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

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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^3 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^3 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.

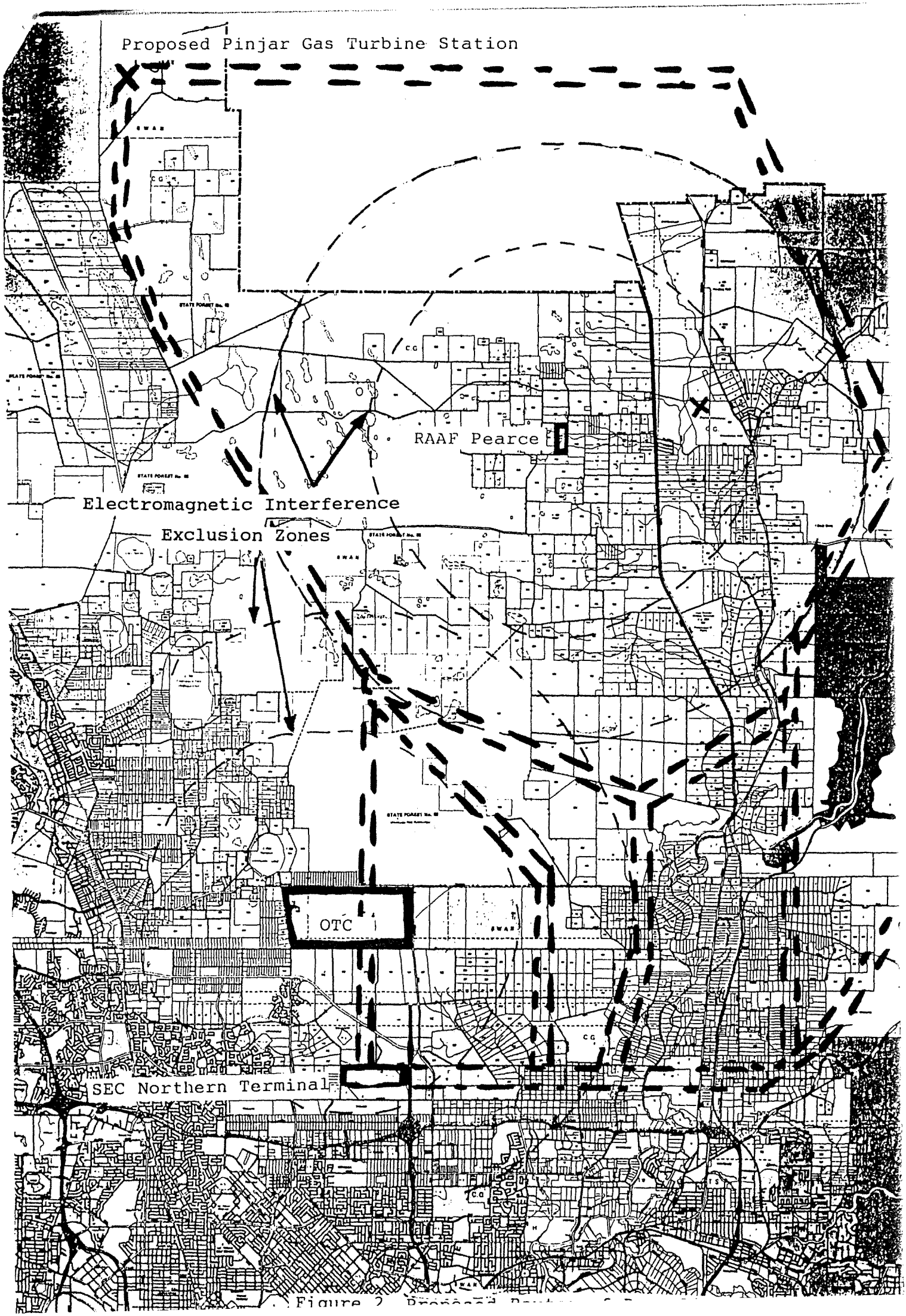

Figure 2 Proposed Route of P

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.