

Mine dust and you

People living near mine sites often ask about the effects of dust emissions in the air as a result of mining activities. This brochure has been prepared to explain the type of dust that is generated from mine sites, the potential risks from mine dust to health and amenity (how pleasant a place is) and the controls the mining operator puts in place to reduce dust emissions.

What is particulate matter?

Commonly called "dust", scientists and regulators use the term **particulate matter** (or PM) to describe the range of particles in the air we breathe.

PM exists naturally in the atmosphere, eg sea-salt spray and pollens. PM can be increased due to human activities such as vehicle exhaust, industrial processes, power stations, mining, farming and wood heaters, or smoke from bushfires.

Exposure to PM can be associated with health and amenity impacts. The likely risk of these impacts depends on a range of factors including the size, chemical make-up and level of the PM and the general health of the person.

Sizes of particulate matter

Just as the size of balls that we can see ranges from marbles to basketballs, PM can be thought of as microscopic balls of varying sizes. Instead of measuring PM in centimetres as we do with balls, scientists use micrometres (sometimes called "microns") to measure the diameter of particles. A micrometre is one-millionth of a metre and its symbol is μm .

For environmental health purposes, particles are usually described by their size:

Particle size	
TSP	Total Suspended Particulate Matter (TSP) refers to the total of all particles suspended in the air. Even the largest of these particles is barely half the width of a human hair.
"larger than" PM ₁₀	A subset of TSP, and refers to all particles of size 10 μm in diameter and greater.
PM ₁₀	Also a subset of TSP, and includes all particles smaller than 10 μm in diameter (smaller than 1/7th of a hair width). Particles in the size range 2.5 μm to 10 μm in diameter are referred to as coarse particles (PM _{2.5-10}).
PM _{2.5}	A subset of both PM ₁₀ and TSP groups and includes all particles less than 2.5 μm in diameter. PM _{2.5} is referred to as fine particles and is mainly produced from combustion, such as vehicle exhaust.

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ISSUED JANUARY 2006

Particle levels in air are measured by the weight (micrograms) of particles per cubic metre of air ($\mu\text{g}/\text{m}^3$). One $\mu\text{g}/\text{m}^3$ equals one-millionth of a gram in a cubic metre of air. TSP can also be measured as the weight of dust falling on a given area over time ("dust deposition").

Particulate matter from mining

The vast majority of dust from mining activities consists of coarse particles (around 40 per cent) and particles larger than PM₁₀, generated from activities such as the mechanical disturbance of rock and soil materials by dragline or shovel, bulldozing, blasting, and vehicles on dirt roads. Particles are also generated when wind blows over bare ground and stockpiles. These larger particles can have amenity impacts as well as health impacts.

Fine particles can have health impacts and are also produced at mine sites, though they only account for about 5 per cent of the particles emitted during the mining process. Fine particles produced at mine sites are mainly from vehicle and mobile equipment exhausts.

Potential health impacts from PM

The human body's respiratory system has a number of defence mechanisms to protect against the harmful effects of PM. PM is often trapped in sticky mucus on the walls of the airways and can be removed by cilia, small hair-like objects which line the surface of the airways. This mucus can then be swallowed or coughed up.

Generally, it is thought that fine particles below 2.5 μm in diameter may be of a greater health concern than larger particles as they can reach the air sacs deep in the lungs. However, coarse particles (PM_{2.5-10}) are also associated with adverse health effects.

People who may be more susceptible to the health effects of fine and coarse particles are:

- infants, children and adolescents
- elderly
- people with respiratory conditions such as asthma, bronchitis and emphysema
- people with heart disease
- people with diabetes.

If health effects arise from exposure to coarse particles, such as from mining activities, the symptoms are most likely to be:

- cough
- wheeze, or worsening of asthma

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- increased need for medications (eg puffers, antibiotics)
- increased breathlessness.

High levels of TSP may also cause coughing, sneezing or sore eyes.

Potential amenity impacts

Amenity impacts from dust are usually associated with coarse particles and particles larger than PM₁₀. The impact of dust from a nearby mine on local amenity depends on the distance from the mine site and climatic conditions, such as wind.

