**15 February 2023**

**RE: Reduction in the guideline exposure limit for diesel particulate matter (DPM) for Queensland Coal Mines**

Dear Site Senior Executive,

Resource Safety Health Queensland (RSHQ) – coal inspectorate, with support from the tripartite Coal Mining Safety and Health Advisory Committee has taken the proactive step of **reducing the current guideline exposure limit for DPM from 0.1 down to 0.05 mg/m$^3$ (measured as Sub-micron elemental carbon).**

This decision was made after consideration of the following issues:

- There is currently no legislated exposure limit for diesel exhaust or DPM in the QLD coal mining regulatory framework.
- Safe Work Australia (SWA) has not assigned a Workplace Exposure Limit (WEL) for this contaminant.
- Diesel engine exhaust was classified as carcinogenic to humans by the International Agency for Research on Cancer (IARC), in 2012.
- There is sufficient evidence to suggest that the current guideline value of 0.1mg/m$^3$ may not provide adequate protection against the cancer risk to coal mine workers.
- There are no technical boundaries with respect to measurement and analysis of DPM at this recommended exposure limit.
- Underground mines in Queensland have already demonstrated the capacity to comply with this recommended guideline limit, using existing technology.
- This decision aligns with the objects of the *Coal Mining Safety and Health Act 1999* (CMSHA), for risks to be at an acceptable level, risk from the operation is to be within acceptable limits and as low as reasonably achievable.

**Note:** Even at this revised guideline value, available personal monitoring data indicates that the risk to Coal Mine Workers (CMWs) at surface operations remains low.

Site Senior Executives should be aware of the following:

- The Queensland coal industry is to adopt an interim 8-hour time weighted average personal exposure guideline limit of 0.05 mg/m$^3$ or 50 µg/m$^3$ (measured as sub-micron elemental carbon) until SWA reviews and provides recommendation for a workplace exposure limit (WEL).
- The limit is to be shift adjusted to account for longer shift duration or altered shift arrangements.
- For compliance purposes, coal mines will have a 12-month transition period from 15 February 2023 to 15 February 2024.
- During the transition period, coal mines apply the interim limit of 0.05mg/m$^3$ at site level and internally investigate any exceedances that occur above this limit.
- Underground coal mines continue to report all DPM exposure data annually to the RSHQ exposure database.
- Notwithstanding the above and in line with the objectives of the CMSHA, QLD coal mines continue to pursue the reduction of exposures to ALARA.

**It is recommended that Site Senior Executives:**

- Review their mine's Safety Health Management System with reference to the lower guideline limit and ensure risk management processes are being effectively applied to reduce DPM exposure. This includes risk assessment and hazard control plans in addition to exposure monitoring.
- Consider adopting the risk based approach to monitoring airborne contaminants outlined in Recognised Standard 14, to establish baseline and periodic exposure monitoring for DPM. In the interim, engage a certified occupational hygienist (COH) to conduct a statistical analysis of the personal monitoring results with the new guideline exposure limit of 0.05mg/m3 (to be shift adjusted), to determine ongoing periodic DPM monitoring.
- Investigate personal exposure results that exceed the new guideline value. **Note:** There is no requirement to notify an inspector of a single exceedance of DPM, but it is important that the site investigates all exceedances internally, to identify the cause and implement corrective actions, with consideration of section 9 in Recognised Standard 14.

**Yours Sincerely**



**Jacques Le Roux**
**Chief Inspector of Coal Mines**

**Supplementary Information**

The operation of diesel engines and the associated combustion process, produces a complex mixture of products that consists of DPM, exhaust gases, including a wide range of organic vapours, and a small amount of metallic compounds. These components are collectively referred to as diesel exhaust emissions. Exposure to diesel exhaust is known to cause short term health effects such as headaches, irritation, nausea and irritation respiratory to the upper respiratory system.

Chronic exposure to diesel exhaust and the cancer risk was the subject of considerable scientific debate over many years. In 2012 the IARC re-classified diesel exhaust from a probable (Group 2A) to a confirmed human carcinogen (Group 1). It is recognised that workers in industries such as underground mining and tunneling are at an increased risk due to the potential for concentration of emissions.

Queensland (QLD) underground coal mines first began to measure personal DPM exposure in the late 1990's. The focus on emission control and personal monitoring rates increased steadily during the early 2000's. In 2005, an industry diesel particulate steering committee was formed by the Coal Inspectorate and continues to meet on a regular basis.

**Note:** A number of surface coal operations have undertaken risk based personal monitoring and all available data indicates that the risk to CMWs at surface operations remains low when compared to the revised guideline value.

**History of diesel exhaust exposure limits**

Unlike other airborne contaminants such as respirable coal dust, respirable crystalline silica or the various mine gases, there is currently no legislated exposure limit for diesel exhaust or DPM in the Queensland coal mining regulatory framework.

This may be in part due to the fact that, SWA has not assigned a Workplace Exposure Standard (WES) for this contaminant. It is general practice that the exposure limits specified in coal mining closely follow the SWA WES.

In the absence of any prescribed limits, the mining industry in NSW, QLD and WA have been applying a guideline value of 0.1 mg/m3 (measured as submicron elemental carbon) since the early 2000's. Elemental carbon is used as a surrogate for diesel exhaust pollutants. This limit was based on prevention of **short-term irritant effects** and not the chronic exposure risks. It had been shown that when workplace exposures are controlled below 0.1 mg/m3, the irritant effects associated with exposure are reduced.

**Current regulated exposure limits for diesel exhaust**

| Agency | Exposure Limit measured as sub- micron elemental carbon ($mg/m^3$) | Notes |
|---|---|---|
| **Safe Work Australia** | No current limit* | Recommendation deferred |
| **NSW Mines (All)** | 0.1 | Legislated |
| **WA Mines (All)** | 0.1 | |
| **QLD UG mines (All)** | 0.1 | Guideline value only |
| **Australia Institute of Occupational Hygienist (AIOH)** | 0.1 | With action trigger level of 0.05 to investigate exposure and review controls |
| **Belgium** | 0.05 | |
| **Germany** | 0.05 | |
| **New Zealand** | 0.1 | |
| **European union nations** | 0.05 | |
| **NIOSH** | the lowest feasible concentration | |

***** In 2018 SWA commenced a review of the consolidated WES that covered over 600 individual substances, including diesel engine emissions (DEE). At the conclusion of this process being applied to DEE, SWA recommended that "*There are insufficient data available to recommend a suitable TWA. Given the data available from the primary sources, it is recommended that a review of additional sources be conducted as priority at the next scheduled review".*

*In their concluding remarks, SWA stated that:*

> *"Epidemiological studies have shown an increased relative lung cancer risk for occupations with exposure to diesel engine emissions"*
> *"diesel engines emissions are characterised as a non-threshold genotoxic carcinogen"*
> *"HCOTN (2019) has derived a risk-based exposure concentration of 0.011 µg/m3 as respirable elemental carbon, for 40 years occupational exposure with lung cancer as the critical effect. This is considered the "target risk level", a concentration at which an additional four extra lung cancer deaths per 100,000 are likely to occur due to 40 years of occupational exposure*