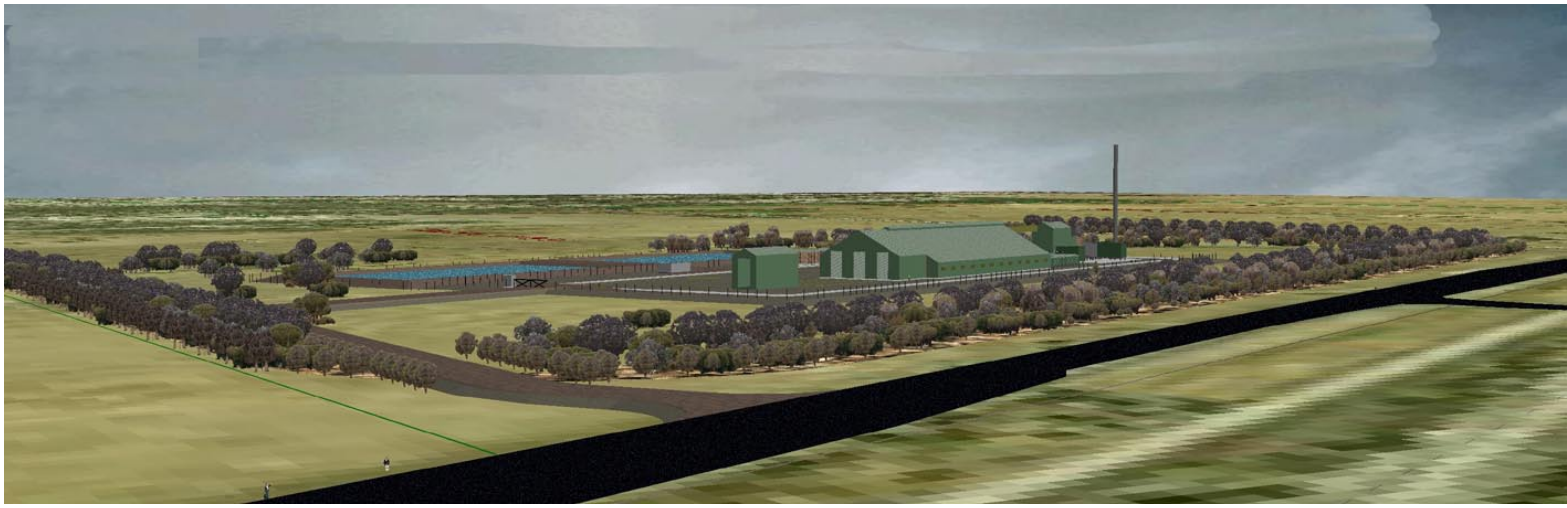
Blair Fox
Generation WA

PUBLIC ENVIRONMENTAL REVIEW

July 2002

POULTRY LITTER POWER STATION



Invitation To Make A Submission

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal. If you are able, electronic submissions emailed to the DEP Project Assessment Officer would be most welcome.

Blair Fox Generation proposes to establish a Poultry Litter Fired Power Station near Muchea. In accordance with the Environmental Protection Act, a PER has been prepared which describes this proposal and its likely effects on the environment. The PER is available for a public review period of 4 weeks from Monday, 22 July 2002 closing on Monday, 19 August 2002.

Comments from government agencies and from the public will help the EPA to prepare an assessment report in which it will make recommendations to government.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence subject to the requirements of the Freedom of Information Act, and may be quoted in full or in part in the EPA's report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal more environmentally acceptable.

When making comments on specific elements of the PER:

- clearly state your point of view;
- indicate the source of your information or argument if this is applicable;
- suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- refer each point to the appropriate section, chapter or recommendation in the PER;
- if you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering;
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name;
- address;
- date; and
- whether you want your submission to be confidential.

The closing date for submissions is: Monday, 19 August 2002

Submissions should ideally be emailed to

richard.sutherland@environ.wa.gov.au

OR addressed to:

The Environmental Protection Authority
PO Box K822
PERTH
WA 6842

[Westralia Square
141 St George's Terrace
PERTH WA 6000]

ATTENTION: [R SUTHERLAND]

BLAIR FOX GENERATION WA

POULTRY LITTER POWER STATION

PUBLIC ENVIRONMENTAL REVIEW

July 2002

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PUBLIC ENVIRONMENTAL REVIEW

POULTRY LITTER POWER STATION
MUCHEA WESTERN AUSTRALIA
BLAIR FOX GENERATION WA PTY LTD

Executive Summary

Introduction

Blair Fox Generation WA Pty Ltd (the proponent), acting as the manager on behalf of an unincorporated Joint Venture with a number of other companies, proposes to construct and operate a renewable energy, poultry litter power station in the Shire of Chittering in Western Australia. The Plant, the associated facilities and operations are referred to as the Project. The Project will be located at a site approximately 70 km north of Perth on the Brand Highway, 5km north of Muchea.

The Project will generate annually approximately: 82GWh of renewable electricity; 73,000 renewable energy certificates; and approximately 8,800 tonnes of fertilizer.

The Project utilizes proven technology with a number of poultry litter power stations successfully operating in Europe and others under development in the United States of America and Asia.

The power station's fuel source will be poultry litter. Poultry litter has been identified as a source of stable fly breeding and has recently been subject to stringent Health Department disposal regulations to reduce this risk.

The ash from the combustion process will be a valuable fertiliser and will be marketed as an alternative to superphosphate.

Construction is planned to start in 2003 and is expected to take approximately 10 months.

The Project was referred to the Western Australian Environmental Protection Authority (EPA), who determined that the Project would be assessed as a Public Environmental Review (PER) with a four week public review period. The PER provides the relevant details of the Project and the proposed management techniques to enable the environmental acceptability of the Project to be assessed.

The key characteristics of the project are contained in Table PER 1.

TABLE PER1

Project Element	
Project Purpose	To construct and operate a poultry litter power station in the shire of Chittering to produce renewable electricity and an ash based fertiliser.
Project Location	Approximately 70 km north of Perth on the Brand Highway, 5km north of Muchea.
Life of Project	25 years
Project Components	• Electricity Supply • Bore water supply • Natural Gas Supply • Poultry litter deliver and storage facility • Ash storage • Power generation facility • Effluent treatment facility • Administration facilities • Plant access roads and car parking • Storm and waste water collection facility • Truck washdown area
Plant operating hours	24 hours per day, 7 days per week

Key Project Outputs	**Quantity**
Ash	1.2 tph
Renewable Electricity	82 GWh pa
Renewable Energy Certificates	73,000 REC's per annum

Key Project Inputs	**Quantity**
Bore Water	550,000 kL/year (TDS < 500 mg/L)
Cooling water	31 kL/h
Boiler make up water	0.1 kL/h
Tanker wash water	15 kL/day
Reverse osmosis plant wash water	12 kL/day
Imported Fuel	Nil
Poultry litter	300 tonnes/day 108,000 tpa 15 trucks/day
Staff Transportation	15 cars/day
Natural Gas (start-up)	1000 GJ/annum (maximum)
Cleaning Chemicals	20 drums/annum
Caustic soda	20 tpa @ 50% w/w

Source	**Discharge**	**Receptor/ Destination**	**Quantity**	**Comment**
Boiler stack (40 m above ground)	Total Flow	Air	75.2 - 86.6 tph	
	Volume	Air	98 – 112 m^3/h	At 200^oC
	Particulate Loading	Air	60 mg/Nm^3	Dry at 0^oC and 12% CO2 Typical
	HCl	Air	4.8 g/s	Typical
	SO_2	Air	3.3 g/s	Typical
	NO/Nox	Air	4.6 g/s	Typical
	Water	Air	8 - 12 tph	
Water from Cooling Tower	Evaporation	Air	30 tph	
	Spray drift water	Air	0.5 tph	

Litter storage shed	Ventilation air	Air	45,000-225,000 m^3/h	1 to 5 store air exchange/hour – 1 air exchange per hour will go to the boiler. Contains poultry litter odour.
Facility-wide	Noise	Nearest residence	30 dBa	At a distance of 1.35 km
		At site boundary	45 dBa	At site boundary
Boiler	Blowdown Water	Evaporation Pond	10 kL/day	75 ppm total solids, 5 ppm Fe, 2-5 ppm Cu
Surface areas subject to contaminant deposition	Storm Water	Evaporation pond	800 kL/ peak day 8,000 kL/annum	
Truck washdown bay	Truck Wash Down Water	Evaporation pond	15 kL/day	Trucks are passed through a shower curtain of water to wash off loose poultry litter
Water Reuse Plant	Concentrated Retentate	Evaporation pond	24 kL/day 8,000 kL/annum	Concentrated minerals from bore water - concentrated by a factor of 36
	Caustic Wash Water	Evaporation pond	6 kL/day 2,000 kL/annum	0.5% w/w caustic soda
	Flush Wash Water	Evaporation pond	6 kL/day 2,000 kL/annum	Bore water.
Sanitary facilities	Domestic Sewage	Anaerobic/Aerobic treatment and to Amended Land	3 x domestic load	5 staff per shift
Evaporation Pond	Sludge	Landfill	100 m^3 pa	Contains concentrated mineral solids from bore water and traces of poultry litter

Benefits of the Project

Social, economic and environmental benefits will flow from the proposed power station to the nation, state and local community, including:

- Revenue will flow to the Chittering Shire from the power station's occupancy of a site that currently generates only unimproved land rates.
- Residents and livestock in the Shire will benefit from the reduction in stable and house flies associated with the power station's alternate use of poultry litter.
- The proposal will have a beneficial impact on the local economy through the disbursement of construction and operation related expenditure, and direct and indirect employment. The construction workforce is expected to be 125. When operational, the facility is expected to employ approximately 15 full time equivalent staff.
- Some local businesses will have the opportunity to purchase electricity from the power station at a lower cost than they currently pay.
- The Shire will host one of WA's few renewable energy power stations and this will attract tourists into the area (the UK's Thetford poultry litter power station attracted over 500 tourists per annum in its early years of operation).

- The project will make a significant contribution to reducing greenhouse gases emissions by offsetting fossil fuel generated electricity in WA.

- The Project will operate under the State's strictest emission criteria and will set new environmental benchmarks for power generation.

- The proposal will also have a positive economic impact on the poultry industry in Western Australia through the resolution of the litter disposal issue.

- The proposal will make a very significant contribution to WA's federally legislated renewable energy obligations.

Need for the proposal

The stable fly problem

The Western Australian poultry industry supplies poultry meat to the State's domestic market. The industry produces some 40 million birds annually and production is increasing at 4% per annum (Agriculture WA, 1998).

A waste stream from this industry is some 250,000 cubic metres of poultry litter per annum. The litter contains a mixture of about 70% by volume manure, and 30% sawdust or some other bedding material.

The industry has always disposed of poultry litter to the horticultural industry for use as fertiliser. Unfortunately, once in the open environment, the litter provides an ideal site for stable flies to breed. Breeding may take place while the litter is temporarily in stockpiles, or in clumps once the litter is distributed upon the ground. The adverse impacts of stable flies have increased over time with the encroachment of urban development and other sensitive land uses in proximity to market gardens.

The Minister for Primary Industry and Fisheries established the Stable Fly Management Project in 1996 to develop and implement management practices and other strategies to control stable fly breeding associated with horticultural and agricultural practices. The Stable Fly Steering Project (1998) found:

"The use of poultry manure in horticulture, principally vegetable, turf and strawberry production is the major source of stable fly breeding [42,000 – 200,000 stable flies per hectare]".

Additionally, the Project (1998) found:

"Extremely high levels of house fly breeding [300,000 house flies per hectare] were associated with poultry manure use, which has implications for human and livestock health. House fly breeding will be effectively dealt with by the practices that have been developed to manage stable fly breeding."

More than 2,000 public complaints were received, between 1994 and 1997, by Agriculture WA and local government authorities in areas where flies are a problem. Grievances included people being "harassed, attacked and bitten" by flies resulting in the inability to conduct social activities in backyards, and livestock owners advising that stock were suffering and even dying as a result of fly harassment (Agriculture WA, 1998).

This project will alleviate the problems associated with stable fly breeding in poultry litter by having the litter used to generate electricity. This follows similar practices adopted in Europe and the United States.

Renewable energy from poultry litter

The energy produced is classified as renewable because the inherent carbon is from biological sources (poultry food and trees).

The Office of Energy has confirmed the classification, and has determined that the output from the proposed poultry litter power station will displace some 81,000 tonnes of fossil fuel generated CO_2 per annum. The value of poultry litter as a fuel source for electricity production is enhanced in practical terms because the poultry litter power station is a *firm capacity* power station (ie. can generate on demand unlike from wind power or solar energy).

The greenhouse benefit of the proposal is further enhanced if nitrous oxide emissions generated from biological decomposition of poultry litter used as a fertiliser are taken into account. After allowing for nitrous oxide emissions that occur during combustion of the poultry litter, the additional greenhouse gas benefit of the proposal compared to the existing situation is conservatively estimated to be more than 16,000 tonnes per annum of equivalent CO_2 emissions.

The ash from the power station's boiler contains trace elements and is able to be sold as a fertiliser.

Evaluation of Alternatives

Method of Disposal	Groundwater Pollution	Pathogens	Accommodation of Industry Growth	Greenhouse Gas Emissions
Proposed Power Station	Negligible	Pathogen free	Can accommodate growth in poultry industry	Reduces emissions and displace the need to build the equivalent fossil fuel generating plant
Composting for Continued Fertiliser Use	Significant risk through loss/leaching of nutrients (particularly nitrogen and phosphorus)	kill most pathogens except *Listeria* and *Clostridium perfringens*	A stable market does not exist for large volumes of composted poultry litter	Increases due to additional nitrous oxide emissions
Landfill	Can pose a significant risk through leaching	Buried presents lower risk of exposure	Conflicts with Government policy on landfill reduction	Increases due to methane generation (GWP of methane is 24.5)

Project Description

The proposal is for an 11 MW (approximate) steam turbine power station near Muchea using poultry litter as a fuel.

Based on the availability of over 100,000 tonnes per annum (tpa) of poultry litter, the plant will burn approximately 13 tonnes per hour (tph) to produce superheated steam. The steam will be passed through a turbine to produce approximately 11 MW of electricity at maximum operating capacity. The plant could operate at near full capacity for approximately 8,200 hours per year.

The parasitic electrical loads for the plant are estimated to be about 1 MW comprising.

The power station and related infrastructure will comprise:

- A chicken litter reception and storage facility to hold up to 2,000 tonnes of chicken litter – to assist in odour control, combustion air will be drawn from the storage facility into the boiler.
- One 35 MW boiler complete with fuel handling, feed water make up, flue gas emission control and ash load out systems.
- One 11 MW steam turbine generator complete with lubricating oil, gland steam, generator cooling and generator control systems.
- A condenser and associated cooling towers and a reverse osmosis plant for the recovery of cooling tower blow down water.
- A 22 kV export electricity facility including a 2.7 km long 22 kV high voltage line to the local Western Power substation.
- Services including a bore water supply, compressed air supply, fire water supply, stormwater retention ponds, drainage, a truck wash station and a natural gas metering station to supply natural gas for boiler start-up.
- A front-end loader for chicken litter and ash handling.
- A small sewage treatment plant and separate evaporation ponds for the disposal of process effluent and stormwater retention.

Operation

The power station will receive poultry litter from all farms in the broad Perth region. The process for delivery and ultimate conversion of this fuel is outlined below.

Following loading up at poultry farms after harvest, sealed trucks (approximately 15 per day) will transport the litter to the power station. Upon arrival, the trucks move through the muster station to the fuel delivery area – an enclosed shed with concrete floor. Each truck reverses into the fuel delivery area via an automatic door, removes its covers and tips its load then exits and proceeds to the washdown bay where the exterior of the truck is laser-washed.

The litter is transported via front-end loader to a conveyor stacking system and from there to the stockpile.

The stockpile will have an air extraction unit above it, to draw air off for use in the combustion process. This captures odour-laden air and will reduce odour emissions from the shed.

As required, the front-end loaders remove fuel from the stockpile and place it in the feed hoppers that deliver fuel to the boiler, where it is combusted.

Combustion gases from the boiler are directed through the scrubbing circuit and are emitted through the stack.

Heat from the boiler is used to generate steam that drives a turbine and generator. The electricity produced is fed via transmission lines to Western Power's zone sub-station and onto the South West Interconnected Grid.

The plant is expected to generate electricity for approximately 8,200 hours per year.

Commitments and Predicted Outcome

To ensure that all of the environmental issues associated with the Project are managed, resulting in an environmentally sound Project, the Proponent has made a number of commitments in the PER.

The environmental factors, potential impacts, proposed management and predicted outcome of the project are summarised in Table PER2.

Table PER2: Environmental Factors and Management

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
BIOPHYSICAL					
Vegetation community types 3b and 20b	To maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	The plant site lies within an area that has been extensively used for pastoral activities and as such is significantly degraded. The plant site itself is on cleared grassland. No Rare or Priority flora species were located on the proposed site.	Proposal avoids all areas of community types 20b and 3b	• Community types 20b and 3b will remain untouched • Fencing of vegetation to protect Vegetation Communities 2A and 2B. • Regeneration of the Melaleuca Woodland on the northeast of the site by including that area within the plant perimeter fencing and thus preventing access by cattle. • Aggressive and regular weed control. • Considering the transplanting of any trees which are required to be removed for the development (mainly *Melaleuca preissiana*) to a position which will assist visual screening of the facility. • Drawing from the list of species suggested in the vegetation survey as appropriate for screening purposes (mainly local native species but also others known to occur in the area). • Significant re-planting of native and site-appropriate vegetation for specialised screening, water table control and aesthetic purposes.	No significant impact.
Terrestrial fauna .	Maintain the abundance, diversity and geographic distribution of fauna. Protect specially protected fauna and their habitats, consistent with the provisions of the Wildlife Conservation Act 1950 and the Environmental protection and Biodiversity Act 1999	No faunal habitats for native species on the plant site.	Disturbance to native fauna.	No disturbance of native fauna.	No impact
Groundwater Management	To ensure that where changes are proposed on land within the	The site is not situated within any proclaimed wetland area and is located	Sustained abstraction from a shallow wellfield on the	The underlying Greensand beds are likely to be suitable for developing a water supply for the power station. The Proponent will submit a further hydrogeological report to	No significant impact.

