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Nicci Marris
Alcoa World Alumina Australia
PO BOX 1
PORTLAND VIC 2205

**PEER REVIEW OF AIR QUALITY HEALTH RISK ASSESSMENT OF ALCOA'S ANGLESEA OPERATIONS**

Dear Ms Marris

This letter provides Alcoa World Alumina Australia (Alcoa) the Golder Associates Pty Ltd (Golder) review of the screening human health risk assessment (HHRA) of Alcoa's Anglesea operations conducted by ENVIRON Australia Pty Ltd (Environ).

## 1.0 CONTEXT

Alcoa commissioned Environ to undertake an air dispersion modelling and screening HHRA of the atmospheric emissions from Alcoa's Anglesea Power Station and Coal Mine. The screening HHRA considered the potential adverse health effects that might be associated with air pollutants emitted currently from the power station and coal mine operations.

Alcoa has requested that Golder undertake a peer review of the HHRA by Environ (Report No AS140151 entitled *Air Dispersion Modelling Study and Screening Human Health Risk Assessment Alcoa Anglesea Power Station & Coal Mine* dated May 2013).

Golder provided Alcoa a review of the Environ report on 7 June 2013 suggesting a number of changes (Golder Report No 117643036-001-L-RevA). Golder received a revised report dated July 2013 in an email from Brian Bell of Environ on 12 July 2013. Golder provided additional comments on the revised draft provided by Environ on 12 July. Environ issued a final report to Alcoa on Wednesday 30 July 2013 which has considered the additional comments raised by Golder.

Golder has scrutinised the final report by Environ and is satisfied that the final report issued has been amended to reflect the comments raised by the peer reviewer.

## 1.1 Scope of Work

Alcoa has requested Golder to:

- Review the HHRA based on air dispersion modelling by Environ of emissions from the Anglesea Power Station and Coal Mine.

The scope of works did not include a review of the ambient air modelling. However, this reviewer will comment on aspects of the modelling section that may influence the interpretation of the results of the HHRA.

## 1.2 Review Process

The review comprised an evaluation of the Environ (2013) report specifically focussing (as outlined in Golder's proposal to Alcoa, Proposal No P17643086-001-R-Rev2, dated May 2013) on the following:

- Fulfilment of the requirements stipulated by the Environment Protection Authority of Victoria (EPAV) in correspondence to Environ (Letter reference 32313, 30 October 2007).
- The appropriateness of the HHRA methods used, including:
  - Identification of the hazard associated with the emissions of interest
  - Selection of air quality reference values
  - Consideration of surrounding land uses
  - Selection of vulnerable receptors
  - Risk Characterisation and
  - Discussion of uncertainties.

Golder will provide comments on each of these areas.

# 2.0 REVIEW

## 2.1 Fulfilment of the requirements stipulated by EPAV in correspondence to Environ (Letter reference 32313, 30 October 2007)

Generally Environ has complied with the requirements outlined in the letter from EPAV dated 30 October 2007.

Environ identified 39 pollutants of interest likely to be associated with emissions from the Alcoa operations at Anglesea based on various sources of information (National Pollutant Inventory, stack monitoring, information about raw materials and process conditions). The air concentrations for these pollutants were compared with the air quality criteria described in the State Environmental Protection Policy (Air Quality Management) (SEPP (AQM)). Consistent with EPAV advice $SO_2$, $PM_{10}$ and $PM_{2.5}$ were selected for the HHRA because the estimated ground level concentrations (GLCs) variously exceeded the SEPP (AQM) criteria.

EPAV recommended the following hierarchy for using standards and guidelines:

i) SEPP (AQM)

ii) Texas Commission for Environmental Quality (TCEQ)

iii) California EPA Reference Exposure Levels (REL).

Environ used this hierarchy for screening pollutants of interest to be included in the HHRA, but it used ambient air quality guidelines published by the National Environmental Protection Council (NEPC) in the National Environment Protection Measure (NEPM) in the screening HHRA. These are the appropriate reference values to use in the HHRA.

