Minerals Council of Australia

27th August 2010

Ms Kerry Scott
Project Manager
NEPC Service Corporation
Level 5/81 Flinders street
Adelaide SA 5000

Via email: kscott@ephc.gov.au

Dear Ms Scott,

Re: Minerals Council of Australia Comments on AAQ NEPM Review Discussion Paper

The Minerals Council of Australia welcomes the opportunity to review and provide comment on the following documents:

- An Australian approach to setting air quality standards: Consultation draft (September 2009);
- Review of the National Environment Protection (Ambient Air Quality) Measure: Discussion Paper Air Quality Standards (July 2010).

The Minerals Council of Australia (MCA) represents companies responsible for over 85% of minerals production in Australia. MCA members have a long standing commitment to responsible product stewardship and the continual improvement of health, safety and environment performance.

The MCA notes that there has been a significant amount of new research, both internationally and in Australia, regarding the health impacts of the common (criteria) pollutants since the AAQ NEPM was made in 1998. With respect to the minerals industry, the most relevant criteria pollutant covered by the AAQ NEPM is particles, while it is acknowledged that in specific areas other pollutants that arise from mineral operations can be of local interest, such as lead. Emissions of other NEPM pollutants from the minerals industry are generally less prevalent than emissions from motor vehicles and other industries, especially when human exposure is considered.

The attached submission developed in collaboration with our industry members and following a third party review by PAEHolmes Ltd, details some of the key issues that the MCA would like considered further in the NEPM review. These issues include the following:

- Adoption of an exposure based approach is supported and may need careful development, possibly on an ongoing basis. Consideration of exposure modelling, coupled with periodic monitoring, inventory development, and validation, iterated on a regular basis may be needed.
- A cost benefit analysis (CBA) approach to any possible changes to the AAQ NEPM is fully supported.
- Closer examination of the differences in particulate matter of crustal and combustion origin, and how this relates to the NEPM goals, and specifically to exposure. Some of the relevant literature that would warrant consideration is summarised in this submission.

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- Closer examination of the differences in particulate matter of crustal and combustion origin, and how this relates to the NEPM goals, and specifically to exposure. Some of the relevant literature that would warrant consideration is summarised in this submission.
- Additional guidance on the applicability of the NEPM and the NEPM goals, especially with a view to engendering uniformity in the regulatory approach (setting process) for managing air quality in the various state jurisdictions.
- Plain English summaries of the key parts of the NEPM to make it more accessible to the public without misinterpretation.

MCA looks forward to participating in any future discussion and consultation on the review and further development of AAQ NEPM.

Should you have any further questions regarding this issue, please do not hesitate to contact Chris McCombe, Assistant Director-Environmental Policy on (02) 6233 0627.

Yours sincerely,

Brendan Pearson

Brendan Pearson
DEPUTY CHIEF EXECUTIVE
MINERALS COUNCIL OF AUSTRALIA

1 REVIEW OF CHANGES TO EXISTING AAQ NEPM

1.1 Particles

MCA agree that there has been a significant amount of new evidence regarding the health impacts of particles since the AAQ NEPM was made in 1998.

MCA consider that it is important to carefully consider the new evidence emerging from these studies, and that it is especially important to separately consider particles originating from combustion and crustal matter.

The United States Enviromental Protection Agency define thoracic coarse particles as those having a nominal mean aerodynamic diameter of greater than 2.5 µm and less than 10 µm (i.e. $PM_{10-2.5}$) and fine particles as those having a nominal mean aerodynamic diameter of less than 2.5 µm (i.e. $PM_{2.5}$). Thus, air quality monitoring of PM_{10} includes both the fine and the coarse fraction. $PM_{10-2.5}$ is not generally monitored directly and is calculated from co-located PM_{10} and $PM_{2.5}$ monitors.

It is relevant to note that the physical generation of fine particles from rocks and crustal materials typically requires the input of mechanical energy to break the larger material into smaller particles. The energy required is proportional to the surface area created. In practice, it is not possible to create ultrafine[1] particles by mechanical means.

