Kennecott Utah Copper

# Kennecott impacts to winter inversion air quality frequently asked questions

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1. **What is a temperature inversion?**
   On most days during the year, the air temperature is cooler at higher elevations. Sometimes the reverse happens, and a temperature inversion forms, where warm air traps the cool air near the ground.

   Conditions that favor the development of an inversion are calm winds and cold ground temperatures. Calm winds, or no winds, prevent the warm air from mixing down to the ground, and cold ground temperature (or snow cover) prevents the surface from warming. A strong high pressure over an area and topography, such as valley locations, enhances the formation of inversions during winter months.

2. **How do inversions impact air quality?**
   Because warm air acts as a lid, and doesn't allow mixing during an inversion, pollutants released within the inversion are trapped near the ground. The strength and duration of the inversion affect the air quality in the valley.

   The affects (or impacts) of pollutants released during an inversion are influenced by several factors such as elevation of the release compared to the inversion elevation. For example, if a pollutant is released above the inversion layer, the gas will not have an opportunity to enter the inversion air because of the lid formed by the warm air during an inversion.

   Emission impacts during an inversion are also influenced by topography (can the pollutant get past a mountain and into the inversion), distance (with no wind, can particles get in if they are released outside of the inversion), etc.

3. **At what elevation does an inversion typically form in the Salt Lake Valley?**
   The University of Utah is conducting ongoing research of the Salt Lake Valley's

winter temperature inversions. This extensive research indicates that inversions typically form at approximately 1,600 meters above sea level.

4. **What are the impacts of Kennecott emissions during an inversion?**
   Kennecott's emissions have very little impact on air quality during a winter inversion. This is due to several factors including elevation of pollutant releases, topography, little or no wind, and limited seasonal operation.

   The smelter stack elevation is over 1,690 meters above sea level. This is well above the inversion ceiling (top), meaning that emissions from the stack would be released above the inversion, and because gasses rise, would not be able to mix with the air trapped in the inversion.

   The tailings impoundment is a source of fugitive dust. Emissions of particles are released when the wind exceeds a certain velocity. During an inversion episode, there is little to no wind. Also, during the winter, we cease construction at the tailings impoundment. Therefore, with ceased operations and little to no winds, there would be minimal to no emissions from tailings during an inversion.

   Kennecott's power plant does not operate in the winter and is therefore not a source of emissions.

   Because of the depth and diameter of the Bingham Canyon Mine, its own inversion forms within the pit when an inversion forms in the valley. According to research conducted by the University of Utah, during their studies of temperature inversions, the pit air mass is warmer than the valley air mass and the inversion layer forms at an elevation higher than the valley inversion.

   Pollutants released at the mine during an inversion become trapped by a lid, as described above, and settle within the mine as a result of its own inversion. Even if emissions were able to escape the top of the pit during an inversion, the elevation at the top of the pit is higher than the valley inversion so those emissions would be unable to mix with the trapped air in the valley.

   $PM_{2.5}$ data on the Utah Division of Air Quality's webpage indicates, the air quality monitor at Magna (near our operations) is the only monitor in the Valley that has always averaged below the $PM_{2.5}$ standard, while the two monitors located east of I-15 in Holladay and Salt Lake City have always had the highest $PM_{2.5}$ levels. The wintertime inversion problem is being caused primarily by low level sources such as cars and small sources located in those areas. (More)

5. **What types of emissions have the greatest impact during an inversion?**
   The Utah Division of Air Quality is currently conducting modeling of the inversions. According to the most recent publically available data, the model has indicated that of all sources present in the valley, small sources of volatile organic compounds (VOCs) (such as paint shops, dry cleaners, auto body shops,

and cars) have the most impact on formation of pollution during an inversion. Using the model, UDAQ has demonstrated that a decrease in VOC emissions from those sources would result in the largest decrease in pollution during an inversion, compared to decreases of other emission types.