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
	catchment of an important wetland those changes will not lead to unacceptable impacts on either the water quality or the hydrology of that wetland.	wetland area and is located on the Guildford Formation geological unit, occurring in a shallow topographic low and cut along its length by the Chandala / Ellen Brooks. To the west of the Guildford Formation is the Bassendean Sand system of the Gnangara Mound groundwater reserve. Cooks Spring, a dam excavated on groundwater seep, is to the northeast of the site. Garboro Pool is located on the ephemeral Chandala Brook approximately opposite the southeast corner of the site. The regional groundwater flow in the superficial formations at the power station's site was easterly towards the Chandala Brook with the Gnangara Mound being to the west of the proposed site. No other waterways or wetlands were relevant to the proposed site	boundary may be locally significant on wetlands or other users.	Proponent will submit a further hydrogeological report to the Water and Rivers Commission following installation and testing of the production bores. The report will assess whether the required yield is sustainable, and will propose a monitoring program to check for impacts of abstraction.	
Surface water quality	To ensure that receiving waterbodies are protected from	The proposed site is a floodplain located within the Ellenbrook catchment,	Pollution of the Ellenbrook catchment through	The proposed site is a floodplain and at times the water table can be at ground level. The developed area of the site will therefore be built up to a height of 1.2 m above	No significant impact.

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
	contamination by providing assessment guidance for the management of surface run-off from industrial and commercial sites. The criteria used for the assessment of surface runoff impacts from new proposals are specified in *Guidance for the Assessment of Environmental Factors – Management of Surface Run-off from Industrial and Commercial Sites (Draft)* (EPA 1999).	(but not within a Bushplan site or proclaimed wetland) which follows the brook to the north and south. Bushplan does, however, recommend that any development within the Ellen Brook catchment be undertaken in an environmentally sensitive manner to ensure the catchment is not altered (Bennett Consulting 2000).	inappropriate waste run-off from the site	ground level. The plant is designed to ensure that all liquid process wastes and stormwater runoff are retained on site and disposed of in a controlled manner. The following outlines the measures have therefore been built into the design of the plant in order to achieve this outcome: • Cooling tower blowdown water will be treated in a reverse osmosis (RO) plant to recover water for use. Retained stormwater, RO plant retentate, boiler blowdown water and other process effluents will be discharged to evaporation ponds. • All site bunding and elevations have been sized to anticipate the maximum expected rainfall. • Onsite roads and carparks will be sealed and curbed and the truck washdown bay designed to be consistent with DEP's Washdown Guidelines (fit for use). • Evaporation ponds will be lined according to DEP guidelines and sludge removed to a appropriate waste facility by a licensed contractor. • Sewage effluent will be treated on site and irrigated on amended soil also located on site. • All chemicals to be stored onsite in sealed drums to DEP standards and bunded where appropriate in order to ensure containment in the event of a spillage from the general stormwater drainage system.	
Decommissioning	Decommissioning Plan	The plant site lies within an area that has been extensively used for pastoral activities and as such is significantly degraded.	Leaving the site in a condition that is unsafe and environmentally unacceptable.	Prior to closure a decommissioning plan will be prepared. The plan will address decommissioning issues, objectives and a procedure by which agreed completion criteria may be developed for the areas to be decommissioned.	The site will be left in a safe, stable and acceptable manner for the required land use.
POLLUTION MANAGEMENT					

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
Air emissions and air quality criteria	To protect public health and amenity from air contaminants emitted as a result of the proposal by ensuring that emissions and ambient levels meet statutory requirements and applicable guidelines. Use all reasonable and practicable measures to minimise SO_2 NOx particulates and greenhouse gases.	The Site is located in a relatively isolated rural environment. The nearest residence is about 1.35 km away. The largest source of atmospheric emissions in the area is the Tiwest Chandala synthetic rutile process facility that is located approximately 1 kilometre from the site.	The significant airborne emissions from the proposed power station are sulphur dioxide, nitrogen oxides particulates and odour. Sulphur dioxide and nitrogen oxides are respiratory irritants. Prolonged exposure to particulates, particularly fine particulates in urban airsheds, has the potential to contribute to cardiopulmonary diseases.	An air modelling study was undertaken to predict the potential ground level concentrations that will result from the expected atmospheric emissions from the plant. Modelling included the combined emissions from the Plant and the Tiwest plant.	Air emissions from the plant will result in compliance with the NEPM criteria. No significant impact.
SO_2 emissions	Ensure that SO_2 emissions meet the air quality standards requirements of the National Environmental Protection Measure (NEPM) and adopted by the EPA. Use all reasonable and practicable measures to minimise SO_2 emissions.	The major source of atmospheric SO_2 in the local area is the Tiwest Synthetic rutile Plant that is opposite the Plant site.	The emissions of SO_2 at concentrations that exceed the maximum permissible emission rate, which result in the ground level concentrations exceeding the NEPM and impacting on the health of the community.	An air modelling study was undertaken to predict the potential ground level concentrations of SO_2 that will result from the expected SO_2 emissions from the Plant combined with Tiwest's SO_2 emissions. As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with the **Department of Environment, Water and Catchment Protection (**DEWCP)) will be implemented to verify that the emissions of SO_2 are within the specifications described in this document. Provision will be made within the Plant for a Flue Gas Desulphurisation System and will be operated if it is necessary to keep the plant below its licence limits. The SO_2 concentration in the gas stream will be reported to the DEWCP on a six monthly basis.	The maximum predicted ground level concentrations of SO_2 is less than 55% of the NEPM criteria. No significant impact.
NOx emissions	Ensure that NOx emissions meet the air quality standards	The major source of atmospheric NO_x in the local area is the Tiwest	The emissions of NOx at concentrations that	An air modelling study was undertaken to predict the potential ground level concentrations of NOx that will result from the expected NOx emissions from the Plant	The maximum predicted ground level concentrations of NOx is less than 12% of the NEPM

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
	requirements of the National Environmental Protection Measure (NEPM) and adopted by the EPA. Use all reasonable and practicable measures to minimise NOx emissions.	Synthetic rutile Plant that is opposite the Plant site.	exceed the maximum permissible emission rate, which result in the ground level concentrations exceeding the NEPM and impacting on the health of the community.	combined with Tiwest's NOx emissions. As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with DEWCP) will be implemented to verify that the emissions of NOx are within the specifications described in this document. The NOx concentration in the gas stream will be reported to the DEWCP on a six monthly basis.	criteria. No significant impact.
Particulate emission	Ensure that particulate emissions (as PM10) meet the air quality standards requirements of the National Environmental Protection Measure (NEPM) and adopted by the EPA. Use all reasonable and practicable measures to minimise particle emissions.	The major source of atmospheric particulates (as PM10) in the local area is the Tiwest Synthetic rutile Plant that is opposite the Plant site.	The emissions of particulates (as PM10) at concentrations that exceed the maximum permissible emission rate, which result in the ground level concentrations exceeding the NEPM and impacting on the health of the community	An air modelling study was undertaken to predict the potential ground level concentrations of particulates (as PM10) that will result from the expected particulate emissions from the Plant combined with Tiwest's particulate emissions. Particulate emissions will be managed by installing a bag filtering cleaning system. As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with DEWCP) will be implemented to verify that the particulate emissions are within the specifications described in this document. The particulate concentration in the gas stream will be reported to the DEWCP on a six monthly basis.	The maximum predicted ground level concentrations of particulates is less than 13% of the NEPM criteria. No significant impact.
Odour	Odour emanating from the Plant should not adversely affect the welfare and amenity of other land users. Guidance for the Assessment of Environmental Factors – Assessment of Odour Impacts – Draft" (EPA 2000) Use all reasonable and practicable measures to	The main source of poultry litter odour within the local area will be the poultry litter power station.	Odour from the poultry litter stockpile may impact on the local community.	An air modelling study was undertaken to predict the 7 OU 1-hour average 99.9 percentile criterion odour contour. The odour will be controlled by: • Limiting the amount of poultry litter on site to the equivalent to what is kept on a large poultry farm • Containing the poultry litter is a enclosed area. • Reducing the ventilation through the storage area with the use of louvers and roller doors • Locating the air intake into the boiler above the litter stockpile combusting and eliminating the odour.	All of the nearby residences lie outside the 7 OU 1-hour average 99.9 percentile criterion odour contour, which demonstrates that this criterion is met No significant impact.

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
	minimise odour.				
HCL emissions	Ensure that HCL emissions levels meet the Californian Reference Exposure Level (CAPCOA 1993) Use all reasonable and practicable measures to minimise HCL emissions.	The main source of atmospheric HCL emissions in the local area will be from the Plant. Tiwest does not emit HCL.	The emissions of HCL at concentrations that exceed the maximum permissible emission rate, which result in the ground level concentrations exceeding the NEPM and impacting on the health of the community	An air modelling study was undertaken to predict the potential ground level concentrations of HCL that will result from from the Plant. As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with DEP) will be implemented to verify that the emissions of HCL are within the specifications described in this document. Provision will be made within the Plant for Flue Gas Desulphurisation System and will be operated if it is necessary to keep the plant below its HCL licence limits. The HCL concentration in the gas stream will be measured on a six monthly basis.	The maximum predicted ground level concentrations of HCL is less than 2% of the CAPCOA criteria. No significant impact.
Dioxin emissions	Ensure that dioxin emissions meet an emission limit of 0.1 ng I-TEQ/Nm^3	Current levels of these substances in the local air shed are unknown. Levels emitted by Tiwest are below the detectable limit.	Dioxins have the potential to cause health impacts.	A multi-pathway model was used to determine dioxin exposures for general and extreme scenarios. New technology, such as the GORE-TEX filter system, will be used to reduce the dioxin emissions. As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with DEWCP) will be implemented to verify that the dioxin emissions are within the specifications described in this document. During the first year of operation, the Proponent will sample and analysis the offgas emissions for Dioxin. Monitoring results for Dioxin will be provided to the DEWCP following the first year of operation. Future monitoring of the offgas emissions for Dioxin will be reviewed by the proponent in conjunction with the DEWCP once the results of the first year's monitoring have been assessed.	The project will not exceed the international standard of of 0.1 ng I-TEQ/Nm^3 No significant impact.

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
Greenhouse gases	To minimise greenhouse gas emissions in absolute terms and reduce emissions per unit product to as low as reasonably practicable. To mitigate greenhouse gases emissions in accordance with the Framework Convention on Climate Change 1992, an in accordance with established Commonwealth and State policies including Environmental protection Authority Interim Guidance No 12 'Minimising Greenhouse Gases'.	Greenhouse gas emissions are a global concern related to climate change. The State's greenhouse emissions are reliably tipped to rise 50% over 1999 levels by 2005. The State is also required, under Federal Government legislation, to develop some 250MW of renewable energy by the year 2010.	Greenhouse gases contribute to global warming.	Poultry litter is classified as a renewable energy source. The litter originates from organic sources which take up CO_2 from the atmosphere during the growth phase. Combusting the litter for power generation, although releasing CO_2, simply completes the carbon cycle. This is unlike CO_2 emitted from fossil fuel burning whereby below-ground, stored carbon is added to the atmosphere in the absence of a return mechanism for uptake. When the poultry litter decays in the field (composted or broad acre spreading) an equivalent amount of CO_2 is given off during its decomposition as is emitted during the combustion of the litter. The greenhouse benefit of the proposal is further enhanced when nitrous oxide emissions from biological decomposition of poultry litter is taken into account after allowing for a greenhouse warming potential of 310 for nitrous oxide. The proponent will employ energy efficiency in Plant design and operation. The poultry litter power station will generate renewable energy and will apply for accreditation with the Australian greenhouse Office The proposal will make a very significant contribution to WA's renewable energy obligations.	The Proposal will reduce WA's greenhouse gas emissions by: • producing electricity for WA on a sustainable basis, displacing the CO_2 that would otherwise be emitted from producing the equivalent amount of electricity from fossil fuels. • reducing nitrous oxide emissions from biological decomposition of poultry litter (nitrous oxide greenhouse warming potential is 310). • Make a significant contribution to WA's renewable energy obligations.
Ash	Management and disposal of ash.	Ash is to be managed, used or disposed of in an environmentally acceptable manner.	Ash could impact on the health of the community.	Ash analyisis was undertaken and reports were prepared by the CSIRO. Ash will be collected and stored in a sealed enclosure. The ash from the power station's boiler contains trace elements and will be sold as a fertiliser.	No adverse impact.
Dust	Ensure that the dust levels generated by the proposal do not adversely impact upon welfare and amenity or cause health problems by meeting statutory requirements and	One other dust producing industries in close vicinity Nearest residential area is 1.3 km	Dust from the Plant may impact on residents and vegetation.	During construction, contractors will be required to use all reasonable dust control measures, including erecting soil movement barriers to prevent the egress of sand pads, etc, into the neighboring environment and will work to the Shire of Chittering's dust control requirements for site construction.	Dust can be managed to meet the EPA's and local Shire's objective

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
	acceptable standards			There are no potential dust or bio-aerosol impacts arising from the plant's operations after commissioning as the poultry litter is transported in covered trucks and unloaded and stored within a closed shed. Ash is also stored and transported in an enclosed environment. The truck wash-down facility will ensure that bio-security standards are maintained and prevent poultry litter particles from lifting off moving vehicles.	
Heavy Metals	Ensure that any emissions of heavy metals meet acceptable standards. Use all reasonable and practicable measures to minimise emissions of heavy metals.	Current levels of heavy metals in the local air shed are unknown.	Heavy metals have the potential to accumulate and adversely impact on the environment.	The fuel source is low in heavy metals. A heavy metal ash analysis was undertaken and reports were prepared by the CSIRO. Filtering of the off gas will remove heavy metals from the off gas stream. As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with DEP) will be implemented to verify that the heavy metal emissions are within the specifications described in this document.	No adverse impact.
Noise Site	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements specified in the *Environmental Protection (Noise) Regulations 1997*	The site for the proposed power station is located on the west of the Brand Highway in a rural environment, approximately 4.5 km north of Muchea. The nearest residence is is 1.3 km from the plant.		The proponent has recognised the need to minimise noise impacts: • The general location was selected on the basis of having a 1 km buffer distance from any residence. • The steam turbine generator set, boiler feed pumps and forced draft boiler fans will be within a building which will significantly attenuate noise emissions. • A noise design criterion is that the external noise from any building, or item of equipment outside a building, will be less than 85 dB(A) at 1 metre. This gives an estimated reasonably worst case noise level at 1.35 km from four such sources of less than 30 dB(A) which is well below the 35 dB(A) criterion. • When the design is finalised, the proponent will submit to the DEP the results of detailed noise modelling to confirm that 35 dB(A) is met at the	No significant impact

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
				nearest residence under worst case conditions. • Infrequent activities that may cause high noise emissions, such as boiler blowdowns, will also be restricted to 7am to 7pm Mondays to Saturdays. • Should noise emissions from the proposal, when implemented, cause annoyance to nearby residences, the proponent is committed to using its best endeavours to remedy the situation.	
Noise Road Transport	Follow the EPA Guidance for the Assessment of Environmental Factors – Road and Rail Transportation Noise (Draft) No. 14. All reasonable measures should be undertaken to minimise noise impacts.	Brand Highway is subject to very substantial vehicle usage. Average daily vehicle movements are in excess of 2000 vehicles per day of which about 25% are heavy vehicles.	Noise from the trucks may impact on the amenity of the residence along the transport route.	A suitable access point into the facility from the Brand Highway will be constructed to Main Roads WA requirements. This will be the only access to the facility. The addition of 30 heavy vehicle movements per day as a result of this proposal will be insignificant in terms of noise impacts. It should be noted that the proposal will displace existing heavy vehicle movements transporting litter to horticultural properties in the metropolitan area. All heavy vehicle movements to and from the facility will be confined to 7am to 7pm Monday to Saturday. The proponent will encourage the use of cartage contractors having vehicles that meet ADR28/01. Should impacts from vehicles associated with the proposal, cause annoyance to nearby residences, the proponent is committed to using its best endeavours to remedy the situation. This could include, for example, placing lower speed limits on the access road to the facility.	No adverse impact.
Hazardous Materials	Ensure that any hazardous materials to be used on site are transported and stored and used in a safe and environmentally acceptable manner.		The risk of transporting storing and using hazardous materials to both people and the environment. Spillage of hazardous materials on the environment.	A Hazardous Materials Management Plan will be prepared and implemented. The transport, storage and use of hazardous materials on the site will be in compliance with the relevant standard, Codes and Regulations.	No significant impact.

