REVIEW OF AIR DISPERSION MODELLING STUDY

AND SCREENING HUMAN HEALTH RISK ASSESSMENT

Alcoa Anglesea Power Station & Coal Mine

FINAL REVIEW REPORT

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24TH JULY 2013

1. Background

CH Environmental has been engaged by Alcoa to peer review the air dispersion modelling undertaken by Environ Australia Ltd. The modelling is part of a screening risk assessment of the potential human health risks to the public from air emissions arising from the Anglesea coal mine and the Anglesea power station.

2. Scope of the Review

This report is limited to a review of the approach and methods used for deriving modelling input data for undertaking the modelling, and for conclusions reached. It is not an audit of the input data or the modelling itself, and does not deal with the health risk assessment which is being reviewed separately.

The review focuses mainly on sulphur dioxide and particle emissions as these feature in the health risk assessment. It is accepted that trace pollutants are below levels of concern.

3. Model and Receptor Selection

Two models have been used in the simulation. TAPM has been used for deriving the meteorological field and for modelling power station emissions. Calpuff has been used for modelling line and area sources associated with coal mining and utilisation. The models selected and used are appropriate and preferable to Ausplume in coastal terrain with limited local meteorological data.

The receptor selection appears to be appropriate for adequately represent community exposure, assuming areas north of the power station are largely unpopulated.

4. Emissions Data

4.1. Sulphur Dioxide

It is understood that that continuous data from in-stack monitors were used as the input to the model and this is appropriate.

4.2. Particulate Matter – coal extraction and utilisation

The methods used for estimating particle emissions from various activities and for classifying the particles into different size fraction are consistent with available estimation techniques. The estimates are based on numerous assumptions, and correctly recognized in the report as subject to uncertainties. They are clearly the weak point of the analysis and make it difficult to draw conclusions from any subsequent modelling with a high level of confidence.

By way of suggestion for future work, it would be appropriate to investigate the feasibility of quantifying the uncertainties in the estimates of particle emissions, and possible ways of reducing the uncertainties.

4.3. Particulate Matter –Stack

The maximum emission rates given and used in the model are discharges from the electrostatic precipitator stacks. Given this, the ratio of $PM_{2.5}$ to PM_{10} seems rather low at less than 20%. It is however understood that this is based on stack monitoring and should therefore be reliable.

The treatment of non-detect data is in line with the EPA request and is appropriate.

5. Monitoring Data Analysis

5.1. Sulphur Dioxide

Measured levels comply with SEPP policy levels. There are no monitoring sites North of the site where modelling indicates levels exceeding SEPP and this is acknowledged. It is assumed that these areas are not populated and if so, this should be stated.

5.2. Particles

The data indicate compliance with NEPM standards and SEPP design criteria for both PM10 and PM2.5. However, only 6 months of monitoring data at 3 sites were available for the report, and this is insufficient to draw any definitive conclusions.

6. Model Validation

6.1. Meteorology

The results presented indicate that the TAPM derived wind fields are in reasonable agreement with the observed wind fields and comfortably meet the performance criteria. Details of the meteorological measurements (parameters measured and measurement heights) would be helpful.

6.2. Dispersion

6.2.1. Sulphur Dioxide

The comparison between measured and predicted levels indicates good agreement and adequate performance. An R of 11 as recommended by Hanna has been preferred for calculating the robust highest concentration (RHC) in preference to the general US EPA guideline value of 26. This is based on specific interest in the 99.9 percentile SO2 concentration (9th highest value) and therefore seems appropriate.

6.2.2. Particles

There are a number of uncertainties and issues associated with particles that make comparisons of modelled and measured results difficult to interpret. These uncertainties are well recognised and explained in the report. The main issue is the paucity of particle monitoring data (length of record and spatial coverage) for validating model results.

The comparisons of modelled and measured values indicate an apparent tendency for significant under prediction of concentrations. The report attributes this to the lack of background and other uncertainties such as uncertainties with emissions estimates. When the "background" is added to the modelled concentrations, the comparisons improve, particularly in relation to the RHC and this makes the explanation plausible.

It is noted that the background levels represent a significant fraction of the total predicted levels. Given this significance, and the fact that the monitoring data, on which the background is based, may be influenced by emissions from the modelled sources, decreases the confidence in the conclusions. It is therefore important to continue the monitoring to substantially increase the length of the data record (as is understood is planned), and to improve the methods for estimating background that removes the possible contribution from modelled sources.

Approaches that could be considered include:

- Screening the monitoring data according to wind directions
- Analysing collected particles and applying source apportioning methods to collected particles,
- Maintaining records of influencing events (e.g. bushfires, agricultural burning, dust storms, etc.

By way of further suggestions, back trajectory analysis could be used to confirm or eliminate source contributions to high particle events.

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24th July 2013