

Sulfur Dioxide (SO₂) FAQ

NANA



Teck

What is Sulfur Dioxide (SO₂)?

- SO₂ is a colorless gas that is heavier than air and has a pungent odor. It is not flammable. SO₂ is generated when oxygen in air reacts with iron-rich rock (oxidation).
- Normally this would not be an issue while in the ground, however when the rock is mined and exposed to air, it heats up and can release SO₂ gas.
- A similar reaction occurs with packet-style hand warmers, which contain iron. When opened, they are exposed to oxygen in the air, which reacts with the iron and creates heat.

Where is the SO₂ at Red Dog coming from?

- Sulfur Dioxide (SO₂) emissions are naturally present due to the nature of the ore at Red Dog. Recently, increased iron sulfide in the ore currently being mined has led to higher emission levels.
- When ore and waste rock are mined, the rocks are exposed to air and generate heat energy, resulting in the release of SO₂, and if water is present, steam.
- While SO₂ emissions have been present at Red Dog since the 1990s, current deposit ore and waste rock contain high iron levels, creating “hot spots” within the pit. These hot spots release SO₂ gasses and recent low temperatures, and low winds have allowed emissions to settle in lower-lying areas.

How is Red Dog prioritizing the safety of site personnel?

- At Red Dog, the safety and health of the personnel on site is our top value. Red Dog is working closely with the federal Mine Safety and Health Administration (MSHA), as well as external experts, to monitor emission levels and take actions to reduce emissions and protect continued health and safety for workers, and keeping NANA informed.
- This includes increased monitoring, raising fresh air intakes to higher elevation, and installing carbon air filters on air handling units in buildings, including the camp residence, to reduce concentrations in facilities.
- We are also fitting all personnel with respirators, limiting the number of personnel on site, cooling reactive ore using water trucks to reduce the SO₂ generating reaction, and reducing production from certain areas of the pit.
- Monitoring is being conducted to confirm emission levels are within federal mine safety and health standards for SO₂ exposures. Monitoring data and mitigation plans were reviewed with MSHA during recent inspections. No citations related to SO₂ were issued.
- In the event SO₂ levels exceed mine safety and health standards, emergency response personnel have protocols in place to move personnel from an area of higher concentration to safe muster areas of low concentration until the SO₂ levels reduce sufficiently.
- Out of an abundance of caution, we are reducing the number of personnel on site until key mitigation measures are in place, which we anticipate to be in the near future.

How is Red Dog prioritizing the safety of site personnel? *Continued*

- Personnel who are required to work onsite but have concern for potential health risks will be evaluated by Medics to determine whether they have elevated risks to exposure.
 - If the Medic finds the employee has an elevated risk from exposure, they will be put on Administrative Leave with Pay until the human health risk to employees is sufficiently resolved.
 - If the Medic finds the employee does not have an elevated risk of exposure, they have the option to be put on unpaid leave.
- Red Dog adheres to the NIOSH exposure limits of 10 hours TWA (Time Weighted Average) at 2ppm and 15 minutes STEL (Short Term Exposure Limit) at 5ppm. This is a stricter (more conservative) exposure limit than federal standards require.

How is Red Dog working with NANA to address the SO₂ events at site?

- Red Dog is working closely with NANA, external experts, and the federal Mine Safety and Health Administration (MSHA), to monitor emission levels and take actions to reduce emissions and ensure continued health and safety for workers.
- An SO₂ management team meets 4 times a week to develop and advance actions to mitigate SO₂ generation in the mine and potential exposure to the workforce. This includes a representative from NANA leadership.

What is Red Dog doing to mitigate SO₂ gas release?

- Main Pit Dump #4 (MPD4) has been identified as a hot spot for SO₂ emissions. To reduce emissions, a water truck is being used to cool MPD4. A pipe bench is also being developed to provide an increase of water to the area.
- All air handlers have been moved to recirculation mode with only the minimal make up air being drawn to maintain positive pressure in the facilities.
- Air intakes for the Personnel Accommodation Complex (PAC) are being relocated to reduce ingress of SO₂ into the living accommodations.
- Activated carbon filters have been installed in the air handler units in support of enhanced SO₂ removal.
- We are securing enhanced media filtration systems to install in the HVAC to scrub more SO₂ out of the air intakes.

How is Red Dog monitoring SO₂ levels on site?

- Numerous monitoring systems have been installed to support early detection of SO₂, and we are procuring more.
- We currently have nine (9) SO₂ portable detectors stationed inside the PAC, Mill and Service Complex areas for continuous monitoring. In addition, the Safety and Health Department team is performing manual readings using handheld SO₂ monitoring devices across fifteen (15) locations outside the PAC, Mill and Service complex areas on day and night shifts. Monitoring around the Mine, Airport and Construction Camp locations is also being performed by the Red Dog Fire Department.
- To further transition from manual readings to real-time stationary monitors, fifteen (15) outdoor semi-stationary monitors, twenty-eight (28) indoor stationary monitors and twenty-six (26) HVAC intake duct monitors have been ordered with an expected delivery date in mid-January.

How is Red Dog working with regulators to ensure compliance?

- The Mine Safety and Health Administration (MSHA) has completed two separate inspections onsite to ensure compliance with federal regulations.
- Monitoring and MSHA inspections show that emission levels are within federal mine safety and health standards for SO₂ exposures.
- Additionally, the MSHA inspector reviewed Red Dog's risk assessment for the mitigation plan to cool the material reacting in Main Pit Dump 4 (MPD4). The inspector was satisfied with the methodology and risk controls proposed to mitigate the hazards and protect the miners while performing mitigation activities.

How is Red Dog preparing for possible further increases in SO₂ levels?

- In addition to monitoring and mitigation efforts, Red Dog is preparing for potential elevated SO₂ events.
- Incident Management Team (IMT) Drills and Tabletop Exercises are being developed to refine our response to potential events.
- Critical roles such as the Mill Control Room Operator and Powerhouse Operators have staged personal protective equipment (PPE).

Is the food served at Red Dog safe to eat?

- Yes. The Food and Drug Administration (FDA) allows SO₂ and other sulfites as food preservatives but requires mandatory labeling if food items contain greater than 10 parts per million (ppm). No readings in the food preparation and distribution areas have exceeded 10 ppm.
- Out of an abundance of caution, NMS has engaged the Alaska Department of Environmental Conservation (ADEC) to determine whether any additional controls should be considered at this time.

Who may be sensitive to the effects of SO₂?

- Impacts of SO₂ may be determined by several factors including the dose (amount) and method of contact (for example, by breathing, eating, drinking, or touching). Other considerations include your age, sex, diet, family history, lifestyle, and health.
- Under low concentrations (<5ppm), inhaling SO₂ can cause irritation to the nose, eyes, throat, and lungs. Those with preexisting respiratory conditions may experience symptoms at concentrations as low as 0.25ppm.
- Unprotected exposure to high concentrations of SO₂ can cause permanent damage to the lungs.
- Symptoms can be worsened by pre-existing health conditions like asthma.
- Health effects can be prevented or mitigated with respiratory protection equipment with appropriate cartridges.
- Monitoring and MSHA inspections show that emission levels are within federal mine safety and health standards for SO₂ exposures.

For more information and updates about SO₂ at Red Dog

Visit www.teck.com/RedDogUpdate.

For questions or concerns

Contact Red Dog Community Relations at rd-ca@teck.com or call 907-758-5168.