Concerns about amenity from mine site dust often relate to 'visibility' of dust plumes and dust sources. Visible dust is usually due to short-term episodes of high emissions, such as from blasting.

Other amenity impacts include dust depositing on fabrics (such as washing) or on house roofs, and the transport of dust from roofs to water tanks during rain. NSW Health's Rainwater Tanks brochure provides advice on how to maintain water tanks for safe drinking. Strategies to reduce dust in water tanks include first flush devices and desludging. The brochure can be obtained from the NSW Health website www.health.nsw.gov.au/public-health/ehb/water/rainwater.html or contact your local Public Health Unit.

Government regulations

In New South Wales, outdoor air quality is governed by both State and Australian regulations. The National Environment Protection Measure (Air NEPM) provides air quality standards that are applied in cities and large towns across Australia. NEPM standards apply to average concentrations across a region.

The NSW Department of Environment and Conservation (NSW DEC) also has regulatory criteria for assessing air quality. Although consistent with the Air NEPM, these criteria are more comprehensive. NSW DEC Impact Assessment Criteria are used to assess PM in localised areas, close to the mine itself.

The standards and criteria imposed by the regulators take into account what we know about health effects on people with asthma, lung conditions, and heart disease. PM standards and criteria are set to control short term (daily) and long term (average) levels. The table below summarises the relevant air quality standards and criteria for mines.

All recent development consents and project approvals for mines in NSW establish the NSW DEC criteria as standards applicable to operating mines. Consents also provide that where these standards are not being met at residences within

the mine's acquisition or management zones, then the property owners are entitled to have their property acquired by the mine at a price established according to a set formula.

How are dust emissions from mine sites minimised?

Primary dust control at mine sites is achieved by a combination of water sprays (such as stockpile sprays and road watering) and enclosures (such as covered conveyors). A further key control is keeping the area of disturbed land to a minimum, through progressive mine rehabilitation. This helps reduce dust from wind erosion. Locating mines some distance from surrounding neighbours, the design of mine layouts and choice of equipment and work practices can also reduce potential dust impacts on both health and amenity.

Dust modelling and prediction is an important part of minimising dust and determining appropriate dust controls and management programs. Many sites use weather stations and real-time dust monitors located between the mine and nearby neighbours to match dust events to activities on the mine site. This information can then be used to adjust mining activities to minimise dust. For example, changing the location of dumping operations or modifying a blasting program based on favourable weather conditions.

How can you avoid mine dust?

Provided that mines are operated with proper dust controls, it is unlikely that healthy adult residents would suffer any serious health effects from the expected exposure to particulate matter.

If you notice that dust levels are high, try to keep your windows and doors closed. People who have asthma or lung conditions should avoid outdoor activities at these times. An air-conditioner can reduce PM levels inside, but it is important to regularly clean the intake filter.

Residents finding dust levels a nuisance or a health risk can obtain advice by contacting their local mine through the community complaints line or by phoning the community relations staff; or raising the issue through the mine's Community Consultative Committee.

Residents experiencing the health symptoms outlined in this brochure should see their local doctor. For further information about potential health effects from PM see www.health.nsw.gov.au/living/airpollution

Residents may also wish to contact the NSW DEC Environment Line on 131 555 for information on air quality and environmental issues.

Air Quality Standards and Criteria for Particulate Matter

Pollutant	Averaging period	Concentration $\mu\text{g}/\text{m}^3$	Set by
TSP	Annual	90	NSW DEC
PM ₁₀	1 day (24 hr)	50	NSW DEC
	1 day (24 hr)	50	NEPM (allows exceedance 5 times/year)
	Annual	30	NSW DEC
PM _{2.5}	1 day (24 hr)	25	NEPM (advisory standard)
	Annual	8	NEPM (advisory standard)
Dust deposition	Annual (total)	4 grams/m ² /month	NSW DEC
	Annual (increase)	2 grams/m ² /month	NSW DEC