Ultrafine particles and indeed much of the mass in the $PM_{2.5}$ range is created via chemical processes e.g. combustion or chemical reactions involving the gases or ashes produced in combustion. Thus, mineral operations do not cause any significant generation of dust in the ultra fine or even the $PM_{2.5}$ size range.

According to measurements made in the Hunter Valley (NSW), typically, only 4 to 5% of the particles generated by mining operations are in the $PM_{2.5}$ size range [**SPCC, 1986**]. The most recent US EPA Emission Factor equations for surface coal mines [see **US EPA, 1998** – Table 11.9-2] recommended the following ratio for $PM_{2.5}$:TSP emissions:

- Blasting 3%;
- Truck loading 1.9%;
- Bulldozing on coal 2.2%;
- Bulldozers on Overburden 10.5%;
- Dragline operations 1.7%;
- Grading 3.1%;
- Vehicle traffic – variable; and
- Wind erosion - no data.

Presently conclusions applied in developing the AAQ NEMP have been made on the basis of studies undertaken in urban areas with large populations where there is a higher level of exposure to air pollutants from combustion sources (that is, emissions from traffic fumes and industrial sources).

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[1] Please note, that technically, the term ultrafine particles refers to particles with equivalent aerodynamic diameters of 0.1 µm

Combustion sources release air pollutants which comprise a significant fraction of fine and ultra fine particulates that contain harmful acidic and carcinogenic substances which are detrimental to health.

Whilst it is acknowledged that in specific areas such emissions from mineral activity can be of local interest, overwhelmingly, particulate releases from mineral operations contain a small fraction of fine particulates and also a relatively low amount of acidic and carcinogenic substances.

These key differences (in the type of particle a population is exposed to) can lead to a different health outcome.

It is also noted that dust concentrations in ambient air due to mineral operations are generally significantly lower than concentrations that can arise during dust storms. Due to this, care needs to be taken in interpreting studies on the effects of exposure to high dust concentrations from dust storms and comparing these to the potential exposure that may arise from mineral operations, which would generally be at a much lower concentration, but may occur more often.

Whilst exposure to mineral operation emissions generally occur outside of urban areas, both urban areas and rural areas also experience combustion related particulate impacts, for example those arising from wood heaters, and open fires, either agricultural, controlled or hazard reduction burns, bushfires and burning conducted for cultural reasons in some areas.

Thus when considering the emerging new evidence, it is important to:

- not assume a simple difference between urban and rural areas;
- carefully distinguish between studies that are based on the results of exposure to crustal matter and combustion particulate matter, and,
- also carefully consider the difference between exposure to episodic high concentration events (dust storms and fires) and low concentration, longer duration events for either crustal or combustion matter effects.

A failure to do this has potential to lead to a NEPM approach that may misdirect efforts to improve overall human exposure to particulate matter for many years to come.

A summary of some of the studies that warrant consideration is provided below:

- The Australian Coal Association Research Program (ACARP) funded a three-year monitoring program to characterise the concentration and composition of fine particles ($PM_{2.5}$ and PM_1) in the Hunter Valley (**ACARP 2007** and **2008**).

  Continuous monitoring took place in 2005 (PM_{10} and $PM_{2.5}$) and 2006 (PM_1) at two representative population sites in the Hunter Valley (Muswellbrook and Singleton), and at two sites immediately adjacent to mining operations ("Glenville" and Rix's Creek). The "Glenville" property is located between two mining operations.

  Data collected at "Glenville" property (monitoring took place between 9th February 2005 – 1st June 2005 and 18th September 2005 to 24th November 2005) showed only one event where the 24-hour average $PM_{2.5}$ concentration was measured above the NEPM advisory reporting standard of 25 µg/m^3. The Rix's Creek data (collected between 16th February 2005 and 4th November 2005) showed two events, and Muswellbrook and Singleton did not record any events above the 24-hour average NEPM advisory reporting standard. The annual average concentrations at "Glenville" and Muswellbrook were below the NEPM advisory reporting standard of 8 µg/m^3, whilst Rix's Creek and Singleton were slightly above.

