive receptors proximate to the Proposal if not adequately managed. There is potential for impacts on human health from toxic air emissions (dioxins, furans, fluoride, hydrochloric acid, cyanide and heavy metals [Pb, Zn, Hg, Cd etc]). There is potential for regional air quality impacts due to photochemical smog, or ozone.

Gaseous emissions are manageable through use of appropriate technologies, to ensure impacts are within acceptable limits. The combination of the flue streams from two generating units into the one stack will result in increased buoyancy of the plume, and combined with the increased stack height, is intended to reduce the air quality impacts associated with the Bluewaters Project below those expected from Bluewaters Phases I and II alone.

4.2 APPLICABLE LEGISLATION

Griffin Power employees and contractors will comply with all Commonwealth and State legislation that applies to the Bluewaters Power Station Phase III and IV Expansion. Legislation relevant to air emissions management is summarised in Table 4.1.

Table 4.1 Relevant legislation for air emissions management

Relevant Legislation	Scope	Administering Body
<i>Environmental Protection Act 1986</i>	Part IV defines the process of referral and assessment of proposals subject to formal assessment under the EP Act. Works Approvals and licences are issued under Part V of the EP Act.	Department of Environment and EPA

4.3 MANAGEMENT PROGRAM

4.3.1 Environmental objectives and key performance criteria

Atmospheric emissions from the operation of the Proposal will be managed to meet the environmental objectives as set out in Table 4.2.

Table 4.2 Environmental objectives and performance indicators for air emissions management

Issue	Environmental Objective	Performance Indicator
Gaseous air emissions	To ensure that air emissions from the ongoing operation of the Proposal are minimised such that the cumulative impacts of the Proposal together with existing and other approved sources of gaseous air emissions do not exceed acceptable health guideline values at any known environmental receptor.	Conformance of measured stack concentrations of SO ₂ , NO _x , CO and PM ₁₀ and ozone with EP Act Part V Environmental Licence requirements.

4.3.2 Management actions

Griffin Power will use a combination of best practicable technology appropriate to the size of the plant to minimise the production and release of atmospheric pollutants from the plant and include the following emission controls;

- low NO_x burners
- fabric filters
- desulphurisation of the fuel and/or the flue gas.

Low NO_x burners, combined with staged combustion and over-fire air technology will be employed to minimise the emissions of oxides of nitrogen. Through the installation of low NO_x burners, oxides of nitrogen emissions from the Bluewaters Power Station will not exceed 606 mg/Nm³ (as NO₂ at 7% O₂ reference level, dry).

Particulate emissions will be controlled through the installation of fabric filters in the exhaust system. The operation of fabric filters involves passing dust-laden gases through the semi porous medium of woven or felted cloth making up the individual filter bags. Fabric filter technology has been selected over alternative dust control technology, as it is able to achieve superior dust collection efficiency for smaller sized dust particles (including sub micron sized particles). Particulate emissions from the Bluewaters Power Station will not exceed 47 mg/Nm³ (at 7% O₂ reference level, dry).

Collie coal, and in particular the coal from Ewington I coal mine which will be used to fire the Bluewaters Power Station, is low in sulphur (typically < 0.6%), and results in the generation of less sulphur dioxide emissions than other coal resources. In order to ensure that emissions are maintained below the sulphur dioxide concentration specification of 1 490 mg/Nm³ (dry basis), the coal feedstock used to fire the Bluewaters Power Station will be blended as required to maintain the sulphur content at or below 0.38%. Sulphur dioxide emissions will be further managed through use of dry desulphurisation technology designed to reduce emissions of this compound by 70%.

Griffin is committed to ensuring that it keeps abreast of technology advances that reduce emissions by Research and Development projects. In addition, Griffin continues to contribute financial support to the Cooperative Research Centre (CRC) for Coal in Sustainable Development for further investigation into clean coal technologies.

The management actions to be implemented are set out in Table 4.3.

Table 4.3 Management actions for air emissions

Aspect	Contaminant	Action	Responsibility
Boiler emission control	Particulates	Operate and maintain fabric filters	Powerhouse Superintendent
	SO ₂	Independent NATA certified laboratory to monitor sulphur content of coal Sulphur content of coal to be <0.38% Operate and maintain dry desulphurisation of the fuel and/or the flue gas	Powerhouse Superintendent
	NO _x , CO	Maintain and operate low NO _x burners Optimise combustion conditions	Powerhouse Superintendent
Boiler emission monitoring	Particulates, NO _x , SO ₂ , CO	Verify emission rates by quarterly stack testing	Powerhouse Superintendent
	Metals	Testing once a year for NPI reporting	Powerhouse Superintendent

4.3.3 Monitoring

Monitoring of stack emissions would be undertaken as set out in Table 4.4.

Table 4.4 Monitoring program for air emissions management

Parameter(s)	Frequency/timing	Purpose
Sulphur dioxide	Quarterly	Compliance with licence
Nitrogen oxides	Quarterly	Compliance with licence targets
Carbon monoxide	Quarterly	Compliance with licence targets
Particulates (PM ₁₀)	Quarterly	Compliance with licence targets
Metals	Yearly	NPI reporting
VOCs	Quarterly	Compliance with licence targets
Volumetric flow rate	Quarterly	Compliance with licence
Stack temperature	Quarterly	Compliance with licence

4.4 CONTINGENCIES

Air emission incidents are those that constitute elevated measurements above specified licence targets or an emission as a result of an emergency, accident or malfunction that has the potential to cause pollution. Actions to be followed as contingency actions in the event of an air emission incident are set out in Table 4.5.

Table 4.5 Contingencies for air emissions management

Trigger	Action	Responsibility
Elevated measurement above licence target	Investigate cause.	Power Station Manager
	Take all practicable measures to alleviate situation.	
	Review operating procedures.	
	Inform the regional office of the Department of Environment and Conservation (DEC) within 48 hours of identifying an incident and send an Environmental Incident Report to the DEC within seven days of becoming aware of the incident	
Emergency emissions with potential to cause pollution	Investigate cause and potential resultant impacts.	Power Station Manager
	Implement corrective procedure if likely to cause adverse resultant impacts, in consultation with the regional DEC office.	
	Inform the regional office of the Department of Environment and Conservation (DEC) immediately on becoming aware of the emission.	
	Send an Environmental Incident Report to the DEC within seven days of becoming aware of the incident	
	Review operating procedures.	

5. NOISE MANAGEMENT PLAN

This plan applies to operation of the power station generating units component of the Proposal.

5.1 ENVIRONMENTAL RISKS

Section 3 of the *Environmental Protection Act 1986* defines “noise” as including “*vibration of any frequency, whether transmitted through air or any other physical medium*”.

Audible noise is the most common problem and may cause disturbance to a range of activities. Noise occurring at night is more likely to disturb a community than noise during the day. Noise may contain annoying characteristics that can increase its impact, such as tonality, modulation, or impulsiveness. In considering noise impacts, infrasound and ultrasound as well as the audible frequency range must be addressed.

Elevated noise levels can create stress, cause health impacts and stimulate aggression and other anti-social behaviours. The most significant causes are vehicle and aircraft noise, prolonged exposure to loud music, and industrial noise. Individuals cope with noise in different ways: some choosing to complain about it, others adapting their lifestyle to accommodate the noise.

Noise emitters in the area are the Bluewaters Power Station, Ewington I and II mining operations, Muja C and D and the Collie Power Stations. Some noise impacts also arise from agricultural and traffic related noise.

Potential impacts associated with this proposal

Noise, specific to the proposal, will be generated from power station operations including:

- coal pulverising mill
- air plant
- steam generators and turbines
- coal conveyor.

The closest residence is located approximately 2.9 km to the north of the Power Station (Figure 5.1).

The noise regulations set assigned levels for premises receiving noise from another premises. The most relevant assigned level is the L_{A10} assigned level of 35 dB(A) for noise received at locations within 15 m of a residence at nighttime. The emission is taken to be not “significantly contributing” to an exceedance of the assigned level if its level is 5 dB(A) below the assigned level. The emission must also be free of tonality, modulation and impulsiveness.

In interpreting these requirements for the Bluewaters Phase III and IV expansion, the following observations can be made:

- the emissions are unlikely to exhibit tonality, modulation and impulsiveness
- as a result of the number of existing and potential mining and industrial operations in the area, there is potential for cumulative noise levels to exceed the assigned level in the future

- the nearest location for a potential future residence could be on the western side of the Williams–Collie Road.

With these points in mind, this Noise Management Plan is based on the interpretation that the noise regulations may require that the individual noise emissions from Bluewaters I and II should not exceed 30 dB(A) each at the Williams–Collie Road.

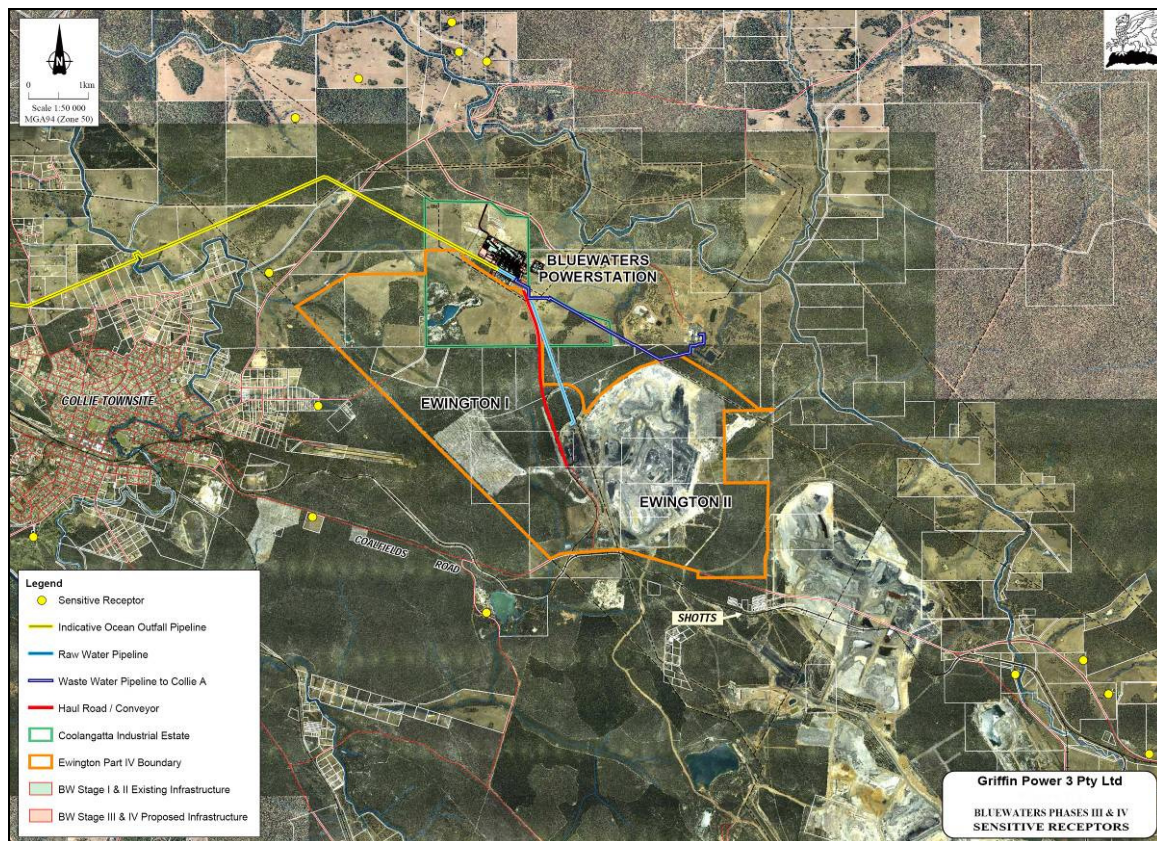
5.2 APPLICABLE LEGISLATION

Griffin Power employees and contractors will comply with all Commonwealth and State legislation that applies to the Bluewaters Power Station Phase III and IV Expansion. Legislation relevant to air emissions management is summarised in Table 5.2.

