Public Comments & WDNR Response
Guidance on Air Quality Review of Industrial $PM_{2.5}$ Emissions from Stationary Sources in Wisconsin

The document, "Air Dispersion Modeling Guidelines" with the appendix, "Air Quality Review of Industrial $PM_{2.5}$ Emissions from Stationary Sources in Wisconsin" is intended for use by internal staff, permit applicants, and external stakeholders. WDNR received 480 comments on the proposal, most via an email campaign and automated web link. The comments are summarized below followed by WDNR's response. All comments received are attached.

Comment Summary

Of the 469 comments received via the email campaign from Clean Wisconsin, 404 were identical except for signatures. The remaining 65 comments included additional statements, but all questioned the approach explained in the guidance. The questions centered on the perceived weakening of the $PM_{2.5}$ regulations by providing an exemption to requirements. The comments also mentioned existing WDNR dispersion modeling results for air pollution control permits and the area of southeast Wisconsin that previously did not meet the $PM_{2.5}$ standards.

Clean Wisconsin submitted additional comments, citing US EPA documents related to direct emissions of $PM_{2.5}$ and the characteristics of these particulates. Clean Wisconsin also referenced previous WDNR dispersion analyses for $PM_{2.5}$ with respect to the modeled concentrations and air permit streamlining efforts. They also questioned whether the trend in specific ambient monitoring data used in the proposal supports WDNR's conclusion. Lastly, Clean Wisconsin questioned whether the proposal will violate State and Federal permitting regulations.

Comments were received from Patricia Popple that expressed her concerns about fugitive dust from blasting events at sand mines and ambient silica concentrations around those mines, including photos of blasting events.

Patricia Hammel submitted comments that discuss the 2013 D.C. Circuit Court decision on US EPA monitoring thresholds for $PM_{2.5}$ and expressed concerns that the WDNR support document contained information from Wisconsin monitors that are located away from the sand mining and processing area of the state.

Pollution Technology provided extensive comments about the proposal including some clarifying questions about inputs to the dispersion model and related to the placement of monitors and the level of direct $PM_{2.5}$ emissions.

Dr. Crispin Pierce of the University of Wisconsin Eau Claire also provided extensive comments. Dr. Pierce cited studies that suggest fugitive dust contains directly emitted $PM_{2.5}$, and that tests by the Mine Safety Health Administration found respirable crystalline silica at plants in Wisconsin. Dr. Pierce mentioned US EPA emission factors for coal mining emissions and referenced his own research on $PM_{2.5}$ levels around sand operations, however, at the time these comments were received, Dr. Pierce had not yet published any findings.

After its publication, Dr. Pierce submitted his paper {*Walters, K, Jacobson, J., Kroenig, Z., and Pierce, C., $PM_{2.5}$ Airborne Particulates Near Frac Sand Operations, Journal of Environmental Health, Volume 78, Number 4, 8-12*}. The paper contained results of 6 air monitoring samples from 4 sites in western Wisconsin.

Midwest Environmental Advocates (MEA) did not dispute that secondary formation is responsible for a significant portion of ambient $PM_{2.5}$, but asserted that direct $PM_{2.5}$ from mechanical sources cannot be ignored. MEA stated that WDNR lacks a factual basis for the proposed $PM_{2.5}$ approach citing US EPA emission documents. MEA also had concerns with the use of regional monitoring information to support the proposal.

The Ho-Chunk Nation requested a government to government consultation with the State of Wisconsin that was held October 12, 2015. After this meeting, MEA, on behalf of Ho-Chunk, provided additional information regarding $PM_{2.5}$ emissions in Wisconsin they feel provides some evidence of the potential for direct $PM_{2.5}$ emissions from mechanical sources.

Darling Ingredients commented in support of the WDNR $PM_{2.5}$ approach, "Because the lack of real data to predict and mitigate impacts… could create significant delays in the permit approval process and has the potential to present a significant economic [effect] to industry."

Fairmount Santrol commented, "We believe that this [$PM_{2.5}$] guidance will help alleviate unnecessary regulatory burdens previously in place on our industry." They further stated that the guidance "Is a refreshing perspective backed by scientific data both in this state and others." Fairmount Santrol also commented that fence-line monitoring at their facility, as well as other similar facilities, have demonstrated that industrial sand mining operations do not cause adverse air quality impacts.

Wisconsin Transportation Builders Association fully supports the WDNR conclusion that direct emissions of $PM_{2.5}$ do not cause or exacerbate violations of the $PM_{2.5}$ NAAQS. WTBA supports the $PM_{2.5}$ approach as it eliminates the need for costly, burdensome, and unnecessary modeling associated with permitting non-metallic mining facilities.

Wisconsin Paper Council (WPC) commented in support of the WDNR proposal but requested several clarifications on implementation. WPC asked that this policy be implemented in a manner that is equitable to larger PSD sources and requested clarification regarding sources that must be modeled under the PSD regulations, the status of existing $PM_{2.5}$ limitations, and the use of the proposal for minor modifications. The comment also included discussion of a new National Council for Air and Stream Improvement (NCASI) report that supports the WDNR proposal.

Wisconsin Manufacturers & Commerce (WMC) agreed that air dispersion modeling should not be required for any operation permit or minor construction permit and commented in support of the WDNR proposal relative to $PM_{2.5}$. WMC further submitted the paper {*Richards, J. and Brozell, T., Assessment of Community Exposure to Ambient Respirable Crystalline Silica near Frac Sand Processing Facilities, Atmosphere 6 (2015): 960-982*} that includes information supporting the WDNR's position.

Response to Comments

WDNR reviewed all comments received and will include additional clarifying language to the final guidance document specific to modeling techniques. In addition, based on the WMC submittal of the published research by Richards et. al., a comparison between monitored concentrations collected during this study adjacent to sand processing facilities and data collected by WDNR regional monitoring locations has been included below.

The comments in opposition to the proposal are based on outdated, anecdotal information and misrepresentation of the issue. In the proposed guidance, WDNR does not suggest exempting sources from the requirement to meet the NAAQS, instead uses a weight-of-evidence approach to demonstrate that existing sources and new minor sources of air pollution do not cause or exacerbate a violation of the $PM_{2.5}$ NAAQS as required by statute. In the comments received, no information was provided to contradict the weight-of-evidence approach.

WDNR continues to assert that the proposed $PM_{2.5}$ policy is consistent with the science of fine particles and that the direct emissions of $PM_{2.5}$ from any individual stack or sources have little influence on the ambient concentrations of $PM_{2.5}$. Through speciation monitoring data collected around the state, WDNR has previously identified that existing $PM_{2.5}$ monitor data is comprised of secondarily formed compounds. WDNR has also noted that individual facility emissions of direct $PM_{2.5}$ are so low they are near the detection threshold of any reference or equivalent test method and thus not easily measurable. Consistent with this determination, in the preamble to the proposed implementation rule for fine particulates (*Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements, 80 Fed. Reg. 15340-15474, March 23, 2015, to be codified at 40 CFR Parts 50, 51, & 93*), US EPA has focused attainment area planning requirements on the impact of secondarily formed compounds and has not proposed changing national emission requirements or regulations of precursor emissions, nor are they proposing any regulation of direct emission of $PM_{2.5}$.

It is commonly accepted that particles 20 to 40 micrometers in diameter are visible to the naked eye. The visible emissions from roadways or blasting events may be a nuisance but they are not a health hazard due to their gravitational settling characteristics and the response of the human body. EPA recognized that total suspended particulate (TSP) was not a health hazard and, in 1987, revoked its TSP standard. While many studies in the late 1990's and early 2000's assumed fine particles were a part of the visible dust emissions (including information provided by the Ho-Chunk Nation), there are no corroborating studies, leading to the conclusion that the fine particles are not being captured by the monitors. Fine particles are transported hundreds of miles independent of the physical characteristic of the emission, and therefore the Department's current ambient air monitoring network would capture direct, nonreactive, fugitive dust particles if they were to exist. The monitoring data does not contain these particles; therefore the older assumptions that fine particles were part of visible emissions from roads and blasting have not been validated.

Wisconsin began addressing direct emissions of $PM_{2.5}$ in air pollution control permits during the second half of calendar year 2011. Limits in construction permits were primarily affected, as the policy for existing source permits was to address direct $PM_{2.5}$ emissions only if total allowable PM emissions increased from past permits. However, inclusion of modeling based limits on $PM_{2.5}$ in air permits has not been the driver of the monitored reductions in $PM_{2.5}$The downward trend in ambient concentration began in Wisconsin well before WDNR was required to address direct $PM_{2.5}$ emissions

in air permits. The downward trend, as expected, has followed the nationwide trend of decreasing sulfur dioxide (SO_2) and nitrogen oxide (NO_x) emissions in spite of additional construction permits and limited permitting of existing sources. The limited number of permits for direct $PM_{2.5}$ emissions from industrial facilities combined with the data showing secondarily formed compounds are the vast majority of fine particles captured by monitors, support the determination that direct emissions from industrial facilities do not impact the ambient concentrations of $PM_{2.5}$. This policy addresses the science behind $PM_{2.5}$ and the proven ineffectiveness of treating $PM_{2.5}$ in permits solely as a directly emitted compound.

Dispersion modeling analyses may be used to support the limitations contained in an air permit. A permit also contains the methods used to determine compliance with those limits. Because $PM_{2.5}$ emission factors or other reliable emissions data do not exist for many types of industrial operations permit applicants, environmental consultants and permit reviewers often start with the assumption that all particulate matter emitted by an operation is $PM_{2.5}$. If this assumption can be shown to meet the ambient standard via modeling, then there is no need to determine the true $PM_{2.5}$ emission rate. If this conservative emission rate cannot be shown to protect ambient air quality, $PM_{2.5}$ emissions limits are established in order for a permit to be approvable Most permit emission limitations for $PM_{2.5}$ are set as high as possible to account for these uncertainties in direct $PM_{2.5}$ emissions estimates. In most instances, this means that dispersion modeling is used to establish a theoretical limit on the emission rate, rather than basing the emission rate on actual physical characteristics of the emission source. The nature of the models combined with the conservative emission inputs mean that dispersion modeling results in support of permits are biased unrealistically high. Additionally, the stack test method used to estimate direct $PM_{2.5}$ emission rates cannot be used in many cases due to the test's sensitivity to moisture in the stack and the bulkiness of the testing apparatus which doesn't fit into many stacks. WDNR modeling analyses will now approach the evaluation of $PM_{2.5}$ using the Technical Support Document and general finding attached to this guidance. Since ambient $PM_{2.5}$ concentrations are heavily impacted by secondarily formed $PM_{2.5}$ and are decreasing in concert with SO_2 and NO_x emissions, the unrealistic modeling of erroneously calculated direct $PM_{2.5}$ emissions provides no legitimate information about the ambient concentrations of this pollutant.

In addition to the monitoring data provided in the draft proposal, additional monitoring data for particulate matter with aerodynamic diameter of 4 micrometers (PM_4) was collected by an independent third party immediately adjacent to a sand processing facility in western Wisconsin (*Richards, J. and Brozell, T., Assessment of Community Exposure to Ambient Respirable Crystalline Silica near Frac Sand Processing Facilities, Atmosphere 6 (2015): 960-982*). Dr. Richards study used regulatory $PM_{2.5}$ filter-based samplers adjusted to capture PM_4 particles and followed federal monitoring siting procedures. The monitors were located within the facility property where ambient concentrations from a directly emitted pollutant would be expected to be highest. Since the size fraction of the collected data includes $PM_{2.5}$ plus additional particles up to 4.0 micrometerss in diameter, the monitors were expected to detect a higher concentration than had the size range include $PM_{2.5}$ alone. The collected PM_4 data was compared to $PM_{2.5}$ data from the WDNR monitor in Eau Claire and concentrations from both locations varied from collection day to collection day in a similar manner. On a few days, the Eau Claire $PM_{2.5}$ data was slightly higher than the PM_4 data, but even when the converse was true there was never more than a few micrograms per cubic meter differences, and all measured concentrations were well below the daily $PM_{2.5}$ standard of 35 micrometers or cubic meter. Therefore, if $PM_{2.5}$ is directly emitted from such an industrial source, it does not affect ambient concentrations of $PM_{2.5}$.

In contrast, Dr. Crispin Pierce's paper (*Walters, K, Jacobson, J., Kroenig, Z., and Pierce, C., $PM_{2.5}$ Airborne Particulates Near Frac Sand Operations, Journal of Environmental Health, Volume 78, Number 4, 8-12*) does not provide enough information about their collection sites to ascertain if Federal monitoring siting criteria for $PM_{2.5}$ were met. The monitored $PM_{2.5}$ concentrations provided by Dr. Pierce were collected with equipment that does not meet regulatory standards, at locations that do not follow regulatory siting procedures, and at sampling times inconsistent with the time period of the standard, i.e. 24 hours. This makes comparisons with regulatory monitor information impossible and therefore, irrelevant to the required determination WDNR needs to make when approving permit actions.

WDNR is implementing all national rules related to the emissions of $PM_{2.5}$ and its precursors, and these federal rules are the most effective way at reducing the ambient $PM_{2.5}$ concentrations in Wisconsin. Continuing to set inaccurate, theoretical, and overly conservative $PM_{2.5}$ emission limits in existing source and new minor source permits through the use of dispersion modeling provides no additional environmental benefit when protection of the NAAQS can be demonstrated and ensured through the other means described in the WDNR proposed guidance. The WDNR's ability to use appropriate pollutant-specific techniques to demonstrate that air quality is protected improves the efficiency and effectiveness of the agency in reducing the impact of all forms of air pollution for all residents of Wisconsin.

Example of Identical Comment from Clean Wisconsin Campaign

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: [redacted]
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits
Sent: Sun 08/30/2015 8:17 PM

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

[redacted]

See more about: Linda Wilinski.

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From: Michael Williams <mikewms788@att.net>
Sent: Wed 08/26/2015 9:03 AM
To: Roth, John A - DNR
Cc:
Subject: Enter Your Action Subject

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

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The Wisconsin DNR had previously been considered a strong proponent for environmental controls to protect our land and the citizens. That seems to have changed to the DNR now being a proponent for corporate interests like frac mining and CAFOs. The citizens and landowners would like to see our old DNR returned to protect us from big money.

Thank you,

See more about: Michael Williams.

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Extra line breaks in this message were removed.

From: Sherlyn Stiewe <Stiewe@catnip-hill.com>

Sent: Wed 08/26/2015 9:44 AM

To: Roth, John A - DNR

Cc:

Subject: Enter Your Action Subject

Dear Mr. Roth & Ms. Hart:
Remember, you must look to the future, and protect all those who will need clean air to survive. Even now, there are" bad air days"
Where children and Seniors must stay inside.
Those of you who make decisions will one way or another be held accountable.I ask that you honor this responsibility by bringing forth policies that will keep Wisconsin air breathable.

Drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution standard.

