

# **Proposed Power Supply: Expansion of Pinjar Turbine Power Station**

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**State Energy Commission of Western Australia**

**Report and Recommendations of the  
Environmental Protection Authority**

**Environmental Protection Authority  
Perth, Western Australia  
Bulletin 501 March 1991**

# **Proposed Expansion of the Pinjar Gas Turbine Power Station, Stage "C"**

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ISSN 1030-0120  
ISBN 0 7309 3500 0  
Assessment Number 357

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# 1. Background

The State Energy Commission of Western Australia (SECWA) originally received approval from the Environmental Protection Authority to construct a gas turbine power station consisting of eight 35 megawatt (MW) gas turbines, at Pinjar north of Perth in January 1988 (Bulletin 370).

Although eight units were approved by the Environmental Protection Authority, SECWA have decided to install only seven units at this time. SECWA commenced construction of the power station in 1989 and it is expected that they will have installed and commissioned the seven units by June 1991.

SECWA's original proposal (April 1988) identified that it would be unlikely that the operational role of the power station would need to be increased.

However, in a review of its electrical load forecasts for the State in December 1989 SECWA determined that, compared to its Central Forecasts in 1988 (which assumed a new base load plant would be on line by 1994), an additional 300MW of gas turbine plant would be required to meet the State's power supply requirements until a new base load plant enters service.

Accordingly, the Commission referred its intentions to develop this forecast generating capacity at the existing Pinjar gas turbine site in January 1990. The Authority determined that the proposal should be assessed by a Consultative Environmental Review (CER) which is a formal level of assessment under the Environmental Protection Act, 1986 and from which the Minister for the Environment can set legally binding environmental conditions.

## 2. The site

The site is located approximately 45km north of Perth on Crown land, which is presently administered by the Department of Land Administration, but is proposed for incorporation into State Forest No. 65. When this change has occurred, the land will be managed by the Department of Conservation and Land Management (CALM).

SECWA propose that the development of a power station in this area is consistent with its designated "multiple use" purpose as described in the Northern Forest Region Management Plan (CALM 1987).

Given the expanding limits of the metropolitan area (Figure 1), the site is still located in a comparatively sparsely populated area. The surrounding land use is predominantly for pine plantation and native vegetation. The site is located over the Gnangara Mound, a major resource for Perth's drinking water supplies identified as an Underground Water Pollution Control Area by the Water Authority of Western Australia.

## 3. The proposal

SECWA proposes to expand the generating capacity of the approved Pinjar gas turbine power station site (eight 37MW units) by approximately 300 megawatts (MW). This represents a doubling in the power generating capacity of the power station.

In SECWA's original proposal (1988) the plant was proposed, and has only been approved by the EPA, as peaking plant which can operate at times of high demand (1 to 8 hours per day) or in emergencies.

In the expansion proposal (1990) the new gas turbines are proposed to operate as mid-merit plant which are generally started up in time to meet the rise in demand on weekday mornings and then operated throughout the day (up to 12 hours per day).

The proposed expansion has been presented under two scenarios, the installation of:

- (i) three 105MW open cycle gas turbines; or
- (ii) two 105MW gas turbines in combined cycle with a 100MW steam turbine.