Table 5.1 Relevant legislation for air emissions management

Relevant Legislation	Scope	Administering Body
<i>Environmental Protection Act 1986</i>	Part IV defines the process of referral and assessment of proposals subject to formal assessment under the EP Act. Works Approvals and licences are issued under Part V of the EP Act.	Department of Environment and Conservation and EPA
Environmental Protection (Noise) Regulations 1997	These regulations stipulate maximum allowable external noise levels at noise sensitive, Commercial and Industrial premises.	Department of Environment and Conservation and EPA and local government

Figure 5.1 Power station and residential receptor locations



The nearest noise sensitive premise to the Proposal is located at the eastern edge of the Collie Township, approximately 5 km southwest of the proposed site (see Figure 5.1). The applicable criterion at this location is as shown in Table 5.2.

Table 5.2 Assigned outdoor noise level

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		LA ₁₀	LA ₁	LA _{max}
Residential	0700 - 1900 hours Monday to Saturday	45	55	65
	0900 - 1900 hours Sunday and Public Holidays	40	50	65
	1900 - 2200 hours all days	40	50	55
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	35	45	55

It is a condition of the Noise Regulations that there shall be no annoying characteristics in the noise emissions and that the noise must not contribute, in conjunction with other noise sources, to an exceedance of the assigned levels.

The target noise level, for the worst case night period, at residential locations, due to four power station units, is 30 dB(A).

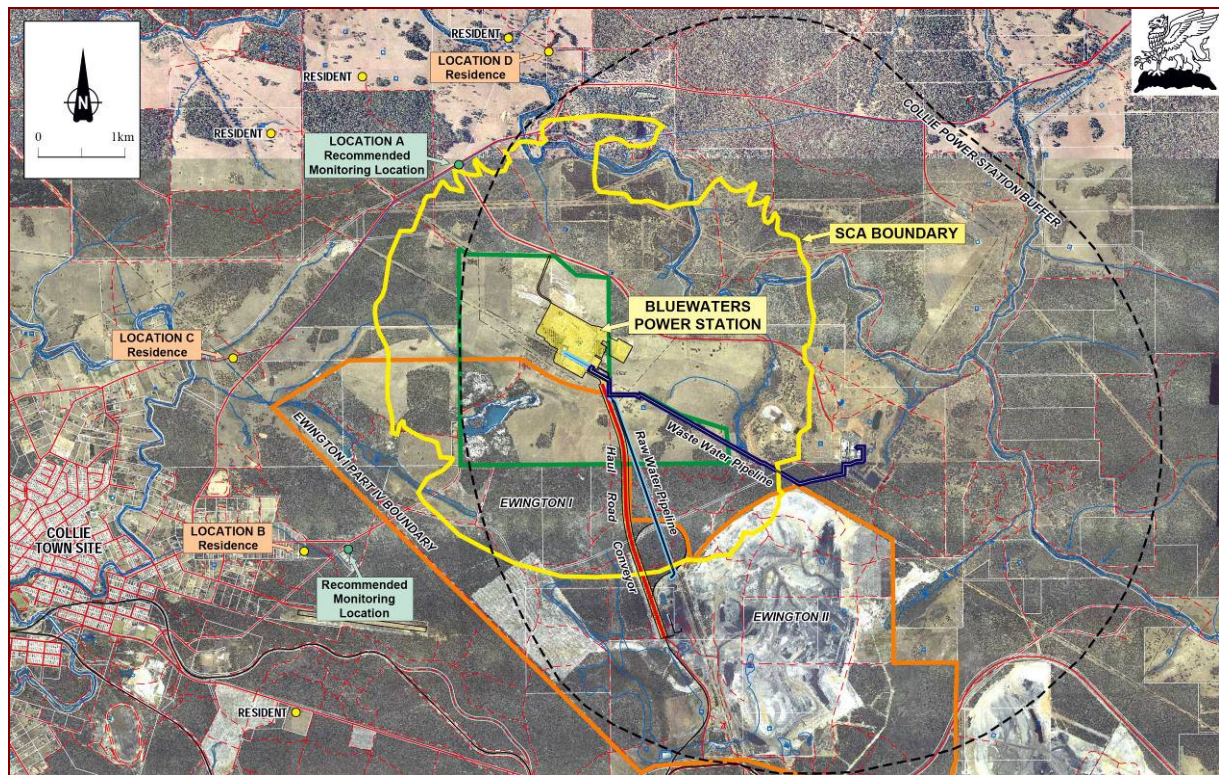
Other criteria likely to be applicable are summarised in Table 5.3.

Table 5.3 Legal noise requirements

Legislation/Approval Document	Reference	Summary of Requirement
Environmental Protection (Noise) Regulations 1997	Regulations 7 and 8	Noise emission from any premises shall not exceed 35 dB(A) at night when received at a dwelling on the nearest noise sensitive premises.
Ministerial Statement (To be determined)	TBD	TBD
Approved Structure Plan (with reference to "Special Control Area" documented in town planning scheme).	Section 13.8 Noise (pgs 70 – 71)	The cumulative noise emissions from the Coolangatta Industrial Estate should not exceed 35 dB(A) at the boundary of the Special Control Area along the Williams – Collie Road.

The most critical of the above criteria will be the requirement to not exceed 35 dB(A) at the Special Control Area (SCA) boundary (see Figure 5.2) as a result of all noise sources within the Coolangatta Estate (Bluewaters Phases I, II, III and IV). Meeting this requirement will ensure that target noise levels at all known existing sensitive receptors are met. However, it should be noted that the buffer zone for the Collie Power Station substantially overlaps the Coolangatta Industrial Estate Special Control Area (see Figure 5.2), such that any noise level exceedances over the eastern two-thirds of the boundary fall within that buffer zone, and consequently would not be an issue. The consequential key area of concern is the SCA boundary adjacent to the Collie-Williams Road. Meeting this requirement will ensure all other requirements are met in terms of impacts on existing and potential future sensitive receptors.

Figure 5.2 Power station and Special Control Area



5.3 MANAGEMENT PROGRAM

5.3.1 Environmental objectives and key performance criteria

Noise emissions from the operation of the Proposal will be managed to meet the environmental objective as set out in Table 5.4.

Table 5.4 Environmental objectives and performance indicators for noise management

Issue	Environmental Objective	Performance Indicator
SCA boundary	The cumulative noise emissions from the Coolangatta Industrial Estate should not exceed 35 dB(A) at the boundary of the Special Control Area along the Williams – Collie Road.	Noise levels at the boundary of the Special Control Area along the Williams – Collie Road.

5.3.2 Management actions

The management actions to be implemented are set out in Table 5.5.

Table 5.5 Management actions for noise emissions

Aspect	Action	Responsibility
Acoustic design	Noise reduction measures will be incorporated into the design of Bluewaters Phases III and IV and retrofitted into Bluewaters Phases I and II so as to ensure that the noise level on the Williams–Collie Road, when predicted under typical worst-case meteorological conditions to the satisfaction of the Department of Environment and Conservation (DEC), does not exceed an LA ₁₀ level of 30 dB(A).	Griffin Power
	Additional best-practice noise reduction measures will be incorporated where reasonably practicable, with a view to achieving a target level of 28 dB(A).	Griffin Power
Measurement during commissioning	During commissioning stages, the contractor will be obliged to provide evidence that the specified sound power levels are being achieved. This is likely to involve measurement of individual systems sound pressure levels, where individual noise level limits have been determined during the detailed design process. These compliance tests will be supervised and/or carried out by the Griffin Power acoustic consultants.	Construction Contractor
	During final commissioning stages the contractor is required to provide evidence that resultant noise levels at the relevant boundary of the SCA from each generator unit (phase) does not exceed 35 dB(A) under worst case propagation conditions.	Construction Contractor
Reference monitoring	A reference monitoring location will be established for use in ambient monitoring, compliance testing and future monitoring.	Griffin Power

5.3.3 Monitoring

Monitoring of noise emissions would be undertaken as set out in Table 5.6.

Table 5.6 Monitoring program

Parameter(s)	Source	Frequency/timing	Purpose
Ambient noise levels	Around the contour of the SCA.	Prior to construction, during commissioning and six monthly after normal operations commence.	To establish pre-operational, commissioning and operational noise levels at various locations.
	At nearest noise sensitive premises.		
	Reference monitoring location.		

5.4 CONTINGENCIES

Actions to be followed as contingency actions in the event of a noise emission incident are set out in Table 5.7.

Table 5.7 Contingencies for noise emissions management

Trigger	Action	Responsibility
Noise complaint	Investigate cause within 12 hours of receipt of complaint, including noise monitoring at reference site and site of complaint.	Power Station Manager
	If complaint attributable to operation of the Bluewaters Power Station, take all practicable measures to alleviate situation.	
	Review operating procedures if appropriate to prevention of further incidents.	
	Log complaint details in the complaints register, including actions taken and results of investigations.	
Noise monitoring indicates exceedance	Investigate cause within 12 hours of receipt of monitoring data.	Power Station Manager
	If exceedance attributable to operation of the Bluewaters Power Station, take all practicable measures to alleviate situation.	
	Review operating procedures if appropriate to prevention of further incidents.	
	Inform the regional office of the Department of Environment and Conservation (DEC) within 48 hours of receipt of monitoring data and send an Environmental Incident Report to the DEC within seven days of becoming aware of the incident	

6. WATER SUPPLY MANAGEMENT PLAN

This plan applies to operation of the power station generating units component of the Proposal.

6.1 ENVIRONMENTAL RISKS

The Proposal will require a water supply to meet an annual average demand of 6.5 GL/yr at full operation (3.25 GL/yr per generator unit), consistent with the demands of the Bluewaters Phase I and II units. The water will be required for cooling water, steam generation, dust suppression, safety showers, emergency fire system and staff amenities.

The water requirements for the Proposal will be nominally supplied from dewatering at the Ewington Mining Operations, unless a water distribution and disposal utility commences operation in the Collie Basin as proposed by the Department of Water, in which case water would be taken from that utility under contract. Infrastructure such as pipelines and storage ponds in place for Bluewaters Phases I and II will be shared and do not form part of this Proposal. Power stations in the Collie region currently operate under the WA Cabinet approved principle that the primary use of groundwater resources (via mine dewatering) in the area is for power generation (CWAG 1996, 1999).

As dewatering is carried out as a requirement to ensure safe mining, and the mines have environmental approval to proceed, the environmental impact of the dewatering activity is beyond the scope of this management plan. It is not proposed that dewatering operations be modified in any way to ensure a water supply for the Proposal. In the event of a water utility becoming operational as proposed by the Department of Water, the environmental impacts of any source development beyond use of water from existing approved sources would be the responsibility of that agency.

However, as there is some uncertainty as to the ability of mine dewatering to provide a reliable supply for the life of the project, particularly in the out years, a water supply strategy has been developed to address this issue and has been included in the environmental impact assessment report (Strategen 2008, URS 2008a).