Sincerely
Sherlyn Stiewe

See more about: Sherlyn Stiewe.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

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From: Alan Muller <alan@greendel.org>
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Sent: Wed 08/26/2015 11:06 AM

Dear Mr. Roth & Ms. Hart:

The scientific literature is filled with bad news about the health impacts of fine particulate and the need to regulate down to smaller sizes (nanoparticles or ultrafines). Please to not take a step in the wrong direction, one that would expose people to additional health hazards.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Alan Muller.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

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From: Arlene Kanno <akanno@uchicago.edu>
Sent: Wed 08/26/2015 10:46 AM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As a resident of a sandy area and highly concerned citizen/retired biology teacher, I am appalled that the DNR is even CONSIDERING allowing ultrafine particulates to be legal in Wisconsin.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

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Thank you,

See more about: Arlene Kanno.

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From: Tim Lowry <tlowry1@wi.rr.com>
Sent: Wed 08/26/2015 11:07 AM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues. Coal miners, shipyard workers, brake mechanics and others were exposed to dangerous levels of particles (asbestos, coal dust) in the air they breathed, but were not warned of the danger. As a result of the failure of the government to recognize the danger and protect workers/ citizens, millions have suffered debilitating diseases. If you shirk your responsibilities to our citizens, you too will have failed to do the job that citizens pay you to do. You are paid by and responsible to Wisconsin citizens, not some lobby or the industry they represent.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

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Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Tim Lowry.

Enter Your Action Subject - Message (Plain Text)

From: Susan Twiggs <setwiggs@gmail.com>
Sent: Wed 08/26/2015 8:47 AM
To: Roth, John A - DNR
Cc:
Subject: Enter Your Action Subject

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

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Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.
We cannot allow exemptions particularly when we don't yet know what the health ramifications are. We do know what particulate in the lungs does. I've seen miners with black lung disease. It is not a pretty site. Their lives are shortened and they have chronic illness.
Keep the standards as they are. No exemptions.
Thanks

Thank you,

See more about: Susan Twiggs.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Ronna Swift <ronnas@athenet.net>
Sent: Wed 08/26/2015 12:43 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

I live in Appleton. I am a retired corrections educator/counselor. I have reactive airways which means invisible particulates in the air from the sand frack mines will affect my quality of life. Stiff regulation is needed. No, I am not a smoker.
Please, the purposed changes are going to cause many more health problems and deaths for Wisconsin residents.
the sand mining place south of New London and ones west of their will produce particulates that will blow toward Appleton. I have friends who live near the New London mine. It is already causing problems. We should be talking conservation and alternative energy use and shut down all fracking. Our planet is dying. YOUR descendants will be affected by this.

See more about: Ronna Swift.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Barbara Willison <teinds-39794@mypacks.net>
Sent: Wed 08/26/2015 1:08 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

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I am a Registered Voter and I VOTE!

Thank you,

See more about: Barbara Willison.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Ashley Williams <ashwill91@gmail.com>
Sent: Wed 08/26/2015 11:41 AM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

This request is especially close to home for me. Growing up in a rural community dominated by the local mining boom, i've witnessed many issues in relation to air quality and the negative impacts associated concerning public health and welfare.

Moreover, fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Ashley Williams.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Fran Field <frann7@msn.com>
Sent: Wed 08/26/2015 3:45 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

There are already too many things in our air and water that can affect our health. We don't need any more.

Right now, the Department of Natural Resources is considering new guidance that would exempt many facilities and operations from limiting their PM2.5 fine particulate emissions. Less than one-twentieth the width of a human hair, PM2.5 pollution particles can get deep in our lungs, even our bloodstreams, harming our respiratory systems and increasing the risk of lung and heart diseases. Children are particularly vulnerable to health impacts from PM2.5 pollution.

Under the proposed guidance, one huge exemption would be frac sand mining operations. These operations, which leave our landscape littered with dust, silt and other pollution, already push the limit for the maximum allowable PM2.5 pollution. If this change goes through, the amount of PM2.5 they put out would no longer be regulated to make sure that the surrounding air stays safe.

Weak PM2.5 pollution protections put the health and wellbeing of our families at stake: I ask the DNR to scrap the proposed changes!

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Fran Field.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Ron Hobart <voyageur@cheqnet.net>
Sent: Wed 08/26/2015 1:10 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's EXTREMELY important that protections and limits are STRENGTHENED NOT WEAKENED. Therefore, I URGE you to drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities SERIOUSLY jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please DO NOT exempt non-combustion/low-temperature facilities.

Thank you for doing the right thing,

See more about: Ron Hobart.

Enter Your Action Subject - Message (Plain Text)

Extra line breaks in this message were removed.

From: Vicki Smith <vikcismtih@yahoo.com>

Sent: Wed 08/26/2015 8:50 AM

To: Roth, John A - DNR

Cc:

Subject: Enter Your Action Subject

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Is frac sand mining the asbestos of our time ? It is not right - or fair - to subject people downwind to essentially being a human guinea pig.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

I'm not saying no sand mines, though I have my reservations since I believe fracking itself is extremely harmful and even dangerous. What I am saying and truly believe is that rules and regulations have been put in place for a reason. The current notion that offering exemptions makes it ok...is NOT ok. Rules should apply to everyone and should certainly NOT be subject to political pressure.

I don't want to be reading, in 20 years, about 'white lung' caused by deeply embedded sand dust in a whole generations' lungs. It's not right !

Thank you,

See more about: Vicki Smith.

frac sand - Message (Plain Text)

From: Jane Bruesch <jbruesch@charter.net>
Sent: Wed 08/26/2015 8:51 AM
To: Roth, John A - DNR
Cc:
Subject: frac sand

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

As a pediatric occupational therapist, I worked with kids with developmental problems with suspected environmental causes. Please no more expecting kids to sacrifice their health.

Thank you,

See more about: Jane Bruesch.

Keep our air clean - Message (HTML)

File | Message

Ignore | Junk | Delete | Reply | Reply All | Forward | Meeting | More | Move to: ? | To Manager | Team E-mail | Move | Rules | OneNote | Actions | Mark Unread | Categorize | Follow Up | Translate | Find | Related | Select | Zoom

From: John Colstad <ngalphorn@yahoo.com>
To: Roth, John A - DNR
Cc: John Colstad
Subject: Keep our air clean
Sent: Wed 08/26/2015 7:41 PM

Dear Sir,
I am very concerned with too many things in our air and water that can affect our health. **We don't need any more.**
Please take time to evaluate the circumstances of considering new guidance that would exempt many facilities and operations from limiting their PM2.5 fine particulate emissions. Less than one-twentieth the width of a human hair, PM2.5 pollution particles can get deep in our lungs, even our bloodstreams, harming our respiratory systems and increasing the risk of lung and heart diseases. Children are particularly vulnerable to health impacts from PM2.5 pollution.
We need stronger laws to protect our health.
Thank you.
Sincerely,

See more about: John Colstad.

Exemption for sand mining - Message (HTML)

File | Message

Ignore | Junk | Delete | Reply | Reply All | Forward | Meeting | More | Move to: ? | To Manager | Team E-mail | Move | Rules | OneNote | Actions | Mark Unread | Categorize | Follow Up | Translate | Find | Related | Select | Zoom

From: blackburnbob49@yahoo.com
To: Roth, John A - DNR
Cc:
Subject: Exemption for sand mining
Sent: Wed 08/26/2015 7:58 PM

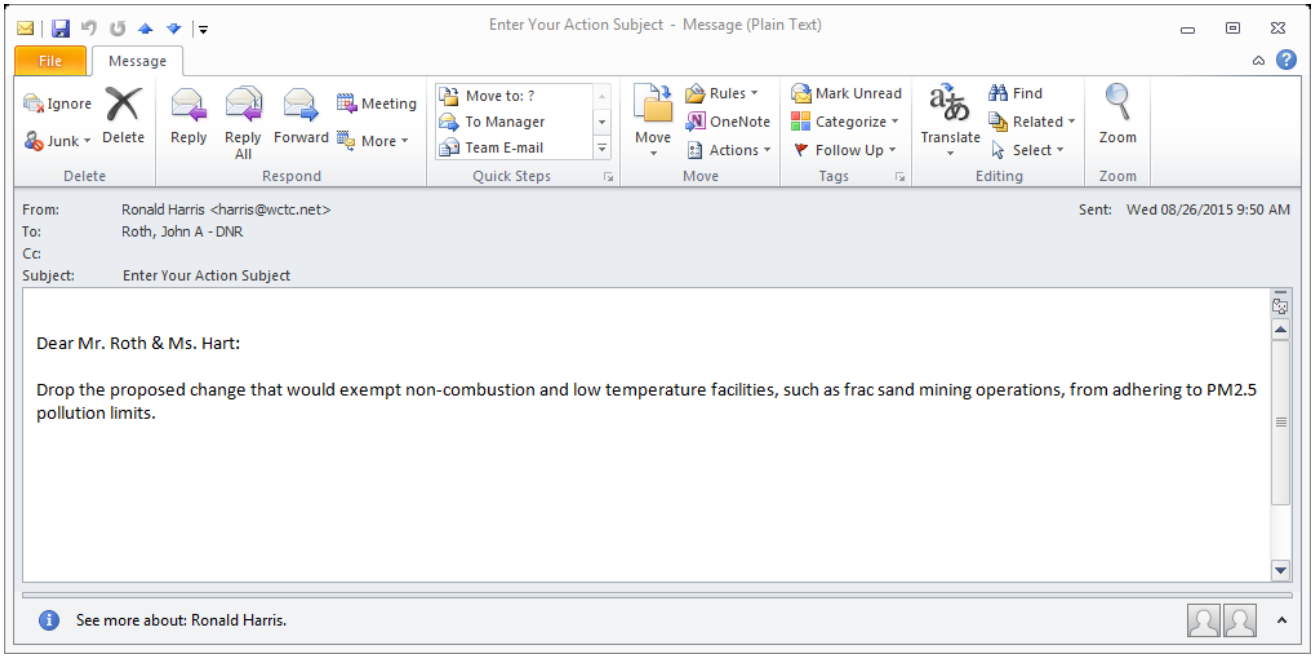
John Roth
Department of Natural Resources

Dear Mr. Roth,

I have recently learned that the Department of Natural Resources is seriously considering exempting sand mine operations from limiting their PM2.5 fine particle emissions. Because the emissions of dust from sand mines pose a threat to the health of human beings living near these mines, I strongly oppose this potential exemption. Our health and the responsible stewardship of our natural resources should take priority over the desires of the sand mining industry to remove needed regulations.

Respectfully,

See more about: blackburnbob49@yahoo.com.


Enter Your Action Subject - Message (Plain Text)
File
Message
Ignore
Junk
Delete
Reply
Reply All
Forward
Meeting
More
Move to: ?
To Manager
Team E-mail
Move
Rules
OneNote
Actions
Mark Unread
Categorize
Follow Up
Translate
Find
Related
Select
Zoom
Delete
Respond
Quick Steps
Move
Tags
Editing
Zoom
From: Ronald Harris <harris@wctc.net>
To: Roth, John A - DNR
Cc:
Subject: Enter Your Action Subject
Sent: Wed 08/26/2015 9:50 AM
Dear Mr. Roth & Ms. Hart:
Drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.
See more about: Ronald Harris.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Phyllis Reames <phyllisreames@yahoo.com>
Sent: Wed 08/26/2015 7:15 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Although my current address is in Maine, my roots are in Trempealeau County. I feel very strongly about this issue.

Thank you,

See more about: Phyllis Reames.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Barbara Richards <ba_45_rbara@yahoo.com>
Sent: Wed 08/26/2015 8:46 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

We must act now for the present generation but more pointedly for future generations. The sand helps in the process of removing carbon the earth wisely stored out of the processes of earth's self care. We are interrupting that to our demise!

Thank you,

See more about: Barbara Richards.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Marlene Case <casebratpack@aol.com>
Sent: Wed 08/26/2015 11:54 AM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

I am fortunate to live in Northern Wisconsin in a rural area, with lots of trees and no sand mining. So my air is wonderful to breathe. I would like the same for my Southern neighbors!

Thank you,

See more about: Marlene Case.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Marga Krumins <margakkrumins@hotmail.com>
Sent: Wed 08/26/2015 6:16 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities. Please keep this a state I want to live in.

Thank you,

See more about: Marga Krumins.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Rich Wentzel <rwent52@yahoo.com>
Sent: Wed 08/26/2015 6:26 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Rich Wentzel.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Brian Schellinger <squatyboy@live.com>
Sent: Wed 08/26/2015 8:01 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

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In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

If we as a whole and enlightened community, won't put a stop to this clear and present danger, then we in our stupid and stubborn selfishness, deserve whatever fate belies us. You politicians have the support and guidance, not to mention the votes of all these good, caring, and prescient people. What is the hold up, in clearing this dangerous path we've put down for future generations? Stop worrying about your next term and caring for those who put their trust in you.

Thank you, Brian Schellinger

See more about: Brian Schellinger.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

File | Message

Ignore | Junk | Delete | Reply | Reply All | Forward | Meeting | More | Move to: ? | To Manager | Team E-mail | Move | Rules | OneNote | Actions | Mark Unread | Categorize | Follow Up | Translate | Find | Related | Select | Zoom

From: Paula Millikin <pamillikin@pulaskischools.org>
Sent: Wed 08/26/2015 8:34 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

I am disgusted that the DNR, employer of many fine public servants, is being coopted into an agency that sells our natural resources to the highest bidder rather than looks at long term economic gains caused by a pristine environment. Below is the latest travesty

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

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Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Paula Millikin.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Dee Ives <hilltopcustoms@mwwb.net>
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits
Sent: Thu 08/27/2015 1:58 AM

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

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With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.In addition, these fine particulates can cause pulmonary silicosis, a deadly lung disease that will cost the lives and health of our citizens living in the affected areas and millions in taxpayers dollars to treat medically

Thank you,

See more about: Dee Ives.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Susan Marks <scfaber@hotmail.com>
Sent: Wed 08/26/2015 3:59 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities. We need to breathe without fearing the loss of our health. We have a right to the air that was clean before these industries pushed their way in. Your job is to protect the environment so it can be enjoyed by all, not by a few investors carving it up and selling it off to the highest bidder. These decisions are important and will have long lasting consequences so please think about what you are doing. Your name is going down in history for either harming or helping our efforts to save our communities from air borne industrial pollution.

Thank you,

See more about: Susan Marks.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Carrine Baldwin <moonrisefarm@hotmail.com>
Sent: Wed 08/26/2015 10:37 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:
My question is why are these changes being proposed. This is a step backwards.
As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

My livelihood depends on it.

Thank you,

See more about: Carrine Baldwin.

Defend our natural resources and our health - Message (Plain Text)

From: Alan Ng <alan@alan-ng.net>
Sent: Wed 08/26/2015 7:27 AM
To: Roth, John A - DNR
Cc:
Subject: Defend our natural resources and our health

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Alan Ng.

