Titan Lansing Transload Ambient Air Monitoring Data Report
North Branch, Minnesota
November 2012 – September 2015
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Executive summary

This report contains air monitoring data from the Titan Lansing Transload (previously Tiller) Corporation’s sand processing facility in North Branch, Minnesota. Ambient air monitoring for particulate emissions began at the facility in November 2012. Monitoring is scheduled to continue for a minimum of two years for PM$_{2.5}$, PM$_{10}$, and respirable crystalline silica (as PM$_{4}$).

At the time of this report publication, the collected data were below the respirable silica health based value and did not suggest any exceedances of ambient air quality standards. We will continue to review and analyze these types of data as they are submitted.

Ambient air measurement comparison with ambient air standards

These data are not yet sufficient for a true comparison to the state or national ambient air quality standards, and are considered preliminary at the current time. Three years of complete data are required to determine regulatory compliance with the PM$_{10}$ and PM$_{2.5}$ ambient air quality standards.

Location of air monitors: monitors are placed north and south of the facility boundary (aerial photograph taken before mining activity began)

The Titan Lansing Transload facility is in North Branch, Minnesota, approximately 35 miles north and east of the Twin Cities.
Activity at facility

Quarter 4 2012 (November 2012 – December 2012): Monitoring start-up prior to permit issuance.
Quarter 1 2013 (January, 2013 – March, 2013): Permit issued on January 3, 2013, for construction and operation of a silica sand processing facility
Quarter 2 2013 – present (April, 2013 – present): Operation of silica sand processing facility

Ambient air monitoring data charts

Respirable crystalline silica

There has been increased concern about potential exposures to air pollutants from silica sand-related facilities and related transportation in Wisconsin and Minnesota. Particulates and diesel-related pollutants are two types of pollutants that are appropriate for air studies near silica sand facilities. Airborne silica is a fairly ubiquitous pollutant and is not unique to silica sand mining and processing facilities. Particle pollutants vary by size. The smallest particles are of most concern because they are able to reach farther into the human lung, and very small silica particles at elevated concentrations and long-term exposures are associated with elevated risks of silicosis. Silica measurements tend to be of particle sizes from four microns and below, or PM$_4$. This is because silica has historically been an important occupational exposure concern, and PM$_4$ is the size fraction typically measured in the occupational health field. Since most of the available health data on PM$_4$ are from the occupational health field, PM$_4$ is the size fraction referenced in the health-based value developed by the Minnesota Department of Health (http://www.health.state.mn.us/divs/eh/risk/guidance/air/table.html). It is also the reason that silica as PM$_4$ is the desired measurement for monitoring studies around silica sand facilities.

The health-based value is a comparison for long term or chronic exposure durations, and so it is not appropriate to compare single 24-hour values to 3µg/m$^3$. For comparison to the health based value, a high estimate of the mean is calculated. The health based value is placed on the charts below for informational purposes only.

There is no U.S. Environmental Protection Agency (EPA)-approved measurement method to collect hourly silica PM$_4$ data. When hourly data are not possible, air measurements are taken on a frequency of one every 6 days or one every 12 days. This allows a non-biased data set, where measurements do not always occur on weekdays or one specific day of the week.

Respirable crystalline silica (PM$_4$) is being monitored at the northwest and south sides of the Titan Lansing Transload fence line at a 1 in 6 day frequency. Monitoring began at the site in January 2013. However, the flow rate on these air monitors was set incorrectly from January, 2013 – September 20, 2013 and data from this time period has therefore been marked invalid. On September 20, 2013, the flow rate was corrected, and valid data from this point on are reported in the charts below. Furthermore, no respirable crystalline silica data were reported from the time period between December 2013 and June 2014. Ambient air samples were collected, but the data were invalidated by MPCA because of flow rate and maintenance problems at the site. The information below reflects valid samples from sampling completed between September 2013 and September 2015. There were four additional invalidations for measurements at the South Monitor on April 12, April 18, June 17, and September 8, 2015, due to incorrect flow rates. For this reason, these values are not represented in the charts below. Respirable crystalline silica results from samples collected with invalid flowrates were not included in the UCL-95 calculations.
The Titan Lansing Transload monitors have had several detected silica measurements. As stated above, a high estimate of a mean is compared to chronic health based values. The high estimate of a mean that is recommended by the EPA is a 95% upper confidence limit of the arithmetic mean (UCL-95). This UCL-95 is calculated in a way that incorporates the values that are not detected, without biasing the data by detection limit replacement. The UCL-95 of the measurements at the North monitor was 1.8 ug/m3 and the UCL-95 of the measurements at the South monitor was 1.7ug/m3.
Respirable Crystalline Silica (PM$_a$) at the South Monitor at the Titan Lansing Sand Processing Facility