In the event of water supply being provided via a third party utility, as proposed by the Department of Water, the aspects of this plan that relate to dewatering will be redundant.

6.2 APPLICABLE LEGISLATION

Griffin Power, its employees and contractors will comply with all Commonwealth and State legislation that applies to the Bluewaters Power Station Phase III and IV Expansion. Legislation relevant to management of water supply is summarised in Table 6.1.

Table 6.1 Relevant legislation for water supply management

Relevant Legislation	Scope	Administering Body
<i>Rights in Water and Irrigation Act 1914</i>	Regulates water issues with respect to water supply sources.	Department of Water
<i>Country Areas Water Supply Act 1947</i>	Regulates supply of water to country areas.	Department of Water

6.3 MANAGEMENT PROGRAM

6.3.1 Environmental objectives and key performance criteria

Water supply for the operation of the Proposal will be managed to meet the environmental objectives as set out in Table 6.2.

Table 6.2 Environmental objectives and performance indicators for water supply management

Issue	Environmental Objective	Performance Indicator
Water quantity	Maintain sufficient quantity of surface and groundwater so that existing users are protected.	No adverse change to water availability to existing surface and groundwater users as a result of operation of the Proposal.
Water use	Minimise water consumption and maximising reuse.	Minimum water demand from natural sources, consistent with efficient construction.

6.3.2 Management actions

The management actions to be implemented are set out in Table 6.3.

Table 6.3 Management actions for water supply

Aspect	Action	Responsibility
Water conservation	Recycle water to the maximum practicable extent to minimise water demand and wastewater discharge volumes.	Griffin Power
	Utilise water of quality appropriate to minimising water demand and wastewater discharge volumes.	Griffin Power
Dewatering (if a source)	Monitor the performance of dewatering operations and annually review the prognosis for water availability from this source to ensure adequate opportunity for developing a contingency water supply development and management strategy if required.	Griffin Power
	Comply with any <i>Rights in Water and Irrigation Act 1914</i> licence conditions associated with dewatering if Griffin Power is a licence holder.	Griffin Power
Water supply utility (if a source)	Comply with any relevant requirements of the <i>Country Areas Water Supply Act 1947</i> and contract arrangements with the water supply utility, if relevant.	Griffin Power

6.3.3 Monitoring

Monitoring of water supply would be undertaken as set out in Table 6.4.

Table 6.4 Monitoring program for water supply management

Parameter(s)	Source	Frequency/timing	Purpose
Water use	Water supply meter.	Monthly.	To establish monthly water use volumes.
Dewatering prognosis as a viable supply source (if used as a source)	Griffin Coal dewatering monitoring and regular reviews.	Annual reviews.	To provide early warning of need for contingency source.

6.4 CONTINGENCIES

Actions to be followed as contingency actions in the event of a water supply incident are set out in Table 6.5.

Table 6.5 Contingencies for water supply management

Trigger	Action	Responsibility
Water use exceeds anticipated demand level	Investigate cause.	Power Station Manager
	Rectify situation if practicable to do so.	
	Review water requirements if situation not practicably rectifiable and develop alternative water supply strategy (see notes below). The water supply strategy would be developed in consultation with the Department of Water and would be referred to the EPA if there were a likelihood of significant environmental impact associated with its implementation.	
Dewatering monitoring indicates alternative source required to replace or supplement dewatering	Develop alternative water supply strategy developed in consultation with the Department of Water (see notes below). Refer strategy to the EPA if there is a likelihood of significant environmental impact associated with its implementation.	Griffin Power

Notes:

The contingency alternative water supply strategy would take into account:

- potential opportunities to further reduce water demand
- the actual conditions being encountered in terms of demand and revised mine dewatering availability predictions at the time
- contemporary information on water availability from alternative supplementary or replacement sources
- water allocation policies and guidelines in force at the time.

7. WATER RESOURCE PROTECTION MANAGEMENT PLAN

This plan applies to operation of the power station generating units component of the Proposal.

7.1 ENVIRONMENTAL RISKS

Surface Water

Potential impacts that may result from Bluewaters Power Station operations and associated activities include:

- increase/decrease in surface water volumes and sediment run-off discharged off-site to downstream watercourses
- potential contamination of surface water runoff with chemicals/hydrocarbons which may enter the local surface drainage impacting the quality of the regional surface water resources
- interruption of existing surface water flows potentially resulting in ponding of water (subsequently flooding of vegetation), drainage shadow effects and/or scour/erosion
- stormwater disposal causing contamination of receiving environment.

Groundwater

Bluewaters Power Station has the potential to affect the groundwater quality on the site in the following ways:

- contamination of local aquifers from hydrocarbons and other chemicals used on site impacting groundwater quality
- runoff from plant hard stand and storage areas infiltrating and contaminating local aquifers
- water leakage from storage ponds potentially contaminating local groundwater.

7.2 APPLICABLE LEGISLATION

Griffin Power, its employees and contractors will comply with all Commonwealth and State legislation that applies to the Bluewaters Power Station Phase III and IV Expansion. Legislation relevant to management of water resource protection is summarised in Table 7.1.

Table 7.1 Relevant legislation for water resource protection

Relevant Legislation	Scope	Administering Body
<i>Environmental Protection Act, 1986</i>	Part IV defines the process of referral and assessment of proposals subject to formal assessment under the Environmental Protection Act Works Approvals and licences are issued under Part V of the Environmental Protection Act.	Department of Environment Conservation and EPA
<i>Waterways Conservation Act, 1976</i>	Conservation and management of water and the associated land and environment	Department of Water

7.3 MANAGEMENT PROGRAM

7.3.1 Environmental objectives and key performance criteria

Water resource protection will be managed to meet the environmental objectives as set out in Table 7.2.

Table 7.2 Environmental objectives and performance indicators for water resource protection

Issue	Environmental Objective	Performance Indicator
Water quality	Maintain or improve the quality of surface water and groundwater to ensure that existing and potential users are not adversely affected.	No adverse change to surface water quality as a result of operation of the Bluewaters Power Station.
Environmental values	Maintain the integrity, functions and environmental values of rivers, creeks, wetlands and estuaries.	No adverse change to water dependent environmental values as a result of operation of the Bluewaters Power Station.
Water quantity	Maintain sufficient quantity of surface and groundwater so that existing users are protected.	No adverse change to water availability to existing surface and groundwater users as a result of operation of the Bluewaters Power Station.

7.3.2 Management actions

The management actions to be implemented are set out in Table 7.3.

Table 7.3 Management actions for water resource protection

Aspect	Action	Responsibility
Site Design	Where possible, pavements will be unkerbed or flush kerbed to promote uniform runoff to the verge or adjacent perimeter swales. Where kerbing is required for traffic control and safety reasons, kerb breaks are to be included to allow runoff to pass to the verge or swale. Runoff from pavements generally will flow across the verge, with infiltration excess collecting in detention swales.	Griffin Power
	Areas not required for buildings, roadways or hardstands remain unpaved and will be formed into swales to accept direct runoff. These areas are to be grassed or finished with a loose crushed rock topping. Verges accepting direct runoff from pavements will be maintained with transverse gradients no steeper than 1 in 6, to control scour and for safety reasons. Swale longitudinal gradients will be considerably flatter to reduce velocities to promote sedimentation and infiltration (near-zero gradients with some slope to ensure that the swales eventually drain). Swale design gradients between 1 in 100 (1%) and 1 in 1000 (0.1%) will be used.	Griffin Power
	Runoff from permanent roofs and from other surfaces will be directed to collection pits where flows may be detained and strained for removal of leaves, litter or accumulated sediments. Outflow from the collection pits will be piped or channelled to the swales that also receive pavement runoff. The collection pits may be constructed as soak wells to facilitate infiltration; however, infiltration rates are expected to be low in the soil types of the site.	Griffin Power
	Biofiltration trenches will be constructed in open space areas of the site (verges around parking areas) to enhance infiltration opportunity and improve retention of soluble pollutants, sediments and trace hydrocarbons. The biofiltration trenches will be sized to treat runoff from common rainfall events and to pass runoff safely from the less common design rainfall events, such as 5-year average recurrence interval storm events.	Griffin Power

Aspect	Action	Responsibility
Water Discharge Requirements	Overland flow riffle zones will be located to provide disconnection between impervious areas such as pavements and pipes. Riffles generally function on sloping ground where sheet flow at low depth (mm) is promoted. The surface run-off outlets from the site discharge over paddocks that will behave as grassed riffle zones to the local watercourses.	Griffin Power
	Site runoff will pass through detention swales prior to discharge from site to minimise transported sediments and other pollutants, and reduce the sheet flow velocity. The swales will be sized to remove particulates from the discharged stormwater and velocities are controlled to avoid re-suspension of sediments. Outlet works will include an oil boom to trap floating pollutants and a wide outlet weir to disperse excess treated water across the paddocks to the north and south of the site. The paddocks will act as riffles to provide a final phase of treatment.	Griffin Power
	Discharge of any water on site to the local environment will be subject to criteria stipulated by the Department of Environment in the operating Environmental Licence.	Power Station Manager
	All surface water run-off captured on site which could potentially be contaminated will pass through a detention swale and an oil water separator and/or other appropriate devices prior to discharge to the environment, so that it meets the required discharge requirements within the Environmental Licence.	Power Station Manager
	Solid or liquid residues remaining after water treatment shall be appropriately managed as a waste material. Any oily water collected by the oil water separator will be pumped into a tanker and removed from site to an appropriate authorised oily waste disposal site.	Power Station Manager
	The quality of any water discharged from site to the local environment will conform to the criteria stipulated by the DEC in the Environmental Licence.	Power Station Manager
	Water which is likely to require the treatment prior to disposal includes: <ul style="list-style-type: none"> • all stormwater captured on the plant site and directed to the perimeter swale • water collected from wash down areas • water collected from hydrocarbon and chemical storage transfer areas. 	Power Station Manager
Stormwater and Runoff	Discharge points from the Power Station site approved under the Environmental Licence will be maintained and remain relevant to this plan.	Power Station Manager
	Clearing kept to the minimum necessary.	Power Station Manager
	Stockpiles of erodible material, stored for rehabilitation, will be located away from roads and pavements to minimise sediment transport in runoff.	Power Station Manager
	Measures will be implemented to minimise wind erosion and dust generation (see the Ash Management Plan Section 10). Appropriate management measures that may be used to reduce wind erosion include bituminising or watering erodible surfaces and/or the application of dust suppressants.	Power Station Manager
	The site will be graded to promote uniform runoff from the finished surface.	Power Station Manager
	Exposed disturbed areas will be stabilised or rehabilitated to minimise erosion, through stabilising batters and verges with mulch and stabilising drains and swales (drain blocks, riprap, fixed matting or revetment works for stabilisation).	Power Station Manager
	Runoff from the site will be collected and stored in shallow perimeter swale drains to facilitate sedimentation. Hay bales, which provide an effective filter medium for trapping sediments, may be used as temporary drain blocks in the steeper swales.	Power Station Manager
Litter and Waste Management	Perimeter drains will be linked to one or more detention swales allowing further treatment or run-off prior to discharge from site to ensure it meets discharge requirements.	Power Station Manager
	All wastes and hazardous materials will be managed as per the Hazardous Materials Management Plan (Section 8)	Power Station Manager
	To help prevent release of waste materials into the stormwater system, specific areas within the plant site will be designated as waste collection areas. These areas will be located away from paved areas, stormwater management systems and low points in the site where water will tend to accumulate.	Power Station Manager
	All site personnel will be made aware of their responsibilities regarding spills and waste management during the general site induction.	Power Station Manager