Please help our air become cleaner, not dirtier - Message (Plain Text)

From: Sondra Olson <rahmyst@yahoo.com>
Sent: Wed 08/26/2015 8:10 AM
To: Roth, John A - DNR
Cc:
Subject: Please help our air become cleaner, not dirtier

Dear Mr. Roth & Ms. Hart:

First off, I ask you to consider children & many people who have difficulties breathing. Many people have impaired breathing already & need clean air to be comfortable and healthy.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Sondra Olson.

pm2.5 particle exemption - Message (Plain Text)

From: Fred Harding <fundamentalfred@earthlink.net>
Sent: Wed 08/26/2015 8:12 AM
To: Roth, John A - DNR
Cc:
Subject: pm2.5 particle exemption

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Further, note that the Frac Sand industry, like many extractive industries, is a boom and bust type of business. The long term impact on health won't be known for potentially decades, long after frac sand miners have disappeared into the night.

Thank you,

See more about: Fred Harding.

Protect our air quality, Do not pass exemptions. - Message (Plain Text)

From: Carol McDonald <cjku7123@yahoo.com>
Sent: Wed 08/26/2015 9:09 AM
To: Roth, John A - DNR
Cc:
Subject: Protect our air quality, Do not pass exemptions.

Dear Mr. Roth & Ms. Hart:

We all need clean air to breathe.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Carol McDonald.

Enter Your Action Subject - Message (Plain Text)

From: Eda Wilson <edesw@yahoo.com>
Sent: Wed 08/26/2015 9:15 AM
To: Roth, John A - DNR
Cc:
Subject: Enter Your Action Subject

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

And fiscally? Dirty our air and water and soil and we'll lose big time in the tourism industry.

Thank you,

See more about: Eda Wilson.

PM2.5 - Message (Plain Text)

From: Matthew Palmer <matt.fullcirclestudios@gmail.com>
Sent: Wed 08/26/2015 10:13 AM
To: Roth, John A - DNR
Cc:
Subject: PM2.5

Dear Mr. Roth & Ms. Hart:

I wish to endorse the following opinion and I feel strongly that the DNR is not considering the best interests of the people of WI. Please consider this carefully.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Matthew Palmer.

More air pollution caution is needed - Message (Plain Text)

From: Anne Nischke <acmalm@yahoo.com>
Sent: Wed 08/26/2015 10:21 AM
To: Roth, John A - DNR
Cc:
Subject: More air pollution caution is needed

Mr. Roth & Ms. Hart:

I completely agree with the form letter that CleanWisconsin has included below. Frac sand mining is still new in WI. We need more information not exemptions. The ironic part about air pollution protection is that it seems to be actually protecting the workers who are employed by these mines more that anyone else. Thank you for considering my position which is clearly explained below.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Anne Nischke.

DNR monitoring air quality to PM 2.5 - Message (HTML)

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From: Linda Meadowcroft <violinda4236@gmail.com>
Sent: Thu 08/27/2015 11:13 AM
To: Roth, John A - DNR; Kristan.Hart@wisconsin.gov
Cc:
Subject: DNR monitoring air quality to PM 2.5

Dear Mr. Roth & Ms. Hart:

I understand that the DNR is reviewing changes to its monitoring of fine particulate matter. Surely, the DNR knows by now that frac sand mining releases harmful amounts of Particulate Matter down to and smaller than PM2.5.

Surely, the DNR is aware of many studies which indicate that respirable frac sand causes harmful and deadly respiratory, heart and circulatory, and auto-immune diseases with repeated exposures over relatively short periods of time (two weeks to several months is enough exposure to induce the most deadly diseases).
Surely, the DNR has seen studies by now that indicate that people in communities within a few miles of frac sand mines and loading facilities are effected in the same way that workers at work sites are effected.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution. The DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issue, much of that now related to open pit frac sand mining and transport. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Linda Meadowcroft.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Jane Furchgott <jfurchgott@yahoo.ca>
Sent: Wed 08/26/2015 2:16 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

I'm writing because my part of Wisconsin, the driftless area, has been considered a frac sand mining area, and I have studied the effects elsewhere in Wisconsin and Iowa. Do not change the air quality standards for frac sand operations! The silica particulate is especially toxic.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Jane Furchgott.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

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From: John Steines <jsteines@gmail.com>
Sent: Wed 08/26/2015 2:28 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

Please do NOT put Wisconsin citizens at risk. protect Wisconsin lungs!

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: John Steines.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Don Ferber <d_ferber@sbcglobal.net>
Sent: Wed 08/26/2015 4:21 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

With the DNR considering changes to PM2.5 fine particulate matter guidance, protections and limits should be strengthened, not weakened. I am asking you to drop proposed change to exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits. We need all sources included, and all people protected.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Don Ferber.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

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Delete | Respond | Quick Steps | Move | Tags | Editing | Zoom

From: Victoria Trinko <vicinvalley@bloomer.net>
Sent: Wed 08/26/2015 4:27 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

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In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

I contracted asthma within one year of a silica mine beginning production across the road from my farm. Dust blows off the sand piles in huge billows on windy days. Allowing this industry an exemption for PM2.5 particles is a free pass to contaminate the air for Wisconsinites. Who are you protecting? If this change is enacted, we certainly know who you are protecting-mining companies. These companies have been lobbying for less regulation since they invaded our state.
Thank you,

See more about: Victoria Trinko.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Barbara With <barbwith@gmail.com>
Sent: Wed 08/26/2015 4:27 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened.

How many times do the people of this state have to be subjected to this lunacy? You are suppose to be PROTECTING US. PELASE DO YOUR JOB.

Thank you,

See more about: Barbara With.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Mary Magnuson <mkm@dewittross.com>
Sent: Thu 08/27/2015 1:54 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

TO WHOM IT MAY CONCERN:

STAND AT ATTENTION AND GOVERN YOURSELF ACCORDINGLY! NO FRACKING IN THE STATE OF WISCONSIN!

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Mary Magnuson.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

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From: Peter Holm, M.D. <pwholm@gmail.com>
Sent: Thu 08/27/2015 3:23 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,
P.S.As a physician who has been encouraging standards for Respirable Crystalline Silica and its dangers, decreasing protection would only endanger both the populace and the truck drivers involved in transport. This reduction can only be seen as a health hazard to all of us as a favor to frac sand industry.

See more about: Peter Holm, M.D..

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

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Delete | Respond | Quick Steps | Move | Tags | Editing | Zoom

From: Margaret Lahti <lahtipeggy@gmail.com>
Sent: Thu 08/27/2015 3:42 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Margaret Lahti.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Lynn Persson <lynn@terraexperience.com>
Sent: Thu 08/27/2015 4:00 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

Please do not weaken these rules. The people of Wisconsin are counting on you to protect their health and their environment. Please do so!

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Lynn Persson.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Marie Anderson <cherishearth@hughes.net>
Sent: Thu 08/27/2015 6:08 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its policy regarding air quality regulations and standards, it's important that protections and limits are strengthened, not weakened. This is especially important in regard to fine 'particulate matter' (PM) emissions, those that are 2.5 microns or smaller in diameter, commonly referred to as PM2.5.

Because these particles are so tiny, less than one-twentieth the width of a human hair, they lodge deep inside our lungs when inhaled. Unable to efficiently expel these minute particles, the body reacts with an inflammatory response that creates a whole cascade of deleterious impacts on health.

Some of these tiny particles can even get into our bloodstream and be carried throughout our bodies, causing a wide range of respiratory, renal and cardiovascular issues.

These fine particulates, smaller than PM2.5, can come from many sources and processes, including diesel engines, power plants and even sources that don't directly involve burning of fuels, like mining operations. As such, they can be made of a wide variety of compounds with various toxicities.

Evidence shows that frac sand mining operations in particular are significant contributors of PM2.5 pollution. The DNR's own modeling shows that frac sand mining operations push their local areas right to the edge of the maximum allowable limit for 24-hour exposure to PM2.5 pollution.

Exempting these 'direct' sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards. In fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just attained goals set for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this achievement.

Throughout the state, but especially in Western Wisconsin where frac sand mines are prevalent, families and communities are already dealing with dangerous air pollution and the associated public health issues.

As the Department moves forward with its proposed PM2.5 pollution guideline changes, please drop the proposed change that would exempt non-combustion and low-temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Thank you,

See more about: Marie Anderson.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Tom Hartjes <thartmd@gmail.com>
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits
Sent: Thu 08/27/2015 5:48 PM

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Please act to keep our health safe!

Thank you for your consideration,

See more about: Tom Hartjes.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: William Hayes <whayes002@centurytel.net>
Sent: Thu 08/27/2015 6:55 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities. Please leave our state standards alone!

Thank you,

See more about: William Hayes.

Enter Your Action Subject - Message (Plain Text)

From: Richard Schoemer <schoemer2@frontier.com>
Sent: Wed 08/26/2015 10:24 AM
To: Roth, John A - DNR
Cc:
Subject: Enter Your Action Subject

Dear Mr. Roth & Ms. Hart:

Remember you work for THE PEOPLE OF WISCONSIN....not Walker, not the Koch Bros. not ALEC....STOP SELLING WISCONSIN DOWN THE RIVER.....DO YOUR JOBS FOR THE PEOPLE OF WISCONSIN....

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Richard Schoemer.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Arlene Kanno <akanno@uchicago.edu>
Sent: Wed 08/26/2015 10:31 AM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As an informed citizen, and retired biology teacher, I am appalled that the DNR is considering allowing dispersal of superfine particulate matter to be "legal" in Wisconsin.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Arlene Kanno.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Pam Fischer RN <pamf@new.rr.com>
Sent: Wed 08/26/2015 11:22 AM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As a Registered Nurse, mother and life time citizen of Wisconsin I am horrified and at a loss for understanding to think that the DNR is even considering loosening regulation and/or monitoring of PM2.5 fine particulate matter emissions for any industry or facility but especially for the Frac Sand Mining industry. Even though we know silicate sand particles cause an incurable and painful terminal lung disease no significant studies have yet been done to determine either the short or long term damage Frac Sand Mining is having or could, in future, have on the health of our children, elders or any living creature exposed to the uncontrolled release and drift of silicate particles now occurring as a result of the rapid increase in this activity in our state. As representatives of our citizenry, as people hired to protect the health and welfare of Wisconsinites, as parents and family members yourself it is your responsibility and duty to set and enforce/re-enforce guidelines strict enough to ensure no damage is done and to only consider altering those guidelines AFTER we have studies, both short and long term, that clearly indicate and show us what the risks are and how to avoid and prevent activity that causes or enables those risks to occur or continue. And at no time should guidelines protecting Wisconsin citizens or any living creature residing here from exposure to harmful airborne particles such as those in the category of M2.5 fine particulate matter EVER be loosened, weakened, ignored or rescinded purely for the convenience or monetary gain of any industry or business practice. Doing so indicates you are willing to put a price on the lives of people and their families, including yourselves and your families, and literally sell those lives to the highest bidder. I consider it unacceptable for you to do anything other than to drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Pam Fischer RN.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Jennifer Bulleit <bulleit@chorus.net>
Sent: Wed 08/26/2015 12:26 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. Please don't sell out Wisconsin's health. As both the daughter and mother of two asmatics, I need you to drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits. Breathing is just too precious. Studies on fine particulate matters role in exacerbating cardiovascular events is also damning.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Jennifer Bulleit.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Peggy Kriebel <pkriebs2@mwt.net>
Sent: Thu 08/27/2015 11:05 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

It's so easy to decide what other people will breathe in their own backyards -- it's much different when it's your yard, your kids, or your property values plummeting.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Peggy Kriebel.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: David Sconzert <ndzert@charter.net>
Sent: Thu 08/27/2015 11:28 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

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In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

The little guys (regular people) need your protection from big businesses that are only concerned about profit and more profit.

Thank you,

See more about: David Sconzert.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Bruce Doar <bhdoar@gmail.com>
Sent: Thu 08/27/2015 11:37 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

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In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,
I know you don't care about people's health, only corporate profits. But remember: your families will be breathing this crap, also.

See more about: Bruce Doar.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Judy Skog <jskog83@gmail.com>
Sent: Wed 08/26/2015 2:36 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

No, No, NO. I have asthma. I cannot take steroids for it. DO NOT weaken the rules for PM2.5 for anyone!

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

PM2.5 is PM2.5 regardless of the process that generates it. And it gets into your lungs just the same.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard.

This is absolutely unacceptable!

Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

Your job is to protect the public, not the industry!

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Judy Skog.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

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Ignore | Junk | Delete | Reply | Reply All | Forward | Meeting | More | Move to: ? | To Manager | Team E-mail | Move | Rules | OneNote | Actions | Mark Unread | Categorize | Follow Up | Translate | Find | Related | Select | Zoom

Extra line breaks in this message were removed.

From: Dieter Brummund <xi.hubu@gmail.com>
Sent: Wed 08/26/2015 4:32 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, causing a wide range of respiratory issues.

I am specifically concerned about silicosis and other environmentally associated respiratory disorders. There are already ways to control dust from such mining operations in an affordable manner so it is not unreasonable for the companies comply with the regulations. As a Wisconsin resident with Reactive Airway Disease, additional fine particulate polluting our air is unacceptable.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Stop putting in loopholes for polluters to destroy our environment.

Thank you,

See more about: Dieter Brummund.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Glory Adams <gloryaec@att.net>
Sent: Wed 08/26/2015 4:37 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

There has NOT been a complete study of the PM2.5 particulates near industrial sand mines. These mines are not located in isolation--they are right next to homes and farms. Ignoring the potential harm to humans is a dereliction of the duties of the DNR.

Thank you,

See more about: Glory Adams.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Kate Houston <khouston@dcwis.com>
Sent: Fri 08/28/2015 2:35 AM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

Please do not put (out-of-state) corporate profits above the health of WI citizens!

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Kate Houston.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Janie Lang <jbquilts.23@gmail.com>
Sent: Wed 08/26/2015 7:30 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,Janie B. Lang
Our issues stemming from this possible sand mine are numerous. Now the thought of a serious health issue compounds the matter. I have been a widow for a little over 2 years.
What do I do if I need to sell my house now?

See more about: Janie Lang.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Peter Sigmann <peter@sigmann.net>
Sent: Thu 08/27/2015 7:39 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

I consider this an important public health issue.

Thank you,

See more about: Peter Sigmann.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Edie Ehlert <edieehlert@centurytel.net>
Sent: Fri 08/28/2015 8:50 AM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

I live in Crawford County where both a frac sand mine and a railroad frac sand loading facility exists in a neighborhood in Prairie du Chien. To exclude a common source of PM2.5 from regulations is to abandon western Wisconsin citizens and our health.

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Edie Ehlert.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Kim Blue <cookieblueyo@yahoo.com>
Sent: Fri 08/28/2015 5:36 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

The safety of all Wisconsin citizens - especially children - and not just easing the financial and regulatory burden on mining and other polluting operations, should remain the focus of all DNR regulation.

Thank you,

See more about: Kim Blue.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Elise Moser <elise.m@videotron.ca>
Sent: Thu 08/27/2015 11:39 AM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. Therefore, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

Thank you,

See more about: Elise Moser.

Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)

From: Nancy Mueller <nancymomma@gmail.com>
Sent: Sat 08/29/2015 12:43 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits

Dear Mr. Roth & Ms. Hart:

I have lived in Wisconsin all of my life because I did not want to give up the clean, healthy and beautiful environment. As the Department of Natural Resources considers changes to its PM2.5 fine particulate matter guidance, it's important that protections and limits are not weakened, but strengthened. As such, please drop the proposed change that would exempt non-combustion and low temperature facilities, such as frac sand mining operations, from adhering to PM2.5 pollution limits.