## 2.2 The appropriateness of the HHRA methods used

Generally the approach taken was consistent with national guidelines (i.e. enHealth, 2012).

The enHealth (2012) model for Health Risk Assessment comprises five stages:

1) Issue identification

2) Hazard identification

3) Dose–response assessment

4) Exposure assessment for the relevant population

5) Risk characterisation.

The ambient air modelling undertaken was presented as a separate section before the description of the HHRA at the front of the document. Whilst the modelling description may fit better under the section entitled "*Exposure Assessment",* it does not affect the outcomes of the HHRA.

### 2.2.1 Identification of the Hazard Associated with the Emissions of Interest

The approach and information provided by Environ was consistent with national guidelines.

The emissions of interest ($SO_2$, $PM_{10}$ and $PM_{2.5}$) were identified according to EPAV advice.

The hazards of the three air pollutants assessed were summarised to highlight the potential adverse health effects.

### 2.2.2 Selection of Air Quality Reference Values

The selected air quality reference values are appropriate.

Environ has used the EPAV SEPP values for screening emissions to select which pollutants should be included in the HHRA and NEPM guidelines for the risk assessment. This is appropriate.

Reference values for averaging times of 1 h, 24 h and one year were used where available and compared with similar averaging times for the modelled GLC.

### 2.2.3 Consideration of Surrounding Land Uses

The geographical area considered (Figure 19 in the Environ report) is adequate. It includes the township of Anglesea and non-residential areas to the north of the township surrounding the Alcoa operations. This is consistent with the previous HHRA undertaken by Alcoa.

### 2.2.4 Selection of Vulnerable Receptors

GLCs were estimated at 14 receptor locations that Alcoa provided to Environ. These receptor locations included areas in the township of Anglesea and others selected according to the potential for exposure to pollutants emitted by the Alcoa operations. Six of the 14 locations selected corresponded to sites at which monitoring has been and is being undertaken. The 14 locations are the same as used in the previous HHRA undertaken by Alcoa and seemingly comprehensive of receptors likely to be exposed to emissions from the Alcoa operations.

The GLCs were estimated at each receptor and the GLCs at various statistical intervals reported. Isopleths were also reported which provided concentration contours over the geographical area considered.

### 2.2.5 Risk Characterisation

Environ compared the modelled GLCs with the reference values for the three air pollutants considered by calculating hazard quotients (HQ) for individual pollutants and hazard indices (HI) for additive effects between pollutants. HQ and HI values less than one indicate that exposure is less than the relevant reference value. Values greater than one indicate that potential exposure exceeds the relevant reference value.

Some of the HQ and HI values that were calculated were marginally higher than one. This reviewer considers that the exceedances reported (highest HI value of 1.53) are not significant and adverse health effects are unlikely to be a result of people being exposed to such concentrations of air pollutants.

Thus outcomes of the Risk Characterisation suggest that there are no causes for concern for the receptors included in the HHRA for the level, frequency and duration of exposure considered in the HHRA.

Monitoring data for sulfur dioxide are available from the six monitoring stations for a number of years. Particulate monitoring was also undertaken for the period July 2012 to December 2012. In the main the modelled GLCs are consistent with ambient air monitoring results which provides confidence in the use of the modelling outcomes in the HHRA.

### 2.2.6 Discussion of Uncertainties

The discussions on uncertainty are adequate for the screening HHRA.

## 2.3 General

This screening HHRA undertaken by Environ has undergone an iterative process as part of this peer review. Golder is satisfied that questions and comments raised during this process were considered by Environ and its report amended accordingly. Based on the information provided, the peer reviewer considers that the conclusions of the screening HHRA are reasonable.

**GOLDER ASSOCIATES PTY LTD**

Peter N Di Marco
Principal Toxicologist

Penny Woodberry
Senior Environmental Engineer

PDM/PW/eh

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