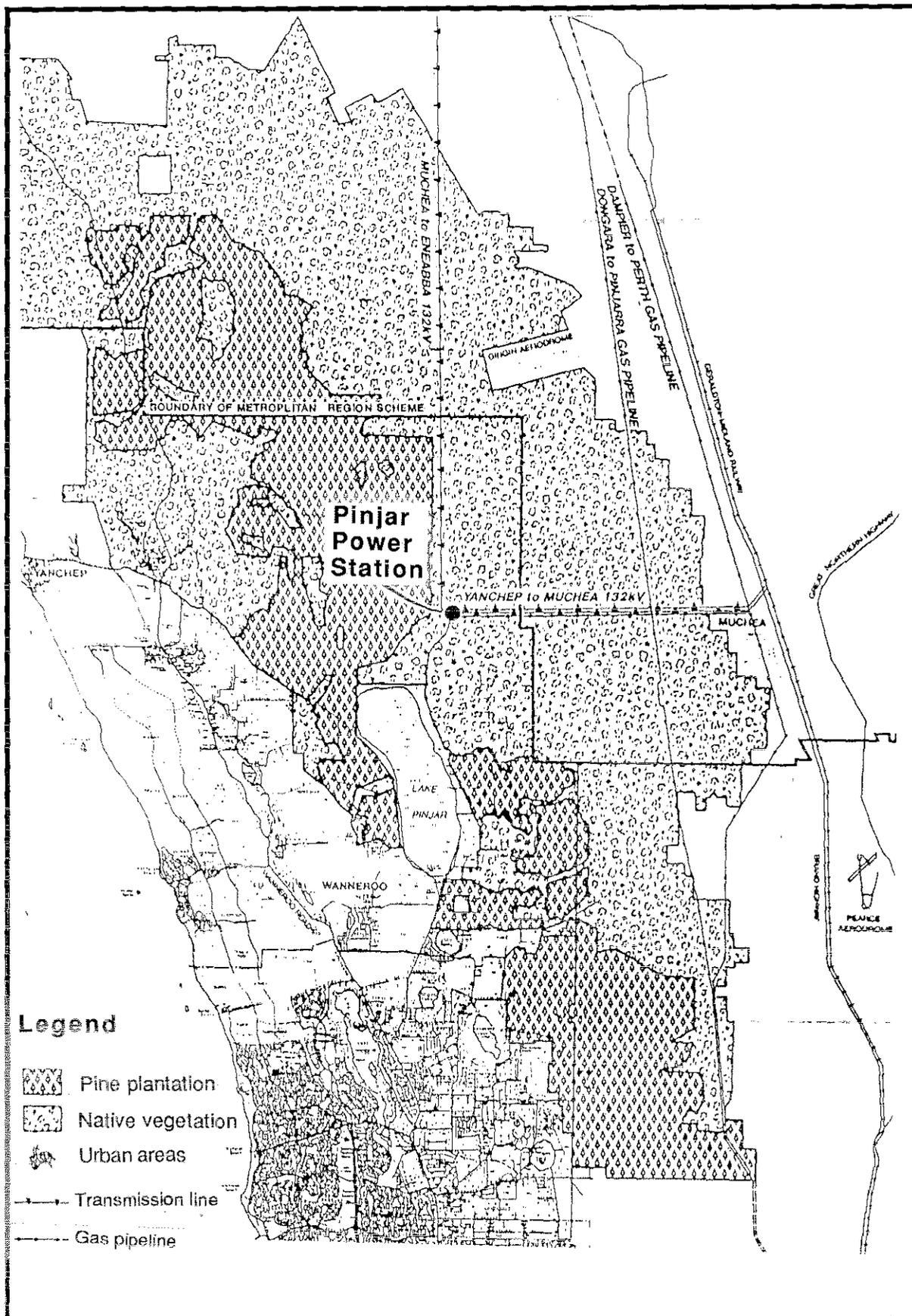


Figure 1: Location map (Source: SECWA's CER)

## 4. Potential environmental impacts assessed by the Environmental Protection Authority

The Authority considers that many of the environmental issues associated with this proposal have not significantly changed since the previous assessment (Bulletin 370, January 1990). These issues include:

- noise impacts;
- impacts on the landscape and surrounding land uses; and
- impacts on the area's groundwater resource.

The Authority considers that the EPA's previous assessment (Appendix 1) together with SECWA's list of environmental management commitments (Appendix 2) has adequately addressed these issues as they relate both to the expansion proposal and the site in general. Therefore the Authority does not propose to duplicate its assessment of these issues in this Assessment Report. However, in relation to the proposed change in the noise buffer zone, it is suggested that SECWA establish arrangements with the appropriate land owners affected by the noise buffer zone and land use planning authorities to ensure its integrity and prevent inappropriate land uses in the future.

The Authority has determined that in its assessment of the Pinjar power station expansion proposal the principle issues to be addressed are those associated with potential air emission impacts.

The Authority is concerned to ensure that the following issues are properly addressed:

- ground level concentrations of NO<sub>2</sub> (nitrogen dioxide);
- photo-chemical smog potential and its relationship to NO<sub>x</sub> (oxides of nitrogen); and
- plume visibility.

SECWA concluded, from its own investigations, that the environmental impacts of air emissions from the proposed expansion would not be so significant as to be a constraint on the proposal.

However, although the Authority considers that SECWA's conclusion is based upon a reasoned argument, given the absence of real data, the validity of a number of the assumptions made by SECWA cannot be fully assessed. Hence the conclusion itself cannot be reliably assessed.

SECWA has been aware of this need for air emissions monitoring data since the original proposal was presented. For example, in SECWA's original proposal, it noted that:

"... a significant increase in power production at the station would create a requirement to accurately re-examine the effects of NO<sub>x</sub> discharges in the exhaust emissions as these will be correspondingly higher." (Notice Of Intent, April 1988, p.29)

Also in a supplementary report prepared for SECWA the following information was provided to the EPA:

"Should, however, the capacity factors be considered for a marked increase in the future, the experience with atmospheric pollution in metropolitan cities such as Sydney and Melbourne would make a comprehensive study of the consequences of the emissions for air quality in the airshed imperative." (Notice Of Intent, April 1988, Appendix C)

Furthermore, SECWA identified that:

"A detailed study of air pollution potential will be conducted prior to any significant uprating of the operational role of the power station." (Notice Of Intent, April 1988, p4)

Altogether, these statements foreshadowed that a significant expansion to the proposed power station would require substantially more information including monitoring data.

## **4.1 EPA's approach to atmospheric emission assessments**

In assessing the acceptability or otherwise of emissions to the atmosphere, the EPA uses two complementary criteria.

Firstly, the emissions (when combined with emissions from any existing or likely future sources) should not cause environmental impacts beyond environmentally acceptable limits. These environmental impacts are normally assessed via computer modelling which relies heavily on meteorological data and needs to be verified against measurements (monitoring data) of the respective air pollutants. The Authority regularly utilises the Victorian EPA guidelines as a starting point in its assessment of ambient air quality impacts.

Secondly, irrespective of the magnitude of the environmental impact, proponents of projects involving a new emission source should take all reasonable and practicable measures to prevent or minimise the discharge of waste. This criterion is provided for under the provisions of Section 51 of the Environmental Protection Act, 1986. The Environmental Protection Authority considers that the Australian and New Zealand Environment Council/National Health and Medical Research Council (ANZEC/NH&MRC) National Guidelines for the Control of Emissions of Air Pollutants from New Stationary Sources (1985) are directly applicable to this second criterion.

This second criterion is directed towards ensuring the long term protection of the environment, and preventing individual emitters from unnecessarily consuming the region's assimilative capacity to absorb pollutants. It should be noted that the unnecessary utilisation of the environment's assimilative capacity may preclude future developments which may be considered desirable by the community.

## **4.2 EPA's assessment of the atmospheric emissions from the original proposal (April 1988)**

In January 1989 the EPA accepted a proposal to install eight gas turbines at Pinjar with no provision for oxides of nitrogen (NO<sub>x</sub>) suppression equipment to be fitted.