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
Waste Management Solid waste disposal	Where possible, waste should be minimised, reused or recycled. Solid waste should be treated on site or disposed of offsite at an appropriate landfill facility. Where this is not possible contaminated material should be managed onsite to prevent groundwater and surface water contamination or risk to public helath.		Solid wastes impact on the environment due to inappropriate disposal methods, or from leaching of contaminates contained in the waste.	Ash analyisis was undertaken and reports were prepared by the CSIRO. Ash will be collected and stored in a sealed enclosure. The ash from the power station's boiler contains trace elements and will be sold as a fertiliser. Evaporation ponds will be lined according to DEP guidelines and sludge removed to a appropriate waste facility by a licensed contractor.	No significant impact
Waste Management Process wastewaters	Where possible, waste should be minimised, reused or recycled. Process wastewater should be treated on site or disposed of offsite at an appropriate facility. Where this is not possible contaminated material should be managed onsite to prevent groundwater and surface water contamination or risk to public helath.		Contaminates in process wastewater impacts on the surface water, groundwater or wetlands.	• The cooling tower blowdown water will be treated in a reverse osmosis (RO) plant to recover water for process use. • Stormwater from areas subject to contamination, waste water from truck washdown, RO plant retentate, boiler blowdown water and other process effluents will be discharged to two evaporation ponds with a minor amount being used for the trickle irrigation of areas landscaped with native vegetation. • The ponds will be fully sealed using two layers of 1 mm thick Nylex Millennium Flexible Polypropelene with an intermediate layer of Geonet. • Monitoring bores will be used to detect any leaks from evaporation ponds.	No significant impact.
Waste Management Sewage	Ensure that sewage does not impact on existing environment.		Nutrients and other constituients of the sewerage contaminate the surface water, groundwater and wetlands.	Sewage from the staff toilets and grey water from showers and the staff cafeteria will be treated using a BioMax C20 anaerobic/aerobic digestion plant. Treated effluent (3 kL^3/day) will be disposed of using subsurface drippers across a 600 m^2 area of soil amended to enhance nutrient uptake.	No significant impact.
SOCIAL SURROUNDINGS					

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
Visual amenity	Visual amenity of the area adjacent to the project should not be unduly affected by the proposal	Area is degraded farmland opposite the Tiwest Sythetic rutile processing facility.	This proposal will contribute negligibly to the overall visual amenity of the area	• Main building will be in 'forest colours' and screening trees will be planted on road • The proponents are committed to a weed eradication program and providing site-specific revegetation to environmentally and visually enhance the site. A key component in the landscaping will be the creation of a wetland which is expected to enhance the fauna abundance in the area. • The landscaping program on site will be on-going, with a caretaker responsible for daily maintenance and landscaping contractors brought in as necessary. Vegetation audits will be undertaken as appropriate. • The buildings and civil works will be consistent with Shire of Chittering guidelines for building materials. In the longer term, the screening trees and shrubs to be planted around the facility are expected to shield all but the stack from direct outside viewing	Proposal will blend well with existing visual amenity and the EPA's objective can be met
Aboriginal heritage	To ensure the proposal complies with statutory requirements in relation to places and sites of heritage significance. To ensure the proposal does not result in changes to the physical and biological environment, which adversely affects cultural associations with the area.	Aboriginal sites are known in the Shire.	Human interference with Aboriginal sites is an offence under the *Aboriginal Heritage Act 1972* unless authorised as outlined in section 17 of this Act.	• An archaeological inspection of the block was conducted and a further anthropological assessment was carried out. • The anthropological assessment consisted of viewing the proposed site with representatives of the Yued People (WC97/071). • No Aboriginal sites were located on the block, with no past cultural material (archaeological remains) noted during the course of the inspection.	There were no perceived heritage impediments that have been identified to date that would prevent its establishment No impact
Light Over Spill	To ensure that lighting at the plant does not cause a nuisance to nearby residences. .	The facility is likely to be visible during night-time from the Brand Highway during the early years of operation, prior to screening vegetation becoming established. It	Light from the Plant may impact on the amenity of nearby residents.	• All outside lights will be hooded. Hoods will be regularly checked by a responsible officer on the afternoon shift, as designated by the Manager. Replacement hoods will be kept on-site. Vandalism to the hoods should be averted through site security measures, including fencing and the proponents' participation in a local Industrial or Rural Watch	No significant impact.

Environmental Factor	EPA and Proponent's Objective	Existing environment	Potential impact	Environmental management	Predicted outcome
		should be noted that this impact is lessened by the existing light impact arising from the high double street lighting associated with the Tiwest turn-off from the Brand Highway.		program. • Screening vegetation will be planted around the perimeter of the site. While it will take time for the vegetation to grow to maturity, planting native species will optimise coverage. • There are not likely to be any light overspill impacts at neighbouring residences because of the significant intervening distance. If, however, a problem does arise, the proponent will endeavour to remedy the cause	
Community	Ensure that the community is informed of the project and is not adversely impacted by the project	Plant is located Shire of Chittering near the town of Muchea.	The Project results in adverse impacts on the local community.	Extensive community consultation program has been implemented and will continue through the development, construction and operation of the Plant.	Open dialogue with the local community and stakeholders.
Socio-Economic	Ensure that positive socio-economic impacts are maximised.	Plant is located Shire of Chittering near the town of Muchea.	Benefits locally, regionally and globally	Project will offer many local, regional and global benefits by providing direct and indirect employment opportunities, reducing fly breeding associated with poultry litter disposal and reducing greenhouse gas emissions.	Positive socio-economic impact
Tourism	The Project should not have an adverse impact on tourism within area.	The area around the site is not a hi'h tourist area.	The projects operations reduce tourism.	The number of visitors to the Plant is expected to increase significantly the number of visitors to the local area.	Positive impact.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1. INTRODUCTION

1.1 PROPONENT

The Project Proponent is Blair Fox Generation WA Pty Ltd ACN 086 861 430, Suite 1, 164 Beaufort St Perth WA 6000.

The proponent is acting as the manager on behalf of an unincorporated Joint Venture with two other companies:

- WABG Biomass Supply ACN 086 712 192, Suite 1, 164 Beaufort St Perth WA 6000
- Pacific Hydro Limited ACN 057 279 508, Level 8, 474 Flinders Street, Melbourne Victoria 3000

The Plant will be managed and operated on behalf of the Joint Venture by Blair Fox Generation WA Pty Ltd. The contact details for Blair Fox Generation are:

Suite 1, 164 Beaufort St Perth WA 6000

PO BOX 8374, Perth BC 6849, Telephone: 9228 8846, Fax: 9227 0488

Email: mrosser@blairfox.leet.com.au

1.2 LOCATION

The proposed location of the proposal is at a site approximately 70 km north of Perth on the Brand Highway, near Muchea (Figures 1 & 2).

The title details are District Swan Suburb Muchea Location 1809 (Brand Highway, Muchea) – In Certificate of Title Volume 1070 Folio 936.

The Brand Highway borders the proposed site on the east. The adjacent land uses are farming to the north, west and south, and Tiwest Joint Venture's Chandala mineral processing operation to the east. The Alinta Gas Muchea Offtake lies on the northern boundary of the site.

The owner of the land is White Toro Pty Ltd. Blair Fox Generation leases the land and is permitted to improve the land and provide an option to purchase under lease conditions.

The proposed site is currently used to graze cattle (Figure 3). No site contamination or details of previous land use that may have contaminated the soil or water resource have come to the attention of the proponents.

The proposed site is currently zoned Rural 2 General Farming with provision for special use of the land. The project proponents will be seeking special use provision from the Shire of Chittering.

1.3 NEED FOR THE PROPOSAL

1.3.1 The stable fly problem

The Western Australian poultry industry supplies poultry meat to the State's domestic market. The industry produces some 40 million birds annually and production is increasing at 4% per annum (Agriculture WA, 1998).

A waste stream from this industry is some 250,000 cubic metres of poultry litter per annum. The litter contains a mixture of about 70% by volume manure, and 30% sawdust or some other bedding material.

The industry has always disposed of poultry litter to the horticultural industry for use as fertiliser. Unfortunately, once in the open environment, the litter provides an ideal site for stable flies to breed. Breeding may take place while the litter is temporarily in stockpiles, or in clumps once the litter is distributed upon the ground. The adverse impacts of stable flies have increased over time with the encroachment of urban development and other sensitive land uses in proximity to market gardens.

The Minister for Primary Industry and Fisheries established the Stable Fly Management Project in 1996 to develop and implement management practices and other strategies to control stable fly breeding associated with horticultural and agricultural practices. The Stable Fly Steering Project (1998) found:

"The use of poultry manure in horticulture, principally vegetable, turf and strawberry production is the major source of stable fly breeding [42,000 – 200,000 stable flies per hectare]".

Additionally, the Project (1998) found:

"Extremely high levels of house fly breeding [300,000 house flies per hectare] were associated with poultry manure use, which has implications for human and livestock health. House fly breeding will be effectively dealt with by the practices that have been developed to manage stable fly breeding."

More than 2,000 public complaints were received, between 1994 and 1997, by Agriculture WA and local government authorities in areas where flies are a problem. Grievances included people being "harassed, attacked and bitten" by flies resulting in the inability to conduct social activities in backyards, and livestock owners advising that stock were suffering and even dying as a result of fly harassment (Agriculture WA, 1998).

This project will alleviate the problems associated with stable fly breeding in poultry litter by having the litter used to generate electricity. This follows similar practices adopted in Europe and the United States.

1.3.2 Renewable energy from poultry litter

In 1998, the WA Broiler Growers' Association in cooperation with Blair Fox Pty Ltd undertook to facilitate the development of a method for disposing of the poultry litter, based on poultry litter power stations currently operating successfully in the UK. This method of generation is similar to that of a coal power station, except that the poultry litter is used as a fuel instead of coal. The energy produced is classified as renewable because the inherent carbon is from biological sources (poultry food and trees).

The Office of Energy has confirmed the classification, and has determined that the output from the proposed poultry litter power station will displace some 81,000 tonnes of fossil fuel generated CO_2 per annum. The value of poultry litter as a fuel source for electricity production is enhanced in practical terms because the poultry litter- power station is a *firm capacity* power station (ie. can generate on demand unlike from wind power or solar energy).

The greenhouse benefit of the proposal is further enhanced if nitrous oxide emissions generated from biological decomposition of poultry litter used as a fertiliser are taken into account. After allowing for nitrous oxide emissions that occur during combustion of the poultry litter, the additional greenhouse

gas benefit of the proposal compared to the existing situation is conservatively estimated to be more than 16,000 tonnes per annum of equivalent CO_2 emissions.

The ash from the power station's boiler contains trace elements and is able to be sold as a fertiliser.

1.3.3 Benefits

The proponents are committed to developing a safe, efficient, modern plant with best practice in technology and operation.

Significant social and economic benefits will flow from the proposed power station to the local community:

- Revenue will flow to the Shire from the power station's occupancy of a site that currently generates only unimproved land rates.
- Residents and livestock in the Shire will benefit from the reduction in stable and house flies associated with the power station's alternate use of poultry litter.
- The proposal will have a beneficial impact on the local economy through the disbursement of construction and operation related expenditure, and direct and indirect employment. The construction workforce is expected to be 125. When operational, the facility is expected to employ approximately 15 full time equivalent staff.
- Some local businesses will have the opportunity to purchase electricity from the power station at a lower cost than they currently pay (the Government access rules will apply, but generally businesses that spend around $5000 per annum at a single site will be able to purchase from the power station).
- The Shire will host one of WA's few renewable energy power stations and this will attract tourists into the area (the UK's Thetford poultry litter power station attracted over 500 tourists per annum in its early years of operation).
- The proposal will also have a positive economic impact on the poultry industry in Western Australia through the resolution of the litter disposal issue. Combusting poultry litter for the generation of renewable electricity provides a long-term solution to WA's poultry litter disposal problem that will not increase the cost of chicken meat to the consumer and will facilitate the industry's continued expansion.
- The project will make a significant contribution to reducing greenhouse gases emissions by offsetting fossil fuel generated electricity in WA.
- The Project will operate under the State's strictest emission criteria and will set new environmental benchmarks for power generation.
- The proposal will make a very significant contribution to WA's federally legislated renewable energy obligations.

1.4 TIMESCALE FOR COMPLETION OF CONSTRUCTION WORKS

The construction will take 10 to 12 months and will be undertaken in accordance with the Construction Environmental Management Plan (Construction EMP), which will be submitted to the Department of Environment, Water and Catchment Protection (DEWCP) for approval prior to the

commencement of construction. It is anticipated that construction will commence in early 2003 and be finished by mid 2004 with commissioning taking an additional four months.

2. CONSULTATION

The Proponent has given a very high priority to consultation and has been actively discussing the project since its earliest phase of development.

2.1 CONSULTATION PROGRAM

During 1999 and 2000, the initial consultation process began when Blair Fox Generation held discussions and briefings with a range of stakeholders. It has continued into 2001, with public information sessions, stakeholder consultations and Council briefings. The main purposes of the consultation have been:

- To inform stakeholders of the environmental, health and economic aspects of the power station proposal.
- To seek input from stakeholders on issues of interest or concern.

Consultation will continue throughout the final design and construction phases of the plant and into its operation. Key stakeholders to be consulted during these phases will be:

Stakeholder	Project Phase
Environmental Protection Authority	Design, construction operation
Shire of Chittering	Final design, construction, operation
Ellenbrook Catchment Group	Final design, construction, operation
Main Roads	Final design, construction of entry point
Water and Rivers Commission	Final design, construction of bore
Office of Energy	Final design, operation
Australian Greenhouse Office	Final design, operation

2.2 GOVERNMENT AUTHORITIES

To date the proponent has consulted with the following government authorities and organisations:

- EPA to provided an overview of the Project and to discuss the environmental issues
- DEP to discuss the environmental aspects of the Project and the PER
- Western Power Corporation to discuss the grid implications of the project
- Waste Management Board to discuss the waste management implications of the project.
- The Minister for Energy (previous and current) to discuss issues regarding projects impacts on states renewable energy obligations and grid interconnect issues
- The Minister for Primary Industry and Fisheries (previous and current) to discuss implications for poultry industry

- The Shires of Chittering and Gingin; the City of Wanneroo; and the Town of Kwinana to discuss stable fly breeding and site issues
- The Health Department of WA, Environmental Health Division to discuss fly breeding and air emissions
- The Office of Energy to discuss renewable energy and grid access issues
- Agriculture Western Australia discuss implications for poultry industry
- Main Roads Western Australia to discuss site access
- The Water and Rivers Commission to discuss water supply
- Greens (WA) to renewable energy issues relating to the project
- The Australian Greenhouse Office to discuss the greenhouse implications of the project

2.3 SPECIFIC INTEREST GROUPS

To date the proponent has consulted with the following individuals and organisations:

- General community in the vicinity of the proposal
- Muchea Progress Association
- The Biomass Taskforce
- The Stable Fly Management Group
- The Ellenbrook Integrated Catchment Management Group
- The Chittering Valley Landcare Group
- The Chittering Valley Bushfire Brigade
- Greens (WA)
- Murdoch University / Alliance for a Clean Environment / Contaminated Sites Alliance
- The Australian Chicken Meat Federation Inc
- The Poultry Farmers Association of WA (Inc)
- Inghams Enterprises Pty Ltd
- Bartter Enterprises Pty Ltd

Many positive comments were received in support of the proposal. A summary of these is provided in Appendix 1A. Appendix 1 also contains details of letters and other memoranda associated with the consultation process.

2.3.1 Concerns raised by Chittering stakeholders

Concerns raised by stakeholders in the Chittering area included:

- Pollution of the Ellenbrook catchment through inappropriate waste run-off from the site (raised by the Ellenbrook Catchment Group at a meeting with the proponents on 27 March 2000).
- Pollution of the natural environment (air and water) through inadequate pollution controls at the power station (raised by the Shire of Chittering).

The engineering design and operational management strategies that will be employed to address these issues form a large part of this report. However, two general statements can be made in relation to the concerns raised during initial consultation with local stakeholders:

- All waste from the power plant will be disposed of so that the Ellenbrook Catchment is not detrimentally affected in any way by the presence of the power station – indeed, the siting of the power station should have a positive impact on the catchment due to revegetation strategies and the removal of poultry manure as a fertiliser in the catchment area.
- Gaseous emissions from the power station will be within EPA determined licence limits. Dioxins from the plant are well below international standards and EPA licence limits. Additionally, the Shire of Chittering, through hosting the plant, will make a large positive contribution to the reduction of greenhouse gases in the State.

2.3.2 Details of significant consultation activities with Muchea community

Date	Nature of Consultation Activity
21 February 2000	Initial Public Consultation evening at Muchea Town Hall, hosted by Muchea Progress Association and attended by around 60 residents at the invitation of the Shire of Chittering via letter to all ratepayers.
27 March 2000	Initial meeting with Ellenbrook Catchment Group at their invitation to discuss design parameters for plant to ensure protection of the Ellenbrook.
27 June 2001	Environmental Review Documents lodged at Council Library and Muchea Shop.
28 June 2001	Public Information Evening and location of Environmental Review Document advertised in local newspaper.
5 July 2001	Consultation session with Shire of Chittering full Council and principal officers.
20 July 2001	Reminder letter re Public Information Evening and information flyer mailed to each ratepayer.
27 July 2001	Public Information Evening at Muchea Community Hall.
13 August 2001	Meeting with Muchea Progress Association.
27 August 2001	Presentation to Ellenbrook Integrated Catchment Management Group.

2.3.2.1 Discussion of introductory meeting with Muchea community

In February 2000, the Directors of Blair Fox Generation attended an initial meeting that was hosted by the Muchea Progress Association to introduce the project.

The purpose of this meeting, which was initiated by Blair Fox Generation, was to brief the local community on the concept of a power station combusting poultry litter (then in its early design phase) and to hear concerns so that these issues could be taken into account when designing the plant and surrounds.

This meeting followed from earlier discussions with the Shire, who advised that the Muchea Progress Association was the relevant community group for consultations of this nature with the local community.

Interest in the project by the local community was reasonable, with around 60 residents and others attending (at the 1996 census, there was a population of 1,677 residents above the age of 15 years in the Shire). – the Shire had invited all residents with a personal letter.

Residents at the meeting had two responses to the project. Firstly, most agreed that it was a really good idea – an excellent response to the problems associated with the current use of poultry litter as a fertiliser.

Secondly, the participants were concerned that their own lifestyles would be detrimentally affected by the presence of the power station in their community. Specifically, the following issues were of concern:

- Odour - it was feared that the smell from stockpiling poultry litter at the power station would be very unpleasant and have an adverse impact on the quality of life in the area.
- Fly breeding - it was feared that the stockpiling would, instead of alleviating the fly problem, actually increase it in Muchea.
- Ground water pollution - the power station should not pollute the Ellen Brook.

The issues raised by the community have been considered in the design and technical capability of the plant. These modifications are described in the sections detailing the operating processes of the plant and addressing environmental factors.

The local newspaper, "The Advocate" reported on this meeting on March 2, 2000 and it is attached as Appendix 1B.

2.3.3 Presentation to Shire of Chittering

In June 2001, following the EPA's comments on the draft environmental reports and outline of draft licence limits, it was appropriate to put the Environmental Review Document to the Shire of Chittering Councillors and principal officers for their comments and feedback. Thus, a meeting was held at the Shire offices on July 5.

The session was attended by all but one Councillor and 6 principal officers of the Shire. Issues and questions raised at that session are attached in full as Appendix 1C.

