

# **AMBIENT PM4 CRYSTALLINE SILICA SAMPLING**

**Fairmount Minerals, Inc.  
Maiden Rock, Wisconsin**

## **EXECUTIVE SUMMARY**

### **Conclusions**

Ambient PM4 crystalline silica levels both upwind and immediately downwind of the Fairmount Minerals Ltd. (Fairmount) underground quarry and processing plant near Maiden Rock, Wisconsin are extremely low.

The Maiden Rock facility emits very little PM4 crystalline silica as indicated by the very small differences between the upwind and downwind concentrations.

The upwind PM4 crystalline silica concentration data measured in the Maiden Rock area indicate that a major portion of the ambient PM4 crystalline silica is due to the combined contributions of a variety of common sources including farms, unpaved roads, construction activity, and global transport of dust. The measured levels both upwind and downwind of the facility are well within accepted background levels considered typical and consistent with good air quality.

### **Sampling and Analysis Procedures**

These conclusions are based on a comprehensive year-long sampling program conducted by Fairmount and designed by Air Control Techniques, P.C. During the sampling period from March 11, 2013 through March 19, 2014, Fairmount conducted 374 twenty four hour sampling runs at a total of three community oriented sampling locations on or near the facility. The samplers were placed at locations satisfying EPA sampling location siting criteria stated in 40 CFR Part 58, Appendix E. Ambient PM4 particulate matter in the ambient air was pulled into the instruments and filtered to obtain samples for crystalline silica analysis. This is one of the largest sets of ambient PM4 crystalline silica concentration data ever compiled.

Fairmount used state-of-the art ambient air samplers that met the stringent U.S. EPA design and operating requirements stated in 40 CFR Part 50, Appendix L for PM2.5 particulate matter monitors. These samplers are identical to ambient air samplers used by the Wisconsin Department of Natural Resources (DNR), many other state agencies, and the U.S. EPA. The samplers were operated with quality assurance procedures that exceeded the recommendations of the U.S. EPA and DNR.

Air Control Techniques, P.C. adjusted the air flow rate through these instruments to sample for PM4 particulate matter. This is particulate matter that has a size of equal to or less than 4 micrometers as measured by the National Institute of Occupational Safety and Health (NIOSH). PM4 is the size range used for many years by industrial hygienists and regulatory agencies concerned with crystalline silica occupational health. The measurement of ambient crystalline silica in the PM4 particulate matter size range ensured that the ambient concentration data compiled by Fairmount could be directly evaluated with respect to the extensive occupation hygiene literature.

Ambient crystalline silica concentrations for each of the filter samples were determined by a leading analytical laboratory, R. J. Lee Group, Inc. in Pittsburgh, Pennsylvania. They used X-ray diffraction analyses in accordance with the stringent requirements specified in NIOSH Method 7500. This is the same analytical method used for analyzing crystalline silica in occupation hygiene sampling programs. R. J. Lee Group, Inc. is accredited for NIOSH Method 7500 analyses.

The samplers operated for 24-hours—midnight-to-midnight every third day. Over the one-year period, Fairmount conducted tests during one hundred twenty four days. During each sampling day, samples were obtained simultaneously at the three community oriented sampling locations. This sampling frequency doubled the sampling frequency used by the Wisconsin Department of Natural Resources (DNR) for ambient particulate matter sampling for most of their filter-based samplers.

The ambient crystalline silica sampling methods used by Fairmount allowed for an extremely low detection limit of 0.3 micrograms per cubic meter. This is well below the detection levels of instruments used in workplace crystalline silica

studies. Despite this extreme sensitivity of this sampling method, most of the samples at the sampling sites at Fairmount Minerals did not have detectable crystalline silica levels.

## Results

All of the measured long-term average (12-month) PM<sub>4</sub> crystalline silica concentrations at the community-oriented sampling sites were very low. The annual average concentrations of ambient PM<sub>4</sub> crystalline silica at the three sampling locations ranged from 0.06 to 0.45 micrograms per cubic meter—values of 2.1 to 15.1 percent of the California Office of Health Hazard Assessment (OEHHA) chronic reference exposure level (REL) of 3.0 micrograms per cubic meter (70 year lifetime exposure).

A set of three samplers was used to estimate the contribution of Fairmount facility emissions to the long-term average concentration. Based on measured wind directions, Air Control Techniques, P.C. identified the downwind site during each sampling day. The upwind background concentrations were determined based on the arithmetic average of the concentrations measured at the other two sampling sites. The long-term average increase in the 24-hour downwind concentrations over the upwind background concentrations was 0.23 micrograms per cubic meter. The maximum observed increase on one of the 124 sampling days was 2.2 micrograms per cubic meter. These data indicate that Fairmount does not significantly increase the ambient PM<sub>4</sub> crystalline silica concentrations downwind of the Maiden Rock facility.

The regional background concentrations of ambient PM<sub>4</sub> crystalline silica contributed significantly to the measured concentrations at the three sampling locations. The regional background concentrations were clearly indicated by sets of sampling days in which all three sampling locations had measurable PM<sub>4</sub> crystalline silica concentrations regardless of the prevailing wind direction. The regional background concentrations are due to a variety of well-known sources of ambient PM<sub>4</sub> crystalline silica including (1) agricultural operations, (2) unpaved roads, (3) construction activity, (4) industrial sources, and (5) the global transport of dust from the Gobi (China) and Saharan (Africa) deserts. Considering that crystalline silica comprises 12% of the earth's crust, any activity that disturbs rock or soil has the potential to contribute to ambient PM<sub>4</sub> crystalline silica concentrations. The data compiled in this sampling program suggest that the combined contributions in Western Wisconsin from all of these sources are small and do not result in ambient concentrations that approach or exceed the OEHHA REL.

It was not the intent of this study to compile PM<sub>2.5</sub> particulate matter concentration data. Nevertheless, the PM<sub>4</sub> particulate matter concentration data provide a useful surrogate for PM<sub>2.5</sub> particulate matter concentrations because the PM<sub>4</sub> size range includes (1) all particulate matter between 0 and 2.5 micrometers, plus (2) all particulate matter between 2.5 and 4.0 micrometers. Accordingly, PM<sub>4</sub> particulate matter is a more inclusive size category. The PM<sub>4</sub> particulate matter concentration compiled as part of this study demonstrate that PM<sub>2.5</sub> concentrations in the Maiden Rock area are consistent with good air quality.

## Closing

Fairmount conducted this sampling program in accordance with well-established U.S. EPA and Wisconsin DNR sampling principles and procedures and with well-established NIOSH crystalline silica analytical procedures. The sampling program was long-term and comprehensive. The results are clear. The PM<sub>4</sub> crystalline silica concentrations in the Maiden Rock area are very low and well within the range considered to be consistent with good air quality.

During the recent increase in the number of sand producing companies in Wisconsin, a number of individuals have raised questions and concerns. This study directly addresses these questions and concerns in a constructive manner.

It is now time to go beyond speculation based on low quality data obtained by inappropriate sampling instruments for extremely short sampling periods using procedures that are entirely inconsistent with established ambient air sampling procedures. High quality data are now available—and these data strongly challenge the speculation.

Fairmount Minerals is pleased to be able to report that the ambient crystalline levels in the residential and agricultural areas surrounding its quarry near Maiden Rock are extremely low and in the normal range of concentrations found throughout the Midwest.