$PM_{2.5}$ monitoring has continued at Muswellbrook and the most recent State of Environment Report published by Muswellbrook Shire Council shows that annual average $PM_{2.5}$ concentrations have remained below the NEPM advisory reporting standard.

Elemental compositional analysis of the samples collected (see **Table 1**) has shown that the fine particles ($PM_{2.5}$) are primarily sourced from combustion products (almost 67% of the emissions are from motor vehicles and power generation), and sea salt and its reacted products (15%) with a smaller contribution from local soils (11% emissions result from mining and agriculture). In comparison, the coarse thoracic particles ($PM_{10-2.5}$) are mainly from seasalts and soils (almost 40% each).

Table 1: Contribution of different sources to coarse and fine particulate matter

[illegible]	[illegible]	[illegible]	[illegible]
Combustion	BC, Cr, F, Ni and S	18.83	66.87
Industry	Co, Cu, Mn and Zn	0.32	0.23
Motor Vehicles	Br and Pb	0.16	0.26
Seasalts	Cl and Na	39.90	15.19
Soils	Al, Ca, Fe, Si and Ti	38.48	10.62
Woodsmoke/Biomass burning	K	1.97	0.94
Others	H, P and V	0.33	5.88

Source: ACARP (2007)

The studies discussed below show that either there is no association or a considerable degree of uncertainty in the potential association between coarse particles and their impacts on mortality and hospital admissions for cardiovascular and respiratory diseases. It is evident that the air shed in those studies where a potential association was shown (**Middleton et al (2008)** and **Perez et al (2008)**) are significantly different to the air shed near a typical mine and as such cannot be reasonably applied to such areas.

The following presents an analysis of four studies that have been completed to investigate whether coarse particles are a risk to morbidity/mortality. These studies have been completed by identifying episodes of high concentrations of coarse, but not fine, particles, for example, dust storms:

- **Schwartz et al (1999)** used data from 17 dust storms which occurred between 1989 and 1995 in Spokane, Washington. The 24-hour mean PM_{10} concentration during these storms was 263 μg/m³. Comparison of non-accidental deaths on control dates that were the same day of the year in other years (but with no dust storm on that day) and that had a mean PM_{10} concentration of 42 μg/m³, showed little evidence of any risk for mortality on the episode days. The authors concluded that coarse particles from windblown dust are not associated with mortality risk.

  Table 2 shows the mean 24-hour PM_{10} measured across the monitoring network near an open cut mine. The mean dust level at the various monitoring sites is between 23.4 μg/m³ and 27.6 μg/m³, significantly lower than the data on the both the dust storm and non-dust storm days in the study.

Table 2: TEOM data collected near an open cut coal mine

[illegible]	[illegible]	[illegible]
1	1/1/2004 - 31/5/2009	27.4
2	1/1/2004 - 31/5/2009	23.4
3	1/1/2004 - 31/5/2009	25.1
4	1/1/2004 - 31/5/2009	27.6
5	1/1/2004 - 31/5/2009	24.3
6	20/2/2007 - 31/5/2009	27.6

- **Peng et. al (2008)** assembled a database of daily cardiovascular and respiratory disease admission rates from 108 US counties covering the period 1 January 1999 to 31 December 2005. During this period there were a total of 3.7 million cardiovascular admissions and 1.4 million respiratory disease admissions. $PM_{10-2.5}$ concentrations were calculated from co-located monitors for PM_{10} and $PM_{2.5}$. After adjustment for $PM_{2.5}$, there were no statistically significant associations between coarse particles and hospital admissions for cardiovascular and respiratory diseases.

  Table 3 presents a comparison between the PM_{10} data assessed in the study, with data collected near an open cut mine. These data would suggest the air quality around the open cut mine is similar in level to that in the study, except that the Peng data were all collected in urban areas (the US census defines an urban area as a densely settled area consisting of core census block groups that have both a population density of at least 1000 people per square mile and are surrounded by census blocks that have an overall density of at least 500 people per square mile).