These units were projected to emit well in excess of the ANZEC/NH&MRC emission guideline of 34 parts per million (ppm) NO<sub>2</sub>, but the following arguments advanced by SECWA were considered by EPA to render the proposal environmentally acceptable overall:

- (i) the only commercially available system for NO<sub>x</sub> suppression (via water injection into the combustion chamber) introduced a number of operational and possibly environmental problems.
- (ii) environmental impacts were predicted to be relatively small.
- (iii) the gas turbine units would be used as peak load plant only, i.e. they would run for short periods of time each day.
- (iv) SECWA gave an indication that future expansion of the site was unlikely.

## **4.3 EPA's assessment of the atmospheric emissions from the current proposal**

The current proposal includes the installation of a further 300MW of power generating capacity at the site which would result in more than a doubling of the NO<sub>x</sub> emissions.

The current proposal presents a good analysis of ground level concentrations of NO<sub>2</sub> from the fully developed site. It concludes that relevant objectives for NO<sub>2</sub> concentrations will not be exceeded even under adverse conditions. However, the analysis suffers from a lack of monitoring data to support estimates of background NO<sub>x</sub> and ozone levels (discussed below) but is nevertheless considered acceptable as an interim analysis until such time as more data is available.

Plume visibility (brown plumes) associated with NO<sub>x</sub> emissions has been identified as a potential issue at the Pinjar power station but the analysis undertaken in the CER is limited to assessing visibility of the plumes close to the stacks. The possibility of visible plumes at greater heights and distances is of

concern to the Authority, and this issue still needs to be fully addressed by SECWA for both the approved frame 6 machines and the current proposal.

Accordingly, the Environmental Protection Authority considers that the power station site should be licensed under Part V of the Environmental Protection Act, 1986 in order to ensure such investigations and any necessary remedial actions are undertaken.

The potential for the gas turbines to contribute to photo-chemical smog formation was assessed by SECWA via a desk top analysis with virtually no supporting monitoring data. Had SECWA undertaken a detailed assessment as proposed in its original document in April 1988, the Authority would be in a better position to assess the environmental implications of this proposal.

SECWA's photo-chemical smog analysis focuses on attempting to predict whether or not the gas turbine units will increase the production of smog without providing any reliable indications of the actual levels of smog products (notably ozone). Although the scientific theory employed is sound, the results depend heavily on estimates of hydrocarbon and NO<sub>x</sub> emissions across the metropolitan area and the dubious assumption that these are well mixed.

The EPA has not to date, had the resources to mount a comprehensive study of metropolitan air quality but recent preliminary results and analysis indicate that photo-chemical pollution does occur at significant levels in the metropolitan area on certain occasions and that the addition of more NO<sub>x</sub> could increase these levels. Whether emissions from Pinjar would make a significant contribution to smog levels is unknown.

#### **4.4 Oxide of nitrogen emission suppression technologies**

The 105MW gas turbines proposed for use at the site would emit 127ppm NO<sub>x</sub>. The CER advances an argument against the application of the ANZEC/NH&MRC stationary source emission guideline of 34ppm. That argument includes an assessment of available NO<sub>x</sub> control technologies.

SECWA suggests that water injection is the "best available technology" and several problems associated with the method are discussed before SECWA conclude that NO<sub>x</sub> control technology is not warranted on environmental grounds.

The Authority considers that water injection is a less desirable option, compared to dry low-NO<sub>x</sub> systems, but cannot assess its environmental implications without further information which SECWA would need to provide should they wish to promote water injection systems at Pinjar.

Another way to reduce NO<sub>x</sub> emissions is through the special design of burners but this method is also rejected by SECWA as developmental, and as yet unavailable at reasonable cost.

The EPA has itself investigated the effectiveness and availability of special burner designs (commonly called "dry low-NO<sub>x</sub>" systems) and has found that such systems are very effective and have recently become commercially available from two major manufacturers. The emission values cited by the manufacturers are all below 40ppm and their installation would meet the EPA's second atmospheric emission criteria of ensuring all reasonable and practicable measures had been taken in the design and operation of the proposal. Furthermore, the EPA is unaware of any compelling reasons against requiring future gas turbines to be fitted with similar emission technology thus enhancing the gas turbines reputation as a clean source of electricity.

However, SECWA is already committed to the purchase of a brand of gas turbine for which a dry low-NO<sub>x</sub> system is not yet available (but will be available in due course). Such models would not meet the environmental standards applied in Sydney or Melbourne for new installations.

#### **4.5 EPA's recommendations**

The Environmental Protection Authority is concerned with the potential air emission impacts associated with the Pinjar gas turbine power station.

SECWA has concluded that ambient NO<sub>2</sub> emission levels, photo-chemical smog potential and plume visibility issues associated with the expansion should not present a constraint to the proposal.

These issues relate to the Authority's first criteria in its assessment of emissions to the atmosphere and the Authority considers that this conclusion (notably in relation to smog) is only as good as the data used to predict the air emission impacts which is itself limited as discussed above.

In relation to the Authority's second criteria for atmospheric emission assessments, the proposed gas turbines would have approximately 4 times the NO<sub>x</sub> emission levels (127ppm) when compared with the ANZEC/NH&MRC guidelines for emissions from stationary sources (34ppm). The Authority understands that dry low-Nox systems are currently available for other brands of gas turbines and that older systems are now being retrofitted in the Northern hemisphere to meet more stringent atmospheric emission levels. Accordingly, the EPA considers that the ANZEC/NH&MRC guidelines are a practicable and reasonable expectation for new gas turbine installations.

The Authority advised SECWA that it was rare for the EPA not to apply the ANZEC/NH&MRC emissions guidelines for proposals assessed under the Environmental Protection Act and that exceptions to this position are only considered if the proponent can demonstrate that its application is not warranted in a particular case.

