Voices of the Valley submission with respect to terms of reference 6 and 7

1. Voices of the Valley's primary concern relates to how pollutants released during the mine fire have affected, and may continue to affect, the health of residents and workers. During and since the fire VotV has given voice to the residents' concerns, and played a valuable role in collating and presenting community views and experiences to the Hazelwood Inquiry.

2. VotV's objective is for the coal mines and coal fired power stations in the Latrobe Valley to be managed and operated in a way that ensures the long-term health and safety of residents and workers in the Latrobe Valley, including by preventing future mine fires and adverse health impacts from such fires.

3. VotV submits that it is vital that the Board of Inquiry obtain further statistical data, evidence from Latrobe Valley local health practitioners and expert analysis of that data and evidence, to enable it to adequately address the questions posed in terms of reference 6 and 7.

Term of reference 6

Whether the Hazelwood Coal Mine Fire contributed to an increase in deaths, having regard to any relevant evidence for the period 2009 to 2014.

4. In the days from 9 February to 25 March 2014 residents of the Latrobe Valley were subject to severe smoke and ash from the mine fire.[1] The pollutants produced by the mine fire included carbon monoxide; particulate matter, especially small particles with a diameter of not more than 10 micrometres (PM_{10}) and fine particles with a diameter of not more than 2.5 micrometres ($PM_{2.5}$); sulphur dioxide; nitrogen dioxide; volatile organic compounds; ozone; polycyclic aromatic hydrocarbons; dioxins; furans; and metals - magnesium, manganese,

[1] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 22

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mercury and zinc.[2] Monitoring of air quality in the second week of the Hazelwood Mine fire indicated very high levels of carbon monoxide and $PM_{2.5}$.

5. Each of the pollutants identified can have severe health effects on people, in particular vulnerable members of the community, including children, pregnant women and unborn children, the elderly, and those suffering from pre-existing cardiovascular and respiratory illnesses.[3] Fine particulates ($PM_{2.5}$) are a very hazardous form of air pollution. We note that EPA Victoria states the following on its website**:**

> **Health effects of particles**
>
> In general, the smaller the particle, the greater its effect, as smaller particles can penetrate further into the lung to cause harm. Particles can aggravate existing lung and heart diseases, leading to increased hospital admissions and emergency room visits, and sometimes premature death. Airborne particles have also been associated with decreases in lung function, worsening of asthma and alteration in the body's defence and lung clearance mechanisms.
>
> Sensitive members of the population include the elderly, children and people with existing lung or heart disease. Health benefits will result from any reduction of particle concentrations, whether or not the current levels are above or below the limit values.[4]

6. During the period of the mine fire, residents of Morwell reported a number of adverse health effects.[5] The health effects were significant and commenced from the first day of the fire.[6] Effects included sore and stinging eyes, headaches, blood noses, nausea and vomiting, sinus and respiratory problems.[7]

7. There is considerable ongoing concern in the Latrobe Valley community about the impact of pollution from the mine fire on the health of local residents. In particular, whether it caused or contributed to the deaths of some residents and whether it may lead to further deaths or serious illnesses.

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[2] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 241.
[3] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 23.
[4] EPA Victoria's website at: http://www.epa.vic.gov.au/your-environment/air/air-pollution/particles-in-air. And see par. 27 below.
[5] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 23.
[6] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 309.
[7] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 309.

VotV analysis

8. During and immediately after the mine fire, members of VotV noticed an apparent increase in death notices in the newspaper.[8] They collated this information and sought official statistics from Births Deaths and Marriages (**BDM**). VotV's analysis of the figures it obtained from BDM indicated that there had been an increase in deaths during the time of the fire.

Associate Professor Adrian Barnett's analysis

9. VotV subsequently requested Associate Professor Adrian Barnett of Queensland University of Technology to review the data and provide an analysis. Assoc. Prof. Barnett is a statistician with a particular focus on air pollution and health.

