

# Baseline Crystalline Silica PM<sub>4</sub> Monitoring Protocol

February 3, 2015

## **PURPOSE**

In response to requests for baseline ambient air monitoring in Tunkhannock Township, Wyoming County, the Pennsylvania Department of Environmental Protection (DEP) will develop the capability of measuring ambient crystalline silica concentrations. Crystalline silica will be measured and reported as particulate matter, 4 microns (PM<sub>4</sub>). The sampling initiative will be designed to collect baseline fine particulate matter including PM<sub>2.5</sub>, PM<sub>10</sub> and PM<sub>4</sub> ambient crystalline silica samples for at least 90 days. An analysis of the results of the sampling will determine the baseline levels of ambient crystalline silica concentrations in the monitoring area.

## **BACKGROUND**

D&I Silica of Sheffield, Pennsylvania, proposes to build a silica sand transload facility in Tunkhannock Township. However, area residents have expressed a great deal of concern regarding silica emission from the facility and the proposed D&I site's proximity to the Hickory Dickory Dock daycare center and two little league ball fields. They believe that silica sand as well as an increase in diesel emissions from an anticipated increase in truck traffic will present respiratory hazards for children and the entire community. The daycare center has taken a stance that the silica sand and increased diesel emissions pose health risks to its children. Residents opposed to the D&I Silica transload facility have brought forth documentation and expert opinions reporting that airborne crystalline silica is a known lung carcinogen that can lead to *silicosis*, which is irreversible, crippling, and potentially fatal.

The World Health Organization's International Agency for Research on Cancer and the U.S. National Toxicology Program have both identified crystalline silica as a known carcinogen. According to the U.S. National Toxicology Program's *13th Report on Carcinogens*, "*crystalline silica is an abundant and commonly found natural material. Human exposure to respirable crystalline silica, primarily quartz dust, occurs mainly in industrial and occupational settings. Non-occupational exposure to respirable crystalline silica results from natural processes and anthropogenic sources; silica is a common air contaminant. Residents near quarries and sand and gravel operations potentially are exposed to respirable crystalline silica.*"<sup>1</sup>

## **MONITORING PLAN**

### **● Phase I: Meteorological Tower - Site Selection and Installation**

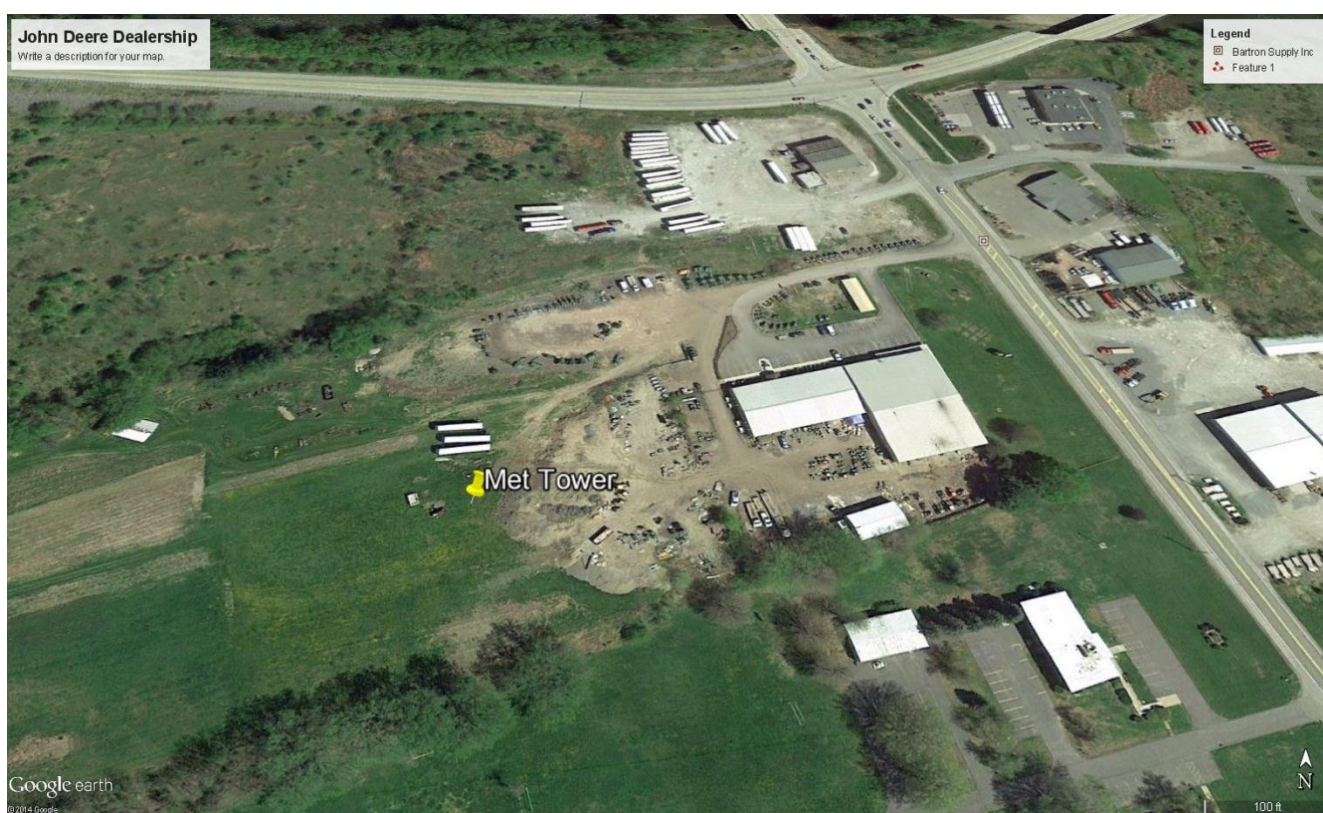
DEP will erect a portable 10-meter meteorological tower to measure local meteorological conditions during the baseline sampling periods. The specific meteorological measurements will include wind speed and direction, which will be measured at a height of 10 meters using a conventional anemometer and wind vane that meet the performance specifications in EPA-454/R-99-05, "Meteorological Monitoring Guidance for Regulatory Modeling Applications." Temperature, relative humidity and