In response to the above concerns, SECWA has put forward a proposal (Appendix 3) to undertake a detailed multimillion dollar Perth airshed study to provide the information needed to further evaluate the air quality work provided in the CER. The results of the study would then allow a decision for the need or otherwise, to retrofit the gas turbines at Pinjar to be deferred pending the results and evaluation of the study by EPA.

The Authority has reviewed the terms of the study and considers that it will fulfil the Authority's expectations from SECWA's 1988 Report in that it will provide real monitoring data that will allow the EPA to fully assess predicted air emission impacts from the Pinjar power station and act to ameliorate any impacts based on the results of the study. The study will also have much wider benefits by providing the EPA with a sound basis on which to assess impacts on Perth's urban air quality from a wide range of future developments, notably those involving the combustion of fossil fuels eg. increased motor traffic and additional power generating facilities.

Therefore the Authority recommends that Scenario 1 of the Pinjar "C" Gas Turbine Power Station Expansion proposal, involving the installation of up to three open cycle frame 9 (105MW) gas turbines, could proceed subject to the recommendations in this Report, SECWA's list of environmental management commitments, SECWA's commitment to undertake a Perth airshed study and SECWA's commitment to retrofit the frame 9 gas turbines should the EPA decide that the results of the Perth Airshed study indicate that air emission impacts from Pinjar are environmentally significant.

## **Recommendation 1**

**The Environmental Protection Authority recommends that the installation and operation of up to three open cycle frame 9 (105MW) Gas Turbines as described in Scenario 1 of the State Energy Commission of Western Australia's Consultative Environmental Review for the Pinjar gas turbine power station could proceed subject to the recommendations in this Report, SECWA's list of environmental management commitments and SECWA fulfilling its commitments to fund and complete a Perth airshed study.**

**The Environmental Protection Authority recommends that this study should be completed to the Environmental Protection Authority's satisfaction within four years of any Ministerial approval for the expansion of the Pinjar gas turbine power station and the Environmental Protection Authority should make appropriate recommendation(s) based on the results of that study, as it relates to the need or otherwise to retrofit the frame 9 and any existing gas turbines, to the Minister for the Environment.**

**Failing the adequate implementation or completion of the study as determined by the Environmental Protection Authority, SECWA should be required to retrofit the frame 9 gas turbines with NO<sub>x</sub> suppression systems to the satisfaction of the EPA.**

The Authority considers that the water supply and wastewater management issues associated with combined cycle gas turbine systems as identified under Scenario 2 by SECWA, would need to be

further reviewed by the EPA should SECWA choose to propose such a system. The Authority indicates the protection of the Gnangara groundwater mound would be the EPA's pre-eminent concern.

As identified in Section 4.3 the Authority considers that the Pinjar Gas Turbine Power Station site should be licensed under the provisions of Part V of the Environmental Protection Act to ensure that ongoing investigations by SECWA and any necessary remedial actions are undertaken.

If the results of the Perth airshed study indicate that the environmental impacts of the existing frame six gas turbines are greater than those predicted by SECWA in 1988, the EPA would assess the need for corrective measures under Part V of the Environmental Protection Act. Accordingly, the Environmental Protection Authority recommends that:

## **Recommendation 2**

**The Environmental Protection Authority recommends that SECWA apply for a licence under Part V of the Environmental Protection Act for the development and operation of the Pinjar gas turbine power station.**

Furthermore, as discussed above the Authority recommends that future gas turbine installations should be required to meet the ANZEC/NH&MRC guidelines for emissions from stationary sources. These emission levels are currently applied in Sydney and Melbourne and are achievable using currently available NO<sub>x</sub> reduction techniques.

## **Recommendation 3**

**The Environmental Protection Authority recommends that all reasonable and practicable measures should be taken by SECWA to reduce atmospheric emission levels from future gas turbine installations to the satisfaction of the Environmental Protection Authority for metropolitan or near-metropolitan installations. This means that the ANZEC/NH&MRC guidelines should be met.**



## **Appendix 1**

**Environmental Protection Authority's original assessment of  
the Pinjar Gas Turbine Power Station, January 1990**



280 MW GAS TURBINE POWER  
STATION AT PINJAR

STATE ENERGY COMMISSION

REPORT AND RECOMMENDATIONS  
OF THE  
ENVIRONMENTAL PROTECTION AUTHORITY

Environmental Protection Authority  
Perth, Western Australia

Bulletin 370 January 1989



## 1. BACKGROUND

The State Energy Commission is proposing to establish a gas turbine power station at Pinjar, north-east of Wanneroo.

At completion of construction in 1994, the station will comprise eight 35 MW gas turbine units. Initially only two units will be built, the others being added over the next six years.

The station is designed to meet peak power loads and provide emergency power to the grid. The ability of gas turbines to come to power very rapidly makes them ideal for this proposed purpose. The gas turbine will link into the state grid supplying energy south to Perth and acting as a switch station for powerlines from the north. The EPA required that the SEC prepare a detailed Notice of Intent (NOI) for this project.

## 2. THE SITE

The site is shown in Figure 1, it is situated on Crown Land in banksia woodland in a comparatively sparsely populated area. Surrounding land uses are pine plantation and native vegetation.

## 3. THE PROPOSAL

It is proposed to fuel the station with natural gas piped to the site from the existing Dampier to Perth Gas Pipeline via a new lateral. Fuel oil will be stored on site for back-up in the event that the gas supply is interrupted. The station will be linked to the main grid via existing 132 KVA transmission lines which pass close to the site.

## 4. ENVIRONMENTAL IMPACTS AND MANAGEMENT

In its assessment of the NOI the EPA gave particular consideration to the following environmental issues:

- . the emission of noise from the turbines; and
- . the air emissions, particularly of oxides of nitrogen (NOx).