Aspect	Action	Responsibility
Wash-Down Management Practices	If equipment wash-down is required on site, it will occur in designated areas that are separated from the site stormwater system.	Power Station Manager
	Wash-down water will be contained using bunds or similar devices. It will be treated so it meets appropriate discharge requirements prior to discharge.	Power Station Manager
	Water will be conserved by eliminating leaks, minimising wash water usage and turning off taps after use wherever possible.	Power Station Manager
Contamination Management Practices	All potentially hazardous materials will be stored in accordance with relevant legislation and regulations as outlined within the Hazardous Materials Management Plan (Section 8).	Power Station Manager
Groundwater	Contamination and spills management as described in the Hazardous Materials Management Plan (Section 8). With correct storage and handling, there is little risk that a spill would move offsite or infiltrate to the groundwater beneath the site.	Power Station Manager
	Waste management as described within the Waste Management Plan (Section 9) and other relevant plans will ensure that all wastes are disposed of appropriately minimising the risk of groundwater contamination, in particular: <ul style="list-style-type: none"> ash will be disposed of in accordance with the Ash Management Plan (Section 10) saline waste water will be managed in accordance with the Saline Wastewater Disposal Management Plan (Section 11) sewage waste facilities are connected to an on site treatment system. 	Power Station Manager
	Water storage ponds, with the exception of the stormwater retention pond, on site will be lined to ensure no leakage.	Power Station Manager

7.3.3 Monitoring

Monitoring of water resource protection would be undertaken as set out in Table 7.4. Additional or alternative requirements may be imposed by the DEC in the operating Environmental Licence issued under Part V of the *Environmental Protection Act 1986*. The monitoring program will be reviewed on an annual basis as part of the annual reporting requirements.

Table 7.4 Monitoring program for water resource protection¹

Parameter(s)	Source	Frequency/timing
Groundwater Levels. Water Quality: pH, EC, temperature, TDS, TSS, Dissolved Oxygen, As, HCO ₃ , Na, K, Mg, Ca, Cl, SO ₄ , SiO ₂ , Oil & Grease, NO ₃ , PO ₄ , Al, Cd, Co, Cr (tot), Cu, Fe, Pb, Mn, Ni, V and Zn.	Local monitoring bores	Bi-annual (April and October).
Flow velocity. Water Quality : pH, EC, temperature, TDS, TSS, Dissolved Oxygen, As, HCO ₃ , Na, K, Mg, Ca, Cl, SO ₄ , SiO ₂ , Oil & Grease, NO ₃ , PO ₄ , Al, Cd, Co, Cr (tot), Cu, Fe, Pb, Mn, Ni, V and Zn.	Surface water locations (local tributaries to Collie River East Branch)	Bi-annual (April and October).
Water Quality : pH, EC, temperature, TDS, TSS, Dissolved Oxygen, pH, EC, temperature, TDS, TSS, Dissolved Oxygen, As, HCO ₃ , Na, K, Mg, Ca, Cl, SO ₄ , SiO ₂ , Oil & Grease, NO ₃ , PO ₄ , Al, Cd, Co, Cr (tot), Cu, Fe, Pb, Mn, Ni, V and Zn.	Surface water discharge at prescribed locations	Periodically, when discharge is occurring

¹ The listed analytes are prescribed from site hydrogeological investigations, the ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality and groundwater abstraction licences issued from Department of Water.

Parameter(s)	Source	Frequency/timing
Volumes and flow rates. Water Quality monitoring: Temperature, pH, EC, TDS, Total Alkalinity, Total Hardness, Cl, CO ₃ /HCO ₃ , SO ₄ , NO ₃ , NO ₂ , Na, K, Ca, Mg, Fe, SiO ₂ , Al, Mn, Cd, As, Cu, Pb, Se and Zn.	Raw water supply	Monthly Quarterly
Volumes and flow rates. Water Quality monitoring: pH, EC, TDS, TSS, Cl, HCO ₃ , SO ₄ , NO ₃ , PO ₄ , Na, K, Ca, Mg, Fe, SiO ₂ , As, Al, Mn, Cd, Cr (Tot), Cu, Hg, Pb, Ni, Vn and Zn).	Saline water discharge	Monthly Monthly during commissioning and quarterly during operations.

All water sampling is to be undertaken in accordance with *AS 5667.1-1998*. The specified analytes are compatible with the known potential contaminants linked to brackish discharge water, ash leachate, stored chemicals and runoff sources.

Reporting

The operator will report all data collected from monitoring to the Griffin Project Director on a bi-annual basis (or immediately in the event of a serious incident). The report will include:

- raw data
- data organised and analysed
- discussion outlining conclusions drawn from analysis undertaken.

The operator will also produce a monthly report for submission to the Griffin Project Director outlining:

- any water discharged (quality and quantity) to the environment and controls put in place to ensure discharge criteria were met
- any incident that occurred which had the potential to cause contamination of surface or groundwater and the controls put in place to remediate the impacts and prevent it happening again.

7.4 CONTINGENCIES

Actions to be followed as contingency actions in the event of a water resource incident are set out in Table 7.5.

Table 7.5 Contingencies for water resource protection

Trigger	Action	Responsibility
Unexpected adverse change to local surface water quality, water dependent environmental values or water availability to existing surface and groundwater users.	Advise Department of Water (DoW) and DEC regional offices within 24 hours of becoming aware of change.	Construction Manager
	Investigate cause.	Construction Manager
	If cause relates to Bluewaters Power Station operations: <ul style="list-style-type: none"> • develop and implement remedial measures in consultation with DoW and DEC regional offices, where practical to do so. • revise operating procedures to avoid further impacts. 	Construction Manager
	If cause does not relate to Bluewaters Power Station operations, advise Department of Water and Department of Environmental Conservation regional offices.	Construction Manager

8. HAZARDOUS MATERIALS MANAGEMENT PLAN

This plan applies to operation of the power station generating units component of the Proposal.

8.1 ENVIRONMENTAL RISKS

Wherever chemicals, hydrocarbons and other hazardous materials are stored and handled there is potential for soil, groundwater and surface water pollution to occur through spills. Limited quantities of chemicals, hydrocarbons or other hazardous materials and their associated wastes will be stored on site for use during operation of the Proposal. An indicative list (and approximate volumes where available) includes, but is not limited to:

- fuels including distillate, LPG and diesel (storage of up to 10 000 L)
- oil and greases – stored in containers of 20 L or 200 L capacity
- paints and degreasers (typically in 5 L or 10 L drums)
- solvents (5 L or 10 L drums)
- sulphuric acid (10 kL storage tank)
- sodium hydroxide (20 kL storage tank)
- anhydrous ammonia (hypochlorate) (15 kL storage tank)
- potassium permanganate (15 kL storage tank)
- antiscalant (200 L drums)
- ferric sulphate
- quicklime
- liquid nitrogen
- gaseous chlorine
- waste chemicals, hydrocarbons and other hazardous materials.

If not managed effectively, the on-site storage and use of chemicals, hydrocarbons or other hazardous materials has the potential to result in the following impacts:

- discharge to the environment, contaminating surface and groundwaters, atmosphere and soil
- creation of acute and/or chronic health hazards
- creation of flammable or explosive safety hazards.

Management of the saline water discharge is detailed in the Water Resource Protection Management Plan (Section 7), and the Saline Wastewater Disposal Management Plan (Section 11). Management of ash and its disposal is detailed in the Ash Management Plan (Section 10).

8.2 APPLICABLE LEGISLATION

Griffin Power, its employees and contractors will comply with all Commonwealth and State legislation that applies to the Bluewaters Power Station Phase III and IV Expansion. Legislation relevant to management of hazardous materials is summarised in Table 8.1.

Table 8.1 Relevant legislation for hazardous materials management

Relevant Legislation	Scope	Administering Body
<i>Dangerous Goods Safety Act 2004</i> and regulations	Regulates the manufacture, use and storage of dangerous goods.	Department of Consumer and Employment Protection
<i>Environmental Protection Act 1986</i>	Part IV defines the process of referral and assessment of proposals subject to formal assessment under the EP Act. Works Approvals and licences are issued under Part V of the EP Act.	Department of Environment and Conservation and Environmental Protection Authority
Environmental Protection (Controlled Waste) Regulations, 2004	Regulates the transport of controlled wastes that may cause environmental or health risks. Controlled Waste is defined as all liquid waste, and any waste that cannot be disposed as a Class I, II or III landfill site. Controlled Waste also includes asbestos, clinical or related waste, tyres and waste that has been immobilised or encapsulated.	Department of Environment and Conservation
<i>Waterways Conservation Act 1976</i>	Conservation and management of waters and the associated land and environment.	Department of Water

Other relevant standards and guidelines include:

- Australian Standard 1940 – 1993 for the Storage and Handling of Flammable and Combustible Liquids
- Australian Standard 3780-1994 for the Storage and Handling of Corrosive Substances
- DoIR (DoCEP) Guidance Note S301 “Storage of Dangerous Goods Licensing and Exemptions”
- DoIR (DoCEP) Guidance Note S305 "Storage of Dangerous Goods – General Requirements for Premises Exempt from Licensing"
- Australian Code of Practice for the Transport of Dangerous Goods by Road and Rail (Advisory Committee on the Transport of Dangerous Goods 1998).

8.3 MANAGEMENT PROGRAM

8.3.1 Environmental objectives and key performance criteria

Hazardous materials associated with the operation of the Proposal will be managed to meet the environmental objectives as set out in Table 8.2.

Table 8.2 Environmental objectives and performance indicators for hazardous materials management

Issue	Environmental Objective	Performance Indicator
Compliance with standards and legislation	To store, handle and transport dangerous goods in accordance with dangerous goods legislation and Australian Standards.	Compliance with all relevant legislation and industry standards.
Best practice control	To achieve best-practice environmental control of the prevention and management of spills and release of hazardous materials.	No significant spillage of chemicals, hydrocarbons or other hazardous materials to occur during construction.
Spill management	To manage the purchase, transport, storage and disposal of chemicals and oil and prevent the uncontrolled release of chemicals or oil to the environment.	Number of spills recorded during construction phase.

8.3.2 Management actions

The management actions to be implemented are set out in Table 8.3.