Health Based Value for Chronic (long-term) Exposure to Respirable Crystalline Silica

*Below Detection Limit
Particulate matter less than 2.5 microns (PM$_{2.5}$)
Particulate matter less than 10 microns (PM$_{10}$)

PM$_{10}$ Concentrations Measured at the Titan Lansing Sand Processing Facility

PM$_{10}$ Standard

North

South

Pre-Permit

Post-Permit

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Wind direction

Wind direction is an important factor in considering ambient air monitoring data. Two ways of illustrating wind direction are included below. A “wind rose” is a graphic depiction of wind direction, frequency, and speed. In these charts the wind is blowing into the center of the wind rose plot (i.e., the plot represents the “blowing from” scenario). The monitor located on the northern boundary of this facility captures facility-related air emissions coming from the southwest. The monitor on the southern boundary captures facility-related air emissions coming from the north. Particulates are collected and measured over 24 hours, but the wind speed and direction are measured hourly, so it is not possible to state which hourly air mass may have carried a pollutant that was measured at the monitor. Wind roses were created for all of the data, as well as on each date that respirable crystalline silica was detected.

Hourly Wind Directions for all meteorological data from January 2013 – November 2014

Hourly Wind Directions for meteorological data on June 4, 2014. Respirable crystalline silica measurement captured at South monitor, facility impacts would be from the north.
Hourly Wind Directions for meteorological data on July 10, 2014. Respirable crystalline silica measurement captured at North monitor, facility impacts would be from the south.

Hourly Wind Directions for meteorological data on August 9, 2014. Respirable crystalline silica measurement captured at South monitor, facility impacts would be from the north.

Hourly Wind Directions for meteorological data on January 6, 2015. Respirable crystalline silica measurement detected at South monitor, facility impacts would be from the north.

Hourly Wind Directions for meteorological data on January 12, 2015. Respirable crystalline silica measurement detected at South monitor, facility impacts would be from the north.
Hourly Wind Directions for meteorological data on January 30, 2015. Respirable crystalline silica measurement detected at North monitor, facility impacts would be from the south.

Hourly Wind Directions for meteorological data on February 23, 2015. Respirable crystalline silica measurement detected at North monitor, facility impacts would be from the south.

Hourly Wind Directions for meteorological data on March 7, 2015. Respirable crystalline silica measurement detected at North monitor, facility impacts would be from the south.

Hourly Wind Directions for meteorological data on April 12, 2015. Respirable crystalline silica measurement detected at both monitors, facility impacts would be from the north and south. The detected concentration was higher at the North monitor.
Hourly Wind Directions for meteorological data on April 18, 2015. Respirable crystalline silica measurement detected at South monitor, facility impacts would be from the south.

Hourly Wind Directions for meteorological data on April 12, 2015. Respirable crystalline silica measurement detected at both monitors, facility impacts would be from the north and south.

Hourly Wind Directions for meteorological data on May 6, 2015. Respirable crystalline silica measurement detected at the South monitor, facility impacts would be from the north.

Hourly Wind Directions for meteorological data on May 24, 2015. Respirable crystalline silica measurement detected at the North monitor, facility impacts would be from the south.
Hourly Wind Directions for meteorological data on July 23, 2015. Respirable crystalline silica measurement detected at the South monitor, facility impacts would be from the north.

Hourly Wind Directions for meteorological data on September 15, 2015. Respirable crystalline silica measurement detected at the North monitor, facility impacts would be from the south.