The EPA also considered:

- . arterial impacts - the routes taken by the gas supply pipeline, power lines and access roads;
- . the possible contamination of the Gnangara Mound groundwater resource by fuel oil spillage;
- . the impact of the construction of the plant; and
- . fire risk.

These impacts are discussed below:

### 4.1 NOISE

Gas turbines are known to be noisy. There are noise attenuating design modifications possible. However, the best option for minimising noise impact is to provide an adequate buffer zone.

At the two closest residences approximately 5 km to the south west, background noise levels have been measured at 25 and 27 dB(A) respectively. These figures indicate a very quiet neighbourhood. Taking into account various factors which may decrease the noise such as the shape of the land, vegetation and weather conditions, the NOI calculates that at 2.5 km from the plant the noise level will be 30 dB(A) with all the 8 turbine units operating. The NOI reports that this will occur no more frequently than 85 hours/year. This is the maximum allowable night time noise level set by the "Assigned Outdoor Neighbourhood Noise Levels" established under the Environmental Protection Act, 1986. Consequently the NOI propose that a buffer zone extends out 2.5 km from the site.

The EPA considers that the noise emissions from the station outside the buffer zone will not be disruptive to residents of the area. The gas turbine station buffer zone will however have implications for the use of the area within the buffer zone and consequently the EPA supports the interaction currently taking place between the Shire of Wanneroo, the State Planning Commission and CALM to ensure appropriate land uses take place within and outside the buffer zone.

#### 4.2 AIR EMISSIONS

Because the station is powered by turbines which burn gas there will be very little emissions of sulphur compounds or particulates which commonly cause nuisance from oil and coal powered stations.

However because of the high temperatures associated with gas turbines there will be emissions of oxides of nitrogen (NOx) from the plant.

The estimated exhaust gas NOx emission from the turbine is between 0.42→0.54 g/m<sup>3</sup> while operating at base load and depending upon whether gas or back-up emergency fuel oil is used. The relevant National Health and Medical Research Council NOx concentration guideline is 0.07 g/m<sup>3</sup> which is considerably lower than the estimated emissions.

The NOI argues that although the estimated emissions are higher than the recommended guideline the emission is environmentally acceptable for the following reasons:

- (i) when all the exhaust conditions for gas turbines and normal coal/oil powered steam boiler stations are corrected to comparable power production conditions, the NOx emissions for both plants are similar and within the NH & MRC guidelines for steam boilers;
- (ii) the gas turbines will only operate intermittently and mostly not at full capacity;
- (iii) the mathematical modelling of the ground-level fall out of NOx was conducted very much on the worst case. Despite this, these results produced predicted maximum ground level concentrations of NOx lower than the Victorian EPA standards for conventional power stations.

The NOI also addresses the possibility that NOx emissions from the plant will contribute to the formation of photochemical smog. The NOI lists reasons why it is considered the emissions from the gas turbine will not contribute to the formation of photochemical smog. In summary, there are:

- . the prevailing atmosphere conditions are not conducive to smog formation;

- . there is a low ratio of non-methane hydrocarbons to NOx in the Perth air shed. This condition limits the formation of photochemical smog.

Based on the information in the NOI, and that the site is removed from other major NOx sources the EPA considers that the air emissions from the plant are acceptable.

## 5. IMPACTS ON LANDSCAPE AND SURROUNDING LAND USES

The NOI addressed the following issues:

- the visual profile of the plant;
- the impact of clearing the site and the pipeline construction on vegetation and the spread of dieback;
- the effects on other uses, particularly recreational uses, of the area surrounding the station; and
- the added effect of fire risk on the area.

The EPA considers that given the information in the NOI and the additional discussions taking place between CALM and the SEC that the plant will not be obtrusive and the surrounding uses of the area will be effectively managed. The EPA requested that the SEC brief the Authority on the proposed possible routes for powerlines to and from the gas turbine station. The SEC defined two broad sets of proposed routes between the Pinjar station and Perth northern terminal at Gnangara. These two sets of proposed routes are (see Figure 2):

- from SEC northern terminal north between the electromagnetic interference exclusion zones around OTC and Pearce over State Forest 65 to Pinjar;
- west from SEC northern terminal across the Swan River along the foothills or scarp then east to Pinjar.

The EPA considers that the option to cross the Swan River is not environmentally acceptable and consequently favours the more direct northern route for the powerlines.

The actual selection of a route within this corridor will be the subject of a later assessment by the EPA.

The route of the gas supply pipeline lateral from the Dampier-Perth gas main will follow the existing Muchea-Yanchep transmission line easement.

## 6. IMPACTS ON WATER RESOURCES

As the station does not use water in the power generation cycle there is no major water use or discharge occurring. The proposed site overlies the Gnangara Mound, which will be used as a water supply for Perth in the future.

The EPA acknowledges that there is a potential for pollution of the ground water reserve either from the spillage of fuel oil on site or from an accident involving transport of fuel to the site. Consequently the EPA does not consider that this project should be seen as setting a precedent for the establishment of any large fuel oil store above a groundwater resource. It has therefore, made a recommendation to this effect.

## 7. CONCLUSIONS AND RECOMMENDATIONS

The SEC is proposing to develop gas turbine power station at Pinjar to supply peak load demand. The NOI prepared by the SEC addressed the major environmental issues of noise emissions and NOx emissions from the station as well as other issues. The EPA has also been briefed on the proposed routes of the powerlines.

Based on the information and commitments in the NOI and the subsequent briefing by the SEC on powerline routes.