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<sup>1</sup> <http://ntp.niehs.nih.gov/pubhealth/roc/roc13/index.html>

rainfall will also be measured. The electronic data logger measures the values every 10 seconds and stores hourly averages of wind speed, resultant wind direction, sigma theta (standard deviation of horizontal wind direction), hourly average temperature, percent relative humidity sampled on the hour and hourly total rainfall. DEP intends to maintain operations of the meteorological tower throughout the duration of the project to better inform the Department and public on localized meteorological conditions.

During November 2014, DEP performed a site visit in Tunkhannock to identify an area for installation of the meteorological tower. The best possible area was determined to be in the rear lot of the John Deere dealership (“Bartron Supply”) located at 109 State Route 92 South in Tunkhannock. To this end, DEP installed the tower on January 22, 2015. An image of the meteorological tower site is shown below.



● **Phase II: Site Selection and Sampler Placement**

During February 2015, DEP will initiate sampler site selection activities. The activities will include securing access to appropriate locations for siting the samplers (e.g., upwind, downwind and background sites), consistent with relevant federal criteria codified in 40 CFR Part 58, Appendices D and E.

● Phase III: Pre-operational Sampling

The pre-operational stage of the sampling project includes the period of time before the D&I facility is constructed in the Tunkhannock area. During the pre-operational sampling period, three sets of particulate samplers will be deployed near the site of the silica transloading facility to evaluate silica levels at locations upwind, downwind and at a background site.

Each site will operate three R&P 2025 particulate monitors. The first monitor will be configured to collect fine particulate matter (PM<sub>2.5</sub>). The second monitor will be configured to collect coarse particulate matter (PM<sub>10</sub>). The third monitor will be configured to collect airborne concentrations of crystalline silica samples (PM<sub>4</sub>) utilizing methodology currently being used in Minnesota<sup>2</sup>. There will be a 30-day pre-operational sampling period during which samples will be taken on a daily basis. When the transloading facility is operational, DEP will commence an additional sampling period.

● Phase IV: Operational Sampling

The second sampling period will last 60 days at the daily sampling rate with the option to continue at a reduced sampling frequency for an extra 30 days if the monitoring data indicate the need for additional sampling. For example, if there is a statistically significant difference in silica concentrations between sites, the co-location of PM<sub>2.5</sub> and PM<sub>10</sub> samplers could be deployed to assess precision.

Following is the tentative timeline for the monitoring plan:

Timeline	Activity
Dec. 2014	Identify site for pre-operational meteorological sampling and meteorological tower installation*
	<b>*Concurrently prep and refurbish equipment for field deployment</b>
Jan. 2015	Install meteorological tower
+90 days	Identify upwind, downwind and background sites based on collected meteorology and site availability**
+120 days	Deploy equipment for a 30- day pre-operational sampling period
+150 days	When facility is operational, conduct an additional 60 days of daily sampling
	<b>**If any of the selected sampling sites require the execution of a lease agreement, the timeline will be extended to account for this and any other unanticipated delays.</b>