Fine particulates like PM2.5 can come from many sources and processes, including mining operations that don't require heating or burning, and can be made of a wide variety of compounds. Because these particles are so tiny, less than one-twentieth the width of a human hair, they can get deep inside our lungs when inhaled, and some can even get in our bloodstream and be carried throughout our bodies, causing a wide range of respiratory and cardiovascular issues.

With mining operations in particular, evidence shows that frac sand mines are significant contributors of PM2.5 pollution; DNR's own modeling shows that frac sand mines operations push their local areas right to the edge of the maximum allowable limit for 24-hour PM2.5 pollution standard. Exempting these types of "direct" sources from PM2.5 permitting requirements has the clear potential to cause exceedances of air quality standards; in fact, a preliminary independent study shows that some frac sand operations may be causing exceedances of the 24-hour standard even with the existing permit limitations in place.

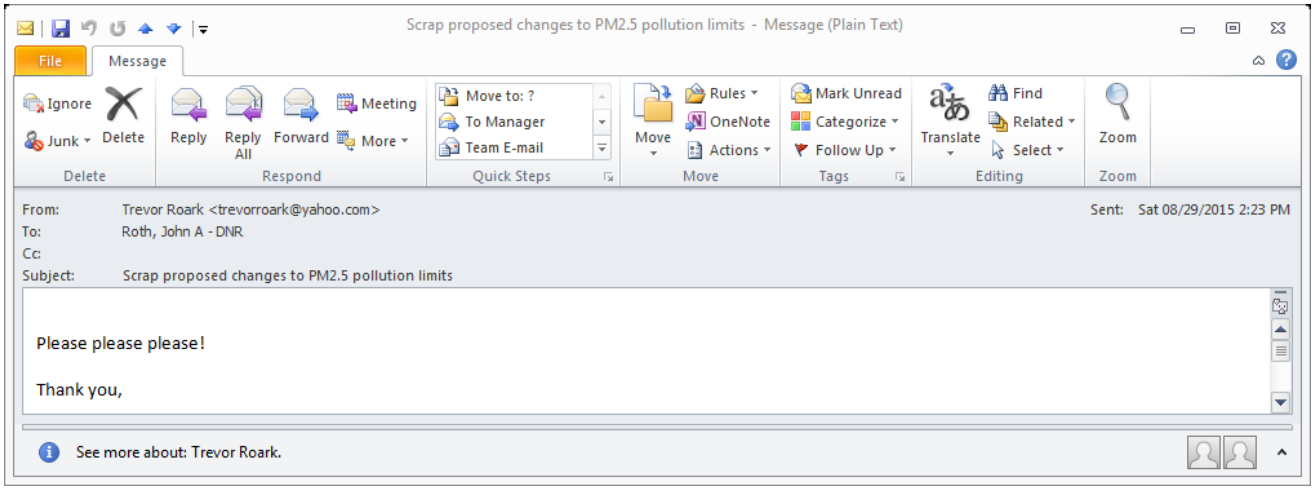
In addition, Southeastern Wisconsin just achieved attainment for PM2.5 pollution. Allowing more fine particulate matter in the air by exempting these types of facilities jeopardizes this attainment.

Throughout the state, but especially in Western Wisconsin, families and communities are already dealing with dangerous air pollution and the associated public health issues. As the Department moves forward with its proposed PM2.5 pollution guidance changes, please do not exempt non-combustion/low-temperature facilities.

I live in southeastern Wisconsin, but I travel the state and care about the health of Wisconsinites living in the affected areas, as should you. Keep the legislation strong, make it stronger. Lives are not for wasting and corporate profits do not benefit dead people.

Thank you,

See more about: Nancy Mueller.


Scrap proposed changes to PM2.5 pollution limits - Message (Plain Text)
File
Message
Ignore
Junk
Delete
Reply
Reply All
Forward
Meeting
More
Move to: ?
To Manager
Team E-mail
Move
Rules
OneNote
Actions
Mark Unread
Categorize
Follow Up
Translate
Find
Related
Select
Zoom
Delete
Respond
Quick Steps
Move
Tags
Editing
Zoom
From: Trevor Roark <trevorroark@yahoo.com>
Sent: Sat 08/29/2015 2:23 PM
To: Roth, John A - DNR
Cc:
Subject: Scrap proposed changes to PM2.5 pollution limits
Please please please!
Thank you,
See more about: Trevor Roark.

cleanwisconsin

your environmental voice since 1970

August 28, 2015

TO: Gail Good, Section Chief for the Monitoring Section,
Bureau of Air Management, Wisconsin Department of Natural Resources

Kristin Hart, Section Chief for Permits & Stationary Source Modeling,
Bureau of Air Management, Wisconsin Department of Natural Resources

John Roth, Air Quality Modeling Team Leader for Permits & Stationary Source Modeling, Bureau of Air Management, Wisconsin Department of Natural Resources

FROM: Tyson Cook, Director of Science and Research, Clean Wisconsin
Paul Mathewson, Staff Scientist, Clean Wisconsin
Pamela Ritger, Staff Attorney, Clean Wisconsin

SUBJECT: Guidance Documents Regarding Changes to $PM_{2.5}$ Permitting

Dear Ms. Good, Ms. Hart, and Mr. Roth,

Thank you for the opportunity to comment on the following guidance documents related to $PM_{2.5}$ Permitting: 2015 Approach to Dispersion Modeling for Permits, Air Dispersion Modeling Guidelines, Guidance for Including $PM_{2.5}$ in Air Pollution Control Permit Applications and Variance Request Procedures under NR 415.075(4) dated July 29, 2015.

Air pollution from particulate matter, especially fine particulate matter with an aerodynamic diameter < 2.5 um, is widely understood to cause numerous adverse public health impacts such as increased hospital visits, premature mortality, negative birth outcomes, cancer, and a wide range of cardiovascular and respiratory ailments.[1] Recent

[1] See, e.g., Sarnat SE et al. 2015. Fine particulate matter components and emergency department visits for cardiovascular and respiratory diseases in the St. Louis, Missouri-Illinois Metropolitan Area. Environmental Health Perspectives 123:437-444; Zanobetti A and Schwartz J. 2009. The effect of fine and coarse particulate air pollution on mortality: a national analysis. Environmental Health Perspectives 117: 898-903; U.S. EPA (Environmental Protection Agency). 2009. Integrated Science Assessment for Particulate Matter (Final Report). EPA/600/R-08/139F. Washington, DC:U.S. Environmental Protection Agency.

studies also link greater exposure to $PM_{2.5}$ air pollution to negative impacts on brain development in infants, and to greater cognitive decline in aging brains.[2] Accordingly, it is imperative that emissions of $PM_{2.5}$ are carefully controlled and monitored in order to protect the health of Wisconsin residents, and we appreciate WDNR's stated commitment to regulating $PM_{2.5}$ consistent with federal requirements.

However, Clean Wisconsin has carefully reviewed the Technical Support Document ("TSD"), "Air Quality Review of Industrial $PM_{2.5}$ Emissions from Stationary Sources in Wisconsin", and found many flaws in the analyses conducted, leading to erroneous conclusions. As the TSD leads to erroneous conclusions, and forms the basis for the additional three guidance documents, we request that the WDNR seriously consider these comments and withdraw its proposed changes to $PM_{2.5}$ permitting. Combined with the compounding effects of other permit streamlining efforts, such as exempting "natural minor sources" from the need for operation permits[3], proposals to exempt minor sources from modeling both primary and secondary $PM_{2.5}$ emissions modeling, and limiting stack testing requirements from major sources, we have serious concerns about the future of Wisconsin's air quality. The proposed changes in these guidance documents will result in certain local sources emitting significant amounts of fine particulates unmonitored to the detriment of nearby residents and potentially in excess of federal requirements. Not only will these proposed changes lead to worse public health outcomes for Wisconsin residents, they also do not pass legal muster and could lead to Wisconsin's violation of the federal Clean Air Act.

I. Direct, Primary $PM_{2.5}$ Emissions from Non-combustion Sources and Low Heat Sources Do Emit Significant Amounts of $PM_{2.5}$ and the WDNR Must Continue to Require Modeling from these Direct $PM_{2.5}$ Emission Sources

WDNR's conclusion that direct, primary $PM_{2.5}$ emission sources do not emit significant amounts of $PM_{2.5}$ is inaccurate. While Clean Wisconsin agrees that PM_{10} and $PM_{2.5}$ can come from different sources and that secondary formation of $PM_{2.5}$ from precursors such as SO_2 and NO_x is a substantial source of $PM_{2.5}$, there is also a significant amount of $PM_{2.5}$ that is directly emitted each year in the State of Wisconsin. Indeed, the most recent data from the U.S. EPA indicates more than 100,000 tons per year (tpy) of reported $PM_{2.5}$ emissions in Wisconsin.[4] In addition, WDNR's classification of $PM_{2.5}$ as "fine-mode" originating solely from secondary sources, or "coarse-mode" being directly emitted, is a gross over-simplification. Depending on the types of sources most prevalent in an area, the speciation of particulate matter by aerodynamic diameter can vary greatly from the "idealized distribution" illustrated by Wilson and Suh (1996). This is highlighted by recent research showing the highly significant contributions of direct

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[2] Peterson, MD et al, Effects of Prenatal Exposure to Air Pollutants (Polycyclic Aromatic Hydrocarbons) on the Development of Brain White Matter, Cognition, and Behavior in Later Childhood, 72(6) JAMA Psychiatry, 531, 540 (2015); Wilker EH et al, Long-term exposure to fine particulate matter, residential proximity to major roads and measures of brain structure, 46(5) Stroke, 1161, 1166 (2015).

[3] Wis. Stats. s. 285.60(6)(c)1.

[4] US EPA. "State and County Emission Summaries: Wisconsin." Accessed August, 2015 from: http://www.epa.gov

sources of $PM_{2.5}$, e.g. finding that the sum of contributions of secondary sulfate and secondary nitrate was only approximately half – ranging from 48 to 56% – of total $PM_{2.5}$ at various sites around the Midwest, contrary to what would be indicated by that idealized distribution.[5]

Another flaw of the WDNR's TSD is that the fate and transport of particulates in the atmosphere is not properly categorized in the binary fashion of "fine-mode" or "coarse-mode." Instead the fate and transport is determined by a large number of factors, with the result that while $PM_{2.5}$ can indeed have a long atmospheric residence time, and thus disperse widely throughout a region, there are still significant spatial and temporal variations in concentration[6] – particularly around direct sources. Even the single factor considered by WDNR, aerodynamic diameter, can vary greatly within the category of $PM_{2.5}$ – for example from the larger 2.5 - 1 um diameter fine particulate matter that can be formed through direct and low-temperature processes, to the smaller 1 – 0.1 um particulate matter that is primarily formed through secondary processes, to the ultrafine particulate matter that is less than 0.1 um in diameter, which is primarily directly emitted from combustion processes. However, the TSD makes no differentiation between these different sizes of particulates.

Moreover, the phrase "low temperature particulate sources" is ambiguous about what types of direct $PM_{2.5}$ sources would have permitted emissions limits. There are no guidelines regarding the processes that would be categorized as "high temperature" versus "low temperature," so the WDNR could arbitrarily determine which $PM_{2.5}$ emissions must be modeled and which need not be modeled. While this lack of clarity precludes a detailed analysis of impact, a highly conservative estimate would put the number of "low temperature" sources at over 230 potentially exempted sources based on 2011 data.[7] While these sources may pale in comparison to the largest direct emitters such as power plants, pulp and paper mills or foundries, they are locally significant and have the potential to cause or contribute to an exceedance of air quality standards. Even considering only the subset of those with the highest potential for local significance (> 2,000 pounds per year of $PM_{2.5}$ emission), census population data shows over 25% (1,550,000) of Wisconsin's population lives within 5 miles of a stationary, potentially exempted source.

Given the significant public health concerns related to $PM_{2.5}$ pollution, it is critical that the WDNR models and regulates all sources of direct emissions. As discussed in further detail below, the WDNR is required by federal law to have legally enforceable procedures in place to determine if sources can cause or contribute to

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[5] Buzcu-Guven B, et al. 2007. Analysis and apportionment of organic carbon and fine particulate sources at multiple sites in the Midwestern United States. J Air& Waste Mgmt Assoc 57: 606-619.

[6] See, e.g. Eeftens M, et al. 2012. Spatial variation of PM2.5, PM10, PM2.5 absorbance and PMcoarse concentrations between and within 20 European study areas and the relationship with NO2 – Results of the ESCAPE project. Atmospheric Environment 62: 303–317.

[7] Source categories included were: Mining and Quarrying (270 total tons per year), Wholesalers (62 tpy - includes grain handling), Rail Yards (41 tpy), Printing (8 tpy), Farm Product Warehousing and Storage (6 tpy), Construction (3 tpy), Office Administrative Services (1.3 tpy), and Linen and Laundry Services (0.5 tpy).

violations of the National Ambient Air Quality Standards ("NAAQS") around $PM_{2.5}$. Under the current proposal, which exempts direct, primary $PM_{2.5}$ emission sources from permitting requirements, it is difficult to see just how the WDNR could make those determinations or maintain air quality, especially considering the limited applicability of regional monitoring data to such a task. Moreover, it is important to note that there is also a potential for future facilities to have even higher levels of direct $PM_{2.5}$ emissions. The DNR should have rules in place for $PM_{2.5}$ to prevent future negative public health impacts and NAAQS violations.

Therefore, Clean Wisconsin disagrees that the WDNR's analysis in its Technical Support Document ("TSD"), "Air Quality Review of Industrial $PM_{2.5}$ Emissions from Stationary Sources in Wisconsin", sufficiently establishes that local direct sources of $PM_{2.5}$ cannot violate or exacerbate an exceedance of the air quality standards for $PM_{2.5}$. In particular, we note the following additional problems with the TSD:

1. The DNR analysis fails to recognize that there may be locally significant direct mechanical sources of fine particulate matter that could cause NAAQS exceedances, particularly 24-hour standard exceedances. Figure 1 on page 58 of the TSD clearly shows that some coarse-mode particles (i.e., those that can come from non-combustion or low-temperature processes) are categorized as $PM_{2.5}$. The most obvious example is frac sand mining, where there are multiple lines of evidence suggesting that this industry is a significant local direct source of fine particulate matter, even though under the proposed guidance it is *a priori* not considered to be a source.

    a. In prior sand mine air permit applications, WDNR consistently found that $PM_{2.5}$ emissions exceed the $PM_{2.5}$ 24 hour NAAQS significant impact level, and estimate that these operations take up one quarter of the area's 24 hour $PM_{2.5}$ ambient air quality standard (Table 1). When emissions from sand mines are added to background levels, nearly the entire $PM_{2.5}$ 24 hour ambient air quality standard is taken up (Table 1). Given how close to the standard sand mines push their local areas, it is important that the direct emissions from these operations be considered in permitting decisions and conditions. We note here that these prior modeling efforts do not adequately account for cumulative impacts of multiple mines in the same area.[8] Therefore, background levels are likely underestimated for many newer mines, suggesting that the 24-hour NAAQS is at a greater risk of being exceeded than is indicated by the modeling in these air permits.