Table 3: PM10 data collected within close proximity[(a)] to an open cut mine compared with Peng et. al

Location	Period	25th percentile	Median	75th percentile
		Peng et al		
All 108 counties	1/1/1999 – 31/12/2005	20.6	23.5	28.6
Eastern US	1/1/1999 – 31/12/2005	23.0	19.9	26.3
Western US	1/1/1999 – 31/12/2005	28.0	21.2	36.4
		near an open cut mine		
1	1/1/2004 - 31/5/2009	15.3	22.3	33.1
2	1/1/2004 - 31/5/2009	14.0	20.0	28.2
3	1/1/2004 - 31/5/2009	15.0	21.0	30.0
4	1/1/2004 - 31/5/2009	16.0	22.9	33.2
5	1/1/2004 - 31/5/2009	15.0	21.0	28.5
6	20/2/2007 - 31/5/2009	14.2	21.9	32.7

(a) Samples taken within 300m -1000m of open cut mine, including nearest sensitive receptor

- **Middleton et al (2008)** assessed the effects of changes in daily levels of PM_{10} and ozone (O_3) on hospitalisation for all cardiovascular and respiratory causes at two hospitals in Nicosia, Cyprus (population approximately 270,000) during the 10-year period 1995-2004. A particular feature in the region is dust blown from the Sahara a few times a year, resulting in extreme PM_{10} concentrations.

  Middleton found that for every 10 $\mu g/m^3$ increase in daily average PM_{10} concentrations there was a 0.9% increase in all-cause and 1.2% increase in cardiovascular admissions. With respect to respiratory causes, an effect was only seen in the warm months. There appeared to be stronger positive associations due to increases in ozone which were independent of the effect of PM. All-cause and cardiovascular admissions were 4.8% and 10.4% higher on non dust-storm and dust storm days, respectively. Middleton et al. acknowledge that inference from these associations is limited due to the small number of dust storm days in the study period (n=63).

  As the data in **Table 4** show, the maximum measured values in the vicinity of the open cut mine are greater than those in the Middleton study; however, all the maximum data in the vicinity of the open cut mine were collected during a major dust storm day on 23rd September, 2009. Aside from this event, the data collected in the monitoring network in the vicinity of the open cut mine are significantly lower than those in the Middleton study. In addition, the data from the study were again collected in an urban area with a significantly larger population than rural areas.

Table 4: PM10 data collected within close proximity[(a)] to an open cut mine compared with Middleton et. al

	Period	Mean	SD	Min	5th percentile	Median	95th percentile	Max
				Middleton et al				
Cold months	1995-2004	57.6	52.5	5.0	20.0	50.8	103.0	1370
Warm months	1995-2004	53.4	30.7	18.4	32.0	50.5	77.3	933.5
				near an open cut mine				
1	1/1/2004 - 31/5/2009	27.4	40.2	1.6	8.5	22.3	22.3	1756.0
2	1/1/2004 - 31/5/2009	23.4	31.2	2.4	8.2	20.0	56.3	1381.6
3	1/1/2004 - 31/5/2009	25.1	36.4	2.8	8.3	21.0	62.9	1575.4
4	1/1/2004 - 31/5/2009	27.6	28.8	1.0	9.0	22.9	76.9	1086.9
5	1/1/2004 - 31/5/2009	24.3	34.4	1.3	9.0	21.0	57.3	1503.2
6	20/2/2007 - 31/5/2009	27.6	54.2	1.1	6.9	21.9	78.3	1740.8

(a) Samples taken within 300m -1000m of open cut mine, including nearest sensitive receptor

- **Perez et al (2008)** investigated the effects of exposure to $PM_{10-2.5}$ and $PM_{2.5}$ between March 2003 and December 2004 in Barcelona (Spain) on daily mortality. Barcelona is often affected by Saharan dust storms.

  The study found that during Saharan dust days, a daily increase of 10 μg/m^3 of $PM_{10-2.5}$ increased daily mortality by 8.4% compared with 1.4% during non-Saharan dust days. There was no increase risk of daily mortality for $PM_{2.5}$ during Saharan dust days.

  As this study did not present PM_{10} monitoring data, it is difficult to compare the study air shed to that near an open cut mine.