### RECOMMENDATION 1

The EPA considers that the SEC's proposal to establish a gas turbine power station at Pinjar is environmentally acceptable provided that:

- the SEC adheres to the commitments made in its Notice of Intent;
- the powerlines from the proposed power station to SEC northern terminal follow the broadly defined north-south route passing between the electromagnetic interference exclusion zones around RAAF Pearce and the OTC station at Gnangara and are referred to the Environmental Protection Authority for assessment.

### RECOMMENDATION 2

The EPA considers that the water resource below the gas turbine station should be protected from contamination by hydrocarbons. Therefore, the EPA recommends that the State Energy Commission prepares plans detailing the design of storage, monitoring of leaks and transport contingencies for the fuel oil used at the gas turbine station. These plans should be to the satisfaction of the Water Authority of WA.

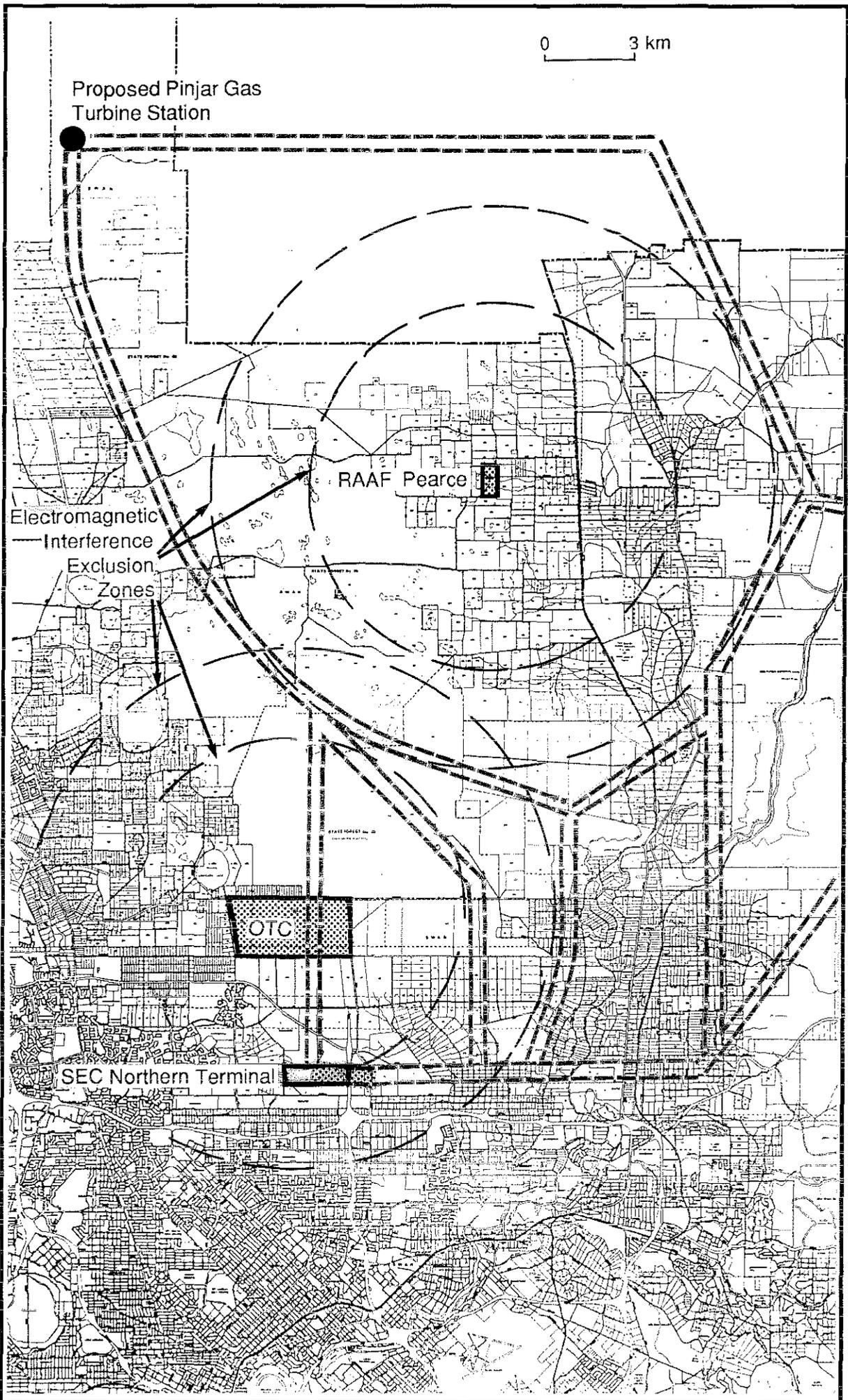


Figure 2 Proposed Possible Routes of Powerlines



## **Appendix 2**

**The State Energy Commission of Western Australia's  
Environmental Management and Monitoring Commitments,  
October 1990**



## 5.0 ENVIRONMENTAL MANAGEMENT AND MONITORING COMMITMENTS

### 5.1 Landscape Considerations

SECWA has employed a specialist Landscape Architect to develop landscaping plans for the Power Station. Strategic plantings of native trees and shrubs will be established to soften the visual profile of the power station and to enable the site to blend with the surrounding landscape to the greatest practical extent.

### 5.2 Noise

Monitoring of operational noise from the proposed turbines and in the peripheral environment will be conducted at commissioning, and on an annual basis thereafter. Monitoring stations will be established at appropriate locations along the power station site boundary, at the buffer zone boundary and at the nearest residences during the initial years of operation to establish the noise characteristics that result from various load and weather conditions that will be experienced.

The noise monitoring programme will be conducted to specifications discussed and agreed with EPA and will be reported on an annual basis.