[8] See, e.g., Findings of Fact, Conclusions of Law, and Order, *In the Matter of an Air Pollution Control Construction Permit Issued to FTS International services, LLC, Located in Trempealeau County, Arcadia, Wisconsin* Wisconsin Department of Hearings and Appeals, Case No. DNR-13-043, December 1, 2014. "The modeling may not fully take into account the impact of PM2.5 and PM10 emissions from other nearby facilities because the background concentrations used in the modeling were calculated using ambient air quality data gathered before many of the nearby industrial sand mines and processing facilities were permitted or constructed."

b. Wisconsin does not require sand mines to monitor their fine particulate matter emissions, but preliminary data from an independent study found 24 hour $PM_{2.5}$ samples around frac sand mines as high as 50 $\mu g/m^3$, well in excess of the 35 ug/m^3 24 hour standard.[9] Furthermore, this study found that fine particulate matter concentrations substantially increased when the sand mines were active.

c. A WDNR environmental engineering supervisor has said that there are a couple sand mines that "would exceed the [federal] $PM_{2.5}$ standards" if they were actually monitoring fine particulate levels.[10]

d. An Ontario, Canada air quality study found $PM_{2.5}$ and PM_{10} levels near sand mine operations that approached or exceeded levels of concern and concluded that the operations were having an adverse impact on the area's air quality.[11]

Table 1. Impact of select industrial sand mines on the 24 hour $PM_{2.5}$ air quality standard (35 $\mu g/m^3$) as estimated by WDNR in prior air permit application processes. Background levels were estimated by WDNR to be 25.6 $\mu g/m^3$ for all facilities.

Facility (Year)	**Facility Impact ($\mu g/m^3$)**	**% air standard taken up by facility**	**% air standard taken up when added to existing background levels**
Preferred Sands (2012)	8.3	24%	97.0%
Superior Sands (2011)	7.1	20%	93.0%
Superior Silica (2012)	7.3	21%	94.0%
Chiefton Sand (2014)	9.3	27%	99.7%
Chippewa Sands (2011)	8.5	24%	97.0%
Will Logistics (2011)	8.9	25%	98.6%
US Silica	8.5	24%	97.0%
Unimin (2012)	8.7	25%	98.0%
Hi-Crush (2014)	8.6	25%	98.0%
FTS International (2013)	9.3	27%	100.0%

2. On page 62 of the TSD, WDNR states that estimates used in $PM_{2.5}$ modeling are based on few, highly variable data and may overestimate $PM_{2.5}$ emissions. This is

[9] Pierce C, Walters K, Jacobson J, Kroening Z. (2015, in press). PM2.5 airborne particulates near frac sand operations. Journal of Environmental Health.
[10] Hirji Z. 2013. 'Frac Sand' Mining Boom: Health hazard feared, but lawmakers aim to ease regulation. InsideClimate News. Nov. 5, 2013. *Available at*: <http://insideclimatenews.org/print/28836>
[11] Ladouceur, M. 2013. Air Quality Impacts of Unimin Ltd. On Kasshabog Lake near the Town of Havelock, Ontario (February 15, 2013). *Available at:*< http://www.pcchu.ca/wp-content/uploads/2013/04/Unimin_Report-of-a-PO-Original-Signed-byMEL.pdf. >

not an acceptable reason to abandon modeling of a pollutant with such severe health impacts. Rather, the WDNR should work with facilities in the state to produce more reliable emissions factors to use in the modeling. In the meantime, results from models using emissions factors with lower quality rankings can be interpreted with this potential source of error in mind.

Furthermore, the statement on page 62 that "the actual emissions of direct, primary $PM_{2.5}$ that are used in permit review are likely far lower than what is currently used" is without sufficient justification. This statement appears to be based on a single study of one type of process and does not support such a broad statement. This study does not make it "likely" that $PM_{2.5}$ factors for processes across the board are unreliable to the same extent.

3. WDNR's analysis on pages 66-69 of the TSD is flawed, and it is unclear how widely the trends identified in the TSD to support their conclusions in this analysis apply to other monitoring stations throughout the state and to time periods other than the 2013 data used. When dealing with a pollutant with such severe health impacts as $PM_{2.5}$, a more robust and comprehensive analysis is warranted.

   In particular, this analysis draws conclusions about the difference between $PM_{2.5}$ and PM_{10} sources beyond what the data presented support and thus should not be used in its current state to support WDNR's conclusions. Specific problems include:

   a) *Page 68 of the Technical Support Document says: "In comparison to the $PM_{2.5}$ graph in Figure 9, PM_{10} concentrations at Waukesha did not always increase similarly to concentrations in Madison…"*
   However, the $PM_{2.5}$concentrations did not always increase similarly in Madison and Waukesha either. There were 9 concurrent monitoring days (representing 20% of all days) where $PM_{2.5}$ levels went in opposite directions in Madison and Waukesha (i.e., increasing since previous monitoring day in Madison while decreasing in Waukesha, or vice versa). This is very similar to the PM_{10} trends, where there were 14 days (26% of concurrent monitoring days) where PM_{10} levels went in opposite directions.

   b) *Similarly, page 69 of the TSD states "[a]lthough there are some days where PM_{10} increases along with $PM_{2.5}$…"*
   This is a misleading statement since PM_{10} shows the same trend (i.e., increasing or decreasing) as $PM_{2.5}$ for the <u>*majority*</u> (72%) of days when PM_{10} and $PM_{2.5}$ were monitored concurrently in Madison in 2013.

   c) *Page 68 of the TSD states that "for PM_{10} concentrations at Waukesha and University Avenue in Madison (54 days) the correlation coefficient was 0.56 or one-third lower than the $PM_{2.5}$ correlation [of 0.84]."*

While this is true, an unusually high concentration of PM_{10} on May 16 is impacting the PM_{10} correlation calculations. If the May 16 data point is removed, the PM_{10} correlation coefficient jumps to 0.73, which is not significantly different than the $PM_{2.5}$ correlation coefficient (Fisher z-transformation test; $p>0.05$). Therefore, the ambient PM_{10} concentrations are not acting differently than ambient $PM_{2.5}$ concentrations in a statistically meaningful way.

d) *On page 69, the WDNR supports its conclusion that there is a difference between fine and coarse particulates by showing how the correlation between $PM_{2.5}$ and PM_{10} at the same monitor in Madison is lower than the correlation of both PM_{10} and $PM_{2.5}$ between Madison and Waukesha.* However, a different result emerges if you compare $PM_{2.5}$ and PM_{10} correlations at the same monitor in Waukesha (rather than Madison) to correlations between Waukesha and Madison. In Waukesha, the correlation coefficient between $PM_{2.5}$ and PM_{10} for 47 concurrent monitoring days is 0.75. This is not significantly different than the correlation coefficients for $PM_{2.5}$ between Waukesha and Madison or PM_{10} between Waukesha and Madison when the unusually high PM_{10} reading in Madison on May 16 is removed (Fisher z-transformation test, $p>0.05$ for both).

As a final, general comment stemming from this analysis: While it is true that the WDNR analysis shows that distant monitors can display similar $PM_{2.5}$ trends supporting the idea that regional factors influence ambient $PM_{2.5}$ levels, the figures also clearly show that there can be substantial differences in the absolute $PM_{2.5}$ levels between monitors (up to a 9.3 $\mu g/m^3$ difference between Madison and Waukesha in 2013). This suggests that local direct sources can influence ambient $PM_{2.5}$ concentrations.

4. The first summary point on page 71 states "This analysis demonstrates that direct emissions of $PM_{2.5}$ from any individual stack or source have little influence on ambient concentrations of $PM_{2.5}$ and therefore $PM_{2.5}$ emissions from any individual stack or source do not cause or exacerbate violation of any $PM_{2.5}$ increment or standard."

   We disagree with this statement. We believe that this analysis shows that regional factors appear to play a dominant role in ambient $PM_{2.5}$ concentrations, but it does not demonstrate that a direct source cannot influence ambient concentrations to cause or exacerbate violations of a $PM_{2.5}$ standard. At no point does the DNR explicitly analyze the contributions of any direct $PM_{2.5}$ source to ambient conditions. This is in spite of preliminary investigations showing that a direct source (frac sand mines) can substantially impact local $PM_{2.5}$ levels.[12] In order to justify an assumption that direct sources do not impact ambient $PM_{2.5}$ levels, a

[12] Slides 66 through 73 showing how PM2.5 measurements increase when sand mines are operating in: Frac Sand Mining Environmental Research Webinar: Current status of research findings. June 18, 2014. Available at: <http://www.uwsp.edu/cnr-ap/clue/Documents/Mining/FracSand2014WebinarFinal.pdf>

more explicit and comprehensive analysis is required, and it should clearly address existing research with evidence to the contrary.

II. The WDNR's Proposed Changes to $PM_{2.5}$ Permitting Could Lead to Violations of State and Federal Regulations

$PM_{2.5}$ pollution must be properly controlled to a level below the National Ambient Air Quality Standards ("NAAQS") set by the Environmental Protection Agency ("EPA").

The NAAQS are a federally derived health-based measurement of acceptable level of criteria pollutants, required under the Clean Air Act. Administration and enforcement of the Clean Air Act ("CAA") rests with individual States and their respective agencies through the formation of a State Implementation Plan. In Wisconsin, the WDNR is responsible for ensuring that pollutants do not exceed the NAAQS, and the first and most critical action in maintaining $PM_{2.5}$ below the NAAQS is in permitting facilities that either directly emit primary $PM_{2.5}$ emissions or chemical precursors that lead to secondary formation of $PM_{2.5}$ (such as sulfur dioxide, nitrogen oxides, volatile organic compounds, and ammonia).

Without the appropriate permits in place, based on sound monitoring and modeling methodology, there is no way for the WDNR to have an adequate mechanism for enforcing the maintenance and/ or attainment of $PM_{2.5}$ levels below the NAAQS. This is why the WDNR's proposed changes to ignore direct emissions of $PM_{2.5}$ are so troubling. If the WDNR does not require that permittees accurately account for their direct $PM_{2.5}$ emissions, the WDNR cannot ensure that $PM_{2.5}$ NAAQS are met.

Several Wisconsin Statutes and provisions of the federal Clean Air Act will be implicated and potentially violated if the WDNR removes the requirement for permittees to model and monitor direct, primary $PM_{2.5}$ emissions. Section 285.63 of the Wisconsin Statutes requires any permitee to show that it "will meet all applicable emissions limitations and other requirements promulgated under this chapter [and] standards of performance for new stationary sources under s. 285.27(1)" and "will not cause or exacerbate a violation of any ambient air quality standard or ambient air increment under s. 285.21(1) or (2)." As a criteria pollutant under the federal Clean Air Act with an established NAAQS, $PM_{2.5}$ has both an applicable emissions limitation and an ambient air quality standard.[13] However, the WDNR cannot ensure that a permit applicant will not exceed an emissions limitation or an ambient air quality standard should it implement its proposed changes, because the WDNR would not have a record of $PM_{2.5}$ emissions from non-combustion and low-heat sources. Similarly, the following chapters of the Wisconsin Administrative Code, which implement provisions of the federal Clean Air Act, could be violated due to a lack of information from permittees regarding their total $PM_{2.5}$ emissions:

- **NR 404.04(9):** The WDNR is responsible for ensuring compliance with the ambient air quality standard for $PM_{2.5}$ laid out in NR 404.04(9),

[13] Wis. Admin. Code NR 404.04(9)

including the 24-hour average concentration of 35 ug/m^3.[14] However, as previously noted in these comments, these limits are already being exceeded, with 24-hour $PM_{2.5}$ samples around frac sand mines as high as 50 µg/m^3.[15] With violations of the $PM_{2.5}$ ambient air quality standard already occurring, the WDNR's proposed elimination of the requirement to monitor certain direct $PM_{2.5}$ emissions will only ensure these federal Clean Air Act violations continue and become worse.

- **NR 405.08:** NR 405.08 requires that every major stationary source or major modification meet applicable emissions limitations and apply best available control technology for each air contaminant it would have the potential to emit in significant amounts.[16] Without including direct $PM_{2.5}$ emissions, new or modified sources will not be able to ensure that they meet applicable emissions limitations and may also select an inadequate best available control technology for $PM_{2.5}$, as the source will not have accurately accounted for its total $PM_{2.5}$ emissions.
- **NR 405.09:** NR 405.09 requires that owners and operators of proposed major sources or major modifications demonstrate that emissions increases from the source or modification not cause or contribute to air pollution in violation of the NAAQS or any applicable maximum allowable increase over baseline pollutant concentrations ("increments") in any area.[17] Again, without accounting for the direct emissions from non-combustion and low-heat $PM_{2.5}$ emission sources, these owners and operators cannot ensure that they will not violate the $PM_{2.5}$ NAAQS or increments.
- **NR 406.13:** The WDNR will not be able to ensure permittees' compliance with the $PM_{2.5}$ emission limits in Chapters NR 400 through 499, or with the air quality standards of Chapter NR 404 if these permittees are not required to model or monitor all of their $PM_{2.5}$ emissions.
- **NR 406.17**: The WDNR will not be able to ensure that all applicable criteria for permit approval stated in Section 285.63 of the Wisconsin Statutes are met, as is required for the issuance of registration construction permits under NR 406.17.
- **NR 406.09**: The air quality impact analyses for proposed stationary sources required by NR 406.09 will necessarily be inaccurate if all $PM_{2.5}$ emissions are not included in those analyses, particularly given that the WDNR's own Technical Support Document demonstrates that local direct sources can influence ambient $PM_{2.5}$ concentrations, as noted in section I. 3. of these comments.
- **NR 407.09:** Requires that operation permits include applicable emission limitations and standards, as well as a means to ensure compliance with

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[14] Wis. Admin. Code NR 404.04(9)(a) 2.
[15] Pierce C, Walters K, Jacobson J, Kroening Z. (2015, in press). PM2.5 airborne particulates near frac sand operations. Journal of Environmental Health.
[16] Wis. Admin. Code NR 405.08(1) & (2)
[17] Wis. Admin. Code NR 405.09(1) & (2)

those limitations and standards, including monitoring and reporting of air contaminants emitted from the source.[18]

- **NR 407.105**: The WDNR may only issue registration operation permits under provision if the permit approval criteria in s. 285.63 are met, requiring assurances that emissions limitations and ambient air quality standards for all air pollutants subject to NAAQS are met.

Furthermore, Wis. Stat. § 299.15 states that the WDNR must require all persons discharging air contaminants report the amount of the contaminant discharged.[19] Accordingly, if sources of direct, $PM_{2.5}$ emissions are not required to model those emissions, they will not be able to report on their discharge of all air contaminants as required by this statute.