10. Assoc. Prof. Barnett reviewed monthly deaths from January to June 2009 to 2014 across the four postcodes closest to the mine fire (being for Morwell, Moe, Traralgon and Churchill). He used a regression model to examine whether death rates were higher during the two months of the fire (February and March 2014).

11. The Barnett report concludes that, when monthly temperatures are factored in, there is an 80% (0.80) probability that the death rate during the fire was higher than average. The mean increase in deaths over that time was 11% (1.11) which translates to 11.2 additional deaths over the four postcodes during the time of the fire.[9]

Department of Health analysis

12. In response to VotV's concerns, the Department of Heath reviewed the data from BDM and concluded that in March 2014 there was an increase in deaths across the four postcodes of 21% compared to the previous five years. For the period January to June there was an 11% increase on the previous five years, but a 19% decrease in deaths in Morwell in February and March 2014 compared to the previous five years. They also acknowledged that there was an unexplained increase in deaths in Moe of 32%. They concluded that the data from BDM showed nothing more than yearly variability.

13. There are a number of problems with the Department of Health's analysis. For example:

[8] See par. 5, p 3 of VotV's submission dated 22 September 2014 (attachment A).
[9] Adrian Barnett, *Analysis of death data during the Morwell mine fire*, September 2014, p. 4 (attachment B).

a. It consisted of a basic comparison of the number of deaths in 2014 to the average number of deaths in the preceding five years. Unlike the Barnett report, it did not factor in monthly temperature or other mitigating and contributing factors.

b. It stated that as 2014 was the third hottest summer on record, any additional deaths in that year could be attributed to the heat rather than the mine fire. However, it did not acknowledge that the first and second hottest summers on record were within the previous five years (that have been used for the five year average) and therefore deaths attributed to heat were unlikely to be higher in 2014 than they were in the five year average.

c. It did not factor in the high number of deaths in Morwell in January 2014, which may have led to a lower number of deaths in February 2014.

d. It also did not take account of the fact that a large number of Morwell residents relocated at some stage during the fires (possibly around 65%).[10]

14. The Department of Health subsequently requested a further review of the BDM data from Melbourne University. The report concluded that slightly more deaths occurred from January to June 2014 compared with the previous five year average, but that the evidence that this is not just due to chance is inconclusive[11]. The report noted that it had not analysed cause of death and had no information on underlying age/sex distribution or demographic changes.

Government response

15. On the basis of the analysis done by the Department of Health, the Victorian Government stated that the deaths were within the normal expected variation.[12] However, the Government's conclusion does not appear well-founded. Both Assoc. Prof. Barnett and the authors of the Melbourne University review stated that further analysis is required using additional data, including cause of death.

[10] The Hazelwood Inquiry report notes that 65% of Morwell residents received a relocation or respite payment. Criteria included low income, hardship experienced by the smoke, and intention to leave for respite. Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 370

[11] Melbourne University, *Review of Birth Deaths & Marriages Victoria (BDMV) mortality data for the Latrobe Valley and the time of the Hazelwood coal mine fire in Morwell*, undated, p. 2

[12] See for example Victorian Parliamentary Debates, Legislative Assembly 17 September 2014, p. 3357

Could the mine fire have caused an increase in deaths in the Latrobe Valley?

16. VotV submits that answering this question will require the further data and analysis referred to by Assoc. Prof. Barnett and the Melbourne University review to determine any causative link between the mine fire and the deaths that occurred in the relevant period. VotV therefore asks the Board to seek further data from BDM as to the causes of death of relevant residents of the Latrobe Valley during the period under consideration and, subsequently, to seek expert analysis and opinion as to whether the deaths that occurred during and following the mine fire were likely to have been caused or contributed to by the air pollution caused by the fire.