  However, the study also investigated the chemical composition of the PM data. Whilst the chemical components of the analysed dust are not exactly the same as those in **ACARP (2007)**, as **Table 5** shows, the study air shed contained a significantly higher proportion of industry emissions in both the coarse and fine fractions, compared with data collected at Muswellbrook, a town in the upper Hunter Valley that is near major mining activity.

  Perez et al. acknowledge that several studies have shown that Saharan dust may contain irritants or allergens and conjecture that the increased mortality may be related to biogenic factors associated with coarse particles.

Table 5: Contribution of different sources to coarse and fine particulate matter – ACARP Muswellbrook compared with Barcelona

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Combustion	BC, Cr, F, Ni and S	Cr and Ni	18.8	2.9	2.6	66.9	3.0	3.5
Industry	Co, Cu, Mn and Zn	Cu. Mn and Zn	0.3	48.7	43.7	0.2	61.9	56.1
Motor Vehicles	Br and Pb	Pb, Sb and As	0.2	8.2	7.6	0.3	12.5	11.7
Seasalts	Cl and Na	N/A	39.9	N/A	N/A	15.2	N/A	N/A
Soils	Al, Ca, Fe, Si and Ti	Fe, Ti, Zr and Ba	38.5	29.4	36.0	10.6	11.8	15.3
Woodsmoke/Bio mass burning	K	N/A	2.0	N/A	N/A	0.9	N/A	N/A
Others	H, P and V	P and V	0.3	10.8	10.1	5.9	10.7	13.5

Table 6, compares present Australian standards for particles to the US and EU. Australia currently has the most stringent AAQ standards in the world for particles, even more stringent than presently considered by The US EPA for application in the near future.

Table 6: Comparison of air quality standards/criteria

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PM_{10}	24-hour	50(a)	150(b)	65-85(b)	50(c)
	Annual	-	-	-	40
$PM_{2.5}$	24-hour	25(d)	35(e)	25(e)	-
	Annual	8(d)	15(f)	12(f)	25(g)

a) Maximum 5 days a year exceedences

b) Not to be exceeded more than once per year on average over 3 years.

c) 35 permitted exceedences per year

d) Advisory reporting standards.

e) 3-year average of 98th percentile.

f) 3-year average of annual mean.

g) By 2015 a new Directive becomes legally binding targeting the exposure of the populations to fine particles. These objectives are set at the national level and are based on the average exposure indicator (AEI). The AEI is determined as 3-year running annual average mean PM2.5 concentration and is set at 20 [illegible]g/m³ to be met by 20105, and 18 µg/m³ to be met by 2020 based on an exposure concentration.

It is also noted that the Australian standards and reporting levels are set at a level below or near to the existing ambient levels in some areas. For example, a brief review of NEPM monitoring data for NSW shows that between 1999 and 2008 no NSW NEPM monitoring station has always had 24-hour PM_{10} levels below 50 µg/m^3, and the number of days greater than criteria varies year-on-year (**DECCW, 2009**). Between 1999 and 2009 annual average $PM_{2.5}$ concentrations in Muswellbrook ranged from 5.5 to 7.5 µg/m^3

Before any changes are made to the NEPM with respect to particles, MCA consider that significantly more information is required relating to:

- The ratio of $PM_{2.5}/PM_{10}$ in urban, regional, and rural areas;
- Composition of the particles in urban, regional, and rural areas; and,
- The role that confounding pollutants play in heath impacts, which will require monitoring of other criteria pollutants outside the current monitoring in regional and urban areas.

1.2 Lead

Whilst MCA notes there is significant epidemiological data relating health impacts at lead blood levels lower than that in the current NEPM, it is noted that since the introduction of unleaded fuel, the lead levels in urban areas are so low that a number of jurisdictions no longer monitor lead.

MCA support a shift to periodic monitoring, including areas that may experience elevated levels. Ideally, the monitoring could incorporate work to confirm the bioavailability of the measured emissions, and potentially also consider that exposure to pollutants such as lead may be significantly influenced by other exposure pathways such as direct contact, ingestion and not only inhalation.