III. The WDNR's Proposed Elimination of Required $PM_{2.5}$ Modeling in its Air Pollution Control Permits Will Negatively Impact Public Health and Could Lead to Violations of the federal Clean Air Act

In these comments, Clean Wisconsin has noted a variety of inconsistencies and weak analytical points contained within the WDNR's Technical Support Document, "Air Quality Review of Industrial $PM_{2.5}$ Emissions from Stationary Sources in Wisconsin", which forms the basis for these Guidance Documents. Neither WDNR's "weight of evidence finding" that direct emissions of $PM_{2.5}$ do not cause or exacerbate a violation of the ambient air quality standards or increments nor the WDNR's conclusion that it is not appropriate or informative to perform air quality modeling for direct emissions of $PM_{2.5}$ from individual sources can be justified by the Technical Support Document. Accordingly, we ask WDNR to withdraw its proposed guidance.

Sincerely,

Tyson Cook
Director of Science and Research

Paul Mathewson,
Staff Scientist

Pamela Ritger
Staff Attorney

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[18] Wis. Admin. Code NR 407.09(1)(a) and NR 407.09(4)(a).

[19] Wis. Stats. 299.15(1)

FW: PM2.5 measurements around frac sand mines - Message (HTML)

From: Hart, Kristin L - DNR
Sent: Fri 08/28/2015 11:14 AM
To: Roth, John A - DNR; Good, Gail - DNR
Cc: Stewart, Andrew M - DNR
Subject: FW: PM2.5 measurements around frac sand mines

Message | 10 28 14_0564.JPG (537 KB) | 10 28 14_0565.JPG (746 KB) | 10 28 14_0566.JPG (571 KB) | 10 28 14_0568.JPG (339 KB) | 10 28 14_3679.JPG (751 KB)

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Kristin Hart
Phone: (608) 266-6876
kristin.hart@wisconsin.gov

From: Patricia J. Popple [mailto:sunnyday5@charter.net]
Sent: Friday, August 28, 2015 2:05 AM
To: Hart, Kristin L - DNR
Subject: PM2.5 measurements around frac sand mines

Dear Ms. Hart:

Attached are 5 pictures taken at a blast site in Eau Claire County close to Amish and other homes.
Comment from the PHOTOGRAPHER:

One of the biggest blasts I have been at. I was told I had to get off the road from where I was parked because I was in the blast zone. I moved to the east and parked. The plume came over me and I went into a coughing attack. I told myself I was a fool and I should roll up my window and get out of there. It was massive. The plume hung around for more than 5 minutes. It was probably less than 200 yards from Amish homes.

See more about: Hart, Kristin L - DNR.

Continued on Next Page…

FW: PM2.5 measurements around frac sand mines - Message (HTML)

From: Hart, Kristin L - DNR
Sent: Fri 08/28/2015 11:14 AM
To: Roth, John A - DNR; Good, Gail - DNR
Cc: Stewart, Andrew M - DNR
Subject: FW: PM2.5 measurements around frac sand mines

Message | 10 28 14_0564.JPG (537 KB) | 10 28 14_0565.JPG (746 KB) | 10 28 14_0566.JPG (571 KB) | 10 28 14_0568.JPG (339 KB) | 10 28 14_3679.JPG (751 KB)

It is critical that the State of Wisconsin set a standard for respirable crystalline silica particulates. The DNR and the State of WI are remiss in not doing so with the proliferation of the industry that continues to be permitted without consideration for those living near the mines and other facilities. In my estimation the written guidance should be tossed and the DNR authorities be required to study the real issues with a vengeance using the available science and additional research studies with appropriate and new equipment.
There are people living very close to these mines. Animals, plants and other life are affected!

Several states have set standards and should be used as models.

To date, the DNR and the State of WI are listening to the industry and large numbers of lobbyists. This approach must change.
Ms. Hart: I have spoken to you and at the time you were not even aware of the NIOSH Studies reported a year ago. People living in states where hydraulic fracturing is practiced by the oil and gas industry are receiving Wisconsin's "dust"! Wherever there is transload of frac sand to trucks or trains or to the rigs in the hydraulic fracturing field, the dust flies and affects the workers. No respirator is effective enough to protect workers from disease. What about the human beings living in homes, being cared for in nursing homes or attending day cares or schools nearby in those states? The are impacted.
Please get a grip on the problem. In 2012, the people in WI appealed to the DNR to do a study on silica issues. The paper clearly demonstrates the issues.
At that time, the report indicated there was not time nor money. In my opinion, a great deal of valuable time has been lost since that paper was written.

Please open the attachments and note the serious consequences of blasting. Fugitive dust also comes from crushing, heavy winds that carry away huge mounds of respirable crystalline silica along with the smaller particulates that can not be seen, industrial sludge that lands on the highways where it dries and is wisked away by winds and passing vehicles after it Please bring in true scientists who have made great strides studying particles that can't be seen with the naked eye. Take a look at the science behind nano-sized particulates that invade cells in the human and animal organs. Add a moratorium to the development of any future sand mines in the state of WI until specific scientific studies can prove there is no danger! Consider the wide range of people impacted in the counties where frac sand mining is occurring.

I would like to know the source of information that brought the State of Wisconsin and the DNR to the conclusion that it was not necessary to monitor nor to be no longer concerned about respirable crystalline silica, PM 2.5's, and the dangers inherent in the type of product being mined for use in the oil and gas industry.

Sincerely,

See more about: Hart, Kristin L - DNR.

Pictures on Next 5 Pages…

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Proposed Program Guidelines re: Air Pollutant Dispersion Modeling Guidelines, Including PM 2.5 in Air Pollution Control Permit Applic...

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From: Patricia Hammel <attyhammel@herricklaw.net> Sent: Thu 08/27/2015 9:06 PM
To: Roth, John A - DNR; Hart, Kristin L - DNR; Good, Gail - DNR
Cc:
Subject: Proposed Program Guidelines re: Air Pollutant Dispersion Modeling Guidelines, Including PM 2.5 in Air Pollution Control Permit Applications and Variance Request Procedures u

Dear Mr. Roth, Ms. Hart and Ms. Good;

I have not had a great deal of time to review these proposed modeling guidelines, permit application exclusions and variance request procedures, however I would note the following:

1) The D.C. Circuit Court decision that is relied upon to exempt applicants from providing data for PM 2.5 emissions does not support exempting applicants from providing date for PM 2.5 emissions. It appears, and the EPA's position on it also appears to support requiring this data from applicants pending: "...As a result of the Court's decision, federal PSD permits issued henceforth by either the EPA or a delegated state permitting authority pursuant to 40 CFR 52.21 should not rely on the PM 2.5 SMC to allow applicants to avoid compiling air quality monitoring data for PM 2.5 ..." from March 4, 2013 publication of the U.S. Environmental Protection Agency titled "Circuit Court Decision on PM 2.5 Significant Impact Levels and Significant Monitoring Concentration."

2) The Appendix B linked to the Draft Guidance Air Dispersion Monitoring Guidelines which is the basis for Wisconsin DNR's optimistic conclusion that "...direct emissions of PM 2.5 from existing sources, minor new sources, and minor modifications of sources will not cause or exacerbate violations of any PM 2.5 standard or increment..." only includes one county in which industrial "frac" sand mining is presently occurring, Eau Claire County, and none of the counties where it is most prevalent in western Wisconsin. Most of the June 2015 technical document is focused on Dane and Waukesha Counties where no industrial sand mining is present. Eau Claire County only seems to have been added in 2011 or so, while other counties and communities in the northern, eastern and southern parts of the state were monitored over a period of 13-14 years.

Based on the review of multiple urban sources of PM 2.5 emissions in other parts of the state, the DNR's Draft Guidance for Including PM2.5 in Air Pollution Control Permit Applications goes on to conclude that:

> "...Examination of the science behind particle pollution leads to the conclusion that only combustion and high temperature industrial sources directly emit significant amounts of PM 2.5 . PM 2.5 emissions will not be estimated in an air permit review for fugitive dust sources, mechanical handling, grain handling, and other low temperature particulate sources. " and that

> "The PM 2.5 TSD concludes that it is not appropriate or informative to perform air quality modelling for direct emissions of PM 2.5 from individual sources and, instead, makes a finding using a weight of evidence approach, that direct emissions of PM 2.5 do not cause or exacerbate a violation of the ambient air quality standards or increment..."

See more about: Patricia Hammel.

Continued on Next Page…

Proposed Program Guidelines re: Air Pollutant Dispersion Modeling Guidelines, Including PM 2.5 in Air Pollution Control Permit Applic...

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From: Patricia Hammel <attyhammel@herricklaw.net> Sent: Thu 08/27/2015 9:06 PM

To: Roth, John A - DNR; Hart, Kristin L - DNR; Good, Gail - DNR

Cc:

Subject: Proposed Program Guidelines re: Air Pollutant Dispersion Modeling Guidelines, Including PM 2.5 in Air Pollution Control Permit Applications and Variance Request Procedures u

and so goes on to instruct applicants that they should assume that "...mechanical processes such as crushing, grinding, sanding, sizing, evaporation of sprays, suspension of dusts, etc. are not sources of PM 2.5 emissions and not include PM 2.5 emission estimates for these types of sources in the application." Furthermore, it goes on to state that modeling/monitoring of PM 2.5 emissions "will not be performed" by DNR. The "conclusion" that sand mining cannot be a significant source of PM 2.5 emissions is based on the study of PM 2.5 emissions in parts of the state where industrial sand mining is absent. DNR has never monitored PM 2.5 emissions from sand mining, and refuses to regulate dust despite a 2012 request from over 70 health care workers in western Wisconsin to do so because it says it's not a problem based on no evidence.

Finally we have the "Variance Request Procedure under NR 415.075(4), which will allow industrial sand mining facilities who may have been doing some dust emission monitoring to stop doing any monitoring. Given that the Draft Guidance for Including PM 2.5 in applications has "concluded" that industrial sand mining just cannot produce PM 2.5 fugitive dust and the DNR will not look for it, and the statements in the preamble of the variance request document's emphasis on the absence of any legal duty to notify the public of a variance request, the outcome of most variance requests is not difficult to predict.

Crystalline silica dust is monitored and regulated by New York, Texas, Virginia, California, New Jersey and Minnesota. NIOSH and other state agencies recognize that it's a serious health hazard causing permanent respiratory damage, heart disease and arthritis. Minnesota has a fraction of the number of industrial sand mines that Wisconsin has; partly because they have less sand suitable for hydraulic fracturing of oil and gas, but also because their industry is regulated to protect people, trout streams, and nature. By further exempting industrial sand mining from air quality regulation contrary to federal guidelines and without doing any meaningful scientific inquiry into the issue, Wisconsin's DNR is literally burying its head in the sand.

Fourteen counties passed a resolution for a moratorium on new permits for industrial sand mines at this year's Wisconsin Conservation Congress meeting in April, including Chippewa, Columbia, Crawford, Eau Claire, Pierce, St. Croix, and Waupaca Counties which are all currently the site of industrial sand mining facilities. That resolution was passed again by the W.C.C. Environmental Committee on Saturday August 22. These proposed guidance documents violate the public's trust in the state agency tasked with protecting "the ecosystems that sustain all life."

See more about: Patricia Hammel.

Pollution Technology, Inc.

POLLUTION TECHNOLOGY, Inc. P.O. BOX 620221 MIDDLETON, WI 53562 (608) 831-2730 JIMF@POLLUTIONTECHNOLOGY.COM

August 28, 2015

Ms. Kristin Hart
Department of Natural Resources
Box 7921
Madison, WI 53707

Re: Attached Comments on PM-2.5 guidance

Dear Ms. Hart:

Comments on the various PM-2.5 guidance documents by Pollution Technology Inc. are attached. We feel that there are certain elements of the air quality program that should be protected, if anything else to reasonably provide the public with health protections guaranteed under the Clean Air Act. The DNR "technical" documents appear to be flawed or misleading, and resulting proposed policy directions do not do provide the general public with basic protections related to ambient air quality. Essentially the policy proposes that only the largest major sources will be modeled for the fine particulate impacts, and documentation provided does not adequately support this new direction.

If you have any questions regarding this letter or the associated comments, please give me a call at (608) 831-2730.

Sincerely Yours,
POLLUTION TECHNOLOGY Inc.

Jim Fleischmann

James J. Fleischmann
Manager, Permits/Compliance Programs

Comments on DNR PM2.5 Policy Changes

Comments are provided here by Pollution Technology Inc. (PTI) addressing the recent July 2015 DNR policy guidance related to air quality modeling and air permitting regarding concentrations of emissions of fine particulates, PM-2.5. Specific recent policy documents by the air proggram include: "Draft 2015 Approach to Dispersion Modeling for Permits", "Guidance for Including PM-2.5 in Air Pollution Control Permit Applications" (authored by Kristin Hart), "Air Dispersion Modeling Guidance" for four separate permit categories (believed to be authored by John Roth), and "Air Quality Review of Industrial PM-2.5 emissions from Stationery Sources in Wisconsin, AM-527 2015" (unknown author).

It should be noted that PTI does not generally comment on DNR proposals. We are filing comments because we believe that DNR is not basing their proposals on the weight of evidence, but seems to be moving forward with a set of policy changes that are based on a very limited set of outdated industry data and perhaps political motivations. The resulting policies result in a dangerous precedent and will undoubtedly result in higher fine particulate concentrations that will be detrimental to human health. In our experience when estimated PM-2.5 emissions (based on a review of emission factors and available test data) are modeled, for more than two thirds of such studies initial PM-2.5 model results show that ambient standards would be violated unless acceptable corrections are made. The Departments new policy excludes all related PM-2.5 modeling (except for a handful of very large PSD projects) and excludes most sources from estimating emissions (except for a minority of projects for combustion sources.

My personal experience includes over 38 years of professional experience as an air pollution specialist developing permit applications and air dispersion modeling analyses, with over 33 years as an air dispersion modeler. DNR's proposed actions are the most damaging air quality proposals that I have reviewed in the past 38 years. If implemented, the policies will clearly prevent the intelligent review of National Ambient Air Quality Standard compliance and estimation of emissions. If implemented, the DNR will take away the ability of DNR and even the progressive facilities to make realistic technical decisions that affect residents neighboring the industrial operations.

The proposed policy changes for PM-2.5 emissions by DNR will prevent the adequate assessment of related emissions and air quality concentrations. We support a position that allows independent technical decisions by DNR engineers, meteorologists and other scientists to make case-by-case judgments on emissions and modeling. But then that's what they are supposed to be doing now.

Our policy statement comments begin with air modeling related issues and also include comments on PM-2.5 emissions which are the stated basis for modeling changes. Comments by report are summarized below first for dispersion modeling then for permit/emissions.

1. **Draft 2015 Approach to Dispersion Modeling for Permits**

No comments are provided here on the nonattainment area sources or the Major PSD Source policies. The Department appears to be proposing approaches that meet federal PSD regulations. In addition the amount of nonattainment modeling that has been needed is quite limited.

The attainment area modeling for categories including minor source construction permit (baseline and non-baseline areas) and all 3 categories of operation permits propose references that PM-2.5 modeling is not needed. Similarly, the last page of the Guidance for Including in Air Pollution Control Permit Applications (K. Hart, et al) indicates that for operation permits and minor construction permits "…no

modeling will be performed, even if the emissions units are significant sources of PM-2.5". The basis is for this are comments in the new DNR "Technical" Support Document.