17. It is also submitted that, if the Board of Inquiry has not done so already, it must urgently make inquiry with relevant Latrobe Valley local health practitioners as to any observation they have made of a link between the mine fire and morbitity or mortality. It is inadequate to simply rely on statistical analysis, when it has been repeatedly stated that it is difficult to determine whether those statistics represent an increase in deaths as a result of the mine fire or simply variability without apparent cause. It is essential that the Board of Inquiry seek the opinion of local health practitioners likely to have had contact with at risk members of the community. Such health practitioners would include respiratory physicians, cardiologists, obstetricians, pediatricians, emergency physicians and general practitioners. They should each be asked whether they have detected any link between the mine fire and an increase in illness and/or death in the Latrobe Valley and the information and data obtained from them should be put before the Inquiry.

18. VotV hopes to obtain expert opinion from a biostatistician and a respiratory physician as to whether there was any link between the deaths that occurred during the relevant period and the increased level of air pollution present prior to the deaths. Should such evidence be obtained, VotV will also ask the Board of Inquiry to call those experts.

19. The Hazelwood Inquiry previously noted that the Government had received advice during the time of the fire that "no additional deaths would be expected even if the level of exposure to the measured level of air quality continued for six weeks"[13]; but if fine particles remained in the extreme range for 3 months, it may

[13] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 317.

result in additional deaths in the community.[14] However, the Hazelwood Inquiry noted that the advice "used the air quality level at the average exposure in Morwell during the fire – the actual exposure level used was not detailed"[15] and "the study was based on a standard Victorian population and was not adjusted for the poorer health status found in Morwell"[16]. The Inquiry also noted that there is a lack of specific information as to the effect of medium term exposure of the sort faced by residents of the Latrobe Valley during the mine fire.[17]

20. The Hazelwood Inquiry commissioned an expert report on health impacts from Professor Donald Campbell, Director General, Medicine Program, Monash Health, who advised that *short term exposure to the pollutants released during the mine fire could cause adverse health impacts, including death*. Relevantly, the report stated in relation to short term exposure to the pollutants released in the mine fire that:

    a. "There is strong evidence from epidemiological studies that daily (24 hour average) exposures to PM are associated with both mortality and morbidity immediately and in subsequent days. Repeated (multiple day) exposures may result in larger health effects than the effects of single days."[18]

    b. "… [A]s the ambient air level concentration of $PM_{2.5}$ increases by 10µg/m^3 there is a 1.04% increase in mortality." (That is, for every 10µg/m^3 increase in $PM_{2.5}$ the mortality increases 1.51% for respiratory causes, 0.84% for cardiovascular causes, 3.36% for ischaemic heart disease, 1.85% stroke and 2.86% for COPD.)[19]

    c. "There is strong evidence that links short term exposure (daily average levels) and mortality and morbidity, with effects not just due to exacerbation but also due to progression of underlying disease."[20]

    d. Clinical studies of $PM_{2.5}$ exposure from traffic "suggest that 1-2 hour exposures can result in physiological changes, suggesting that this may be sufficient to contribute to exacerbations of chronic disease".[21]

[14] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 317.
[15] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 317.
[16] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 317.
[17] Hazelwood Mine Fire Inquiry, *Hazelwood Mine Fire Inquiry Report*, 2014, p. 316.
[18] Donald Campbell, *Hazelwood Coalmine Fire Health Effects Report* 28 May 2014 p. 17
[19] Donald Campbell, *Hazelwood Coalmine Fire Health Effects Report* 28 May 2014 p. 16
[20] Donald Campbell, *Hazelwood Coalmine Fire Health Effects Report* 28 May 2014 p. 16

21. Short term exposure to Ozone, Carbon Monoxide, and $PM_{2.5}$ can result in fetal death; death in the general population (due to effects on respiratory tract, cardiac conduction; coagulation state); and death in people with pre-existing ailments (due to effects on respiratory tract, cardiac conduction, coagulation state, pre-existing congestive cardiac failure).[22]

22. In order to adequately answer the question posed by this term of reference, VotV submits that the Board of Inquiry will need to consider further data, statistical, epidemiological, medical and scientific evidence.

