Letter Health Consultation

Valley School Silica Exposures Status Update
Valley, Stevens County, Washington

July 30, 2016

Prepared by

The Washington State Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Washington State Department of Health

DOH 334-380

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

VALLEY SCHOOL SILICA EXPOSURE STATUS UPDATE

VALLEY, STEVENS COUNTY, WASHINGTON

Prepared By:

Washington State Department of Health
Under a cooperative agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Foreword

The Washington State Department of Health (DOH) prepared this health consultation in accordance with the Agency for Toxic Substances and Disease Registry (ATSDR) methodologies and guidelines. Health consultations are initiated in response to health concerns raised by community members or agencies about exposure to hazardous substances released into the environment. The health consultation summarizes our health findings and if needed, provides steps or actions to protect public health.

The findings in this report are relevant to conditions at the site during the time the report was written. It should not be relied upon if site conditions or land use changes in the future.

This report was supported by funds provided through a cooperative agreement with the ATSDR, U.S. Department of Health and Human Services. ATSDR has reviewed this document and concurs with its findings based on the information presented.

Use of trade names is for identification only and does not imply endorsement by state or federal health agencies.

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Kevin Foster
Superintendent
Valley School District No. 070
3030 Huffman Rd
Valley, Washington 99181

Re: Valley School Ambient Air Quality (crystalline silica issue), Valley, Stevens County, Washington

Dear Mr. Foster:

At the [12/11/2015] request of the Valley School District (VSD), the Washington State Department of Health (DOH) is providing this response as our evaluation of the outdoor air quality at Valley School.

The goal of the evaluation was to:

- Characterize measured particulate matter less than 10 micrometers (PM_{10}) for crystalline silica at Lane Mountain Company (LMC) near Valley School.
- Inform VSD and the community about next steps and recommendations to protect or reduce possible human exposure to silica.

We reviewed the results of a silica analysis completed by the Washington State Department of Labor and Industries (LNI) Laboratory on a subset of PM_{10} filters collected at LMC near Valley School. After reviewing the results, we found that all but one filter exceeded the Washington State acceptable source impact level (ASIL) of 3 micrograms per cubic meter (3 µg/m^3) for crystalline silica [The ASIL is adopted from the California health based reference exposure level (REL)]. However, this ASIL is based on data from respirable particulates, which have a cutpoint[1] of 4 microns in aerodynamic diameter (PM_4). Additionally, these data were collected on-site at LMC and not on the grounds of Valley School. Since the only data available for our review were collected on-site at LMC with an aerodynamic cutpoint of PM_{10}, we cannot conclude what concentration of respirable silica (PM_4) that students and staff may be exposed to at Valley School. We recommend additional crystalline silica sampling be collected from Valley School. We are working with the Agency for Toxic Substances and Disease Registry (ATSDR) to assess

[1] Cutpoint – specific diameter of dust particles

the feasibility of conducting additional sampling through ATSDR's Exposure Investigation (EI) program.

Background

Valley School is an elementary/middle school (kindergarten to eighth grade) located in Valley, Washington. The school has been in operation since the 1880s. The school has undergone several upgrades and expansions. In 1992, during an upgrade and repair of the roof, a large quantity of sand was found in the ceiling. Located directly across the street from Valley school is LMC silica sand production facility. LMC is the largest silica sand production facility in the Northwest and has been in operation at their current site since 1961 [1].