Our comments in the subsequent sections support that DNR **does** need to include PM-2.5 modeling for all categories identified, as there are PM-2.5 emissions (filterable and condensable) from most all sources at varying levels of emissions and has not adequately supported the lack of PM-2.5 from sources other than combustion sources. We provide support that there are PM-2.5 emissions that are "significant" even for both non-combustions sources and combustion sources (or sources that operate at higher temperatures). DNR has recognized historically that all PM-2.5 is significant and should be listed in the permit and related emissions should generally be included in air dispersion modeling analyses. The guidance document now would exclude all but combustion sources (or sources that operate at higher temperatures). We agree that related sources have relatively smaller emissions, but the documentation provided by DNR to support a 0 emission assumption for these sources is reviewed as being quite thin at best. Perhaps DNR can supplement the industry-based literature supporting this position with some DNR data or EPA emission factors. The DNR support for eliminating all modeling of PM-2.5 for minor sources is not supported in an acceptable manner.

Although the focus here is on PM-2.5 the policy includes broader references which should be revised or related sections of NR 404 should be updated. The document refers to "NOx" emissions but "NO_2" is the regulated pollutant as listed in air quality value rules in NR 404. In this case there would be an overstatement of emissions and related change may benefit industries applying for a permit. For baseline area Class II increment modeling refers to use of highest second high values (which are applicable for ambient standards), but state rule language in NR 404 refers to the highest values. One way or the other changes are needed for consistency. Perhaps this can be accomplished with planned rule revisions to implement the new 1-hr SO_2 an NO_2 federal ambient standard implementation, which was authorized this summer by the DNR board. Perhaps the new DNR guidance can also comment on implementation of these new standards, scheduled for action next spring.

Some other specific comments on the modeling protocol are provided here, which don't relate to PM-2.5, but are released with the related policy guidance as draft modeling guidelines (John Roth et al). The guidelines appear to be very comprehensive (with exception of PM-2.5 emissions) and provide clear division of requirements for each permit category. The technical modeling guidelines provide an improvement on previous guidance. Some specific refinements suggested follow, as they apply to minor source construction permits or operation permits:

- "multiple load conditions should be analyzed separately…" - This may provide useful information for larger, buoyant sources, but for smaller sources operating near room temperature, there may be no need for this - the maximum operating conditions will provide a worst case concentration. Perhaps a discussion with the modeler before proceeding would address this issue, rather than requiring evaluation in ALL cases. In any case the DNR permit reviewer can provide guidance on how allowed permit conditions can address related concern.
- Buildings - the "base elevations should be determined from the facility plot plan" - This may be a good general rule, but in some cases the best technical solution would be to let the AERMAP function in the model depict a base elevation for buildings and stacks that are consistent with

what the NEDs database is showing for the region. In that way all features are developed with consistent treatment. This is a bit case-by-case and some wiggle room should by considered. The idea is that stacks are modeled at a given height and ultimately that height should match out with that for corresponding nearby receptors. This is especially significant for smaller sources with controlling concentrations near the property line, perhaps only 25 meters from the stack. Other building, receptor and stack discussion is fine and provides some detail not previously shown.

- Terrain Considerations - The reference to AERMAP terrain processing with 1/3 arc second data covering a 10 km X 10 km field with AERMAP domain of 22 km X 22 km. This seems a bit extensive and some wiggle room should be provided for those with small stacks and nearby maximum impacts. A lot small sources, with stacks at 100' or less, may have the highest impact within a half km of the source. Perhaps the DNR can run a comparison of such sources with or without the more extensive specifications and see if this is warranted. There is time involved in processing large terrain and receptor specifications

- Class II increment consumption - the guidance refers consistently to use of "high second highest" concentrations for this. The NR 404 rules state that the concentrations "may not exceed the following" (the highest value). The DNR is currently using an approach that the 1-hr NO2 and SO2 national ambient air quality standards can be ignored for state purposes, since the state rules (one page prior in NR 404) don't yet acknowledge the new 1-hr standards. It would seem that the DNR would want to meet NR 404 consistently.

- PM-2.5 - As indicated modeling should include PM-2.5.

2. **Air Quality Review of Industrial PM-2.5 Emissions from Stationery Sources in Wisconsin (author unknown)**

This document is at times referred to as a TSD (technical support document) which contends to demonstrate that PM-2.5 emissions are insignificant for most permit and modeling. Our comments focus on the summary and conclusions, which we believe are flawed and misleading and should be revised or excluded.

This starts with the "Summary" (page 71 of the document). DNR comments are followed by ours.

SUMMARY (*by DNR*)

> This analysis demonstrates that direct emissions of $_{PM2.5}$ from any individual stack or source have little influence on ambient concentrations of $_{PM2.5}$ and therefore $_{PM2.5}$ emissions from any individual stack or source do not cause or exacerbate violation of any $_{PM2.5}$ increment or standard. In summary:

PTI Comment - The DNR and other states were encouraged to site PM-2.5 monitors to capture regional sulfate and nitrate related concentrations, while intentionally avoiding local source contributions. This I confirmed years ago with the monitoring section managers. This explains why monitors have not been capturing PM2.5 concentrations that exceed the standards - they weren't designed to do this, they were designed to avoid local stack influence. If DNR were to take my guidance, and redirect the locations of monitors, as I would recommend they would most likely show violations. But since 1982 the air program has used modeling as the front line tool to assess local air quality status, and before that DNR used modeling combined with monitors sited to capture local source contributions - DNR previously decided to avoid local source contributions as they set up monitoring networks. By using inappropriate monitoring data to make a point and denying use of modeling, a dangerous precedent is established, which denies the public the protection guaranteed by the Clean Air Act.

> Emissions of $_{PM2.5}$ derive from different sources than those of $_{PM10}$ and therefore $_{PM2.5}$ emissions cannot be characterized simply as a subset of total particulate matter.

PTI Comment *- To some degree there are different sources of PM10 and PM2.5, and this would be accentuated by monitoring to only go after the regional sources and ignore local source impacts from industrial sources. No matter what DNR's premise that PM10 emissions would have emissions that fall off to 0 lb/hr as you approach a PM 2.5 size. This is unproven and untested. The DNR has PM2.5 stack test results on file that show that emission sources (including non-combustion sources) of PM-2.5 are significant. Choosing to ignore these results, claiming that such data is not accurate or claiming EPAs methods are not accurate opens DNR to much scrutiny. To our knowledge EPA has not disclaimed the accuracy of most of these methods. In addition, the DNR has many facilities that report significant PM2.5 emissions on the annual ARS reports, who report if related emissions are above 5 tons/yr. We have a report furnished by DNR which shows that over 200 facilities reported PM2.5 emissions in recent years. Are all of these inaccurate overestimates? To throw out emission for half the sources (those not from combustion equipment) and later throw out the need for all modeling of PM2.5 from* ***ALL*** *minor sources is unsupported. At the minimum, the Department should develop a screening tool based upon the PM2.5 test data on file, or provide support for a similar national database.*

> Emissions of $_{PM2.5}$ have long lifetimes in the atmosphere and travel long distances from the emission source thus becoming well-mixed in ambient air.

PTI Comment *- Please see the response to the first bullet. The emissions currently being monitored fit this description. DNR is* ***not*** *monitoring to determine what is happening for local sources. Most of my modeled highest concentrations for minor sources occur within 100 m and for taller stacks occur within 500 m. At typical wind speeds of 10 m/s the minor source high concentrations occur within 10 seconds, and are not well mixed.*

> National emissions estimates of $_{PM2.5}$ from direct sources have remained steady from year-to-year, yet monitored concentrations have steadily decreased at both rural and urban locations bolstering the conclusion that directly emitted $_{PM2.5}$ is not affecting monitored concentrations of the pollutant.

PTI Comment *- See the response to bullet 1. This decrease only relates to the intended monitoring of regional sources. DNR knows almost nothing about localized PM2.5 industrial hot spots and we recommend that localized PM2.5 monitoring be conducted (and supplementing modeling analyses for these locations) before the modeling section of these guidelines is adopted.*

> Both national and Wisconsin emission estimates of the $_{PM2.5}$ precursors SO_2 and NO_x from direct sources have decreased year-to-year, similar to $_{PM2.5}$ monitored concentrations.

PTI Comment *- See response to bullet 1. By focusing on the regional sources the SO2 and NOx (sulfate and nitrate) related contributions may be decreasing. But if you look at local sources these values are immaterial toward demonstrating compliance.*

> The true level of direct, primary $_{PM2.5}$ emissions may be at least nine times lower than previously reported due to errors in stack testing methods that were used to develop emission factors.

PTI Comment *- The study was completed by NCASI. Although NCASI may be more credible than others the fact remains that industry directly funded the "study" and industry managers set the terms for how the work gets done and what gets included or excluded. DNR should complete their own analysis or accept work submitted by environmental groups for greater balance. I have seen related emission tests run for 24 hours to prove some point - but related testing needs to be completed in 3 hours or longer, depending on detection limits to be valid. I also note that some outdated references are used by DNR including many citations from 1996. But DNR and EPA had access to this information when PM2.5 rules were created and at that time decided to create the rules.*

> Concentrations of ambient $_{PM2.5,}$ as measured by monitors in Wisconsin, are below the NAAQS and continue to steadily decrease with time.

PTI Comment *- Again, DNR is focusing on regional concentrations. Local concentration most likely are not being met. If DNR pursues this policy of gathering no modeling or monitoring for localized sources, then nobody would be able to assess what's happening in their back yards.*

> All of Wisconsin is considered in attainment for both the 24-hour and annual NAAQS for $_{PM2.5}$ due to the steady decrease of ambient levels of $_{PM2.5}$ as monitored by DNR's air monitoring network.
PTI Comment *- Please see response to bullets 1 through 5. Regional impacts are decreasing, the local affects need to still be evaluated, case-by-case, as they have for every other pollutant, and modeling is the approach that should be used.*

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> Comparison of ambient $_{PM2.5}$ concentrations from monitors both in close proximity of each other and far apart show strong correlations, indicating that broad regional factors, such as weather patterns and long-range transport from distant sources have a greater effect on ambient air than direct emissions from stationary sources.

PTI Comment *- See response to bullets 1 through 5. The equipment is looking at regional concentrations and ignoring local impacts. As a meteorologist and modeler for 33 years I can tell you that these weather patterns are inconsequential for local impacts.*

> Examination of component substances captured by $_{PM2.5}$ speciation monitors illustrates that concentration of elemental carbon (corresponding to directly emitted $_{PM2.5}$ from fuel combustion) are not a major contributor to ambient $_{PM2.5}$ concentrations and are not increasing.

PTI Comment *- Again, we recommend that some monitors be placed near local sources. Carbon and certain HAPs may be significant.*

> Sulfate, nitrate, and organic carbon, produced by secondary reactions in the atmosphere, comprise most of the ambient $_{PM2.5}$ in Wisconsin. *PTI - Has this been verified with monitoring*

> Decreased concentrations of ambient $_{PM2.5}$ correlate to national technology improvements such as fuel efficiency and reductions in sulfur content of fuels for both industry and mobile sources.

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CONCLUSION (DNR)

To approve air permit applications for direct sources of fine particulate $_{(PM2.5)}$ traditional dispersion modeling in not an appropriate method to demonstrate whether the emissions from the source will cause or exacerbate an exceedance of the air quality standards for $_{PM2.5}$. Reductions in ambient air concentrations of pollutants such as ozone and $_{PM2.5}$ are influenced by regional factors such as weather patterns, long-range transport from distant sources, and secondary formation.

Ambient concentrations of $_{PM2.5}$ have decreased over time due to reductions in concentrations of sulfate, nitrate, and organic carbon. Reductions in concentrations of sulfate, nitrate, and organic carbon are due to national technology improvements, increases in mobile source fuel efficiency, and reductions in the sulfur content of fuels, leading to reductions in emission of SO_2 and NO_x. The trend in ambient concentrations of $_{PM2.5}$ does not correlate to trends in concentrations of elemental carbon, and so do not correlate to direct, industrial $_{PM2.5}$ emissions.

Therefore, the WDNR concludes that direct emissions of $_{PM2.5}$ from a single, direct stationary source will not cause or exacerbate violation of any $_{PM2.5}$ air quality standard or increment. For existing sources, minor new sources, and minor modifications of sources dispersion modeling of $_{PM2.5}$ is not necessary to demonstrate whether the emissions from the source cause or exacerbate an exceedance of the air quality standard for $_{PM2.5}$ and will no longer be performed for this purpose. Wisconsin will continue to regulate emissions of NO_x and SO_2 and will follow USEPA guidance on assessing the impact of direct $_{PM2.5}$ and secondarily formed $_{PM2.5}$ under the Prevention of Significant Deterioration permit program.

This report serves as the WDNR determination pursuant to s. 285.63(1)(b), Wis. Stats and is consistent with the determination made for other pollutants, such as ozone.

PTI Comment *- Comments provided support that DNR needs to set up a substantial network of local monitors to verify whether industrial sources can be ruled out completely as contributing to high PM-2.5 concentrations. Unfortunately when the PM-2.5 evaluation started DNR monitoring staff had verified that only regional concentrations were being monitored and localized industry impacts were avoided, since EPA was focusing on regional sulfate and nitrate impacts. As such, there is no DNR monitoring database that would show the impact from local sources. To now state that we can forego any modeling of PM-2.5, except where mandated by federal PSD regulations, is unacceptable. DNR has provided very limited support that PM-2.5 emissions are minimal, relying on one statement within one industry sponsored study to indicate that PM-2.5 emissions are overstated. There have been 100s of stack test results using test methods that have not been disqualified by EPA that show PM-2.5 is significant and is not limited to combustion sources. There have been 100s of annual reports by industrial sources showing that facility PM-2.5 emissions are significant, and are not limited to combustion sources. The stated initiative to ignore PM-2.5 for modeling purposes is unwarranted. The information provided here by DNR is inconclusive or needing substantiation.*

In Conclusion, it is our recommendation that the Department commit to:

- Devoting resources over the next 5 years, to develop better PM2.5 test methods, emission factors by industry type and relocation of some, if not all PM2.5 monitors close to representative stacks for all major industrial source categories, targeting on relatively short stacks with higher emissions.

- Reconsideration of PM2.5 modeling requirements. Clearly dismissing all modeling for non-PSD sources is not consistent with the science and the requirements of the NAAQS. Part 70 Sources and many non-part 70 sources clearly have local impacts that should be modeled to protect the local inhabitants.

- The Department will meet its due diligence responsibilities in regard to PM2.5 and restructure the new policy so all concerns are addressed to clearly demonstrate to the public that fine particulates are not a threat to human health, as assumed by this new policy.