2.3.4 Public information evening

In order to acquaint the local community with the operating parameters and licence limits for the power station, a second Community Meeting was called for Friday, July 27, 6-9pm at the Muchea Town Hall.

This meeting was advertised in "The Advocate", the local newspaper, on June 28, 2001 . "The Advocate" also ran a reminder piece on July 26, 2001 regarding the meeting for the following night (See Appendix 1D).

On June 28, copies of the Environmental Review Document were lodged with the following:

- The Shire of Chittering Library
- The Muchea Petrol Station and Shop

In addition, the copies of the Environmental Review Document were circulated to the following organizations, who were also advised of the Public Information Evening and invited to contact the proponents if their group would like an individual presentation/discussion opportunity. The Muchea Progress Association and the Ellenbrook Integrated Catchment Management Group asked for the proponents to attend a meeting of their respective organizations; the other groups declined.

- Muchea Progress Association
- Bindoon Progress Association
- Chittering Valley Progress Association
- Wannamal Community Centre
- Ellenbrook Integrated Catchment Management Group

As an additional memory prompt, the proponents again notified all ratepayers of the meeting and the location from where the Public Consultation document could be accessed via personal letter on Friday, July 20 – one week before the Public Information Evening. Included in the mailout to all ratepayers was an information flyer. This letter, and the accompanying flyer about the project, is attached as Appendix 1E. Thirteen of these letters were "returned to sender / not at this address".

Residents were given the opportunity at that meeting to see how their initial concerns had been addressed in the design and operation of the proposed power station and to discuss other issues of concern to them. The air quality, botanical, hydrogeolgical and toxicology consultants who had worked on the Environmental Review Document also attended to answer specific questions from the community. The record of that meeting, including attendances, questions and responses, is included at Appendix 1F.

The Information Evening was later reported in "The Advocate" on August 2, 2001 – a copy of which is at Appendix 1G.

2.3.5 Presentation to Ellenbrook Integrated Catchment Management Group

On August 27, at the invitation of the Group, the proponents made a presentation to the Ellenbrook Integrated Catchment Management Group which was similar to the presentation made to the Shire of Chittering on July 5. Mr Kevin Hazelgrove, hydrogeologist, and Ms Caroline Watkins, toxicologist, assisted the proponents at this presentation. Record of attendance and key issues are attached as Appendix 1H.

2.3.6 Meeting with Muchea Progress Association

At the invitation of the Association, Mr Matthew Rosser, representing the proponents, attended an ordinary meeting of the Muchea Progress Association on August 13, 2001. The proponent's attendance at that meeting was advertised by the Muchea Progress Association in "The Advocate" on August 9. Record of attendance and key issues are attached as Appendix 1I. A follow-up letter from the proponents to the Muchea Progress Association is available on request.

In addition to the above, consultation activities were undertaken as part of the Health Risk Assessment and Planning Approvals processes and these are outlined in the relevant sections of this report.

3. EVALUATION OF ALTERNATIVES

3.1 DISPOSING OF POULTRY LITTER

The four methods available for disposing of poultry litter are:

1. Use directly as a fertiliser (current situation),
2. Combusting to raise steam for electricity generation,
3. Composting to a stage where fly breeding no longer occurs; and
4. Landfilling.

3.1.1 Composting

The disposal of poultry litter via composting has considerable difficulties. The most basic problem is that the volume will exceed market demand and the poultry industry is growing at 4% per annum. Also future trends will be to require composted poultry litter to be pathogen-free, thus adding another difficulty to the process and increasing the cost of compost production. Furthermore, loss and leaching of nutrients (particularly nitrogen and phosphorus) during the composting process further reduce the cost competitiveness of composted poultry litter against its competitors. See Best practice guidelines for using poultry litter on pastures - Appendix 2

3.1.2 Landfill

Landfill disposal may be in direct conflict with the WA Government's goal of significantly reducing landfill burden by the year 2000 (the industry generates some 250,000 m^3 of poultry litter per annum). Additionally, disposal via landfill would cost approximately $35 per tonne of poultry litter dumped and would significantly impact on the cost of poultry production. This would increase the WA poultry industry's growing cost by some 21% which, until recently, has benefited from a break-even payment from the horticultural industry for the product.

Both composting and landfilling will increase the cost of production thereby reducing the competitiveness of the WA industry. This may encourage unsafe disposal methods such as not cleaning out sheds in a timely manner or dumping waste in the bush. These practices are difficult to police and are highly undesirable from both a State and industry perspective.

The use of poultry litter as a fuel for power generation is consistent with the findings of the Stable Fly Management Steering Group and the recommendations of the Biosecurity in the Poultry Industry report, initiated by the Australian Animal Health Council.

These groups have not supported the alternative methods of disposal.

An evaluation of alternative methods of poultry litter disposal is shown in Table 1.

Table 1 Evaluation of alternative methods of poultry litter disposal

Method of Disposal	Groundwater Pollution	Pathogens	Accommodation of Industry Growth	Greenhouse Gas Emissions
Proposed Power Station	Negligible	Pathogen free	Can accommodate growth	Reduces emissions
Composting for Continued Fertiliser Use	Significant risk through loss/leaching of nutrients (particularly nitrogen and phosphorus)	kill most pathogens except *Listeria* and *Clostridium perfringens*	Stable market does not exist for large volumes of composted poultry litter	Increases due to additional nitrous oxide emissions
Landfill	Can pose a significant risk through leaching	Buried presents lower risk of exposure	Conflicts with Government policy on landfill reduction	Increases due to methane generation (GWP of methane is 24.5)

3.2 PLANT LOCATION

Three potential plant locations were investigated on their suitability. They were located in the following area's Hazelmere, Muchea and Wanneroo. The selection criteria included:

- Logistics for raw material supply – poultry litter, water, gas
- Proximity to suitable transport route
- Proximity to communities and residence
- Supply of utilities – gas, electricity transmission substation
- Availability of suitable land
- Operating cost
- Manageable environmental impact
- Perceived social acceptance

Table 2 presents a matrix of the locations compared to the above criteria ranked from high to low where low is preferred.

Table 2 Site Selection Criteria and Ranking

Location	Infrastructure requirement	Capital Expenditure	Operating Cost	Proximity to Major population Center	Social and Environmental Constrains*	Overall Ranking
Hazelmere	M	H	H	H	H	2
Muchea	L	M	L	L	M-H	1
Wanneroo	H	VH	VH	VH	H	3

Notes:
VH Very High (least preferred)
H High
M Medium
L Low (most preferred)
** Subjective assessment by proponent*

Using the analysis in the Table above the Muchea site was identified as the preferred site for the Plant. The close proximity of the Muchea zone substation, the access to the gas pipeline, relative isolation

and proximity to a major transport route with all farms being an average of 50km from the site are all reflected in its ranking.

4. DESCRIPTION OF PROPOSAL

4.1 DESIGN DETAILS

The proposal is for an 11 MW (approximate) steam turbine power station near Muchea using poultry litter as a fuel.

Based on the availability of over 100,000 tonnes per annum (tpa) of poultry litter, the plant will burn approximately 13 tonnes per hour (tph) to produce superheated steam. The steam will be passed through a turbine to produce approximately 11 MW of electricity at maximum operating capacity. The plant could operate at near full capacity for approximately 8,200 hours per year.

The parasitic electrical loads for the plant are estimated to be about 1 MW comprising of:

- Boiler plant – 800 kW;
- Wet surface air cooled condenser – 200 kW; and
- Water reuse reverse osmosis plant – 200 kW.

The net electricity produced by the plant will therefore be 9.8 MW.

The power station and related infrastructure will comprise:

- A chicken litter reception and storage facility to hold up to 2,000 tonnes of chicken litter – to assist in odour control, combustion air will be drawn from the storage facility into the boiler.
- One 35 MW boiler complete with fuel handling, feed water make up, flue gas emission control (baghouse) and ash load out systems.
- One 11 MW steam turbine generator complete with lubricating oil, gland steam, generator cooling and generator control systems.
- A condenser and associated cooling towers and a reverse osmosis plant for the recovery of cooling tower blow down water.
- A 22 kV export electricity facility including a 2.7 km long 22 kV high voltage line to the local Western Power substation.
- Services including a bore water supply, compressed air supply, fire water supply, stormwater retention ponds, drainage, a truck wash station and a natural gas metering station to supply natural gas for boiler start-up.
- A front-end loader for chicken litter and ash handling.
- A small sewage treatment plant and separate evaporation ponds for the disposal of process effluent and stormwater retention.

The existing 11 kV distribution line running adjacent to the proposed site will be accessed during construction.

4.2 OPERATION

The power station will receive poultry litter from all farms in the broad Perth region. The process for delivery and ultimate conversion of this fuel is outlined below.

Following loading up at poultry farms after harvest, sealed trucks (approximately 15 per day) will transport the litter to the power station. Upon arrival, the trucks move through the muster station to

the fuel delivery area – an enclosed shed with concrete floor (Figure 4, 5 & 6). Each truck reverses into the fuel delivery area via an automatic door, removes its covers and tips its load then exits and proceeds to the washdown bay where the exterior of the truck is laser-washed.

The litter is transported via front-end loader to a conveyor stacking system and from there to the stockpile.

The stockpile will have an air extraction unit above it, to draw air off for use in the combustion process. This captures odour-laden air and will reduce odour emissions from the shed.

As required, the front-end loaders remove fuel from the stockpile and place it in the feed hoppers that deliver fuel to the boiler, where it is combusted.

Combustion gases from the boiler are directed through the scrubbing circuit and are emitted through the stack.

Heat from the boiler is used to generate steam that drives a turbine and generator. The electricity produced is fed via transmission lines to Western Power's zone sub-station and onto the South West Interconnected Grid.

The plant is expected to generate electricity for approximately 8,200 hours per year.

4.3 MAJOR INPUTS, OUTPUTS AND DISCHARGES

The major materials inputs, outputs and discharges for the proposed poultry litter power station are summarised in Tables 2 to 4 respectively.

Table 3 Major inputs

Input	Quantity
Bore Water	550,000 kL/year (TDS < 500 mg/L)
Cooling water	31 kL/h
Boiler make up water	0.1 kL/h
Tanker wash water	15 kL/day
Reverse osmosis plant wash water	12 kL/day
Imported Fuel	nil
Poultry litter	300 tonnes/day 108,000 tpa 15 trucks/day
Staff Transportation	15 cars/day
Natural Gas (start-up)	1000 GJ/annum (maximum)
Cleaning Chemicals	20 drums/annum
Caustic soda	20 tpa @ 50% w/w

Table 4 Major outputs

Output	Destination	Quantity
Ash	Sold as fertiliser	1.2 tph
Renewable Electricity	Grid	82 GWh pa
Renewable Electricity	On site use	9 GWh pa
Renewable Energy Credits	Financial	73 GWh equivalents

Table 5 Major discharges

Source	Discharge	Receptor/ Destination	Quantity	Comment
Boiler stack (40 m above ground)	Total Flow	Air	75.2 - 86.6 tph	
	Volume	Air	98,000 – 112,000 m^3/h	At 200°C
	Particulate Loading	Air	6 mg/Nm^3	Dry at 0°C and 12% CO2 typical
	HCl	Air	4.8 g/s	typical
	SO_2	Air	3.3 g/s	typical
	NO/NOx	Air	4.6 g/s	typical
	Water	Air	8 - 12 tph	
Water from Cooling Tower	Evaporation	Air	30 tph	
	Spray drift water	Air	0.5 tph	
Litter storage shed	Ventilation air	Air	45,000-225,000 m^3/h	1 to 5 store air exchange/hour – 1 air exchange per hour will go to the boiler. Contains poultry litter odour.
Facility-wide	Noise	Nearest residence	30 dBa	At a distance of 1.35 km
		At site boundary	45 dBa	At site boundary
Boiler	Blowdown Water	Evaporation Pond	10 kL/day	75 ppm total solids, 5 ppm Fe, 2-5 ppm Cu
Surface areas subject to contaminant deposition	Storm Water	Evaporation pond	800 kL/ peak day 8,000 kL/annum	
Truck washdown bay	Truck Wash Down Water	Evaporation pond	15 kL/day	Trucks are passed through a shower curtain of water to wash off loose poultry litter
Water Reuse Plant	Concentrated Retentate	Evaporation pond	24 kL/day 8,000 kL/annum	Concentrated minerals from bore water - concentrated by a factor of 36
	Caustic Wash Water	Evaporation pond	6 kL/day 2,000 kL/annum	0.5% w/w caustic soda
	Flush Wash Water	Evaporation pond	6 kL/day 2,000 kL/annum	Bore water.
Sanitary facilities	Domestic Sewage	Anaerobic/Aerobic treatment and to Amended Land	3 x domestic load	5 staff per shift
Evaporation Pond	Sludge	Landfill	100 m^3 pa	Contains concentrated mineral solids from bore water and traces of poultry litter

See Appendix 5 for the full Air Quality Assessment.

5. ENVIRONMENTAL MANAGEMENT

5.1 ENVIRONMENTAL MANAGEMENT SYSTEM

The proponent is committed to developing an Environmental Management System (EMS) that is in accordance with the principles of the ISO 14001 standard. The EMS will provide a structured framework to assist organisations proactively managing their environmental impacts to achieve specified environmental performance outcomes and to continuously improve performance. The key elements of an EMS are:

- Environmental policy
- Planning
- Implementation and operation
- Checking and corrective action
- Management Review
- Continual improvement

The EMS will ensure that implementation of the proposal will achieve the environmental outcomes that are prescribed in this document.

5.2 ENVIRONMENTAL MANAGEMENT PLAN

The description of specific environmental objectives, commitments, management and responsibilities for the proposal following the environmental impact assessment process will be addressed in an Environmental Management Plan (EMP).

The EMP will address:

- Construction
- Surface Water
- Commissioning
- Waste
- Environmental objectives
- Environmental requirements and compliance
- Management measures
- Responsibilities and reporting
- Training
- Audit and review
- Community liaison
- Monitoring program
- Appendices
    - Environmental policy
    - Conditions and commitments

5.3 DECOMMISSIONING

The operational life of the proposal is anticipated to be about 25 years. If it became necessary to decommission the proposal a decommissioning plan would be prepared well before the end of the life of the plant. The plan would address decommissioning issues, objectives and a procedure by which agreed completion criteria may be developed for the areas to be decommissioned.

6. BIOPHYSICAL ENVIRONMENTAL FACTORS

6.1 VEGETATION

EPA Objective (Vegetation)

To maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.

6.1.1 Setting

The proposed plant site lies within an area that has been extensively used for pastoral activities and as such is significantly degraded.

To the east of the boundary of the Gnangara groundwater reserve, the land is predominantly cleared of deep-rooted vegetation and is used primarily for stock grazing. Localised areas of thick vegetation occur at the margins of the swampy areas.

To the west of the boundary of the Gnangara groundwater reserve, the vegetation is predominantly native banksia woodland.

The proposed site is located within the Ellenbrook catchment, (but not within a Bushplan site) which follows the brook to the north and south. Bushplan does, however, recommend that any development within the Ellen Brook catchment be undertaken in an environmentally sensitive manner to ensure the catchment is not altered (Bennett Consulting 2000).

6.1.2 Remnant vegetation description

A vegetation survey of the site was undertaken on 31st March 2000 by Dr Eleanor Bennett (Bennett Consulting 2000). The following summarises the report, which is reproduced in full as Appendix 3.

- Most of the proposed development site (about 70%) is pasture with scattered trees. There are only small pockets of moderate to good condition vegetation.
- No Rare or Priority flora species were located on the proposed site.
- Five vegetation communities were described:
  1. *Eucalyptus rudis* Woodland,
  2. *Banksia* sp. Woodland,
  3. *Melaleuca preissiana* Woodland,
  4. *Juncus pallidus* Sedgeland and
  5. Pasture.

  Only two communities were considered by the consultant to be worthy of active protection. These were:
  - 1. *Eucalyptus rudis* over *Astartea* affin. *fascicularis*; and
  - 2A. Northern *Banksia attenuata – B. menziesii* Woodland (the Dampier to Bunbury gas pipeline passes through this section).
- There is considerable weed infestation on the proposed site. This includes the presence of Arum lily which, under the *Agriculture and Related Resources Protection Act,* is required to be controlled.

6.1.3 Assessment and management

The facility is proposed to be located at the south-eastern corner of the site (Figure 4 & 5). This area contains pasture with a few scattered trees. No remnant vegetation communities of any significance will be affected.

The infrastructure site will be built up to 1.2 m with sand prior to construction to assist with drainage.

With the exception of the areas containing the vegetation communities to be protected, it is intended that the degraded pasture will continue to be grazed following the development of the power station.

The vegetation survey contained a number of suggestions for the protection of existing vegetation communities and the enhancement of the natural attributes of the site. In accordance with these suggestions, the proponent is committed to the following:

- Fencing of vegetation around the gas pipeline easement to protect Vegetation Communities 2A and 2B, provided this is allowed by the Minister for Energy.
- Regeneration of the Melaleuca Woodland on the northeast of the site by including that area within the plant perimeter fencing and thus preventing access by cattle.
- Aggressive and regular weed control.
- Considering the transplanting of any trees which are required to be removed for the development (mainly *Melaleuca preissiana*) to a position which will assist visual screening of the facility.
- Drawing from the list of species suggested in the vegetation survey as appropriate for screening purposes (mainly local native species but also others known to occur in the area).
- Significant re-planting of native and site-appropriate vegetation for specialised screening, water table control and aesthetic purposes.

6.2 GROUNDWATER

EPA Objective (Groundwater Management)

The EPA's general environmental objective with regard to groundwater management is:

- to ensure that where changes are proposed on land within the catchment of an important wetland those changes will not lead to unacceptable impacts on either the water quality or the hydrology of that wetland.

6.2.1 Setting

The Water and Rivers Commission have advised that the proposed site is not situated within any proclaimed wetland area.

Mr Kevin Haselgrove, Hydrosearch Pty Ltd undertook a hydrogeological survey of the proposed site and relevant surrounds during April 2000 (see Appendix 4). The following is drawn from that report.

The proposed site is located on the Guildford Formation geological unit, occurring in a shallow topographic low and cut along its length by the Chandala / Ellen Brooks.