Timeline of events

- *1992:* Valley School contacted the Washington State Department of Ecology (Ecology) with concerns about silica dust and its potential impact on the health of students and staff. Ecology began monitoring the site in 1992, which resulted in enforcement action during 1992 and early 1993. LMC conducted a study to identify additional fugitive dust controls that would minimize impacts to the school. LMC also installed three high volume particulate matter samplers in 1993.
- *July 2008:* Valley School again contacted Ecology with concerns about health risks to children from silica dust exposure. LMC had substantially increased its stockpiles during the previous year. In addition, VSD was about to expand Valley School. Northeast Tri-County Health District (Local Health) is responsible for reviewing school building plans and, as part of the school plan review, the school has to address any mitigating health hazards. Local Health contacted DOH to express their concerns.
- *September- November 2008*: Ecology began monitoring ambient air quality at Valley School. Hourly PM_{10} data were collected using a Beta Attenuation Monitor (BAM) and in addition 24-hour integrated samples were collected with a Federal Reference Monitor (FRM). Samples were collected using a Thermo Scientific Partisol 2000 PM_{10} monitor using pre-weighed 47-mm Teflon filters. Samples were collected either once every 3 days or every 6 days.
- *February 2009*: Ecology shared the results report with DOH and Local Health. All agreed that there were not enough data to conduct a health risk assessment. DOH recommended a baseline standard of 3 to 5 $\mu g/m^3$ crystalline silica exposure based on EPA's estimated average ambient and acceptable ambient level [2, 3]. Ecology agreed that $3\mu g/m^3$ is protective of the general population. They agreed that additional multiyear monitoring of crystalline silica content of the dust was needed. These data were collected by LMC as part of a settlement agreement with Ecology to control fugitive dust emissions from the facility [4].
- *October 2010:* Additional collection of hourly PM_{10} data at a monitoring site located at Valley School began with only the BAM.
- *November 2012:* DOH contacted ATSDR Science Support Branch for assistance in summarizing and examining trends in hourly airborne data collected at Valley School. ATSDR analyzed BAM measurements and FRM data from October 2010 to March 2013. The results indicated that there were significant increases in measured PM_{10} during

weekdays and daylight hours, especially when the winds were strong and from the south and southwest. A seasonal pattern was found where PM_{10} concentrations to be highest during the summer and lowest during the winter with spring and fall as transitional periods. While PM_{10} measurements were below the National Ambient Air Quality Standards, more than 10 percent silica was present, so the PM_{10} standard was not applicable. ATSDR recommended that mineralogical characterization of the measured PM_{10} would be necessary to assess the potential health risk and sources [5].

- *February 2014:* ATSDR met with DOH, Ecology, LNI, Local Health, VSD and LMC to discuss options to move forward in assessing potential health risks. ATSDR provided a strategy to identify previously collected PM_{10} filters for silica analysis [6]. The FRM collects particulate samples on filters, which are later weighed and analyzed in a laboratory. LNI volunteered to provide silica analysis of a subset of the FRM samples. The subset came from samples from LMC, none were available from Valley School. LNI digested the original filters provided and redeposited the particulates on silver membrane filters for analysis using X-ray diffractometry. LNI also performed additional particle identification using scanning electron microscopy with energy dispersive X-ray spectroscopy to confirm particle size and quartz content.
- *August 2015*: DOH received the results of this study from LNI Laboratory.

Respirable crystalline silica (crystalline silica with aerodynamic size small enough to reach the respirable portion of the lungs) is a well-known occupational hazard. It has been associated with silicosis, pulmonary tuberculosis, and increased risk of lung cancer [7]. Respirable silica in the workplace is generally measured using PM_4. EPA evaluated risks of silicosis from ambient exposures, and found that current National Ambient Air Quality Standards for PM_{10} were adequate for exposures where less than 10 percent silica was present [8]. However, several states (e.g. California and Minnesota) have adopted standards for crystalline silica at 3 $\mu g/m^3$ measured at PM_4. Washington State also adopted a 3 $\mu g/m^3$ of PM4 as the acceptable source impact level (ASIL) in WAC 173-460-150 [9].

Discussion

Comparison of the hourly BAM data at Valley School and daily FRM data at LMC shows that PM_{10} concentrations on Valley School property are two to three times higher than those measured on the south side of LMC during the summer. While PM_{10} measurements were below the National Ambient Air Quality Standards, more than 10 percent silica was present, so the PM_{10} standard was not applicable. No silica ambient air monitoring data has been collected from Valley School.

In an attempt to assess potential risks that may be occurring at Valley School, LNI performed a retrospective analysis for silica on 40 archived FRM filters, collected on-site from LMC. Valley School had a different type of monitor, so analysis of those filters was not possible. Based on the analyses form LMC filters, we can make the following determinations:

- *Filter Mass Analysis*: The analysis of 38 FRM filters (excluding one lost in the sonicator and one used to confirm quartz by Raman spectroscopy) for silica by LNI showed silica

concentrations ranging from 12 to 76 percent of the measured PM_{10} mass, with a mean of 33 percent.