MCA recommends that with the significantly increased knowledge of the effects of lead, particularly in children, that the lead standard should be reviewed, but with the recognition that total ambient air lead levels may contribute only part of the whole contribution to blood lead levels.

1.3 Ozone and Nitrogen Dioxide

MCA acknowledges the NEPC work with respect to an eight-hour ozone standard, noting that current one-hour and four-hour ozone levels are close to or above the standard in key Australian cities. An eight-hour ozone standard has significant implications for cities like Sydney with increasing summer temperatures.

However, MCA urges the need for great care in setting an eight-hour ozone standard or amending the one-hour or four-hour standards. Amendments to these standards would lead to regulatory implications for industry that is generally not the main cause of the problem, particularly industry located well away from large cities.

2 EXPOSURE ASSESSMENT/MONITORING LOCATIONS

It is apparent that there is expected to be greater focus in the future on estimating population exposure to pollutant levels rather than on basic monitoring to assure equivalent protection of urban populations.

MCA considers that for accurate estimates of population exposure to be made, the following information is required:

- Monitoring of criteria pollutants in rural areas, both those where mineral activities do and do not take place, to provide the data required for exposure modelling. Collecting these data may also assist to establish any links between exposure to particulate matter in conjunction with other pollutants;
- Monitoring at air quality hot-spots that correspond to areas occupied by a significant fraction of the population, for example near roads, commercial, industrial, mining/minerals processing and other such areas;
- Monitoring in remote areas largely unaffected by nearby anthropogenic emissions to represent the underlying exposure levels, for a range of localities;
- Commence development of an agreed protocol for population exposure monitoring. This necessitates better air emissions inventory data for domestic, commercial and industrial emissions, including roads;
- Regular validation, and refinement of the monitoring, validation, inventory, modelling loop needed for the estimation of overall population exposure.

3 GUIDANCE OF APPLICABILITY

Although guidance is provided to the jurisdictions as to how and where the NEPM applies, it is evident that in the absence of specific health based goals, the NEPM goals are applied by state governments as criteria for approval and management of individual developments.

During the recent stakeholder briefings, the Commonwealth reiterated that the NEPM was not intended to be used for the purposes of setting compliance limits. But it was acknowledged that in some jurisdictions this has occurred. It was stated that a revised version of the NEPM would take this into consideration but ultimately the NEPC does not control how the jurisdictions implement the NEPM.

The NEPC could potentially expand on the applicability guidance to include additional guidance to the jurisdictions on how to apply uniform national approaches to address the cause of exceedances and to implement appropriate control measures in a consistent manner, as necessary.

Although most air quality experts understand the aims, inherent limitations and functions of the NEPM and the NEPM goals, increasingly laypersons and citizens are misinterpreting these.

The MCA considers that (in almost any public forum or debate) the evident lack of a good community understanding of air quality matters is a serious issue, and the stress and worry some individuals experience as a result of misunderstanding key instruments, such as the NEPM, can potentially be reduced.

The MCA recommends that a plain English summary, and potentially a summary text box at each key section should be provided to make the NEPM, its purpose and applicability more accessible to the public.

4 SUMMARY OF KEY AREAS FOR CONSIDERATION & RECOMMENDATIONS

The following provides a summary of key areas for consideration and recommendation:

- Adoption of an exposure based approach is supported and may need careful development, possibly on an ongoing basis. Consideration of exposure modelling, coupled with periodic monitoring, inventory development, and validation, iterated on a regular basis may be needed.
- A cost benefit analysis (CBA) approach to any possible changes to the AAQ NEPM is fully supported.
- Closer examination of the differences in particulate matter of crustal and combustion origin, and how this relates to the NEPM goals, and specifically to exposure. Some of the relevant literature that would warrant consideration is summarised in this submission.
- Additional guidance on the applicability of the NEPM and the NEPM goals, especially with a view to engendering uniformity in the regulatory approach (setting process) for managing air quality in the various state jurisdictions.
- Plain English summaries of the key parts of the NEPM to make it more accessible to the public without misinterpretation.

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