To the west of the Guildford Formation is the Bassendean Sand system of the Gnangara Mound groundwater reserve.

Cooks Spring, a dam excavated on groundwater seep, is to the northeast of the proposed site.

Garboro Pool is located on the ephemeral Chandala Brook approximately opposite the southeast corner of the proposed site.

Figure 6 of Appendix 4 shows the proposed power station site in relation to the Gnangara Mound. The regional groundwater flow in the superficial formations at the power station's proposed site was easterly towards the Chandala Brook with the Gnangara Mound being to the west of the proposed site.

No other waterways or wetlands were relevant to the proposed site.

6.2.2 Current groundwater use

Figure 2 of Appendix 4 shows all the main bores in the area, with the exception of a large number of bores on the Tiwest Chandala site. The dominant uses of groundwater in the area were found to be for domestic purposes and stock watering. The only known significant abstraction centres are associated with the Tiwest Joint Venture synthetic rutile processing plant. The Tiwest water supply bores in the Gnangara wellfield have a combined licensed extraction of 1,000,000 kL/annum, while contaminant recovery bores within the processing plant have a licensed abstraction of 250,000 kL/annum.

6.2.3 Water supply location and quantity required

The water requirements of the plant are for 550,000 kL/annum of water of salinity less than 500 mg/L of total dissolved solids. Ninety-five percent of this water will be used for the cooling tower make-up; with other uses including boiler make-up, truck washing, amenities and hosing. The required maximum annual abstraction equates to around 1507 kL/day or 63 kL/hr.

Beneath the proposed power station site, the rate of water movement in the superficial formations is likely to be slow, owing to the removal of much of the throughflow by evapotranspiration at the line of swamps to the west of the site. It is possible that good quality shallow groundwater could be found in

the superficial formations beneath the western boundary of the proposed site. However, there is a risk that sustained abstraction from a shallow wellfield on the boundary may be locally significant on wetlands or other users (Hydrosearch Pty Ltd 2000).

The underlying Greensand beds are more likely to be suitable for developing a water supply for the power station. The eastward dip of these beds would allow them to be recharged by low-salinity water from the Bassendean Sand to the west.

Data for the area indicates that sufficiently good aquifers are likely to exist in the formation to deliver the required yield. The most propitious target zone would be that which encompasses Mesozoic-age greensand strata from 40 to 120 metres below ground level. A single production bore screened in the best aquifer in these strata could probably supply the required yield of 40 to 70 kL/hr, but a spare bore will be installed to allow for breakdown and maintenance of the main production bore (Hydrosearch Pty Ltd 2000).

The proponents will undertake an exploration phase prior to installing production bores. This investigation will involve:

- Drilling a hole to about 140 m depth to identify aquifers.
- Installing a monitoring bore into each of the superficial formations and the underlying Mesozoic strata to sample groundwater for water quality.
- Installing a second shallow monitor bore on the western boundary of the proposed site to determine the shallow aquifer quality and salinity at this site.

The proponents will submit a further hydrogeological report to the Water and Rivers Commission following installation and testing of the production bores. The report will assess whether the required yield is sustainable, and would propose a monitoring program to check for impacts of abstraction.

6.2.4 Potential impacts from abstraction on nearby areas

The main potential impacts of groundwater abstraction are:

- Damage to fringing vegetation around the swampy regions to the west of the proposed site if water table elevations decline significantly. This is expected to be a minor impact because the required abstraction is not large and a similar level of abstraction has applied for a number of years at the Tiwest Gnangara wellfield with very small impact on water table levels.
- Reduction in water levels in neighbours' bores, and in Cooks Spring outside the northwest corner of the lease. Cooks Spring is a dam excavated on a groundwater seep and neither this nor the neighbours' bores are likely to be affected to any more than a minor degree, for the reasons outlined above.
- Reduction in water level in Garboro Pool, which is located on the ephemeral of Chandala Brook approximately opposite the southeast corner of the proposed site. This effect is highly unlikely because of clay soils near the base of the superficial formations, which would restrict transmission of drawdown from the pumped aquifer to the water table at Chandala Brook (Hydrosearch Pty Ltd 2000).

6.2.5 Management measures

Good quality shallow groundwater may be found in the superficial formations beneath the western boundary of the proposed site. However, if that source were utilised, there is a risk that sustained abstraction from a shallow wellfield on the boundary may be locally significant on wetlands or other users.

Thus, the underlying Greensand beds are more likely to be suitable for developing a water supply for the power station. The proponents are committed to comply with these recommendations and abstract water from the locations recommended in the Hydrosearch report.

In addition, the proponent will submit a further hydrogeological report to the Water and Rivers Commission following installation and testing of the production bores. The report will assess whether the required yield is sustainable, and will propose a monitoring program to check for impacts of abstraction.

6.3 SURFACE WATER QUALITY

EPA Objective (Surface water quality)

- To ensure that receiving waterbodies are protected from contamination by providing assessment guidance for the management of surface run-off from industrial and commercial sites.

6.3.1 Assessment criteria or policy context

The criteria used for the assessment of surface runoff impacts from new proposals are specified in *Guidance for the Assessment of Environmental Factors – Management of Surface Run-off from Industrial and Commercial Sites (Draft*) (EPA 1999).

6.3.2 Assessment and management

The proposed site is a floodplain and at times the water table can be at ground level. The developed area of the site will therefore be built up to a height of 1.2 m above ground level. The existing ground bearing pressure is expected to be in excess of 100 kPa.

The plant is designed to ensure that all liquid process wastes and stormwater runoff are retained on site and disposed of in a controlled manner.

The following outlines the measures have therefore been built into the design of the plant in order to achieve this outcome:

- Cooling tower blowdown water will be treated in a reverse osmosis (RO) plant to recover water for use. The blowdown water flow-rate from the evaporative condenser or cooling tower will be approximately $12m^3/h$. The plant will comprise a microfiltration unit, a reverse osmosis (RO) plant and an RO permeate concentration plant. Retained stormwater, RO plant retentate, boiler blowdown water and other process effluents will be discharged to evaporation ponds.
- All site bunding and elevations have been sized to anticipate a rainfall event of 77 mm per day (the maximum value since 1935).
- Onsite roads and carparks will be sealed and curbed and the truck washdown bay designed to be consistent with DEP's Washdown Guidelines (fit for use).
- Evaporation ponds will be lined according to DEP guidelines and sludge removed regularly by a licensed contractor.
- Sewage effluent will be treated on site and irrigated on amended soil also located on site, as indicated earlier in this document.
- Any chemicals to be stored onsite in sealed drums to DEP standards and bunded where appropriate in order to ensure containment in the event of a spillage from the general stormwater drainage system.

7. POLLUTION MANAGEMENT

7.1 AIRBORNE EMISSION IMPACTS

EPA Objective (Airborne emissions)

- To protect public health and amenity from air contaminants emitted as a result of the proposal by ensuring that emissions and ambient levels meet statutory requirements and applicable guidelines.

7.1.1 Setting

As previously described, the power station is proposed to be located in a relatively isolated rural environment. The nearest residence is about 1.35 km away.

The significant airborne emissions from the proposed power station are sulphur dioxide, nitrogen oxides particulates and odour. Sulphur dioxide and nitrogen oxides are respiratory irritants. Prolonged exposure to particulates, particularly fine particulates in urban airsheds, has the potential to contribute to cardiopulmonary diseases.

7.1.2 Assessment procedure or policy context

The criteria for acceptable ambient air impacts applicable to the airborne emissions are shown in Table 6 below.

Table 6 Ambient air quality criteria

Contaminant	Concentration	Averaging time	Maximum allowable exceedences	Reference
Sulphur dioxide	0.20 ppm (≈572 μg/m^3)	1 hour	1 day a year	"National Environment Protection Measure for Ambient Air Quality" (NEPC 1998)
	0.08 ppm (≈229 μg/m^3)	1 day	1 day a year	
	0.02 ppm (≈57 μg/m^3)	1 year	none	
Nitrogen dioxide	0.12 ppm (≈246 μg/m^3)	1 hour	1 day a year	
	0.03 ppm (≈62 μg/m^3)	1 year	none	
Particles as PM10	50 μg/m^3	1 day	5 days a year	
Hydrochloric acid	3000 μg/m^3	1 hour	none	Californian Reference Exposure Level (CAPCOA 1993)
Odour	7 OU/m^3	1-hour	9 hours per year	"Guidance for the Assessment of Environmental Factors – Assessment of Odour Impacts – Draft" (EPA 2000)

7.1.3 Assessment and management

Welker Environmental Consultancy was engaged to predict the ambient levels of key airborne emissions from the proposed power plant. This report, *Air Quality Assessment for Proposed Poultry Litter - Power Station, Muchea*, which describes the assessment procedure in detail, is attached as Appendix 5.

The approach taken to determine the ground level concentrations of the airborne contaminants was to use the Ausplume computer dispersion model to predict concentrations over the course of a year. The predicted concentrations were then compared to applicable criteria for acceptable levels.

Odour emissions from the litter storage shed were estimated using data from the Report on Odour Emissions from Poultry Farms in Western Australia (Jiang & Sands, 1998).

The maximum design emission rates were used for all contaminants. Emissions would typically be below these levels.

7.1.3.1 Emission parameters

Emission parameters were obtained from a number of sources:

1. Operational report from an operating poultry litter power station in the UK that uses very similar combustion technology and poultry litter:

   Operational data is from the EYE poultry litter fired power station in the UK. The EYE Power Station was commissioned in 1994 and is of a very similar size to the Proposal – 12.6MW sent out capacity as opposed to 10MW for the proposal. Both Powers stations use very similar poultry litter - detailed in Table 7.

2. Chemical analysis of WA's poultry litter
3. Consulting engineers report
4. Laboratory analysis
5. Expert reports

Table 7 WA poultry litter and poultry litter used at the Eye power station in the UK

	CARBON %DB	HYDROGEN %DB	NITROGEN %DB	SULPHUR %DB	CHLORINE %DB
WESTERN AUSTRALIAN POULTRY LITTER	46	6	3	0.3	0.5
EYE POULTRY LITTER POWER STATION	43	6	5	0.5	0.5

The EYE samples are averaged from the analysis contained in the plant log-book and from samples obtained before the plant was commissioned (ETSU, 1995). The results for WA were obtained from a composite sample obtained from the WA poultry industry and analysed by a specialist combustion laboratory (HRL Technology, 1999)

7.1.3.2 Comparing proposal to international emission limits

Table 8 details the average emission levels from the Eye power station along with its licence limits and the expected average emission levels from the Proposal and the Proponent recommended Licence limits. Also listed are the difference between the two proposals in terms of emission control equipment. The final columns in the able show the US EPA and European Commission licence limits and National Guidelines for the Control of Emission of Air Pollutants from New Stationary Sources (AEC/NHMRC 1985).

Table 8 Comparing Proposal to the Eye power station in the UK and international emission limits

	UK EYE Plant Average value *(a)*	Proposal Average expected range *(b)*	Comment on emission control *(c)*	UK EYE Plant Licence Limit *(d)*	Proponent proposed licence limit *(e)*	EC and/or US EPA LIMITS	(AEC/NHMRC 1985 LIMITS
Sulphur dioxide (g/Nm^3)	0.109	0.11 – 0.185	Proponent will install flue gas desulphurisation equipment described in Appendix 9 EYE plant does not have this technology	0.300	0.300	0.2 (1/2 hour)	N/a
Solid particles (g/Nm^3)	0.155	0.005 - 0.015	Proponent will install a fabric filter system described in Appendix 6 EYE plant does not have a fabric filter	0.200	0.03	0.03 (1/2 hour)	0.25
Nitrogen oxides as NO_2 (g/Nm^3)	0.172	0.17 – 0.258		0.435	0.357	0.357 (1/2 hour)	0.5
Hydrogen chloride (g/Nm^3)	0.181	0.18 – 0.27	Proponent will install flue gas desulphurisation equipment described in Appendix 9 EYE plant does not have this technology	0.250	0.270	0.036 (1/2 hour)	0.4
Dioxin & Furans (I-TEQ)	0.22 ng/Nm^3	Expected average value - less than 0.1 ng/Nm^3	Proponent will install dioxin scrubbing technology described in Appendix 6 EYE plant does not have this technology	NA	0.1 ng/Nm^3	0.1 ng/Nm^3	NA

(a) Show the average emission values from the EYE power station. Values at 11% O_2

(b) Average emission levels for the Proposal based on the performance of the UK plant, fuel analysis and emission guarantees from equipment suppliers. Accurate average values will not be known until the plant is operational.

(c) Comments detailing the difference between the Eye plant and the Proposal with regards to emission control technologies

(d) HMIP licence limits the EYE plant operates under. ETSU, 1995, Use Of Poultry Litter For Power Generation – Monitoring Of 'Eye' Power Station 1995, ETSU B/FW/00235/REP. Values at 11% O_2

(e) *These limits have been discussed with the DEP, EPA, 2001.*

Table 9 shows the average heavy metal emission levels from the Eye power station and the expected average emission levels from the Proposal and EPA recommended Licence limits (EPA 2001). The final columns show the US EPA and European Commission licence limits and National Guidelines for the Control of Emission of Air Pollutants from New Stationary Sources (AEC/NHMRC 1985). More details regarding heavy metals are contained in Appendix 5.

Table 9 Comparing Proposal to the Eye power station in the UK and heavy metal emission limits

	UK EYE Plant *(a)*	**Proposals Expected Average value (b)**	**Proponent recommended emission standard *(c)***	**EC and/or US EPA LIMITS**	**Ambient Air Quality**
Arsenic (g/Nm^3)	0.0000358	0.0000027	0.000005	0.000005	
Cadmium (g/Nm^3)	0.000048	0.0000003	0.000014	0.000014	0.000000005
Lead (g/Nm^3)	0.0039162	0.0000066	0.00014	0.00014	0.0000016
Mercury (g/Nm^3)	0.0000292	Less than 0.00000003	0.00005	0.00005	N/A
Total Metal ** (g/Nm^3)	-	Less than 0.0007	0.0007	0.0005	NA

(a) Average emission values from the EYE power station (vapour plus particulates). ETSU, 1995, Use Of Poultry Litter For Power Generation – Monitoring Of 'Eye' Power Station 1995, ETSU B/FW/00235/REP. Values at 11% O_2

*(b) Expected average heavy metal emission levels based on metal composition in WA litter ash (*CSIRO Land and Water Division, 2001, WA Poultry Litter Ash Suitability as Fertilizer with Respect to Heavy Metal) x TSP emission concentration

(c) These standards have been discussed with the DEP, EPA, 2001

*** Total of antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium*

7.1.3.3 Emission parameters used in modelling

The emissions parameters for the power station boiler stack and the litter storage shed are shown in Table 10 and 11 respectively - the modelling of ambient sulphur dioxide, nitrogen oxides and particulates also took into account emissions from the nearby Tiwest synthetic rutile plant.

Table 10 Proposal and Tiwest stack emission parameters used in computer modelling

Parameter	Proposal Values used in emission modelling	Tiwest synthetic rutile plant Values used in emission modelling
Stack height above ground (m)	40	58
Location (AMG mE, mN)	400889, 6510178	401691, 6510589
Sulphur dioxide (g/Nm^3)	1.230 *	3.9 **
Particulates (g/Nm^3)	0.08 *	0.25 **
NOx (g/Nm^3)	0.387 *	0.09**
Hydrochloric acid (g/Nm^3)	0.410	NA
Dioxins and furans (ng TEQ/Nm3)	0.208 to 0.040	0.034 ***
Exit volume at exit temperature (m^3/hour) (m^3/s)	 112,000 31	 22
Exit velocity (m/s)	15	11
Exit temperature (C)	200	80
Height of boilerhouse above ground (m)	30	NA
Width of boilerhouse (m)	40	NA

** Very conservative values have been used in the air pollution modelling to provided surety that the emission criteria are well within the standards. More detail on the maximum limits is contained in Appendix 5. Note that for Sulphur the expected average value range is between 0.11 to 0.185(g/Nm^3); for Particulates 0.005 to 0.015(g/Nm^3); for NOx 0.17 to 0.258(g/Nm^3); and for HCl 0.18 to 0.27(g/Nm^3) – see Table 8*

*** Tiwest licensed maximum rates*

**** Tiwest have not detected dioxin and furans in their emissions therefore half the detection limit and relative concentrations of dioxin congeners from incinerator emissions published by the US EPA were used. See Appendix 6 for more detail. The values for the Proposal were obtained from the EYE Plant in the UK.*

Table 11 Litter storage building emission parameters

Parameter	Value
Location (AMG mE, mN)	400889, 6510178
Volume of litter (m^3)	5,000 (approx)
Surface area of litter stockpile (m^2)	1,559 (max)
Building dimensions (length x width x height) (m)	87.6 x 40.9 x 14
Height of side louvres above ground (m)	2
Side louvre dimensions (length x height) (m)	22 x 1

The emission rates used for Tiwest were licensed maximum rates. Emissions would typically be below these levels. Given the conservatism already inherent in the emission rates assumptions for the

proposed power station, the predicted maximum ambient concentrations are likely to be considerable overestimates. The chance that both facilities would be emitting at maximum levels during the time meteorological conditions caused the highest ground level concentrations is extremely remote.

7.1.3.4 Discussion of modelling results

The maximum predicted ground level concentrations of each contaminant are shown in Table 12. In all cases, the maximum predicted concentration was below the relevant criterion for acceptable impacts.