Table 8.3 Management actions for hazardous materials management

Aspect	Action	Responsibility
Storage and containment	Potentially contaminating materials will be stored in accordance with relevant regulatory requirements and standards. The substances will be stored in a manner that minimises the likelihood of release to the environment. Dangerous Goods that are stored may require to be licensed by the Dangerous Goods Safety Branch of DoCEP (a dangerous Goods Licence issued after an application illustrates that proposal will meet Australian Standards (AS) and Regulatory requirements).	Power Station Manager
	Hazardous materials will be transported, stored and handled according to WorkSafe regulations	Power Station Manager
	Corrosive materials will be stored and handled in accordance with Dangerous Goods Regulations	Power Station Manager
	Large quantities of chemicals and hydrocarbons will be stored to meet the requirements of AS 1940, which will include the following; <ul style="list-style-type: none"> chemicals and hydrocarbons will be located in bunded compounds so at least 100% of the capacity of the largest tank plus at least 10% of the second largest tank is contained chemicals stored in drums will be bunded to contain at least 25% of the maximum stored quantity of chemicals areas will be designated to store hazardous materials, and any runoff will be designed to control flow away from those areas waste chemicals and hydrocarbons will be stored in appropriate compounds prior to removal from site for recycling by approved contractors. 	Power Station Manager
MSDS and records	Material Safety Data Sheets (MSDS) will be kept in a register at the site office along with a copy located near the chemical storage facility. Records will be kept on existing inventory, storage location, personnel training and disposal of waste for any hazardous materials used on site	Power Station Manager
	A manifest will be kept by the Power Station Manager on current inventory (including storage location, volumes, types of chemicals and receipt date), personnel training and disposal of waste for all hazardous materials used on site. These records will be reviewed regularly.	Power Station Manager
Spill response	Mobile spill kits will be available on-site to ensure a rapid response in the event of a hydrocarbon or chemical spill.	Power Station Manager

Aspect	Action	Responsibility
	All relevant construction personnel will be trained in appropriate handling and spill clean-up requirements.	Power Station Manager
	Containment of any spillages or leakage will be a priority, and spills will be cleaned up immediately.	Power Station Manager
	An emergency response plan will be prepared and implemented to enable a rapid response in the event of a significant spill or loss of potentially contaminating material.	Power Station Manager
	Should an incident occur that results in the uncontrolled release of potentially contaminating substances, or breach of regulatory standards and/or industry standards in relation to chemical and oil management, the following corrective actions will be undertaken as appropriate: <ol style="list-style-type: none"> 1. Contain and clean up spill material immediately and remediate. Contaminated material will be appropriately disposed of in accordance with regulatory and local Shire requirements. 2. All incidents and near misses involving dangerous goods will be reported to Griffin Power within 12 hours, who will notify the regulatory authorities as required. 3. Inspect bunds and carry out necessary repairs to ensure they are maintained in good working condition, and bund plugs are secure. Inspections will be routinely undertaken on a regular (daily) basis. 4. Regular Inspections will be carried out to ensure all chemicals and hazardous materials are located in appropriately banded or approved storage areas. Any non compliance will be reported to Griffin Power within 12 hours, who will notify regulatory authorities if required. 	Power Station Manager

8.3.3 Monitoring

Monitoring of hazardous materials management would be undertaken as set out in Table 8.4.

Table 8.4 Monitoring program for hazardous materials management

Parameter(s)	Source	Frequency/timing	Purpose
Hazardous material storage	Bulk and packaged chemical containers, banded areas and waste oil storage areas.	Weekly	To ensure compliance with regulatory requirements.
Soil and surface water samples	Affected soil and water	In the event of a major spill with potential for off-site contamination.	To assess potential impacts of spill.

8.4 CONTINGENCIES

Actions to be followed as contingency actions in the event of an incident are set out in Table 8.5.

Table 8.5 Contingencies for hazardous materials management

Trigger	Action	Responsibility
Spill occurs	Implement spill response management actions as set out in Table 8.3 (Spill response).	Power Station Manager
	Monitor soil and surface water in accordance with contingency plan if spill has potential for off-site contamination.	Power Station Manager
	Investigate cause of spill.	Power Station Manager
	Revise hazardous material storage and handling procedures.	Power Station Manager

9. WASTE MANAGEMENT PLAN

This plan applies to operation of the power station generating units component of the Proposal, but excludes management of ash and saline water disposal.

9.1 ENVIRONMENTAL RISKS

Wastes likely to be generated during commissioning and operation of the Proposal include:

- cooling tower blow down
- coal dust, sediment
- fly-ash
- waste chemicals from boiler, waste water treatment plant and chemical cleaning
- waste water from various sources
- waste oils and solvents
- maintenance parts, scrap metal
- packaging wastes
- controlled wastes, including on-site sewage and used tyres
- general office waste/rubbish
- other solid wastes.

If not managed effectively, waste generated from the operation has the potential to result in the following impacts:

- potential contamination of the receiving environment (surface soil, natural drainage features, surface water and ground water)
- potential contamination on site through inadequate storage, disposal or transport of waste water, saline water, chemicals and fly ash
- degraded amenity and hygiene
- inefficient use of resources.

These impacts are described further in the following sections.

Contamination to the receiving environment

This may include:

- localised contamination of surface soil
- localised contamination of groundwater
- potential contamination of natural drainage features or surface water in the vicinity of the project area (potentially resulting in downstream environmental impacts if not contained).

Potential contamination

This may include accidental discharge of saline wastewater or waters containing coal sediments, fly ash, hydrocarbons or chemicals that may enter local drainage systems in vicinity of the project area, impacting surface water quality and potentially harming vegetation communities.

Degraded amenity and hygiene

This may include:

- wind-blown litter from the site may affect amenity and hygiene of the local area in the absence of appropriate housekeeping practices
- all food wastes to be disposed of in covered bins and emptied regularly.

Inefficient resource use

This may include inefficient production / consumption of waste materials that could otherwise be re-used or recycled to minimise the net amount of net generated waste.

9.2 APPLICABLE LEGISLATION

Griffin Power, its employees and contractors will comply with all Commonwealth and State legislation that applies to the Bluewaters Power Station Phase III and IV Expansion. Legislation relevant to management of waste is summarised in Table 8.1.

Table 9.1 Relevant legislation for waste management

Relevant Legislation	Scope	Administering Body
<i>Environmental Protection Act 1986</i>	Part IV defines the process of referral and assessment of proposals subject to formal assessment under the EP Act. Works Approvals and Licences are issued under Part V of the EP Act.	Department of Environment and Conservation and EPA
Environmental Protection Regulations 1987	Part III - General control of pollution (administration, works approval, licensing & registration of prescribed premises); Part VI - Disposal of tyres.	DEC
Environmental Protection (Rural Landfill) Regulations 2002	Applicable to the construction and management of registered Putrescible Landfill Sites with a design capacity of more than 20 but less than 5000 tonnes per year (i.e. prescribed premises category 89).	DEC and EPA
Environmental Protection (Controlled Waste) Regulations 2004	Obligations relating to the transportation and disposal of 'controlled' (generally hazardous) wastes. Controlled wastes listed in Schedule 1 of the Regulations.	DEC and EPA
Environmental Protection (Unauthorised Discharges) Regulations 2004	Defines materials that must not be burnt or discharged into the environment.	DEC and EPA
<i>Waterways Conservation Act 1976</i>	Conservation and management of waters and the associated land and environment.	Department of Water
<i>Litter Act 1979</i>	Defines actions legally considered as littering and associated penalties	Keep Australia Beautiful Council

Relevant Legislation	Scope	Administering Body
<i>Health Act 1911</i>	Regulates the use of apparatus for the treatment and disposal of sewage	Department of Health, and local authority
Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974	Applicable to the construction or installation of apparatus for the treatment of sewage and disposal procedures	Department of Health, and local authority

9.3 WASTE MANAGEMENT PROGRAM

Management of ash and its disposal is detailed in the Ash Management Plan (Section 10). Management of the saline water discharge is detailed in the Water Resource Protection Management Plan (Section 7), and the Saline Wastewater Disposal Management Plan (Section 11).

9.3.1 Environmental objectives and key performance criteria

Waste from the operation of the Proposal will be managed to meet the environmental objectives as set out in Table 9.2.

Table 9.2 Environmental objectives and performance indicators for waste management

Issue	Environmental Objective	Performance Indicator
Environmental impact	Manage all on-site wastes to minimise potential contamination to the receiving environment.	Surface and groundwater quality.
Recycling and reuse	Conserve resources of water, energy and raw materials and minimise solid and liquid wastes through resource recovery, reuse and recycling programs.	Records kept of all waste types generated and how they have been disposed of or recycled/ re-used.
Waste reduction	Reduce the production of hazardous wastes where practicable.	Volume of waste exported from site.
Disposal practices	Control and dispose of waste in accordance with required waste management practices and the applicable environmental authorities.	Maintenance of site hygiene and good housekeeping. Training and induction records.
Compliance	Ensure compliance with all relevant health and environment regulations and legislation.	Compliance with all legislation and regulatory requirements for waste management.

9.3.2 Management actions

The management actions to be implemented are set out in Table 9.3.

Table 9.3 Management actions for waste

Aspect	Action	Responsibility
Waste Prevention	Implementation of waste management hierarchy: waste avoidance/reduction, reuse and recycling.	Power Station Manager
	Minimisation of solid and liquid wastes through resource recovery, reuse and recycling programs.	Power Station Manager
Waste Separation and Recycling	Where practicable, timber, scrap-metal, bricks and other major recyclable wastes will be segregated and stored in safe, secure, designated waste collection areas away from drains, prior to re-use or collection by recycling contractors.	Power Station Manager

Aspect	Action	Responsibility
Contamination Avoidance	Waste paper and cardboard will be collected and prepared for removal by a paper recycler.	Power Station Manager
	Other recycling opportunities will be investigated and implemented by the Operator where possible.	Power Station Manager
	Waste oils will be labelled and stored in a suitable bunded facility prior to collection by a licensed waste contractor for recycling (for bunding requirements refer to Hazardous Materials Management Plan – Section 8).	Power Station Manager
	Loading and unloading of potentially hazardous waste materials will only be undertaken in designated areas in a manner that minimises potential for spillage or loss. Prior to hazardous materials arriving on site or waste material being generated on site, users will be trained in contingency actions and spill clean-up protocols as necessary.	Power Station Manager
	Bulk transfers of waste hydrocarbons and/or chemicals on-site will be supervised by appropriately trained personnel.	Power Station Manager
	Should a spill occur during bulk transfer of waste hydrocarbons or chemicals, the spilt waste material will be captured in the bund system and pumped into containers (material will be assessed for reuse or disposal by a licensed waste disposal contractor).	Power Station Manager
	Sewage wastes generated during operations and maintenance will be handled by an on-site package treatment plant, approved by the local Shire and meeting the requirements of the <i>Health Act 1911</i> .	Power Station Manager
	Saline wastewater will be stored temporarily on site in holding tanks, with contingency bunding/capture methods, prior to being directed for discharge in accordance with the Saline Wastewater Disposal Management Plan (Section 11).	Power Station Manager
	Storm water management requirements are defined in the Water Resource Protection Management Plan (Section 7). Stormwater from the stormwater sedimentation pond is available to be used on site.	Power Station Manager
Waste Tracking	Designated areas on site for the collection and storage of waste, which are located away from paved areas, stormwater management systems and low points on the site where water tends to accumulate.	Power Station Manager
	All chemicals, hydrocarbons or other hazardous materials bought onto the Bluewaters Power Station site will have the appropriate MSDS, enabling correct storage, handling and disposal as outlined in the Hazardous Materials Management Plan (Section 8).	Power Station Manager
Waste Disposal	The Operations EHS Representative will maintain an on-site Waste Disposal Register of the types and quantities and destinations of all waste material taken off-site during operations.	Operations EHS Representative
	All waste shall be disposed of in accordance with relevant legal requirements and recommendations obtained from MSDS.	Power Station Manager
	Any controlled waste that may be generated during operations will be handled and transported in accordance with the Environmental Protection (Controlled Waste) Regulations 2005. Specifically: <ol style="list-style-type: none"> 1. Non-recyclable wastes (Class I & II) will be transported by licensed contractor to the local landfill site at Collie. 2. Any Class III or IV waste will be transported offsite to an appropriate waste management facility by a licensed contractor. Regulated wastes will not be sent for disposal at any facility without prior written consent from the Operator. 	Power Station Manager
	Site hygiene and litter management will be ensured through visual inspections for litter and general waste.	Power Station Manager
	Food waste will be placed in bins with lids and emptied regularly by a waste disposal contractor.	Power Station Manager
	Solid or liquid residues remaining after water treatment shall be appropriately managed as waste material. Oily water collected by the oil water separator will be pumped into a tanker and removed from site to an authorised oil waste disposal site by an authorised contractor.	Power Station Manager

Aspect	Action	Responsibility
	Fly ash requiring disposal will be stored and contained on site for regular disposal to the Griffin Coal Ewington mining operations, as per the Ash Management Plan (Section 10).	Power Station Manager
	Saline water from the wastewater treatment plant will be stored and tested prior to disposal to Collie A, as per the Saline Wastewater Disposal Management Plan (Section 11).	Power Station Manager

9.3.3 Monitoring

Monitoring of waste management would be undertaken as set out below.