23. It is essential that the Board obtain and assess data as to the causes of deaths during the mine fire as compared to those that occurred in comparison years. Where cause of death is recorded as respiratory or cardiopulmonary, medical evidence as to the likelihood that the air pollution resulting from the mine fire should be considered. VotV wishes to obtain such expert opinion and asks the Board to access and release the underlying data from BDM to enable it to do so.

24. VotV further submits that it is necessary to obtain data as to the number of residents of the Latrobe Valley who relocated during the mine fire, the location from which they relocated and the duration of their relocation. It is believed that such evidence will prove essential to a complete understanding of the BDM data, particularly the low number of deaths in Morwell during the mine fire.

25. VotV may seek to ask the Board to callfurther expert evidence from an air pollution expert. Should they do so, such expert evidence should provide a report on the air pollutants and the air movements in the Latrobe Valley during the Hazelwood Mine Fire.

26. As referred to above, VotV also hopes to obtain expert evidence from a biostatistician and a respiratory physician to address the question of whether there is any link between the increased air pollution from the mine fire and the deaths that occurred during and after it. Further information as to any useful evidence such experts may be able to provide to the Inquiry will be provided as soon as it is available.

Term of reference 7

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[21] Donald Campbell, *Hazelwood Coalmine Fire Health Effects Report* 28 May 2014 p. 17

[22] Campbell, Table 1: *Short term health effects that may be caused by exposure to smoke from a brown coal fire, identifying the substance in the smoke that causes each effect* p. 23

Short, medium and long term measures to improve the health of the Latrobe Valley communities having regard to any health impacts identified by the Board as being associated with the Hazelwood Coal Mine Fire.

27. The Latrobe Valley community needs to feel that it is being listened to and provided with adequate information and resources to enable it to deal with consequences of the mine fire. VotV submits that an active program of health care support and health care planning is required in the short, medium and long term to respond to health impacts identified by the Board as being associated with the Hazelwood Coal Mine Fire.

28. In order to provide adequate health services it would be desirable to map the populations of the Latrobe Valley that are most vulnerable to the short, medium and long term effects of the mine fire. The mapping would ideally take into account known vulnerabilities of the local population relating to age, pre-existing illness, any shortcomings in the health services presently available in the Latrobe Valley and the level and type of exposure to pollutants. This latter factor is particularly important for fire-fighters, mine workers, power station workers and others who lived or worked in close proximity to the mine fire and may have an increased likelihood of exposure related illness.

29. The mapping should be updated on a regular basis to track trends and identify and address unforeseen consequences. It is essential that the Latrobe Valley community be fully informed as soon as any new and relevant information becomes available about the extent of the exposure of the population to air pollutants and the consequences of that exposure.

30. Members of the Latrobe Valley community should have access to specialists in environmental medicine who have the equipment and capacity for health testing to measure health impacts of the Hazelwood Mine Fire. The appropriate specialists should be funded to work in the Latrobe Valley, to ensure that community members are not forced to travel long distances for screening or treatment.

31. VotV submits that, as per the 'Future Proposals' put forward in the Hazelwood Mine Fire Inquiry Report 2014, that an appropriately resourced, independent local Health Advocate should be appointed for the Latrobe Valley to provide a local

health voice for the Latrobe Valley. That Health Advocate should have the responsibility to monitor and review the implementation of recommendations of the Board of Inquiry. It is important that any ongoing short, medium and long-term management program be designed not only to monitor the effects of the mine fire on community health, but also to respond to those effects with appropriate information, dissemination and treatment.

32. VotV submits that, as per the 'Future Proposals' put forward in the Hazelwood Mine Fire Inquiry Report 2014, the State should create a Health Conservation Zone in the Latrobe Valley.

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Environmental Justice Australia