Table 12 Comparison of maximum predicted cumulative (Tiwest + Proposal) concentrations to criteria

Contaminant	Maximum predicted concentration anywhere[(a)]	Contribution from the proposal (%)	Fraction of criterion (%)	Criteria	
				Concentration	Averaging time
Sulphur dioxide	308 μg/m^3 [(c)]	0	**54**	0.20 ppm (≈572 μg/m^3)[(c)]	1 hour
	100 μg/m^3 [(c)]	57	**44**	0.08 ppm (≈229 μg/m^3) [(c)]	1 day
	19.5 μg/m^3	3	**34**	0.02 ppm (≈57 μg/m^3)	1 year
Nitrogen dioxide[(b)]	26.0 μg/m^3 [(c)]	100	**11**	0.12 ppm (≈246 μg/m^3) [(c)]	1 hour
	1.5 μg/m^3	93	**2**	0.03 ppm (≈62 μg/m^3)	1 year
Particles as PM10	6.6 μg/m^3	48	**13**	50 μg/m^3	1 day
Odour	4.5 OU/m^3 [(d)]	100	**64**	7.0 OU/m^3	1 hour
Hydrochloric acid	84.6 μg/m^3	100	**2**	3000 μg/m^3	1 hour

[(a)] Excludes within the Tiwest lease boundary.
[(b)] Conservatively assumes that 50% of NOx from both Tiwest and the proposal is or becomes NO2.
[(c)] Second highest day per year.
[(d)] Refers to predicted 99.9 percentile ground level concentrations predicted anywhere.

The maximum predicted ground level concentrations of all contaminants are less than 50% of the NEPM criteria except for the maximum 1-hour sulphur dioxide concentration and odour. In the case of sulphur dioxide, the maximum predicted concentration is 54% of the NEPM criterion, however, this event is attributable to Tiwest only since the contribution from the proposal to this event is zero.

The results from modelling only the proposal (not including Tiwest) are summarised in Table 13.

Table 13 Highest predicted concentrations from proposal only

Contaminant	Maximum predicted concentration anywhere	Fraction of criterion (%)	Criteria	
			Concentration	Averaging time
Sulphur dioxide	173 μg/m^3	**30**	0.20 ppm (≈572 μg/m^3) [(a)]	1 hour
	82 μg/m^3	**36**	0.08 ppm (≈229 μg/m^3)	1 day
	9.0 μg/m^3	**16**	0.02 ppm (≈57 μg/m^3)	1 year
Nitrogen dioxide[(b)]	27 μg/m^3	**11**	0.12 ppm (≈246 μg/m^3) [(a)]	1 hour
	1.4 μg/m^3	**2**	0.03 ppm (≈62 μg/m^3)	1 year
Particles as PM10	5.2 μg/m^3	**10**	50 μg/m^3	1 day
Hydrochloric acid	57 μg/m^3	**2**	3000 μg/m^3	1 hour
Odour	4.5 OU/m^3 [(c)]	**64**	7.0 OU/m^3	1 hour

(a) Second highest day per year.
(b) Conservatively assumes that 50% of NOx from both Tiwest and the proposal is NO2.
(c) Refers to predicted 99.9 percentile ground level concentrations predicted anywhere.

The maximum predicted ground level concentrations of all contaminants from the proposal in isolation are less than 50% of the criteria levels for all contaminants except for Odour. Odour management is discussed blow.

It is important to note that the assessments have been made on the basis of worst case emissions rates and that actual ambient levels are likely to be well below those shown in the above Table for comparisons to criteria.

7.1.3.5 Odour management

The odour will be controlled by:

- Limiting the amount of poultry litter on site to the equivalent to what is kept on a large poultry farm
- Containing the poultry litter in an enclosed area.
- Reducing the ventilation through the storage area with the use of louvers and roller doors
- Locating the air intake into the boiler above the litter stockpile combusting and eliminating the odour.

Should odour complaints be received, closing the side louvres on the litter storage shed can reduce odour emissions. This would direct the ventilation air in the shed into the boiler, and substantially reduce emissions from the facility - the management of public complaints regarding the impact of air emissions is described in Section 9 – a dedicated phone number will be provided to take any calls related to the plants operation.

7.1.4 Air toxics

The potential for the formation of toxic polychlorinated dibenzodioxins (PCDD, 'dioxins') or polychlorinated dibenzofurans (PCDF, 'furans') species as a by-product of combustion of the poultry litter has been assessed by HRL Technologies (HRL 2000). Their advice, in summary, was that:

- the precursor conditions present in the combustion and post combustion zones downstream from the boiler furnace do not favour the formation of dioxins; and
- there is no added potential for dioxin formation from the use of poultry litter as a fuel compared to any modern power plant burning solid fuels.

Using a multi-pathway model to determine dioxin exposures for general and extreme scenarios it has been determined that the project will not exceed international standards or be higher than world dietary intakes. Therefore the Proposed Poultry Litter Power Station when complying with a licensed emission rate of 0.1 ng I-TEQ/Nm^3 does not pose any known health risks to individuals in the surrounding area.

Blair Fox Generation has made a commitment to the DEP to use either Carbon Injection, GORE-TEX Bag (detailed in Appendix 6) or better technology (if available and practical) that will greatly reduce dioxin emissions. GORE-TEX membranes capture fine particulate on the surface of the filter. As the filter is cleaned, solids are released from the surface and collected in the bottom of the bag house hopper. The gaseous dioxins and furans pass through the GORE-TEX membrane into the catalytic felt where they are converted into insignificant amounts of CO_2, H_2O and HCL (Gore & Associates, 2001).

A more detailed description of this analysis is provided in Appendix 6.

7.1.5 Fugitive dust

During construction, contractors will be required to use all reasonable dust control measures, including erecting soil movement barriers to prevent the egress of sand pads, etc, into the neighboring environment and will work to the Shire of Chittering's dust control requirements for site construction.

There are no potential dust or bio-aerosol impacts arising from the plant's operations after commissioning as the poultry litter is transported in covered trucks and unloaded within a closed shed.

The truck wash-down facility will ensure that bio-security standards are maintained and prevent poultry litter particles from lifting off moving vehicles.

7.2 AIRBORNE EMISSION CONCENTRATIONS

EPA Objective (Airborne emission concentrations)

To minimise emissions of airborne contaminants as far as practicable.

7.2.1 Assessment procedure or policy context

Recommended maximum emissions limit were obtained from the EPA. Table 14 shows the Proposal's maximum emission limits, the National Guidelines for the Control of Emission of Air Pollutants from New Stationary Sources (AEC/NHMRC 1985) limits the EC and USE EPA emission limits, the expected average emission levels (based on the operating experience of the Eye poultry litter power station and the emission control equipment) and the results of the air emission modelling.

7.2.1.1 Discussion of emission limits of key contaminants from boiler stack

The following Table shows that the Proposals maximum emission limits are all within the AEC/NHMRC limits and are mostly consistent with the limits that applied to the UK Eye plant, with the exception of Hydrogen chloride. However, while the expected operating range is within EC and US EPA Limits the Licence Limits are not. This is best explained by considering the context of the plant and the fact that the US and EC limits typically apply to much larger power projects that are often 10 times larger than the proposal and have mass emission rates that are much higher. This is further supported by the air emission modelling which demonstrated that the Proposal easily complies with the relevant criteria when the emissions levels are at or well in excess of the Proponent proposed licence limits.

Table 14 Proposed maximum emission limits for key contaminants from boiler stack

	Proponent proposed licence limit (a)	Proposal expected average range	UK EYE Plant Licence Limit	EC and/or US EPA LIMITS	(AEC/NHMRC 1985 LIMITS	Maximum Values used in Emission Modelling	Results of Air Emission Modelling
Sulphur dioxide (g/Nm^3)	0.300	0.11 – 0.185	0.300	0.2 (1/2 hour)	N/a	1.230	Under 55% of the criteria for all scenarios
Solid particles (g/Nm^3)	0.03	0.005 - 0.015	0.200	0.03 (1/2 hour)	0.25	0.08	Under 16% of the criteria for all scenarios
Nitrogen oxides (g/Nm^3)	0.357	0.17 – 0.258	0.435	0.357 (1/2 hour)	0.5	0.387	Under 17% of the criteria for all scenarios
Hydrogen chloride (g/Nm^3)	0.270	0.18 – 0.27	0.250	0.036 (1/2 hour)	0.4	0.410	Under 4% of the criteria for all scenarios
Dioxin & Furans (I-TEQ)	0.1 ng/Nm^3	Expected average value - less than 0.1 ng/Nm^3	NA	0.1 ng/Nm^3	NA	0.21 ng/Nm^3	Under worst case modelling lifts the adult exposure value from 0.300 to 0.358 where the WHO standard limit is 1.0 to 4.0 pg TEQ/kgBW-day

(a) These limits have been discussed with the DEP, EPA, 2001.

7.2.2 Assessment and management

The air emissions control system for the boiler includes a baghouse for the removal of particulates and dioxin. Blair Fox Generation has made a commitment to the DEP to use either Carbon Injection, GORE-TEX Bag (detailed in Appendix 6) or better technology (if available and practical) that will greatly reduce dioxin emissions. GORE-TEX membranes capture fine particulate on the surface of the filter. As the filter is cleaned, solids are released from the surface and collected in the bottom of the bag house hopper. The gaseous dioxins and furans pass through the GORE-TEX membrane into the catalytic felt where they are converted into insignificant amounts of CO_2, H_2O and HCL (Gore & Associates, 2001).

The maximum concentration of particulate matter in the gas stream leaving the baghouse is designed to be manufacturer guaranteed at less than 15 mg/Nm^3 and have an operating range of approximately 5 mg/Nm^3 . The particulate concentration immediately downstream of the bags will be continuously monitored (most likely using triboelectric sensors).

Provision will be made within the Plant for a Flue Gas Desulphurisation System and will be operated if it is necessary to keep the plant below its SO_2 or HCL licence limits. The Flue Gas Desulphurisation System. Appendix 9 details of Flue Gas Desulphurisation System technology. The emission control technologies are evaluate below.

7.2.2.1 Sulphur oxides reduction technologies

There are several types of technologies available to remove sulphur dioxide from flue gases. The choice of method depends on the size of the plant, the inlet sulphur concentration and the required reduction, the availability of an appropriate sorbent and the disposal or use of the end product.

The wet/dry lime spray drying process has a disposable/reusable end product and is suited to small and medium sized plants. The reactor in the wet/dry flue gas desulphurisation process allows the reaction between the acid gas and the sorbent (usually lime or limestone) to take place mainly in the wet phase. The reaction product must be dried and collected as dust.

The NID® (New Integrated Desulphurisation) system is able to reduce emissions of carbon dioxide, dust, sulphur dioxide and hydrochloric acid. The process can achieve at least 80% sulphur dioxide removal. The main difference between NID and a conventional dry flue gas desulphurisation process is in the addition of water and lime. The key parameter in a dry flue gas desulphurisation process is the relative humidity of the flue gas as this activates the hydrated lime. In a traditional dry flue gas desulphurisation process, water and lime is supplied to the flue gas as slurry with a solids content of 35 to 50 %. The NID process changes the way in which the water is distributed in the process, shortening the drying time and allowing the reactor vessel to be smaller. Lime consumption would be to the order of 200kg/hour. As well as the operating cost, the parasitic losses would decrease the 'sent out' power of the plant by 1.5 - 2%.

The wet flue gas desulphurisation process utilises an open spray tower with lime or limestone as the sorbent and the capable of producing commercial grade gypsum. In this process, lime or limestone slurry is sprayed into the gas flow and the reaction products and slurry are collected at the bottom of the reactor and recycled. Secondary oxidation is usually achieved through the introduction of oxygen at the bottom of the tank. Wet scrubbing is a good solution for the removal of acid gases, but will also remove particulates and mercury. To avoid a plume from the stack, reheating of the gas is required,

which reduces plant efficiency. The wet ash handling plant is more complex and requires higher maintenance than a dry system. Costs will be similar to the wet/dry lime system.

Wet flue gas desulphurisation systems produce a sludge, which requires to be dried or, if handled wet, stabilised. Sludge can be stabilised by mixing with soil or power plant flyash.

Seawater can also be used as a sorbent for sulphur dioxide as it is naturally alkaline, containing an excess of calcium and sodium carbonates. The Flakt-Hydro® process uses a once through packed bed absorber to contact seawater with sulphur dioxide, then the effluent is pumped to a treatment plant where air is added to oxidise the absorbed sulphur dioxide into sulfate ions. The treated seawater then flows back into the ocean. This eliminates disposal problems at plants with access to suitable amounts of seawater. There are no significant issues with pumping the water out to sea as the slight increase of dissolved sulphates is well within the natural variations of seawater. The Flakt-Hydro process can achieve sulphur dioxide removal efficiencies of up to 99%.

Absorption and neutralisation take place according to these reactions:-

SO_2 absorption $SO_2\ (g) + ½\ O_2(g) + H_2O <> SO_4^{2-} + 2H^+$

Carbonate equilibrium $CO_3^{\ 2-}(aq) + 2H^+ <> H_2O + CO_2\ (g)$

Total $SO_2\ (g) + 1/2O_2 + CO_3^{2-} <> SO_4^{2-} + CO_2\ (g)$

Excluding the seawater supply and return pipework, whose costs make the method prohibitive for all but sea-side plants, capital and operating costs are similar to the other technologies given above.

7.2.2.2 Particulate reduction technologies

Electrostatic precipitators use electrostatic forces to remove dust particles from a gas stream. The gas passes into a chamber containing wire discharge electrodes surrounded by 'curtains' of vertical steel plates (the collecting electrodes). An electric field is established by applying a high voltage between discharge electrodes and grounded collecting electrodes. A corona is then formed around the discharge electrodes, thereby ionising the gas in the vicinity of these electrodes, which in turn negatively charges the particulates entrained in the gas stream. The dust particles therefore move to the nearest grounded surface, the collecting electrode, where they settle and form a layer of dust. The discharge and collecting electrodes are rapped intermittently. The dust layers are thus dislodged from the electrodes and collected in hoppers at the bottom of the precipitator for transportation to storage.

While several factors determine electrostatic precipitator removal efficiency, precipitator size is of greatest importance. Size determines treatment time and the longer a particle spends in the precipitator, the greater its chance of being collected. Electrostatic precipitator overall collection efficiencies can exceed 99.9%, and efficiencies in excess of 99.5% are common.

Electrostatic precipitators can handle inlet dust burdens up to 1kg/Nm3. Outlet burdens depend on the size of the precipitator, with 80mg/Nm3 being a commonly accepted value for power plants. With enough stages values below 10mg/Nm3 are achievable, but at an exponentially rising cost.

Fabric filters (bag-houses) are able to remove dust, heavy metals and sulphur dioxide entrained in large volumetric flows of flue gases. Fabric filters work by filtering the dirty gas through a dust cake that builds up on fabric bags. The fine particles become trapped on this layer of dust. Sulphur dioxide levels can be reduced if lime is added to the flue gas. Fabric filters have removal efficiencies ranging from 95% to 99.9% and can handle inlet dust burdens between 0.1 to 230 g/m3.

Fabric filters can either be a high ratio or low ratio type. In a low ratio filter the gas enters the filter bags from the inside and then flows out the bags through the fabric. The filter bags are suspended upwards from a tube plate. The bags are cleaned by either reversing the gas flow or a system of the deflate and shake mechanism type. In a high ratio filter the dusty gas flow through the bags from the outside to the inside, depositing gas on the outside of the filter bags which hand downwards from a metal plate. The bags are installed over metal cages which prevent them from collapsing. The filter bags are cleaned periodically by expanding the bags with a rapid pulse of air. The dust then falls into a hopper below. In this system the bags are not isolated during cleaning.

7.2.2.3 Dioxin reduction technologies

The **Filsorption**® system is a modification of the conventional fabric filter, where the fabric filter acts as a fixed bed absorption reactor. A mixture of lime and activated coke or carbon is injected into the gas stream before the fabric filter which allows the fabric filter to remove dioxins, heavy metals, dust and acidic gases. Activated coke or carbon has a high surface area and is thus able to be effective in collecting high molecular weight compounds, dioxins, etc. The lime is able to reduce the levels of acidic gases, HCl, SO_2 and SO_3 from the gas stream.

Capital and operating costs of the Filsorption system are similar to the NID system, but disposal of the ash has to be properly handled, as it now contains both activated carbon and the captured high molecular weight compounds, as well as the reaction products of the lime and acid gases.

The GORE-TEX system is a modification of the fabric filter technology where the gaseous dioxins and furans pass through the GORE-TEX membrane into the catalytic felt where they are converted into insignificant amounts of CO_2, H_2O and HCL (Gore & Associates, 2001- detailed in Appendix 6). The membranes also capture fine particulate on the surface of the filter. As the filter is cleaned, solids are released from the surface and collected in the bottom of the bag house hopper. The system is compatible with lime flue gas desulphurisation and is currently recognised as most efficient particulate filler for industrial filtration applications.

7.2.2.4 Emission control technology selection criteria and ranking

Table 15 Emission Control Technology Selection Criteria and Ranking

	Technology	Comments	Ranking
SOx and HCl	Wet/dry lime Flue Gas Desulphurisation (FGD)	Production of limed ash which may affect quality of intended fertiliser.	1
	New Integrated Desulphurisation (NID)	Increase in electrical parasitic loss would reduce net power output by 1.5% to 2.0% (corresponding reduction of net plant efficiency).	2
	Seawater FGD	Not applicable for this project due to inland location of site	3
Dioxins and furans	Carbon Injection	Production of carbon ash may affect quality of intended fertiliser.	2
	GORE-TEX membrane - catalytic felt	Does not require carbon as dioxins and furans are converted into insignificant amounts of CO_2, H_2O and HCL. Compatible with lime flue gas desulphurisation and is recognised as most efficient particulate filler for industrial filtration applications.	1
Particulates	Fabric Filter (bag house)	Compatible with dry lime flue gas desulphurisation. Can capture smaller particle size than Electrostatic precipitator	1
	Electrostatic Precipitator	Not compatible with lime injection	2

Notes: *1 is most preferred*

7.2.3 Emission standards and limits plant will comply with

The plant will comply with stack emission Standards and Limits tabled below.