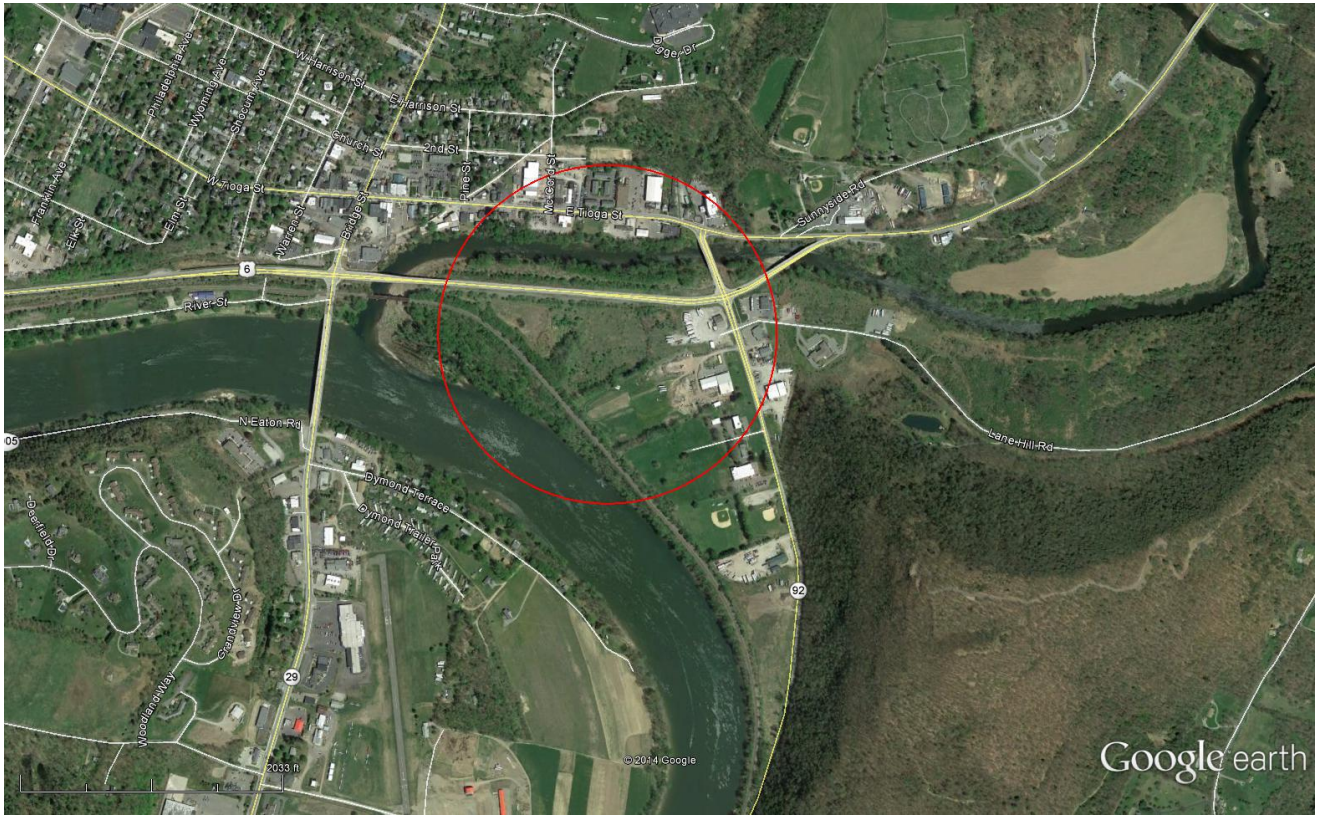
● Phase V: Data Analysis and Report Production

The PM<sub>4</sub> crystalline silica sample analyses will be performed using X-ray diffraction methodology. Because DEP's Bureau of Laboratories does not perform this analysis, DEP will execute a Contract for Services with a NELAP-certified laboratory to perform the analyses. Quality control requirements will be specified in the contract.

<sup>2</sup> The Minnesota Pollution Control Agency is conducting monitoring near silica sand-producing mines. Based on discussions with the agency and with Dr. John Richards, President of Air Control Techniques, P.C., a nationally recognized expert in particulate matter sampling and the "co-developer" of the ambient PM<sub>4</sub> crystalline silica sampling methodology, DEP has determined that the modification of PM<sub>2.5</sub> samplers will be necessary to collect ambient PM<sub>4</sub> crystalline silica samples.

● Site Location and Description

An image of the general Tunkhannock area is provided below. The proposed transloading facility location is within the red circle.



## **LIMITATIONS**

Although diesel emissions from an anticipated increase in truck traffic was listed as one of the two primary concerns regarding D&I's proposed project, diesel particulate matter (DPM) will not be analyzed as part of this study. Under ambient conditions and in any urbanized area, there are multiple possible sources of carbon including diesel trucks which make the source attribution much more complicated and beyond the scope of this project. DPM sampling is performed utilizing different methodology than the crystalline silica analysis.

The primary tool that DEP has for the collection of total black carbon (BC) is the aethalometer. Deploying continuous sensors as part of this project would require substantially more infrastructure (housings and dedicated power drops) as well as formal lease agreements. Due to the time-constrained nature of this project, an additional four to eight months of preparation would preclude collection of pre-construction samples.

Additionally, wood and coal-fired heating during the winter heating season will begin to play a larger role in the local BC load. Based upon D&I's anticipated construction timeline, there exists the possibility that pre-sampling will be influenced by residential heating source emissions while the post sampling may occur during the non-heating months. This scenario could possibly bias the post-construction sampling by generating lower ambient BC readings after construction due to the loss of localized home heating influences.

## **NEXT STEPS**

Based upon the results of the sampling effort and consultations with the Pennsylvania Department of Health, additional sampling may be undertaken to better define ambient concentrations of crystalline silica in the area.