### 5.3 Atmospheric Emissions

Stack gas analysis for  $\text{NO}_x$  will be the primary method of monitoring atmospheric emissions from the power station. SECWA will liaise with the EPA in relation to additional emission monitoring that may be technically useful.

Following the testing of emission quality at commissioning, measurement of  $\text{NO}_x$  concentration in the stack emissions from each turbine will be conducted annually according to a method and procedure approved by the EPA. Results of monitoring will be supplied annually to the EPA.

#### 5.4 Groundwater Management

Recognizing that the power station site is located within the Gngangara Water Reserve which is designated as a Priority One source area within the Water Authority's Draft Land Planning and Groundwater Resource Protection Policy, the handling and storage of distillate and chemicals for both the construction phase and operations phase is carried out in accordance with the Water Authority's requirements. Extensive specifications for safe handling of potential groundwater contaminants have been developed and incorporated in working procedures for construction and operation.

A total of seven monitor bores have been installed around the power station site and a full complement of samples have been analysed to enable background conditions to be determined.

Groundwater samples will be recovered from each monitor bore on a quarterly basis and will be analysed for a range of routine water quality parameters including hydrocarbons.

In addition, on an annual basis, monitor bore samples will be analysed using ultra sensitive techniques to detect trace organic chemicals that may indicate release of petroleum products.

On a quarterly basis water samples will be collected from the underdrains that have been installed beneath the stormwater evaporation pond and the emergency distillate fuel storage tank, and analysed for a range of routine water quality parameters including hydrocarbons. As for groundwater samples, on an annual basis, underdrain samples will also be analysed using ultra sensitive techniques that will detect release of petroleum products.

Water samples will be collected and analysed according to methods approved by the Water Authority, and will be analysed by a NATA registered laboratory.

#### 5.5 Distillate Delivery to Pinjar

In the event that gas supply for the Frame 6 gas turbines is unavailable for an extended period of time, beyond the static capacity of on-site emergency

distillate storage tanks, there may be a need to transport significant quantities of distillate to Pinjar by road. Recognizing that road transport of distillate will create risk of distillate spillage through a road tanker accident, management approaches and procedures to minimize the risk of environmental contamination by distillate have been developed. Management of distillate transport incorporates the measures listed below, which together have the objective of minimizing both the environmental and social consequences of a possible distillate transport campaign.

- i) Distillate handling and transport will utilize procedures specified for hazardous materials by the Regulations of the Explosives and Dangerous Goods Act (1961-1986). Although distillate is specifically not classed as a "hazardous material" within the regulations, this approach will reduce the risk of spillage resulting from a road accident. Specific procedural measures will include:
  - (ii) Tankers normally utilized for motor spirit transport and that are constructed to specific engineering standard such that risk of tank rupture following road accident is minimized, will be utilized for distillate transport.
  - (iii) Emergency information panels will be affixed to distillate transport vehicles so that safety and handling instructions are readily available in the event of an accident.
  - (iv) Tanker drivers licenced under the Act to operate hazardous materials transport vehicles will operate the distillate transport vehicles.
  - (v) Transport routes that are as short as possible, maximize the use of major arterial roads and traverse a minimum distance through residential areas will be utilized for distillate transport.
  - (vi) Distillate deliveries will be restricted to daylight hours, except during emergencies.
  - (vii) The adequacy of road design throughout the possible routes for the transit of distillate delivery vehicles will be routinely monitored

- (viii) A contingency plan for road tanker accidents will be maintained by the Fuel Supply Contractor in accordance with the Western Australian Hazardous Materials Emergency Management Scheme (WAHMEMS) to the satisfaction of the Water Authority of Western Australia.

## 5.6 Dieback Management

Dieback is known to be present in State Forest No. 65, therefore disease protection measures have been instituted for the construction phase of the project. Dieback management will be continued throughout the construction and operations phases in consultation with CALM's District Manager, Wanneroo. The following measures have either been conducted already or will be conducted in the future.

- i) A dieback survey was conducted at the proposed site and within the pipeline corridor and access routes prior to commencement of construction. Dieback infected areas were not identified by survey.
- ii) Areas that are found by future surveys to be infected will be marked out on site and will be separately treated during site preparation. A handling procedure will be developed in consultation with CALM in the event that dieback infestation is identified within the area influenced by the power station or associated infrastructure and linear services.
- iii) All earthmoving machinery will be washed down off-site and will be inspected by CALM representatives prior to entry into State Forest areas.
- iv) Vehicular movements through adjacent vegetation will be limited to those required by essential services such as gas pipeline inspection and fire break maintenance.
- v) Dieback surveys along road access routes and service easements will be conducted at appropriate intervals.

## 5.7 Fire Management

The construction and maintenance of firebreaks in the region around the station has been conducted in consultation with the WA Bush Fires Board. Fire fighting equipment is maintained on site by SECWA to deal with accidental fires within the station. Controlled burning is also carried out to reduce fuel levels within woodland vegetation surrounding the site in accordance with procedures established by the WA Bush Fires Board.

Heavy vehicle crossing points have been established at one kilometre intervals along the entire length of the gas pipeline. The pipeline will be strengthened at these locations to enable heavy vehicles involved in forestry activities or fire fighting to safely cross.

## 5.8 Summary of Environmental Management Commitments

### 5.8.1 Landscape Management

SECWA will continue to conduct landscaping site works to soften the visual profile of the power station and to enable it to blend with the surrounding landscape to the greatest practical extent.

### 5.8.2 Noise Monitoring

Monitoring of operational noise will be conducted by SECWA. Direct reading sound pressure level meters will be used to measure noise from the turbines following commissioning, and on an annual basis thereafter.

Opportunistic measurements will be taken close to the turbines, at the power station boundary, at the buffer zone boundary and at the nearest residences, during the initial years of operation to establish the noise characteristics that result from various load and weather conditions.