The Operations EHS Representative or nominated person will regularly inspect and audit the power station facilities, systems, procedures and records to ensure adherence to this Waste Management Plan. Specifically the operator will:

1. Ensure waste storage and disposal facilities are regularly inspected to ensure they are functioning sufficiently and dealing adequately with the quantities of waste. Inspections to include ensuring integrity of all bunds, tanks, pipes and valves as described in the Hazardous Materials Management Plan (Section 8).
2. Ensure site hygiene and management through:
 - training and awareness
 - provision of bins with lids for food (which are regularly emptied)
 - locating general waste and recycling bins on the site and informing a personnel and contractors of their locations and use
 - visual inspections for litter and general waste (and clean ups if required) within and around the site perimeter.
3. Record the following on the site Waste Disposal Register when any wastes are removed from the site:
 - date
 - quantity
 - type of waste removed
 - name of waste transporter and/or disposal operator
 - intended treatment/disposal destination of waste.
4. Periodically audit the waste disposal contractors to ensure that waste is being disposed of in accordance with relevant legal requirements in accordance with any agreement made with that contractor (including checking of waste disposal receipts and dockets for any regulated wastes).
5. Conduct a monthly review of the site MSDS Register and Waste Disposal Register, to ensure all wastes are being appropriately stored, handled and disposed in accordance with MSDS recommendations.

9.4 CONTINGENCIES

Actions to be followed as contingency actions in the event of an incident are set out in Table 9.4.

Table 9.4 Contingencies for waste management

Trigger	Action	Responsibility
Any non-compliant incidents of site waste management practices, including unauthorised removal of wastes from the premises	Investigate cause.	Operations EHS Representative
	Report to the Power Station Manager, including actions taken to rectify the situation.	Operations EHS Representative
	Determine and implement any remedial action in consultation with the DEC.	Operations EHS Representative
	Review waste management procedures	Operations EHS Representative
	All incidents will be reported to the appropriate authorities.	Power Station Manager

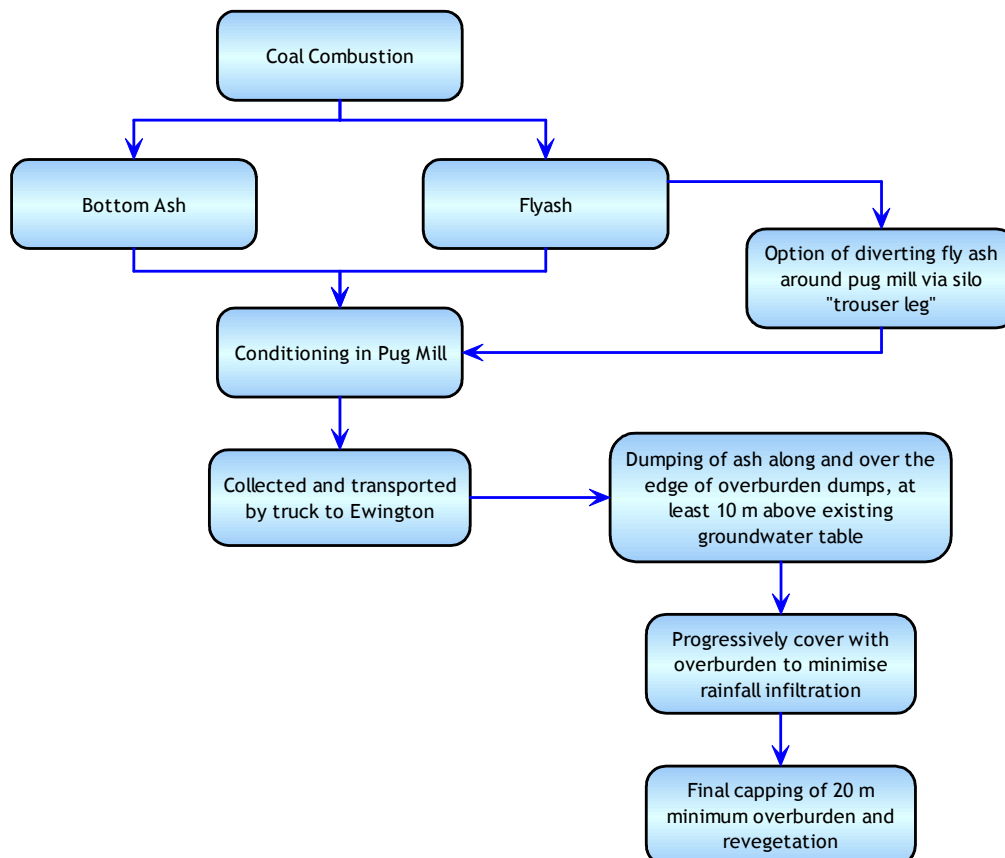
10. ASH MANAGEMENT PLAN

This plan applies to operation of the power station generating units component of the Proposal. The management of ash from the Phase III and IV Expansion will be undertaken within the overall management of ash associated with the combined Bluewaters Power Station Phases I to IV. The disposal method proposed by Griffin is to incorporate the ash with the mining overburden (co-disposal) to minimise leachate generation and placement above the natural water table within the Ewington I and Ewington II overburden dumps and mine voids.

Consequently, the approach taken in this plan is to adopt the measures specified within the Bluewaters Power Station and Ewington Mine Ash Management Plan (Griffin 2008). The key elements of this plan are reiterated below.

An overview of the Ash Disposal process is shown in Figure 10.1. The ash would be emplaced above the pre-mining water table, co-disposed with run-of-mine overburden at the ratio of approximately 1:100 (ash:overburden), and progressively covered to limit contact with rainfall and exposure to the environment. It is expected that the ash would be end-dumped from overburden dumps, with trucks reversing to the edge of the dumps and tipping the ash on the outside slopes. Ash will be covered with ash free overburden, which will minimise the opportunity for rainfall to infiltrate and mix with the ash that may in turn generate acidic leachate run-off.

Figure 10.1 Ash disposal overview



10.1 ENVIRONMENTAL RISKS

As part of the environmental approvals process associated with the Bluewaters Phase II expansion, the issues and opportunities pertaining to the management of ash disposal for Bluewaters I and II were identified. The outcome demonstrated that the dry disposal of ash within the overburden dumps and mine voids of Ewington I and Ewington II was the most environmentally responsible and viable option.

In preparation of the ash management plan for the Bluewaters Power Station (Phases I and II) and the Ewington Mine, studies were undertaken to determine the characteristics of ash and its interaction with overburden. These specifically included

1. A study to determine the trace metal levels and leachate propensity of four different Collie coals including Ewington I coal, using bulk leaching tests (conforming to AS4439.3-1997) and column leaching tests (Burns and Roe Worley 2005).
2. A second study utilising a groundwater flow and solute transport model for the Ewington I operations (URS 2008b).

In preparation of the environmental impact assessment for the Phase III and IV Expansion, URS Australia Pty Ltd examined the proposed disposal of ash from that project as an expansion of the Phase I and II process, building on the earlier work described above (URS 2008c).

Emplacement of ash into mine excavations and pit-perimeter overburden dumps, either during mine operation or as part of final void rehabilitation, provides advantages to the community in minimising the area set aside for waste disposal. International experience in more challenging environments has shown significant benefits arising from the use of ash in mine backfilling operations with few negative impacts (Heidrich et al 2007).

The benefits of this co-disposal method include:

1. **Reduction in the size of mine void lakes** - Coal mine voids are often left open after mining resulting in ground and surface water influx forming a void lake. Interaction of water and air results in oxidation of the void surfaces from Collie coal open cut mines and potentially the production of acidic mine void lakes. The use of ash as backfill material in the mine voids may in part mitigate these risks by reducing the footprint of the mine voids.
2. **Reduction in footprint of fly ash disposal** - Historic ash disposal methods in Western Australia have involved the development of dedicated ash disposal pits at sites away from the mining area. Several of these sites have been classified as contaminated-restricted use by the Department of Environment and Conservation and therefore have limited potential for beneficial future use. In-pit disposal therefore has the potential to reduce the footprint of impact to the environment.
3. **Reduction in potential for groundwater contamination** - Minimisation of ash-water interaction and encapsulation of many soluble species by the overburden. This will substantially reduce the risk of any groundwater contamination due to infiltration of surface water.
4. **Reduction in potential point source contamination** - Co-disposal of the ash and overburden will prevent the leachate contamination problems associated with ash disposal in slurry dams and dumps that create a contamination source point.

10.2 APPLICABLE LEGISLATION

Griffin Power, its employees and contractors will comply with all Commonwealth and State legislation that applies to the Bluewaters Power Station Phase III and IV Expansion. Legislation relevant to management of ash management is summarised in Table 10.1

Table 10.1 Relevant legislation for ash disposal

Relevant Legislation	Scope	Administering Body
<i>Environmental Protection Act 1986</i>	Part IV defines the process of referral and assessment of proposals subject to formal assessment under the EP Act. Works Approvals and licences are issued under Part V of the EP Act.	Department of Environment and Conservation and Environmental Protection Authority
<i>Waterways Conservation Act 1976</i>	Conservation and management of waters and the associated land and environment.	Department of Water

10.3 MANAGEMENT PROGRAM

10.3.1 Environmental objectives and key performance criteria

Ash from operation of the Proposal will be managed to meet the environmental objectives as set out in Table 10.2.

Table 10.2 Environmental objectives and performance indicators for ash management

Issue	Environmental Objective	Performance Indicator
Water quality	No unacceptable long-term diminution of groundwater and surface water quality.	Achievement of assessment levels for elements relevant to potential ash leachate compounds (Table 10.3).
Dust	Minimise the generation of airborne dust from ash disposal operations.	Compliance with applicable licence conditions relating to dust management. No validated dust complaints from nearby residences. Records kept of any high dust incidents and follow-up action. Signed inspection checklists available and reported weekly. Incidents relating to high dust levels are investigated and closed off, with outcomes reported.

Table 10.3 presents preliminary assessment levels for analytes of potential concern in groundwater or surface water.

Table 10.3 Preliminary assessment levels for analytes of potential concern

Analyte	Drinking Water	Fresh Water
Aluminium	200	55 (pH >6.5)
Arsenic	71	24
Barium	700	–
Beryllium	–	4
Boron	300	370
Cadmium	21	0.2
Chloride	250 000 ²	–
Chromium (total)	–	10
Copper	2000 ¹ (1000 ²)	1.4
Fluoride	1500	–
Iron	300 ²	–
Lead	10	3.4
Manganese	500 ¹ (100 ²)	1 900
Mercury	11	0.06
Nickel	20	11
Selenium	10	5.0
Zinc	3000 ²	8

Notes: All units are in µg/L
 – no investigation level established for analyte

1 Drinking Water - Health Protection

2 Drinking Water - Aesthetic Protection

10.3.2 Management actions

The management actions to be implemented are set out in Table 10.4.