Pollutant roses for PM$_{2.5}$ and PM$_{10}$

"Pollutant Roses" are similar to wind roses except that they combine pollutant concentrations and wind direction. In the charts on the left side of the table below, the wind is blowing into the center of the pollutant rose plots (i.e., the plot represents the "blowing from" scenario). The charts on the following pages have been created using the same color scheme as the MPCA's Air Quality Index.

- Green: 0 to 50% of the standard
- Yellow: 51% to 100% of the standard
- Orange: 101% to 150% of the standard
- Red: greater than 151% of the standard (more than 1.5 times the standard)

The pollutant rose charts show three types of information:

1. Wind direction (blowing towards the center)
2. Pollutant concentration (red = highest concentration measured, green = lowest)
3. The number of times the pollutant was at that concentration range and was coming from that wind direction. The longer the coloration, the more times that pollutant concentration range was measured coming from that wind direction.

The polar plots to the right of each pollutant rose may be understood as follows:

1. They represent the un-summarized data incorporated into the pollutant roses. These same data when presented as pollutant roses are summarized by count.
2. The circles on the outside are higher concentrations, and lower at the center of the circles.
a. If there is a cluster of high concentrations in one area of the circle, this would be one piece of information to suggest a localized air pollution source blowing from that wind direction.

b. If the data circles are spread around the circle, this is one piece of information to suggest that the pollutant is more ubiquitous in nature.

**PM$_{2.5}$: North Monitor**

Facility-related air emissions would come from the south.

**PM$_{2.5}$: South Monitor**

Facility-related air emissions would come from the north.
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**Ambient monitoring data from other locations in Minnesota and Wisconsin**

The data displayed on the preceding pages are specific to the geographic area immediately surrounding the Titan Lansing Transload Facility. The data that MPCA collects in other regions of the state are intended to be representative of wider geographic areas. Nonetheless, it can be useful to compare the Titan Lansing Transload data to air concentrations measured at other ambient monitoring locations.

Represented in the following two charts are PM$_{2.5}$ and PM$_{10}$ ambient air concentrations from Minnesota and Wisconsin. Respirable crystalline silica is not a pollutant typically found in the MPCA ambient air network, and is currently only monitored around two silica sand facilities. PM$_{2.5}$ and PM$_{10}$ are “criteria” pollutants, and as such have specific ambient air quality standards, accepted methods for conducting air

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The air concentration charts below contain two pieces of information: the pollutant specific ambient air quality standard and daily measured values. The ambient air quality standards are provided for informational purposes only, as the daily concentrations are not the appropriate value for comparisons to ambient air quality standards. "Design values" are the appropriate comparison value and are statistical summaries of measurements that include an averaging time (e.g., daily, annual, hourly) and a statistical summary (average, 98th percentile, etc.). Each ambient air quality standard has a specific design value. It is not appropriate to compare other summaries of air concentrations (e.g., maximum, minimum, annual average, etc.) to an ambient air quality standard.

**Daily PM$_{10}$ data are shown in the charts below.** The comparison sites are various locations in Minnesota and Wisconsin chosen to be reflective of silica sand operations or roadway related air pollution including: Shakopee Sands in Jordan, Minnesota; Titan Lansing Transload in North Branch, Minnesota; and Dodge, Wisconsin. PM$_{10}$ is not monitored in as many locations as PM$_{2.5}$, and therefore the site selection for comparison sites was limited. The dates represented in the charts below are those when there were either data for Titan Lansing Transload or Shakopee Sands. Some data may be missing because it had not yet been submitted as of the publication date of this report.
Daily PM$_{2.5}$ data are shown in the charts below. The comparison sites are various locations in Minnesota and Wisconsin chosen to be reflective of silica sand operations or roadway air pollution including: Winona, Minnesota; Titan Lansing Transload Corporation in North Branch, Minnesota; Eau Claire, Wisconsin; La Crosse, Wisconsin; and the Near Roadway Site in Minneapolis, Minnesota at the intersection of I-94 and I-35W. The data were truncated to those dates where there were measurements at Titan Lansing Transload Corporation. Some data may be missing because it had not yet been submitted as of the publication date of this report.