The noise monitoring programme will be conducted to specifications agreed by the Environmental Protection Authority and will be reported on an annual basis.

### 5.8.3 Atmospheric Emissions Monitoring

Stack gas analysis for NO<sub>x</sub> will be conducted at the power station by SECWA using standard methods for sampling and chemical analysis.

Following the testing of emission quality at commissioning, measurements of NO<sub>x</sub> concentration in the stack emission of each turbine will be conducted annually, according to specifications agreed by the Environmental Protection Authority. The results of monitoring will be reported to EPA on an annual basis. SECWA will liaise with the EPA regarding the requirement for additional emissions monitoring.

### 5.8.4 Groundwater Management

Extensive specifications for safe handling of liquid substances that are potential groundwater contaminants have been developed by SECWA and have been incorporated in design and working procedures for both the construction and operation phases of the project. SECWA will manage potential groundwater contaminants at the power station according to specifications set out by the Water Authority of WA.

SECWA will conduct analysis of monitor bore samples and underdrain samples from the evaporation pond and distillate storage area on a quarterly basis, using procedures for sampling and analysis agreed by the Water Authority of WA. SECWA will report the results to EPA and the Water Authority of WA on an annual basis.

### 5.8.5 Distillate Delivery to Pinjar

SECWA will arrange for the Fuel Supply Contractor to maintain a distillate spillage contingency plan consistent with the Western Australian Hazardous Materials Emergency Management Scheme according to the requirements of the Water Authority of WA.

### 5.8.6 Dieback Management

SECWA will continue to maintain control of operations, equipment and

procedures to minimize the risk of jarrah dieback disease infection in the vicinity of the power station and associated linear services according to the requirements of the CALM District Manager, Wanneroo.

#### 5.8.7 Fire Management

SECWA will facilitate fire management practices in the region of the power station through the continued maintenance of established fire breaks, in conjunction with controlled burning programmes conducted by the WA Bush Fires Board.



## **Appendix 3**

**The State Energy Commission of Western Australia's  
additional commitment to a Perth airshed study**



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Enquiries  
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15th February 1991

Chairman  
Environmental Protection Authority  
1 Mount Street  
Perth  
WA 6000

Dear Sir

Further to Mr P J Harvey's letter of 21 December 1990, setting out SECWA's position on Pinjar extension NOx emissions and commitments, discussions have been held with EPA officers from the Pollution Control Branch regarding the proposal for a Perth Airshed study.

We understand from these discussions that the Authority is prepared to approve the extensions to Pinjar Power Station, and accept the proposal along the lines that we suggest.

Advice from Dr Ken Rayner on the EPA standpoint regarding NOx emissions and the study have been reviewed, together with his rough assessment of costs. We have also obtained advice on such a study from the CSIRO Division of Atmosphere Research. A copy of the letter from Dr P Manins has been given to Dr Rayner. Further input is still being sought from other experts.

Our current estimates of the total study costs are of the order of \$2M and approval by the SECWA Board is necessary for such expenditure. A response from the Board is expected following its meeting on 20 February 1991.

A study of this magnitude will require about 3 years to conduct and careful design is necessary to achieve the desired objectives with resources that are limited in these times. The exact cost of the study can only be known after all phases and tasks have been elucidated. SECWA would wish to restrict expenditure to well below \$1M per year over the term of the study.

Since the results of the study will be of enormous benefit to the community and other authorities in WA, we may seek to offset costs by contributions either financially or through expertise from such bodies.

Subject to Board approval, SECWA would undertake the following further commitments in respect of Pinjar Power Station:

1. To establish, coordinate and fund a Perth Airshed study, the aim of which would be to elucidate and understand the factors governing photochemical activity in the urban area. The study would have the following major elements:
  - Compilation of an emissions inventory of photochemical precursors.
  - Establishment of a series of monitors to secure data on ambient levels of photochemical oxidants and precursors, together with relevant meteorological data.
  - Development of a model of photochemistry and meteorology relevant to Perth.
  - Assessment of Pinjar Power station emissions impact on urban photochemical oxidant formation.

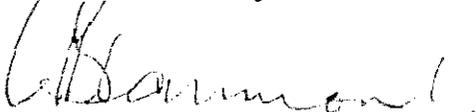
The study will be well designed, with input from foremost Australian experts and officers of EPA. The design phase is envisaged to take several months. A target date for completion of this stage may well be mid 1991 at which stage the study would be initiated.

2. To retrofit low NOx burners to the proposed GE Frame 9 gas turbines at Pinjar after the conclusion of the study if results show that emissions from Pinjar contribute significantly to Perth airshed problems.

SECWA coordination of this study will be undertaken by the Principal Scientific Officer, Dr Roman Mandyczewsky who will address any details relating to the project.

I trust these commitments, together with those already made in the CER for Pinjar Power Station extensions, will expediate the environmental approval of the project.

Yours faithfully



A J BEAUMONT  
MANAGER SYSTEM PLANNING

/L/337RR/TB

Your Ref  
Our Ref  
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20th February 1991

The Chairman  
Environmental Protection Authority  
1 Mount St  
PERTH WA 6000

Dear Sir

This letter is to confirm that today the Board of Commissioners approved SECWA entering into commitments to undertake a Perth Airshed photochemical study as conveyed to you in my letter of 15th February 1991.

Dr Mandyczewsky will liaise with your staff from the Protection Control Division to develop and design a study programme in due course.

Yours faithfully

A handwritten signature in black ink, appearing to read "A J Beaumont". The signature is fluid and cursive, written over a faint circular stamp or watermark.

A J BEAUMONT  
MANAGER SYSTEM PLANNING

/L/842RM.tb