Table 10.4 Management actions for ash disposal

Aspect	Action	Responsibility
Ewington Groundwater	Ash and overburden will be co-disposed a minimum of 10 m above the natural water table in designated areas to ensure that direct interaction with the groundwater will not occur either during or post mining.	Power Station Manager
	Ash will be co-disposed with overburden at an approximate ratio of 1:100 (no less than 1:10) to minimise the risks of leachate generation from the fly ash. This ratio ensures that in the event of any leaching occurs it would be diluted and of insignificant consequence.	Power Station Manager
	Ash will be disposed with a minimum moisture content of 15%. Previous studies have shown that ash has the capacity to hold up to 50% moisture. By disposing ash with low moisture content, it has considerable residual moisture retention capacity to accommodate water ingress by rainfall before saturation and leaching occurs.	Power Station Manager
	The overburden containing clay will be compacted by trucks and heavy equipment traversing over the co-disposed ash, which will further minimise surface water infiltration.	Power Station Manager

Aspect	Action	Responsibility
Ewington Surface Water	Ash and overburden will only be co-disposed to areas within the mine where surface water runoff can be directed towards the pit thereby creating an internally draining area. This disposal strategy ensures that any leachate from the disposal area is controlled by the in-pit water management systems, enabling any rainfall and leachate to be collected for treatment, reuse or disposal as appropriate, as part of the normal mining operations and not released to uncontrolled areas of the mining operations.	Power Station Manager
	Ash will not be placed on the outer flanks of the pit-perimeter overburden dumps to limit interaction with surface water run-off.	Power Station Manager
	Disposal areas will be surveyed and disposal volumes recorded to ensure compliance with the management procedures.	Power Station Manager
	A monitoring program will be implemented to monitor ground and surface water quality.	Operations EHS Representative
Rehabilitation	A minimum 15 m of non-ash containing overburden will be placed on top of the ash-overburden disposal areas prior to rehabilitation. This depth of cover is intended to limit the exposure of the co-disposed ash to rainfall infiltration and the tree-root interaction with the ash-overburden mixture.	Power Station Manager
	The final contours of the overlying overburden will be designed to shed surface water off the disposal area.	Power Station Manager
Dust	Collection, transport and disposal of fly ash will occur in accordance with the commitments made in the Griffin Coal (2008) Ewington Mining Operations - Dust Management Plan and the Griffin Power (2008) Bluewaters Power Station – Operations Dust Management Plan	Power Station Manager
	<p>Whilst it is acknowledged that the potential for dust to be generated will only occur during the drier months of November to April, the following dust management strategies will be implemented all year round.</p> <ol style="list-style-type: none"> Bottom ash and fly ash material is directed to pug mills for mixing and conditioning with water from the power station operations, prior to removal off site as a damp material, thereby reducing the potential for dust during load out and transport. Target moisture content of ash material will be at least 15% to prevent dust lift off. Ash will be conditioned prior to transport to prevent the fly ash from drying out. The co-disposal of ash and overburden will minimise dust generation from the stockpiles of ash. Dust generation will be further minimised by the placement of non ash containing overburden over the co-disposed ash. 	Power Station Manager

10.3.3 Monitoring of ash management

The management of ash from the Phase III and IV Expansion will be undertaken within the overall management of ash associated with the combined Bluewaters Power Stations Phases I to IV. The monitoring proposed within Section 9.2 of the Bluewaters Power Station and Ewington Mine Ash Management Plan (Griffin 2008) would cover inclusion of ash from the Phase III and IV expansion.

Monitoring of ash management would be undertaken as set out in Table 8.4 with objectives as set out in Table 10.6.

Table 10.5 Monitoring program for ash management

Parameter(s)	Source	Frequency/timing
Total and leachable concentrations of Ag, Al, As, B, Ba, Be, Ca, Cd, Cl, Co, Cr, Cu, F, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, Pb, S, SO ₄ , Sb, Se, Si, Sr, Ti, V, Zn, LOI	Fly ash Characterisation	10 samples collected during commissioning and quarterly sampling during operations.
Groundwater Levels	Local Monitoring Bores ²	Monthly
Groundwater Quality: pH, EC and temperature, TDS, Al, As, Be, B, Cd, Co, Cr, Cu, Fe, Pb, Mn, Mo, Ni, Sr, V and Zn.		Quarterly (April, July, October, January)
Stream Flow Quality: pH, EC and temperature, TDS, Al, As, Be, B, Cd, Co, Cr, Cu, Fe, Pb, Mn, Mo, Ni, Sr, V and Zn.	Stream Flow Stations ³ Boronia Gully	Quarterly (April, July, October, January) and at times of flow.
Surface Water Quality: pH, EC and temperature, TDS, Al, As, Be, B, Cd, Co, Cr, Cu, Fe, Pb, Mn, Mo, Ni, Sr, V and Zn.	Surface Water in Areas ⁴ Disturbed By Mining	Campaign sampling based on occurrences of run-off and in-pit pumping from sumps.

Table 10.6 Objectives of ash monitoring programs

Objective	Key Items	Outcomes
Assessment of the impacts of mining and disposal areas on surface water and groundwater environments.	<p>Characterisation of surface water runoff within existing Ewington II areas disturbed by mining to determine overburden impacts.</p> <p>Characterisation of the effects of overburden disposal areas on current groundwater quality. May require the additional installation of monitoring bores at Ewington II to investigate the shallow water quality beneath the overburden dumps.</p> <p>Drilling and construction of the design pit-perimeter and in-pit control monitoring bores to monitor for ash co-disposal impacts.</p> <p>Measurement of groundwater levels and groundwater quality in control monitoring bores assisting to determine origin of impacts detected in monitoring program.</p>	Differentiation of current impacts from potential impacts of disposed ash.
Assessment of the impacts of ash disposal on local water resources.	<p>Drilling and construction of pit-perimeter and in-pit ash disposal monitoring bores.</p> <p>Measurement of groundwater levels and groundwater quality in the monitoring bores.</p> <p>Comparative assessments of the impacts of mining disturbances, disposal areas and ash disposal on the shallow groundwater quality.</p> <p>Verification and improved confidence in the predictive models.</p>	To develop an understanding of the impacts of mining and ash disposal on the groundwater and surface water resources and provide data to define and manage potential adverse impacts on ecological receptors in the vicinity of the project.
Meeting reporting requirements of the regulators.	<p>Annual reporting of the measured impacts of ash disposal.</p> <p>Forecasts of future impacts.</p>	Compliance with the terms, limitations and conditions of the Pollution Control Licence.

² The local monitoring bores at Ewington I and Ewington II would be a network designed to monitor the groundwater quality in the vicinity of overburden dumps within which ash is and is not co-disposed. This network would also include control sites wherein baseline is observed.

³ The designed stream flow stations are located in the Boronia Gully tributary of the Collie River East Branch and the tributary of the Collie River South Branch that extends into the Ewington I Deposit. Design of the stream flow stations is currently in progress and commissioning before the winter of 2008 is expected.

⁴ Sampling would commence in Ewington II Mine in the short-term, with intention to develop a database that characterises surface water and groundwater quality from mine areas that are not influenced by ash co-disposal. The sampling would ideally be linked to photographic and descriptive records that illustrate the source of the water and upstream and/or local landforms and lithologies that might influence quality.

10.4 CONTINGENCIES

A contingency disposal area has been identified for the temporary disposal of ash. This area is a pre-existing overburden dump on the Coolangatta Industrial Estate, north of Bluewaters Lake, southwest of the power station. This disposal area would be utilised when wet weather prevents access to the overburden dumps at the mine or other unforeseen events that limit access. Similar management strategies identified for the permanent ash disposal areas will be implemented for this disposal area involving:

- placement above the water table
- partial cover with overburden to minimise infiltration (as not permanent less overburden)
- downstream surface water monitoring
- installation of monitoring bores to monitor potential impacts on groundwater.

The co-disposed ash would then be relocated and permanently disposed at Ewington when operating conditions permit.

11. SALINE WASTEWATER DISPOSAL MANAGEMENT PLAN

This plan applies to operation of the marine outfall pipeline component of the Proposal, if that component is implemented. If the component is not implemented, saline water disposal would be via a third party, and management responsibility would rest with that third party.

11.1 ENVIRONMENTAL RISKS

The environmental risks relate largely to the saline water discharge into the ocean and impacts on the marine environment. The risks associated with the pipeline itself relate to the potential for a structural failure/breach of the pipeline and leakage of the saline water into the surrounding terrestrial environment, and the potential impact of the structure on coastal processes.

It is proposed that the Griffin diffuser will be inshore from the Collie Power Station outfall diffuser, extending from 540 m to 650 m offshore (Figure 11.1). A concept design for the diffuser for the proposed outfall was developed. The proposed diffuser for the peak discharge of 10 ML/d is as follows:

- length of diffuser: 110 m
- number of ports: 30
- port spacing: 3 m

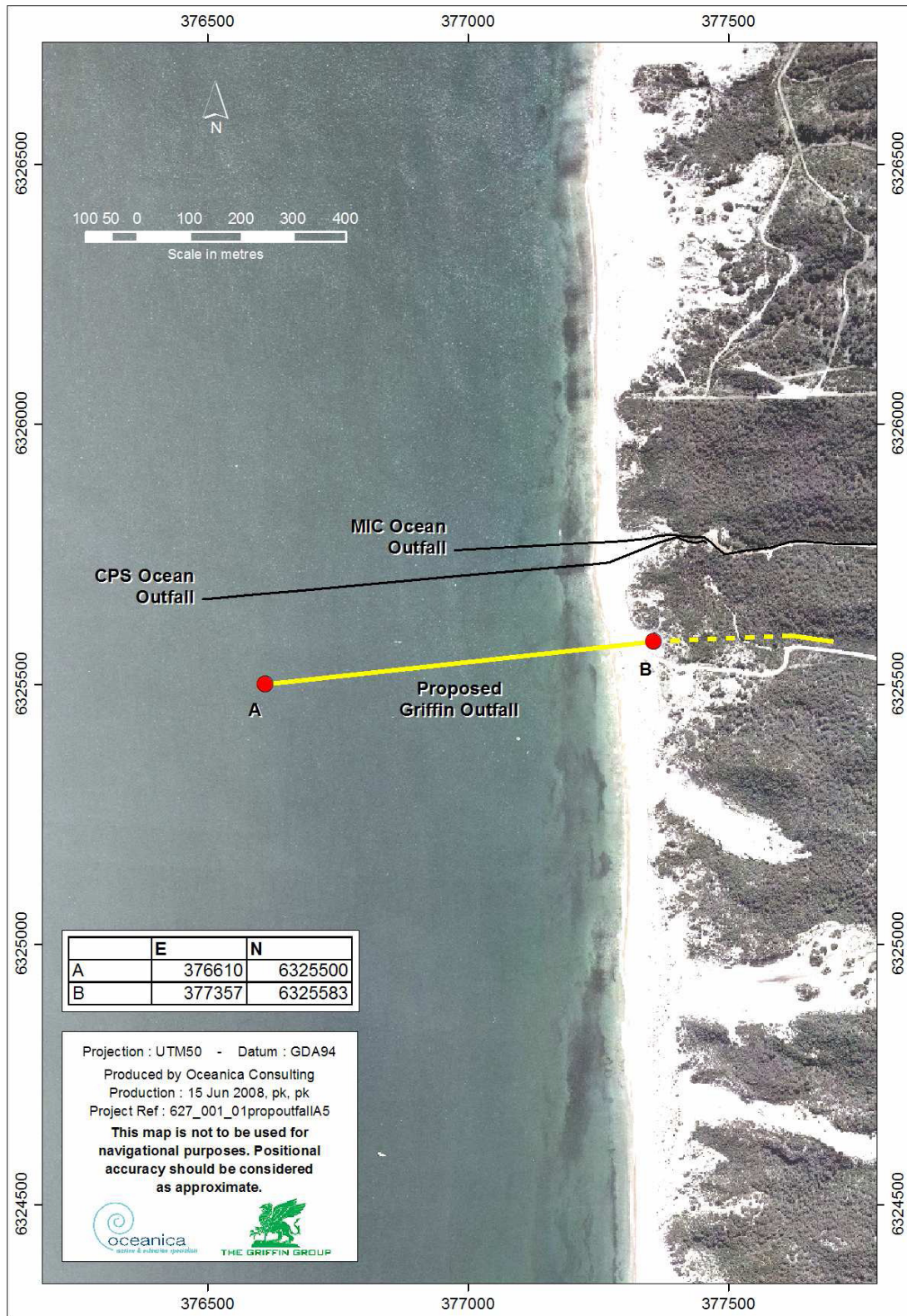
The average initial dilution for discharge to still water for this diffuser design was predicted to be 150:1. For the concept design, it was considered most likely that the outfall would be constructed of HDPE. A nominal diameter of 450 mm with a wall thickness of 27 mm is considered to be the most likely sizing for the flows and purpose.