Table 16. Proponent recommended emission standards and limits for the Proposal

Emission	Measured as	Standard	Limit	Emission control technology
Sulphur dioxide g/Nm^3	SO_2	0.11 - 0.185 (1 hour)	0.300	Proponent will install flue gas desulphurisation equipment described in Appendix 9 and Section 7.2.2.1
Hydrogen chloride g/Nm^3	HCl	0.181 - 0.270 (1/2 hour)	0.270 (1/2 hour)	Proponent will install flue gas desulphurisation equipment described in Appendix 9 and Section 7.2.2.1
Hydrogen fluroride g/Nm^3	HF		0.006 (1 hour)	Poultry litter contains minute amounts of fluroide - not a major emitter and will readily comply
Oxides of Nitrogen g/Nm^3	NO_2	0.258 (1 hour)	0.357 (1 hour)	Low NOx burners will be used
Carbon monoxide g/Nm^3	CO	0.060 (8 hour)	0.100 (8 hour)	Efficient combustion process is essential to plant economics – plant will be designed to operate efficiently
Particulates g/Nm^3	Total particulates	0.005 – 0.015 (24 hour)	0.030 (24 hour)	Proponent will install a fabric filter system described in Appendix 6 and Section 7.2.2.2
Heavy metals		700 μg/m^3		Proponent will install a fabric filter system described in Appendix 6 and Section 7.2.2.2
Lead		140 μg/m^3		Proponent will install a fabric filter system described in Appendix 6 and Section 7.2.2.2
Mercury		50 μg/m^3		Proponent will install a fabric filter system described in Appendix 6 and Section 7.2.2.2
Cadmium		14 μg/m^3		Proponent will install a fabric filter system described in Appendix 6 and Section 7.2.2.2
Arsenic		5 μg/m^3		Proponent will install a fabric filter system described in Appendix 6 and Section 7.2.2.2
Dioxins and furans	Total toxic equivalents		0.1 ng I-TEQ/Nm^3 *	Proponent will install dioxin scrubbing technology described in Appendix 6 and Section 7.2.2.3
Smoke/opacity		Less than Ringelmann 1 as defined in 'AS3543 Australian Standard Miniature Smoke Chart'		Proponent will install a fabric filter system described in Appendix 6 and Section 7.2.2.2

Limits and standards have been discussed with the DEP, EPA, 2001

mg/m^3 means milligrammes per second, expressed dry at 0 degrees Celcius and 101.325 kilopascals, corrected only when O_2 > 11%

emission Limits for SO_2, HCl and HF calculated assuming proposed stack exit volume of 64,600 m^3/hour (112,000 m^3/hour at 200 ºC)

Heavy metals – total of antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium as element or in compound.

Standard – average of test results over four consecutive months to be less than the standard.

Limit – individual test results not to exceed the limit

Emission standards and limits are to be met within the time frame specified (in brackets)

Any test or average of triplicate tests

I-TEQ – International Toxic Equivalent

7.3 AIR EMISSIONS MONITORING AND MANAGEMENT COMMITMENTS

As described previously, the baghouse used to control particulate emissions from the boiler will be fitted with equipment for the continuous measurement of particulate emissions. The operators will be immediately alerted in the event of a bag failure. The redundancy in the number of compartments allows the baghouse to continue to operate and meet the particulate emission specification even in the event that one compartment is taken off-line for maintenance or repair.

The proponent will develop an EMP for the commissioning phase of the Project. The commissioning EMP will detail a stack testing program for the boiler stack. The commissioning EMP will be submitted to the DEWCP for approval prior to the commencement of commissioning. As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with DEWCP) will be implemented to verify that the emissions of key contaminants are within the specifications described in this document. The contaminants measured will include:

- Sulphur dioxide;
- Hydrogen chloride;
- Hydrogen fluoride;
- Nitrogen oxides;
- Heavy metals (arsenic, lead, mercury, cadmium);
- Dioxins and furans; and
- Particulates.

Other parameters which will measured on a continuous basis include temperature, oxygen, carbon monoxide and carbon dioxide.

The proponent is committed to ensuring that air emissions do not exceed required limits and that emissions are otherwise minimized. A summary of the commitments that the Proponent has made in this regard are documented in the Table below.

Table 17. Air emissions monitoring and management commitments

Topic	Action (Commitment)	Objectives

Topic	Action (Commitment)	Objectives
Sulphur Dioxide **Nitrogen Oxides** **Particulates** **Hydrogen fluoride** **HCL emissions**	1. The proponent will develop an EMP for the commissioning phase of the Project. The commissioning EMP will detail a testing program for the boiler stack emissions. The commissioning EMP will be submitted to the DEWCP for approval prior to the commencement of commissioning. 2. Provision will be made within the Plant for a Flue Gas Desulphurisation System 3. Provision will be made within the Plant for a bag filtering cleaning system. 4. As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with DEWCP) will be implemented to verify that the emissions are within the specifications described in this document. 5. The concentration in the gas stream will be measured on a six monthly basis and be reported to the DEWCP. 6. The Flue Gas Desulphurisation System and bag filtering cleaning system will be operated as necessary to keep the plant below its licence limits.	Ensure that emissions meet the air quality standards requirements of the National Environmental Protection Measure (NEPM) and adopted by the EPA. Ensure that emissions are below the maximum permissible levels. Use all reasonable and practicable measures to minimise emissions.
Heavy Metals **Dioxin and furans**	1. The proponent will develop an EMP for the commissioning phase of the Project. The commissioning EMP will detail a stack testing program for the boiler stack. The commissioning EMP will be submitted to the DEWCP for approval prior to the commencement of commissioning. 2. Provision will be made within the Plant for a bag filtering cleaning system that also 3. Dioxin emission control equipment, such as the GORE-TEX filter system, will be used to control the dioxin emissions. 4. As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with DEWCP) will be implemented to verify that the emissions are within the specifications described in this document. 5. During the first year of operation, the Proponent will sample and analysis the offgas emissions to establish if there are any significant concentrations present. 6. Monitoring results will be provided to the DEWCP following the first year of operation. 7. Future monitoring of the offgas emissions will be reviewed by the proponent in conjunction with the DEWCP once the results of the first year's monitoring have been assessed.	Ensure that any emissions meet acceptable standards. Use all reasonable and practicable measures to minimise emissions.

7.4 GREENHOUSE GASES

EPA Objective (Greenhouse gases)

- To ensure that all reasonable and practicable measures are taken to minimise the emission of greenhouse gases.

7.4.1 Setting and policy context

The balance of scientific opinion supports the view that there has been a discernible anthropogenic influence on the Earth's climate, as a result of increasing concentrations of greenhouse gases in the atmosphere. The Governments of developing nations consider this issue of enough concern to warrant global action to arrest greenhouse gas emissions growth.

Under the Kyoto Protocol to the United Nations Framework Convention on Climate Change (agreed in December 1997 and signed by Australia on 29 April 1998), Australia is potentially committed to a target for national greenhouse gas emissions of 8% above 1990 levels by 2008-2012. This represents about a 30% reduction against current business-as-usual projections of greenhouse gas emissions for this period. While Australia faces a challenging task in meeting this initial target, the issue of greenhouse gas emissions reduction is expected to be ongoing far beyond the current commitment period, with the real potential that we will face further, and stricter, targets in the future.

In order for Australia to contribute towards globally abating greenhouse gases and to assist us in meeting our agreed Kyoto targets, the Prime Minister announced a range of greenhouse response measures on 20 November 1997. The initiatives outlined in the Prime Minister's *Safeguarding the Future: Australia's Response to Climate Change* statement, included a number of measures directed at reducing emissions from the electricity sector, one of Australia's major contributors to greenhouse gas emissions.

In this statement, the Prime Minister announced a mandatory target for the uptake of renewable energy in power supplies. The Prime Minister stated:

Targets will be set for the inclusion of renewable energy in electricity generation by the year 2010. Electricity retailers and other large electricity buyers will be legally required to source an additional 2 per cent of their electricity from renewable or specified waste-product energy sources by 2010 (including through direct investment in alternative renewable energy sources such as solar water heaters). This will accelerate the uptake of renewable energy in grid-based power applications and provide an ongoing base for commercially competitive renewable energy. The program will also contribute to the development of internationally competitive industries which could participate effectively in the burgeoning Asian energy market.

Without further action, Australia's total emissions are expected to grow by around 28% from 1990 to 2010. The 1997 National Greenhouse Gas Inventory indicates that, using comparable best available methods, total net emissions in 1990 (excluding land clearing) were 389 Mt compared with 431 Mt in 1997 (11% higher than in 1990). This represents, by 1997, an already higher level of emissions than our agreed emissions cap for 2008-2012. It is therefore essential that the Government implement policies which can firstly curb our emissions growth and then support reductions by the first Kyoto commitment period.

Electricity generation is currently the largest single contributor to Australia's greenhouse gas emissions, at 35.4% (152 Mt) of total emissions. In the period 1990-96, emissions from electricity generation grew by 14% (18.2 Mt). In 1996-97 alone, emissions growth from electricity and heat production activities has been recorded at 3.6%. Australia's electricity consumption is also projected to grow by 1.7% a year to 2014-15. As a result, electricity generation is expected to account for 41%

of emissions in 2009-10. Further emission increases are expected in the future, based on projections that coal will continue to be used as a fuel source.

Renewable energy sources are very low emitters of greenhouse gases and a wide range of technology/resource combinations are currently commercially viable in the Australian context. Increasing the contribution of renewables in the electricity supply mix therefore represents a technologically sound method of reducing greenhouse gas emissions from the electricity sector.

7.4.2 Contribution to reduction in greenhouse gas emissions

Poultry litter is classified as a renewable energy source. The litter originates from organic sources (waste sawdust, straw and digested feed) which take up CO_2 from the atmosphere during the growth phase. Combusting the litter for power generation, although releasing CO_2, simply completes the carbon cycle. This is unlike CO_2 emitted from fossil fuel burning whereby below-ground, stored carbon is added to the atmosphere in the absence of a return mechanism for uptake. The proposed power station will therefore produce electricity for WA on a sustainable basis, displacing the CO_2 that would otherwise be emitted from producing the equivalent amount of electricity from fossil fuels.

The value of poultry litter as a fuel source for electricity generation is enhanced in practical terms because the poultry litter- power station is a *firm capacity* power station (ie. can generate on demand unlike wind power or solar). This negates the need to build 11MW of conventional generation on the system and therefore will reduce WA's CO_2 emissions by some 81,000 tonnes per annum.[1] Over the life of the project, some two million tonnes of CO_2 that would otherwise be emitted by fossil fuel power stations will be displaced because of the construction of the poultry litter power station.

When the poultry litter decays in the field (composted or broad acre spreading) an equivalent amount of CO_2 is given off during its decomposition as is emitted during the combustion of the litter.

The greenhouse benefit of the proposal is further enhanced when nitrous oxide emissions from biological decomposition of poultry litter when used as a fertiliser is taken into account. This process is estimated to contribute about 18,000 tonnes per annum of equivalent CO_2 emissions (after allowing for a greenhouse warming potential of 310 for nitrous oxide). After allowing for nitrous oxide emissions that occur during combustion of the poultry litter, the additional greenhouse gas benefit of the proposal compared to the existing situation is conservatively estimated to be more than 16,000 tonnes per annum of equivalent CO_2 emissions.

The greenhouse gas benefits of the proposal will be reflected through its contribution to greenhouse gas reduction policies.

The proposal will make a very significant contribution to WA's renewable energy obligations. Table 18 shows the contribution made by the proposed power station and WA's mandatory renewable energy generation required to be installed in WA under the Federal Government's 2000 Renewable Energy Legislation.

[1] Greenhouse gas emissions from fossil fuel generation of electricity in WA is 0.998 kg/kWh (Office of Energy, pers. Comm.).

Table 18 Proposal's contribution to reduction in greenhouse gas emissions

Year	Australia-wide renewable energy requirement to provide 2% of total electricity production (GWh)	Proposal's contribution to Western Australia's renewable energy requirement GWh
2003	1800	50
2004	2600	73
2005	3400	73
2006	4500	73
2007	5600	73
2008	6800	73
2009	8100	73
2010 and later years	9500	73

7.5 NOISE EMISSIONS FROM THE PLANT

EPA Objective (Premises noise)

- To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and applicable guidelines.

7.5.1 Setting

The site for the proposed power station is located on the west of the Brand Highway in a rural environment, approximately 4.5 km north of Muchea.

The locations of the three residences closest to the site of the proposed power station are shown in Table 19 below.

Table 19 Locations of nearest residences

Resident ID	AMG Easting (m)	AMG Northing (m)	Distance from plant site (km)
1	400098	6511673	1.69
2	400122	6511531	1.55
3	400476	6511461	1.35

7.5.2 Assessment procedure or policy context

Environmental Protection (Noise) Regulations 1997

The criteria used for the assessment of noise impacts from noise emitting premises (excluding road and rail traffic, aircraft and safety warning devices) are specified in the *Environmental Protection (Noise) Regulations 1997* and apply to all areas of Western Australia.

These regulations define maximum allowable external noise levels at various types of receiving premises caused by noise emitting premises. The maximum levels to be received at residences are shown in Table 20.

Table 20 Assigned outdoor noise levels for residences

Time of day	L_{A10} (dB)	L_{A1}(dB)	L_{Amax}(dB)
0700 to 1900 hours Monday to Saturday	45 + IF	55+ IF	65+ IF
0900 to 1900 hours Sunday and public holidays	40+ IF	50+ IF	65+ IF
1900 to 2200 hours all days	40+ IF	50+ IF	55+ IF
2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35+ IF	45+ IF	55+ IF

"IF" refers to influencing factor.

The regulations allow for the maximum allowable levels to be increased if there are industrial areas, commercial areas or transportation routes (referred to in the regulations as "influencing factors") within 450 m of the receiving premises.

If noise emissions have any annoying characteristics (such as whining and droning, banging and thumping or a siren) that cannot be reasonably and practicably removed, then predictions of noise levels at receiving premises need to be increased in accordance with the values outlined in Table 21 [2].

Table 21 Adjustments to noise emission levels

Where tonality is present	Where modulation is present	Where impulsiveness is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

Note: These adjustments are cumulative to a maximum of 15 dB(A)

A noise source cannot significantly contribute a level of noise which exceeds the assigned level, where "significantly contribute to" means a value which is more than 5 dB(A) below the assigned level.

Where the prediction of noise levels from new noise sources is required, the procedures described in *Guidance for the Assessment of Environmental Factors – Environmental Noise (Draft)* (EPA 1998) should be followed.

Special allowance for noise levels

The DEP has advised that a Ministerial exemption under the Regulations has been granted to Tiwest which allows a night-time noise level of up to 40 dB(A) at the residences nearest to the proposed power station. In these circumstances, a significant contribution to the assigned level by a noise-emitting source would be 35 dB(A) at the point of reception.

7.5.3 Assessment and management

The major noise sources from the power station are expected to be the steam turbine generator set, the forced draft and induced draft boiler fans, the cooling tower fans and the boiler feed pumps. Other minor noise sources will be from vehicle movements, conveyors and running machinery in the litter shed.

The proponent has recognised the need to minimise noise impacts and will develop a Noise Management Plan as part of the EMP.

The general location was selected on the basis of having a 1 km buffer distance from any residence. A significant factor in the decision to site the facility at the southern-eastern end of the block was to maximise the separation from nearby residences.

The steam turbine generator set, boiler feed pumps and forced draft boiler fans will be within a building which will significantly attenuate noise emissions.

The design of the power station is not sufficiently advanced at this stage to determine equipment sound power levels which would allow the modelling of ambient noise levels.

However, a noise design criterion is that the external noise from any building, or item of equipment outside a building, will be less than 85 dB(A) at 1 metre. This gives an estimated reasonably worst case noise level at 1.35 km from four such sources of less than 30 dB(A) which is well below the 35 dB(A) criterion. When the design is finalised, the proponent will submit to the DEP the results of

[2] Alternatively, the noise criteria at receiving premises can be reduced.

detailed noise modelling to confirm that 35 dB(A) is met at the nearest residence under worst case conditions.

The proponent is aware that the exemption currently provide to Tiwest does not necessarily apply in perpetuity. Special attention will be given during the detailed plant design process to, where practicable, reduce noise emissions to the extent that the ambient night-time noise level at the nearest residence due to the proposal does not exceed 30 dB(A).

Noise impacts from traffic directly associated with the proposal will be minimised by having deliveries of poultry litter and other feedstock materials to the facility limited to 7am to 7pm Mondays to Saturdays.

Infrequent activities that may cause high noise emissions, such as boiler blowdowns, will also be restricted to 7am to 7pm Mondays to Saturdays.

The proponent has also consulted with the local community prior to applying for environmental approval and has factored in their concerns regarding noise to the engineering design and siting of the plant.

Should noise emissions from the proposal, when implemented, cause annoyance to nearby residences, the proponent is committed to using its best endeavours to remedy the situation.

7.6 NOISE FROM TRAFFIC

EPA Objective (Traffic noise)

- To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and applicable guidelines.

7.6.1 Setting

As indicated earlier, there will be 30 vehicles per day accessing the proposed power station. These comprise 15 covered trucks carrying poultry litter and 15 staff vehicles.

7.6.2 Assessment procedure or policy context

The assessment of noise impacts from increased heavy vehicle movements should follow that described in EPA *Guidance for the Assessment of Environmental Factors – Road and Rail Transportation Noise* (Draft) No. 14. The principles that relate to this proposal are:

- the maximum pass-by noise level from any heavy vehicle associated with the proposal should meet the specifications in ADR28/01; and
- all reasonable measures should be undertaken to minimise noise impacts.

7.6.3 Assessment and management

A suitable access point into the facility from the Brand Highway will be constructed to Main Roads WA requirements. This will be the only access to the facility.

Brand Highway is subject to very substantial vehicle usage. Average daily vehicle movements[3] are in excess of 2000 vehicles per day of which about 25% are heavy vehicles. The addition of 30 heavy vehicle movements per day as a result of this proposal will be insignificant in terms of noise impacts. It should be noted that the proposal will displace existing heavy vehicle movements transporting litter to horticultural properties in the metropolitan area.

Main Roads WA have given their 'in-principle' support to the concept plan for this proposal. Other roads used by heavy vehicles servicing the power station will be existing heavy vehicle routes in accordance with Main Roads requirements.

As referred to previously, all heavy vehicle movements to and from the facility will be confined to 7am to 7pm Monday to Saturday. This follows existing procedures for the collection of poultry litter from growers. The proponent will encourage the use of cartage contractors having vehicles that meet ADR28/01.

Should impacts from vehicles associated with the proposal, cause annoyance to nearby residences, the proponent is committed to using its best endeavours to remedy the situation. This could include, for example, placing lower speed limits on the access road to the facility.