- *Ambient concentration*: Ambient PM10 concentrations of silica for this subset of the samples ranged from 4.8 to 28.8 $\mu g/m^3$ with a mean of 12.3 $\mu g/m^3$. Emission factors developed for silica processing activities show an average total PM_4: total PM_{10} ratio of 0.48 [10]. Assuming a similar ratio for the silica fraction, all but four of the 38 PM_{10} silica concentrations measured would result in PM_4 silica concentrations greater than the 3 $\mu g/m^3$ ASIL screening standard.

  At the FRM site, LNI analysis found silica concentrations above the 3 $\mu g/m^3$ ASIL screening standard during all seasons, but winter concentrations were lower than those measured in other seasons. Similarly, emission factors developed for silica processing activities show an average emission factor ratio for PM_4 silica: total PM_{10} of 0.056 with a strong dependence on the silica content of the source material [10]. Using this factor with the FRM PM_{10} mass measurements, four of the 40 samples are predicted to have PM_4 silica mass greater than 3 $\mu g /m^3$.

However, it is also important to note the known limitations and uncertainties are associated with this data:

- Two of eight filter blanks had high silica levels. The blanks that showed high silica mass also had high gravimetric mass measurements (63.9 and 186 μg) from their initial analysis. ATSDR noted positive bias in field blanks in the FRM data [5]. This indicates a possibility that the samples were not handled correctly and that the sample result could be biased high. Assuming that mechanisms that resulted in the contamination of these blanks also occurred in the samples, there is a possibility of increasing silica concentrations by 2.67 to 7.75 $\mu g/m^3$. All blanks that had satisfactory initial gravimetric mass measurements also had satisfactory silica mass measurements.
- Only PM_{10} silica was measured --PM_4 silica mass has only been estimated not confirmed.
- FRM filters were collected on-site at LMC and not on the grounds of Valley School. However, if the crystalline silica to PM_{10} mass ratios are considered to be similar at the two locations, crystalline silica concentrations at Valley School would be higher than those measured at the FRM location on the south side of LMC.

  Without crystalline silica measurements from Valley School it is not possible to determine if the crystalline silica to PM_{10} mass ratio is similar to that measured at LMC. However, if we apply the emission factors of 0.056 for PM_4 silica: total PM_{10} mass ratio [10], to the Valley School BAM data, then we would estimate that approximately 16% of daily average PM_{10} measurements from Valley School would result in PM_4 silica concentrations greater than 3 $\mu g/m^3$.
- Silica is a common crustal constituent and is present in many materials such as roadways. Therefore, silica measurements could also be influenced by roads and other sources in close proximity to the monitor.
- The type of filter used (Teflon filter instead of polyvinylchloride filters), sample storage conditions, and holding time (age of the samples) before LNI crystalline silica analysis, may also contribute to sources of uncertainties and results variabilities.

Data quality concerns with the silica data (particularly detection of silica in blank samples) prevent a definitive finding regarding respirable silica concentrations at Valley School or other nearby locations. Depending on the major source of silica (traffic or silica processing), the FRM monitor may not represent the highest silica concentrations in the area.

Conclusion

Since the only data available for our review were collected on-site at LMC with an aerodynamic cutpoint of PM_{10}, we cannot conclude what concentration of respirable silica (PM_4) that students and staff may be exposed to at Valley School. However, there are potential health concerns based on the likelihood of silica being above 3 $\mu g/m^3$ in PM_4.

Recommendations

DOH recommends that because the airborne silica poses a potential threat to students and staff, an environmental exposure investigation (EI) at Valley School should be initiated. This would include air monitoring that includes crystalline silica analysis of PM_4 samples.

DOH is aware of the decision by the Valley School District to restrict children from outdoor activities on windy days. DOH is supportive of this decision as a prudent public health measure to reduce potential exposure to students until additional air monitoring and analyses takes place.

We appreciate the opportunity to update VSD on the latest silica analysis and help with these technical issues. If you have any questions regarding this letter please feel free to contact me at 360-236-3376 or 1-877-485-7316 or by email at Lenford.O'Garro@doh.wa.gov.

Sincerely,

Lenford O'Garro
Toxicologist
Site Assessment and Toxicology Section

cc: Joanne Snarski, Department of Health
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Matt Schanz, Northeast Tri-County Health District
Joe Scates, Lane Mountain Company
Phillip Peters, Labor and Industries
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Debra Gable, ATSDR Region 10

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