The areas in the immediate vicinity of ocean outfalls are generally designated as Low Ecological Protection Areas (LEPAs). For these areas, the Environmental Quality Guidelines (EQGs)⁵ for water and sediment quality which have generally been considered applicable are the ANZECC/ARMCANZ (2000) 80% species protection guideline trigger values for toxicants identified as having the potential to adversely bioaccumulate or biomagnify (e.g. Government of Western Australia 2004, Environmental Protection Authority 2005). The environmental risk posed by the decreased salinity is considered to be negligible (Oceanica 2008) and for management purposes, it is recommended that a LEPA area be established within 50 m of the diffuser structure and that the High Ecological Protection Areas criteria are applied at the LEPA boundary. There is no requirement for any social use restrictions or seafood harvesting restrictions. The scale of the LEPA is such that it is easily monitored and defined and yet is small relative to the open water.

It is highly unlikely that the proposed discharge would have any toxic effects on marine mammals (such as whales and dolphins) as the concentrations of toxic materials are extremely low, and the exposure times of mammals would be limited.

⁵ Environmental Quality Guidelines are quantitative, investigative triggers that signify a low risk of an environmental effect if they are met, and trigger further investigations if an exceedance occurs.

Figure 11.1 Location of proposed Griffin outfall and the existing outfalls



11.2 MANAGEMENT PROGRAM

11.2.1 Environmental objectives and key performance criteria

Saline discharge from the operation of the Proposal will be managed to meet the environmental objective as set out in Table 11.1.

Table 11.1 Environmental objective and performance indicators for saline water disposal

Issue	Environmental Objective	Performance Indicator
Benthic habitat and marine fauna	To maintain the ecological values of the surrounding waters	Criteria used to assess environmental performance during operations include the ANZECC/ARMCANZ guidelines (ANZECC/ARMCANZ 2000) and the Cockburn Sound State Environmental Policy (Government of Western Australia 2005).

11.2.2 Management actions

The management actions to be implemented are set out in Table 11.2.

Table 11.2 Management actions for saline water disposal

Aspect	Action	Responsibility
Disposal of saline water	Water will be disposed of to a marine discharge pipeline operated either by the proponent, or by a third party, in accordance with the requirements of the relevant Environmental Licence(s).	Griffin Power
	The monitoring program outlined in Section 11.2.3 be implemented if Griffin Power operates the marine outfall.	Operations EHS Representative
Terrestrial pipeline leak	Pipeline pressure will be continuously monitored at the power station with alarms set to alert the operator if pressure drops below a threshold value indicating a leak (if Griffin Power operates the marine outfall).	Operations EHS Representative

11.2.3 Monitoring

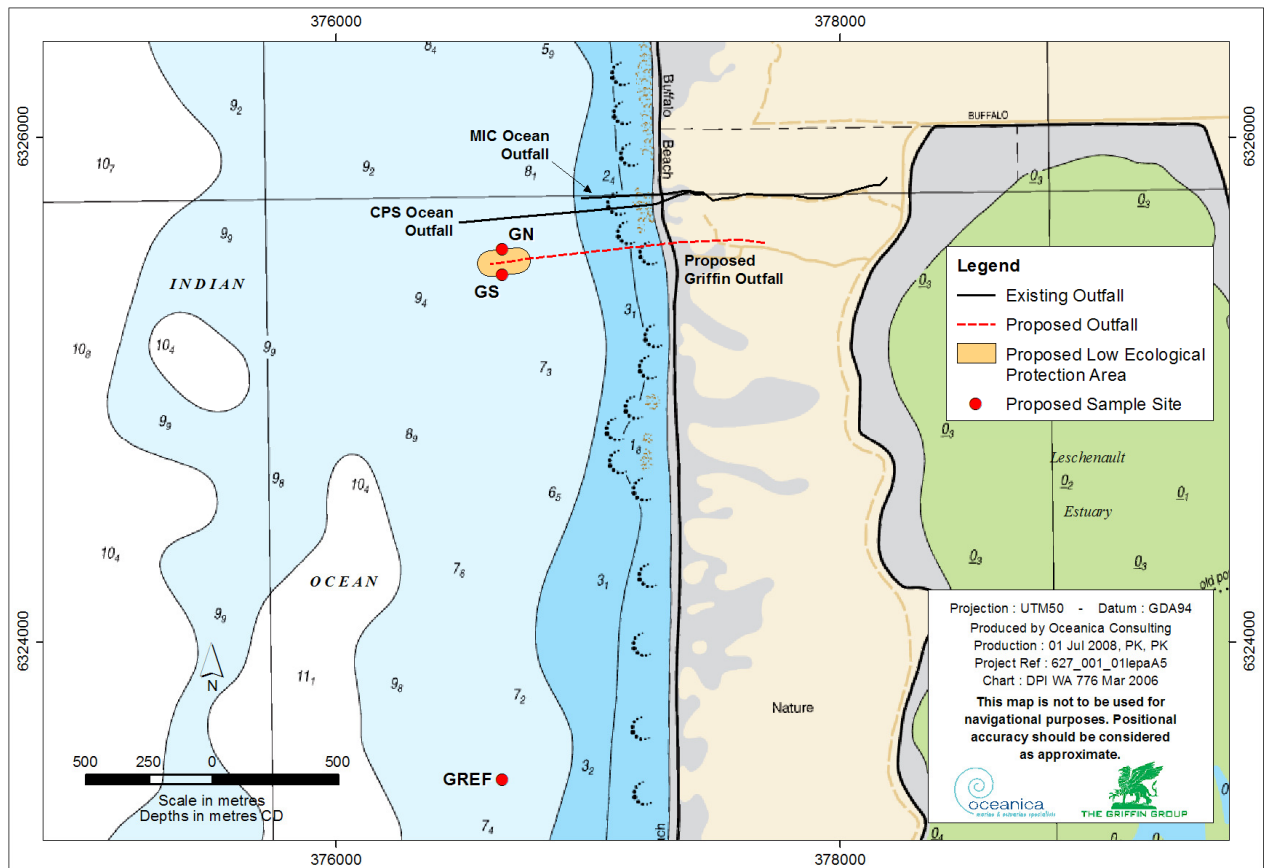
Monitoring of saline water disposal would be undertaken as set out in Table 11.3. The marine monitoring sites are shown in Figure 11.2.

Table 11.3 Monitoring program for saline water disposal

Parameter(s)	Source	Frequency/timing	Purpose
Pressure in pipeline	Power station connection to marine outfall pipeline	Continuous	To provide an alert of a leak occurring.
Volumes and flow rates. Water Quality monitoring: turbidity, pH, EC, TDS, TSS, Cl, HCO ₃ , SO ₄ , NO ₃ , PO ₄ , Na, K, Ca, Mg, Fe, SiO ₂ , As, Al, Mn, Cd, Cr (Tot), Cu, Hg, Pb, Ni, Vn and Zn.	Saline water discharge into pipeline	Monthly Monthly during commissioning and quarterly during operations.	To ensure discharge quantity and quality conforms to the Environmental Licence conditions.

Parameter(s)	Source	Frequency/timing	Purpose
As, Cd, Cr, Cu, Pb, Hg, Vn and Zn	Mussel sampling – sites GN, GS and GREF	Three yearly (if Griffin Power operates pipeline and outfall)	To observe potential biological accumulation of metals in marine environment.
As, Cd, Cr, Cu, Pb, Hg, Vn and Zn	Sediment sampling – GN, GS and GREF	Annually (if Griffin Power operates pipeline and outfall)	To observe marine sediment accumulation of metals.
pH, temperature, total dissolved solids, total suspended solids, dissolved oxygen, As, Cd, Cr, Cu, Pb, Hg, Vn and Zn	Marine water sampling over diffuser	Annually (if Griffin Power operates pipeline and outfall)	To observe extent of effectiveness of mixing in marine environment.

Figure 11.2 Proposed management zones and monitoring sites



11.3 CONTINGENCIES

Actions to be followed as contingency actions in the event of an incident are set out in Table 9.4.

Table 11.4 Contingencies for waste management

Trigger	Action	Responsibility
Pressure drop in the pipeline indicating a failure and potential leakage into the environment.	The pipeline route will be inspected with leak detection equipment and the damaged section of pipeline repaired as a matter of urgency	Operations EHS Representative
	Arrangements for a means of alternative disposal while the repair is effected would be negotiated with the DEC.	Operations EHS Representative
	Investigate cause of pipeline failure.	Operations EHS Representative
	Initiate measures to avoid further similar occurrences.	Power Station Manager
Contaminant concentrations (or loads) exceed the thresholds established in the Environmental Licence	The data, QA/QC processes and application of the guidelines will be checked for accuracy.	Operations EHS Representative
	If there is no apparent reason for the exceedance (e.g. operational malfunction or introduction of new contaminant streams), additional sampling for the contaminant of concern will be undertaken as soon as practicable.	Operations EHS Representative
	If subsequent sampling demonstrates that exceedance is beyond doubt, the DEC will be informed of the exceedance, the cause of the exceedance, any impacts and the next action to be taken as soon as practicable.	Operations EHS Representative
	If the exceedance is the result of normal operations, the protocols set out in ANZECC/ARMCANZ (2000) will be followed, whereby the ecotoxicity of the effluent following initial dilution will be established and the results communicated to the DEC. If there is found to be unacceptable levels of toxicity, the proponent will need to modify the operations to ensure that the approved objectives are met.	Operations EHS Representative
	If the exceedance is the result of operational malfunction, the proponent will immediately engage with the DEC to present the extent of the problem and the solutions that will be implemented to ensure that the environment is protected from harm.	Operations EHS Representative

12. REFERENCES

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