[3] Data from Main Roads WA for 1997/98 measured at site 5074: Brand Highway 3kms north of Gingin Brook Road.

7.7 LIQUID AND SOLID WASTES

7.7.1 Setting

The major solid and liquid waste streams are outlined in Table 22, below:

Table 22 Liquid and solid waste streams

SOURCE OF WASTE	DESTINATION
Boiler blown down water	10m3/day to an evaporation pond
Ash	1.2 tph which will be sold as a fertiliser
Evaporation of water from the cooling tower	30 tph from a plume from the cooling tower (if this is used – we are considering an evaporative condenser option)
Spray drift water from cooling tower	0.5 tph if used (see above comment)
Domestic sewage	3 x domestic load from 5 staff/shift to an anaerobic/aerobic treatment and to amended land
Storm water	800m3/peak day 8,000m3/pa to an evaporation pond
Truck washdown water	15m3/day to an evaporation pond (outside of truck is washed; not inside tray)
Sludge from evaporation pond	100m3/pa to landfill via a licensed contractor

The cooling tower blowdown water will be treated in a reverse osmosis (RO) plant to recover water for process use.

Stormwater from areas subject to contamination, waste water from truck washdowns, RO plant retentate, boiler blowdown water and other process effluents will be discharged to two evaporation ponds with a minor amount being used for the trickle irrigation of areas landscaped with native vegetation.

The estimated volume of water to be evaporated is 13,000 kL/a from stormwater falling on the 240 m x 80 m area covered by the power station plant and yard areas plus approximately 12,000 kL/a of retentate and washwater.

Each evaporative pond will have dimensions of 100 m x 50 m and bund walls not less than 2 m high. The required evaporative area was estimated by Process Developments based by rationing data from the Tiwest site where they use a pond with an area of 40,000 m^2 to evaporate rainwater from 96,000 m^2 of paved area.

The ponds will be fully sealed using two layers of 1 mm thick Nylex Millennium Flexible Polypropelene with an intermediate layer of Geonet.

Sewage from the staff toilets and grey water from showers and the staff cafeteria will be treated using a BioMax C20 anaerobic/aerobic digestion plant. Treated effluent (3 kL^3/day) will be disposed of using subsurface drippers across a 600 m^2 area of soil amended to enhance nutrient uptake.

The ash from the combustion process is sold in the UK as a valuable fertiliser and the proponents are negotiating with fertiliser suppliers here in WA who are eager to take this product as an alternative to superphosphate. An ash analyisis was undertaken and reports were prepared by the CSIRO – Appendix 7. Ash will be collected and stored in a sealed enclosure.

7.7.2 Assessment and management

The liquid and solid waste management systems are designed to prevent any contaminated material from entering the wider environment.

All potentially contaminating effluent streams will be directed to the evaporation ponds. The Geonet between the dual liners will be drained to catchment sumps outside the bund walls. This will allow any seepage through the upper liner (eg due to a tear) to be detected and repairs made thus ensuring that any escape of effluent from the ponds is prevented.

The proponent is committed to the ongoing investigation of further measures to re-use and recycle plant wastes. This process will be incorporated into the Environmental Management Plan.

8. SOCIAL SURROUNDINGS

8.1 ABORIGINAL HERITAGE

EPA Objectives (Aboriginal heritage)

- To ensure the proposal complies with statutory requirements in relation to places and sites of heritage significance.
- To ensure the proposal does not result in changes to the physical and biological environment, which adversely affects cultural associations with the area.

8.1.1 Assessment procedure or policy context

Human interference with Aboriginal sites is an offence under the *Aboriginal Heritage Act 1972* unless authorised as outlined in section 17 of this Act. An application to disturb a site may be made under section 18 of the Act to the Aboriginal Culture Material Committee. This Committee will not consider such an application unless relevant Aboriginal people have been consulted.

8.1.2 Assessment and management

An archaeological inspection of the block was conducted on 14 April 2000 – Appendix 8. A further anthropological assessment was carried out (on site) with representatives of the Yued People (WC97/071) (WC97/071) on 20 April 2000.

Before the Aboriginal Heritage Assessment was undertaken, an examination of the AAD Site Register was carried out. While no aboriginal sites were located on the proposed site (Location 1809), three aboriginal sites (No's. 3565, 3566, 3930, all open status) were located in proximity. Aboriginal sites 3565 and 3566 (Ellen Brook: Muchea 1 & 2) are both stone artefact scatters, which were located in 1988 during the heritage assessment carried out for the synthetic rutile plant (Tiwest). Aboriginal site 3930 (Fewster) is an account of a past occupation area, close to where "Redheads" is now located (see Figure 2 of Appendix 8).

The anthropological assessment consisted of viewing the proposed site with representatives of the Yued People (WC97/071).

No Aboriginal sites were located on the block, with no past cultural material (archaeological remains) noted during the course of the inspection.

There were no perceived heritage impediments that have been identified to date that would prevent its establishment (Deep Woods Surveys, 2000).

8.2 VISUAL AMENITY

EPA Objective (Visual amenity)

- To ensure that the proposal's effect on amenity values is minimised.

8.2.1 Potential visual impacts

Parts of the facility will be visible from surrounding areas due to the size of some of the building and structures. The main items are:

- a 40 m high stack;
- the two level Turbine hall building; and
- the two level services building.

8.2.2 Visual impacts control and management

As indicated earlier, the proponents are committed to a weed eradication program and providing site-specific revegetation to environmentally and visually enhance the site. A key component in the landscaping will be the creation of a wetland which is expected to enhance the fauna abundance in the area.

The landscaping program on site will be on-going, with a caretaker responsible for daily maintenance and landscaping contractors brought in as necessary. Vegetation audits will be undertaken as appropriate.

The proponents desire to involve the community, through Green Corps and Work for the Dole schemes, in the ongoing enhancement of the property to achieve outcomes identified by the Vegetation Study.

The buildings and civil works will be consistent with Shire of Chittering guidelines for building materials. In the longer term, the screening trees and shrubs to be planted around the facility are expected to shield all but the stack from direct outside viewing (see Figure 11).

8.3 LIGHT OVERSPILL

EPA Objective (Light overspill)

- To ensure that lighting at the plant does not cause a nuisance to nearby residences.

8.3.1 Potential light overspill impacts

The facility will be operated on a 24-hour per day basis. Outdoor areas including the boiler, condenser and cooling towers will therefore be illuminated at an intensity of 50 Lux.

The facility is likely to be visible during night-time from the Brand Highway during the early years of operation, prior to screening vegetation becoming established. It should be noted that this impact is lessened by the existing light impact arising from the high double street lighting associated with the Tiwest turn-off from the Brand Highway.

8.3.2 Light overspill control and management

The following measures will be used to control light overspill:

- All outside lights will be hooded. Hoods will be regularly checked by a responsible officer on the afternoon shift, as designated by the Manager. Replacement hoods will be kept on-site. Vandalism to the hoods should be averted through site security measures, including fencing and the proponents' participation in a local Industrial or Rural Watch program.
- Screening vegetation will be planted around the perimeter of the site. While it will take time for the vegetation to grow to maturity, planting native species will optimise coverage.

There are not likely to be any light overspill impacts at neighbouring residences because of the significant intervening distance. If, however, a problem does arise, the proponent will endeavour to remedy the cause.

8.4 TRAFFIC

Main Roads WA indicated that the power station would need an entry point to be constructed on Brand Highway to their specifications and have approved an initial concept design (see Figure 11).

8.5 ONGOING COMMUNITY CONSULTATION AND RELATIONS

The proponent is committed to undertake further community consultations during the environmental assessment process and once the design work has been completed.

The proponent understands and values the need to ensure that the community has input to the operation of the facility so that any problems are quickly and effectively resolved. The most effective means of achieving this is to resource, and allocate responsibility to, a position within the operating staff for community liaison. The project therefore, includes a Community Liaison Officer portfolio. This position will report directly to the Power Station Manager, with reports and issues being referred to the Board of Blair Fox Generation WA. This will ensure that public concerns are responded to in an adequate and timely manner.

The operator will be required to liaise closely with the Ellenbrook Catchment Group, the Chittering Landcare Group, Chittering Rural Watch and the Shire of Chittering in the first instance.

Community initiatives have already been discussed with local representatives including the construction of a wetland on-site as a Green Corp project and the potential for similar projects associated with re-vegetation and weed control.

Blair Fox Generation also desires to be an active participant in the local economy. Where possible, local sources will be used for the procurement of equipment and services.

9. ENVIRONMENTAL MANAGEMENT COMMITMENTS

Table 23 Environmental management commitments

No	Topic	Action (Commitment)	Objectives	Timing	Advice From
1	**General Environmental Management**	1. The Proponent will comply with all applicable environmental standards and regulations pertaining to and appropriate for an renewable energy power station and its operations in WA. 2. Prior to commissioning, the Proponent will prepare an Environmental Management Plan (EMP) for the site, which will be submitted to the Department of Environment, Water and Catchment Protection (DEWCP) for approval. 3. The proponent will develop an EMP for the construction phase of the Project. The Construction EMP will be submitted to the DEWCP for approval prior to the commencement of construction. 4. The Construction EMP will be implemented at the site during the construction period by the Proponent and the contractors undertaking the construction activities. 5. The Proponent will prepare an Environmental Management System (EMS) for the operations of the poultry litter power station prior to commissioning. 6. The Proponent will implement the EMS during the commissioning and operation of the poultry litter power station 7. A dedicated phone number will be provided to take any calls related to the plants operation.	To ensure that any potential environmental impacts associated with the construction and operation of the Project are minimised or ameliorated.	During the design, construction, operation and decommissioning of the Plant	EPA Service Unit, DEWCP and other appropriate regulators.
2	**Vegetation community types 3b and 20b**	1. Community types 20b and 3b will remain untouched 2. Fencing of vegetation to protect Vegetation Communities 2A and 2B. 3. Fencing Melaleuca Woodland on the northeast of the site 4. Weed control will be undertaken annually on site.	To maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	During construction phase and opeeration	1. Shire of Chittering 2. The Chittering Valley Landcare Group 3. The Ellenbrook Integrated Catchment

No	Topic	Action (Commitment)	Objectives	Timing	Advice From
		5. A caretaker will be responsible for maintenance and landscaping.			Management Group 4. The Minister of Energy
3	**Groundwater Management**	The Proponent will submit a further hydrogeological report to the Water and Rivers Commission following installation and testing of bores. The report will assess whether the required yield is sustainable, and will propose a monitoring program to check for impacts of abstraction.	To ensure that where changes are proposed on land within the catchment of an important wetland those changes will not lead to unacceptable impacts on either the water quality or the hydrology of that wetland.	Prior to construction	DEWCP
4	**Groundwater Management**	1. Operate monitoring program to check for impacts of abstraction. 2. The Proponent will report the results of groundwater monitoring to the DEWCP on an annual basis.	As for commitment 3	During operation	DEWCP
5	**Surface Water**	1. The Proponent will prepare a Surface Water Management Plan as a component of the site EMP, which will be submitted to the DEWCP prior to commissioning. 2. The plant will be designed to ensure that liquid process wastes and stormwater runoff are retained on site and disposed of in a controlled manner.	To ensure that receiving waterbodies are protected from contamination by providing assessment guidance for the management of surface run-off from industrial and commercial sites. The criteria used for the assessment of surface runoff impacts from new proposals are specified in *Guidance for the Assessment of Environmental Factors – Management of Surface Run-off from Industrial and Commercial Sites (Draft*) (EPA 1999).	Design construction	DEWCP
6	**Surface Water**	1. The Proponent will implement the Surface Water Management Plan. 2. Evaporation ponds sludge will be removed to a appropriate waste facility by a licensed contractor. 3. Sewage effluent will be treated on site and irrigated on amended soil also located on site. 4. All chemicals to be stored onsite in sealed drums to DEP standards and bunded where appropriate in order to ensure containment in the event of a spillage from	As for commitment 5	Operation phase	DEWCP

No	Topic	Action (Commitment)	Objectives	Timing	Advice From
		the general stormwater drainage system.			
7	**Sulphur Dioxide** **Nitrogen Oxides** **Particulates** **Hydrogen fluoride** **HCL emissions**	1. The proponent will develop an EMP for the commissioning phase of the Project. The commissioning EMP will detail a testing program for the boiler stack emissions. The commissioning EMP will be submitted to the DEWCP for approval prior to the commencement of commissioning. 2. Provision will be made within the Plant for a Flue Gas Desulphurisation System 3. Provision will be made within the Plant for a bag filtering cleaning system.	Ensure that emissions meet the air quality standards requirements of the National Environmental Protection Measure (NEPM) and adopted by the EPA. Ensure that emissions are below the maximum permissible levels. Use all reasonable and practicable measures to minimise emissions.	Design phase	DEWCP
8	**Sulphur Dioxide** **Nitrogen Oxides** **Particulates** **Hydrogen fluoride** **HCL emissions**	As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with DEWCP) will be implemented to verify that the emissions are within the specifications described in this document.	As for commitment 7	Commissioning phase	DEWCP
9	**Sulphur Dioxide** **Nitrogen Oxides** **Particulates** **Hydrogen fluoride** **HCL emissions**	1. The concentration in the gas stream will be measured on a six monthly basis and be reported to the DEWCP. 2. The Flue Gas Desulphurisation System and bag filtering cleaning system will be operated as necessary to keep the plant below its licence limits.	As for commitment 7	Operating phase	DEWCP
10	**Heavy Metals** **Dioxin and furans**	1. The proponent will develop an EMP for the commissioning phase of the Project. The commissioning EMP will detail a stack testing program for the boiler stack. The commissioning EMP will be submitted to the DEWCP for approval prior to the commencement of commissioning. 2. Provision will be made within the Plant for a bag filtering cleaning system.	Ensure that any emissions of heavy metals meet acceptable standards. Use all reasonable and practicable measures to minimise emissions of heavy metals.	Design phase	DEWCP

No	Topic	Action (Commitment)	Objectives	Timing	Advice From
		3. Dioxin emission control equipment, such as the GORE-TEX filter system, will be used to control the dioxin emissions.			
11	**Heavy Metals** **Dioxin and furans**	As soon as possible following commissioning of the plant, the stack testing program for the boiler stack (developed in conjunction with DEWCP) will be implemented to verify that the heavy metal emissions are within the specifications described in this document.	As for commitment 10	Commissioning phase	DEWCP
12	**Heavy Metals** **Dioxin and furans**	1. During the first year of operation, the Proponent will sample and analysis the offgas emissions to establish if there are any significant concentrations of heavy metals present. 2. Monitoring results for the heavy metals will be provided to the DEWCP following the first year of operation. 3. Future monitoring of the offgas emissions for heavy metals will be reviewed by the proponent in conjunction with the DEWCP once the results of the first year's monitoring have been assessed.	As for commitment 10	Operation	DEWCP
13	**Greenhouse gases**	1. The proponent will employ energy efficiency in Plant design and operation. 2. The poultry litter power station will apply for accreditation with the Australian greenhouse Office 3. The proponent will calculate greenhouse emissions and report to the DEWCP.	To minimise greenhouse gas emissions in absolute terms and reduce emissions per unit product to as low as reasonably practicable. To mitigate greenhouse gases emissions in accordance with the Framework Convention on Climate Change 1992, an in accordance with established Commonwealth and State policies including Environmental protection Authority Interim Guidance No 12 'Minimising Greenhouse Gases'.	Design phase and operation	AGO
14	**Dust**	1. The proponent will prepare a Dust Management plan as a component of the EMP for the site. 2. The EMP will be submitted to the DEWCP prior to commissioning. 3. The Dust Management plan will be implemented.	Ensure that the dust levels generated by the proposal do not adversely impact upon welfare and amenity or cause health problems by meeting statutory requirements and acceptable standards	Design and Construction	DEWCP

No	Topic	Action (Commitment)	Objectives	Timing	Advice From
15	**Noise**	1. The proponent will develop an EMP for the commissioning phase of the Project. The commissioning EMP will detail a Noise Management Plan. 2. A noise design criterion is that the external noise from any building, or item of equipment outside a building, will be less than 85 dB(A) at 1 metre. 3. The Noise Management Plan will be implemented.	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements specified in the *Environmental Protection (Noise) Regulations 1997* Follow the EPA Guidance for the Assessment of Environmental Factors – Road and Rail Transportation Noise (Draft) No. 14. • All reasonable measures should be undertaken to minimise noise impacts.	Design phase and construction	DEWCP
16	**Noise**	1. A noise monitoring survey will be undertaken once the Plant is operational to ensuer that noise levels are within those predicted 2. Should noise emissions from the proposal, when implemented, cause annoyance to nearby residences, the proponent is committed to using its best endeavours to remedy the situation.	As for commitment 15	Operation phase	DEWCP
17	**Hazardous Materials**	1. The proponent will prepare a Hazardous Materials plan as a component of the EMP for the site, which will be submitted to the DEWCP prior to commissioning. 2. The Hazardous Materials Plan will be implemented.	Ensure that any hazardous materials to be used on site are transported and stored and used in a safe and environmentally acceptable manner.	Design and operation phase	DEWCP
18	**Waste Management**	The Proponent will prepare a Waste Management Plan based on the principles of Reduce, Recycle and Re-use. The Waste Management Plan will be a component of the site EMP, which will be submitted to the DEWCP prior to commissioning.	Where possible, waste should be minimised, reused or recycled. Solid waste should be treated on site or disposed of offsite at an appropriate landfill facility. Where this is not possible contaminated material should be managed onsite to prevent groundwater and surface water contamination or risk to public health.	Design phase	DEWCP

No	Topic	Action (Commitment)	Objectives	Timing	Advice From
19	**Waste Management**	The Waste Management Plan will be implemented.	As for commitment 18	Operation phase	DEWCP
20	**Visual amenity**	1. The buildings and civil works will be consistent with Shire of Chittering guidelines for building materials. In the longer term, the screening trees and shrubs to be planted around the facility. 2. A caretaker responsible for daily maintenance.	Visual amenity of the area adjacent to the project should not be unduly affected by the proposal	Design phase and construction	

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