University of Wisconsin-Eau Claire
105 Garfield Avenue • P.O. Box 4004 • Eau Claire, WI 54702-4004

Ms. Kristin Hart
Wisconsin Department of Natural Resources

14 August 2015

Dear Ms. Hart:

With this letter, I would like to respond to the Wisconsin Department of Natural Resources request for public comments on the proposed elimination of "mechanical" sources of PM2.5 generation in the permitting of air emissions. While it is clear that combustion and secondary particle formation processes are the principal sources of PM2.5, mechanical processes can be important contributors and so must be considered in air permit calculations.

This response is organized in three areas: 1)Ambient particulate research; 2)Mining particulate research; and 3)Wisconsin frac sand mining and processing particulate research.

Ambient Particulate Research

Numerous studies and regulatory efforts document the generation of PM2.5 in urban particulate mixtures as a result of mechanical processes. The Chinese Academy of Science has identified soil dust as a major component of PM2.5 in evaluating sources of air pollution in Beijing (https://www.thechinastory.org/dossier/cas-identified-six-major-sources-for-pm2-5/). Dust has also been identified as a component of PM2.5 pollution in a Chinese nine-city analysis (http://www.globaltimes.cn/content/915067.shtml). Lee et al. have found that road salt contributes to PM2.5 in Toronto, Canada (http://www.ncbi.nlm.nih.gov/pubmed/14620807). Roadway dust is a component of Salt Lake Valley PM2.5 concerns (http://home.chpc.utah.edu/~whiteman/PM2.5/PM2.5.html#sources).

In the regulatory arena, a draft California Southern Coast Air Quality Management District guidance document states, "For mechanical dust generating sources, e.g., construction, the PM2.5 fraction of PM10 is 21 percent…"(http://www.aqmd.gov/docs/default-source/ceqa/handbook/localized-significance-thresholds/particulate-matter-(pm)-2.5-significance-thresholds-and-calculation-methodology/pm2-5-working-group-meeting-1-draft-methodology-to-calculate-pm2-5.doc?sfvrsn=2)

The US Environmental Protection Agency recognizes the following "top sources" of PM2.5 in their consideration of criteria and hazardous air pollutants (http://www.epa.gov/ttn/chief/net/2008neiv3/2008_neiv3_tsd_draft.pdf, table 4):

1. Agriculture - Crops & Livestock Dust
2. Agriculture - Livestock Waste
3. Dust - Construction Dust
4. Dust - Paved Road Dust
5. Dust - Unpaved Road Dust
6. Industrial Processes – Mining

They note that "[Year-to-year PM2.5] increases in the miscellaneous category are related to increases in dust from agricultural tilling and livestock ... and from paved roads."

The EPA has also listed emission factors for PM2.5 generation in the crushed stone industry for the following activities (http://www.epa.gov/ttn/chief/ap42/ch11/final/c11s1902.pdf Table11-19-2.1):

1. Tertiary Crushing (controlled)
2. Fines Crushing (controlled)
3. Screening (controlled)
4. Conveyor Transfer Point (controlled)

An EPA workshop paper on reconciling PM differences between fugitive dust emissions inventory and ambient source contribution estimates found the following:

> Source apportionment studies show that geological material contributes an average of ~5% to ~20% of PM2.5 in urban areas where National Ambient Air Quality Standards (NAAQS) have been or might be exceeded. Urban emissions inventories show dust emissions contributing ~50% to ~80% of PM2.5.

Measurement of atmospheric aerosols includes identification of crustal material dust:

> These three models identified some common sources of PM2.5: marine aerosol, crustal material, traffic, secondary aerosols (secondary sulfate and secondary nitrate resolved by PMF), a mixed source of heavy fuels combustion and biomass burning, and industrial emissions. [1]
>
> The PMF model identified six main sources: soil dust, coal combustion, biomass burning, traffic and waste incineration emission, industrial pollution, and secondary inorganic aerosol.[2]
>
> A total of five source types were identified, including soil dust, vehicle emissions, sea salt, industrial emissions and secondary aerosols, and their contributions were estimated using PMF.[3]
>
> Statistically significant contributions from natural gas combustion, paved road dust, and vegetative detritus.[4]
>
> Dust: agricultural production, construction, paved road dust, unpaved road dust.[5]

Ho et al. have documented PM2.5 as 11–30% of PM10 in fugitive urban dirt and paved road dust.[6]

The Western Regional Air Particulates Fugitive Dust Handbook identifies the following sources of fugitive dust emissions, indicating a common AP-42 PM2.5 percentage of PM10 of 10-20%:

Agricultural Tilling
Construction and Demolition
Materials Handling
Paved Roads
Unpaved Roads
Agricultural Wind Erosion
Open Area Wind Erosion
Storage Pile Wind Erosion
Agricultural Harvesting
Mineral Products Industry
Abrasive Blasting
Livestock Husbandry
Miscellaneous Minor Fugitive Dust Sources
(http://www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf).

Given that PM2.5 is commonly measured in fugitive dust emissions and indeed is modeled through AP-42 emission factors from many mechanical sources of fugitive dust, the proposal to ignore mechanically-generated PM2.5 from permitted sources in Wisconsin is unsupported. Moreover, the proposal is inconsistent with the June 2015 DRAFT Wisconsin Air Dispersion Modeling Guidelines which state,

> "**Fugitive (non-point source) Emissions**
> Emissions created within a structure that are not vented to a stack but are considered in aggregate in the permit should be included in the dispersion modeling analysis."

And

> "**Fugitive Dust**
> When fugitive dust emissions on the facility property are affected by the permit, those emissions should be included in the dispersion modeling analysis."

PM2.5 Generation in Mining

Madungwe and Mukonzvi found levels of 14.23–69.01 mg/m3 PM2.5 around a stone quarry.[7] Zota et al, found that PM2.5 sources in mine waste included "mobile source combustion, secondary sulfates, mine waste, and crustal/soil."[8]

The US EPA has established PM2.5 emission factors for mechanical processes associated with coal mining (AP-42 section 11.9). Processes identified that generate PM2.5 include blasting, truck loading, bulldozing, dragline, vehicle traffic, grading, active storage pile (table 11.9-1) and drilling, topsoil removal by scraper, overburden replacement, truck loading by power shovel,

train loading, bottom dump truck unloading, end dump truck unloading, scraper unloading and wind erosion of exposed areas (table 11.9-4). Truck transport, conveyor belt transport, crushing and screening processes are not included. They further state "All operations that involve movement of soil or coal, or exposure of erodible surfaces, generate some amount of fugitive dust." (http://www.epa.gov/ttn/chief/ap42/ch11/final/c11s09.pdf). Given that these processes occur in non-metallic mining, particularly frac sand mining, these same conditions apply in Wisconsin.

PM2.5 Generation in Wisconsin Frac Sand Mining

Frequent measurement of PM2.5 and PM4 in Wisconsin sand mining and processing operations is further evidence of mechanical process-generation of fine particulates.

We examined 41 MSHA (Mine Safety and Health Administration) past tests for respirable (PM4) crystalline silica in Wisconsin sand operations using the MSHA mine report search tool (http://www.msha.gov/drs/drshome.htm) and found the following: 1) All samples contained silica, at concentrations ranging from 5.8–130 ug/m3 with an average of 41 ug/m3; and 2) There were three violations of the MSHA respirable crystalline silica standard (two at the EOG plant and one at the A F Gelhar Co Inc.). Values for the three violations are provided below:

Date	Location	Job	Contaminant	Concentration (mg/m3)	PEL (mg/m3, varies by %SiO2)	%SiO2	SiO2 Concentration (mg/m3)
2/18/2009	M - Drying & Roasting	Kiln/ Dryer Operator	Quartz, respirable, >1% Qtz	0.34	0.28	34	0.11
3/27/2012	M - Washing & Screening	Washer Operator	Quartz, respirable, >1% Qtz	0.6	0.53	17	0.10
3/27/2012	S - General	Electrician	Quartz, respirable, >1% Qtz	0.82	0.57	16	0.13

Respirable crystalline silica (quartz) is generated from mechanical processes including blasting, crushing and transporting of Wisconsin sandstone deposits (not formed from combustion nor secondary formation processes). Documentation of respirable quartz, sometimes at levels above the MSHA standard, is evidence of mechanical generation.

Esswein et al. found that PM4 quartz levels exceeded the OSHA occupational standard in 47% of samples at hydraulic fracturing sites.[9] These airborne particulate levels were generated either during the transport of larger-diameter frac sand from upper Midwest sources, and/or from mechanical processing during the hydraulic fracturing operations.

Our research has found levels of PM2.5 around frac sand operations higher than simultaneous measurements at regional WDNR and Minnesota Pollution Control Agency (MPCA) monitors.[10] A 24-hour filter sample in Winona, MN determined a level of 19.6 vs. 13.5 ug/m3 measured by the MPCA. This is of significance because Winona frac sand operations are principally engaged in sand transport (with few combustion or secondary particle sources of PM2.5), indicating mechanical generation of PM2.5.

We also routinely test our particulate monitors in a chemical fume hood where sandstone deposits from the Hoffman Hills area are stirred with a mechanical or magnetic stirrer bar, readily generating atmospheres with concentrations of 100-500 ug/m3 PM2.5

PM2.5 generation is seen in mechanical dust generation in urban settings, mining, and specifically frac sand mining in Wisconsin. AP-42 emission factors for PM2.5 are widely used for mechanical processes. The inclusion of these emission estimates are essential for protection of human health in WDNR air permit processes.

Sincerely,

Crispin H. Pierce, Ph.D.
Professor / Program Director

Excellence. Our measure, our motto, our goal.

Watershed Institute for Collaborative Environmental Studies
(715)836-2628 • http://www.uwec.edu/watershed/ • http://www.facebook.com/WICES/

References

[1] *Atmospheric and Climate Sciences*, 2013, 3, 562-575
http://dx.doi.org/10.4236/acs.2013.34059 Published Online October 2013
(http://www.scirp.org/journal/acs)

[2] Atmos. Chem. Phys., 13, 7053–7074, 2013
www.atmos-chem-phys.net/13/7053/2013/
doi:10.5194/acp-13-7053-2013

[3] *Aerosol and Air Quality Research*, 12: 476–491, 2012
Copyright © Taiwan Association for Aerosol Research
ISSN: 1680-8584 print / 2071-1409 online
doi: 10.4209/aaqr.2012.04.0084

[4] VOL. 36, NO. 11, 2002 / ENVIRONMENTAL SCIENCE & TECHNOLOGY 9 2361

[5] Sangil Lee, Armistead G. Russell & Karsten Baumann (2007) Source Apportionment of Fine Particulate Matter in the Southeastern United States, Journal of the Air & Waste Management Association, 57:9, 1123-1135, DOI: 10.3155/1047-3289.57.9.1123

[6] Atmospheric Environment 37 (2003) 1023–1032. Characterization of PM10 and PM2.5 source profiles for fugitive dust in Hong Kong. K.F. Ho, S.C. Lee, Judith C. Chow, John G. Watson.

[7]Atmospheric and Climate Sciences, 2012, 2, 52-59 http://dx.doi.org/10.4236/acs.2012.21007 Published Online January 2012 (http://www.SciRP.org/journal/acs). Assessment of Distribution and Composition of Quarry Mine Dust: Case of Pomona Stone Quarries, Harare. Emaculate Madungwe and Tinashe Mukonzvi.

[8]J Air Waste Manag Assoc. 2009 Nov;59(11):1347-57. Impact of mine waste on airborne respirable particulates in northeastern Oklahoma, United States. Zota AR1, Willis R, Jim R, Norris GA, Shine JP, Duvall RM, Schaider LA, Spengler JD.

[9]J Occup Environ Hyg. 2013;10(7):347-56. doi: 10.1080/15459624.2013.788352. Occupational exposures to respirable crystalline silica during hydraulic fracturing. Esswein EJ1, Breitenstein M, Snawder J, Kiefer M, Sieber WK.

[10]Pierce, Crispin H., Kristin Walters, Jeron Jacobson, and Zachary Kroening; PM2.5 Airborne Particulates near Frac Sand Operations; J Environ Health, Nov. (2015, in press).

$PM_{2.5}$ Airborne Particulates Near Frac Sand Operations

Kristin Walters
Jeron Jacobson
Zachary Kroening
Crispin Pierce, PhD
University of Wisconsin–Eau Claire

Abstract **The rapid growth of hydraulic fracturing for oil and gas extraction in the U.S. has led to 135 active "frac" sand mines, processing plants, and rail transfer stations in Wisconsin. Potential environmental health risks include increased truck traffic, noise, ecosystem loss, and groundwater, light, and air pollution. Emitted air contaminants include fine particulate matter ($PM_{2.5}$) and respirable crystalline silica. Inhalation of fine dust particles causes increased mortality, cardiovascular disease, lung disease, and lung cancer. In the authors' pilot study, use of a filter-based ambient particulate monitor found $PM_{2.5}$ levels of 5.82–50.8 µg/m³ in six 24-hour samples around frac sand mines and processing sites. Enforcement of the existing U.S. Environmental Protection Agency annual $PM_{2.5}$ standard of 12 µg/m³ is likely to protect the public from silica exposure risks as well. $PM_{2.5}$ monitoring around frac sand sites is needed to ensure regulatory compliance, inform nearby communities, and protect public health.**

Introduction

Hydraulic fracturing ("fracking") is a process where a mixture of sand, water, and hydrocarbon additives is injected under high pressure into the ground thousands of meters vertically then horizontally to extract oil and gas. The force of injection fractures formations such as the Marcellus Shale, and the sand particles prop open fissures for subsequent oil and gas extraction. Sandstone from upper Midwest formations, including Jordan, Wonewoc, Mt. Simon, and St. Peter Formations contains sand grains that are spherical, of substantial compression strength, and appropriate size (commonly 20/40 mesh, 840–420 µm diameter) for fracking operations. Frac sand mines and processing plants (to remove larger- and smaller-sized particles not used in operations) are concentrated in the upper Midwest but present throughout the U.S. and Canada (Frac Tracker, 2014). Including rail transfer sites, 135 are now active in Wisconsin (Wisconsin Center for Investigative Journalism, 2013; Wisconsin Department of Natural Resources [DNR], 2012; Wisconsin Geological and Natural History Survey, 2013). Rapid proliferation of these facilities—more closely located near population centers than traditional sand and gravel pits—has led to concerns about human exposure to airborne pollutants, notably fine particulates ($PM_{2.5}$, particles with a diameter of 2.5 µm and smaller) and crystalline silica (quartz). To our knowledge, this is the first publication of measured $PM_{2.5}$ concentrations around frac sand facilities.

The Wisconsin Department of Natural Resources does not regulate silica and has required less than 10% of frac sand mines and processing plants to measure the larger PM_{10} fraction of airborne particulates (particles with a diameter of 10 µm and smaller). This size fraction is not as closely associated with human health effects as fine particulates, however, and has a much higher U.S. Environmental Protection Agency (U.S. EPA) ambient limit of 150 µg/m³, compared to 12 µg/m³ for $PM_{2.5}$ (U.S. EPA, 2014).

Fine particulates have been identified by U.S. EPA as a cause of cardiovascular and lung disease including lung cancer. Three comprehensive studies of urban air pollution have found that each 10 µg/m³ increase in long-term average $PM_{2.5}$ concentration was associated with

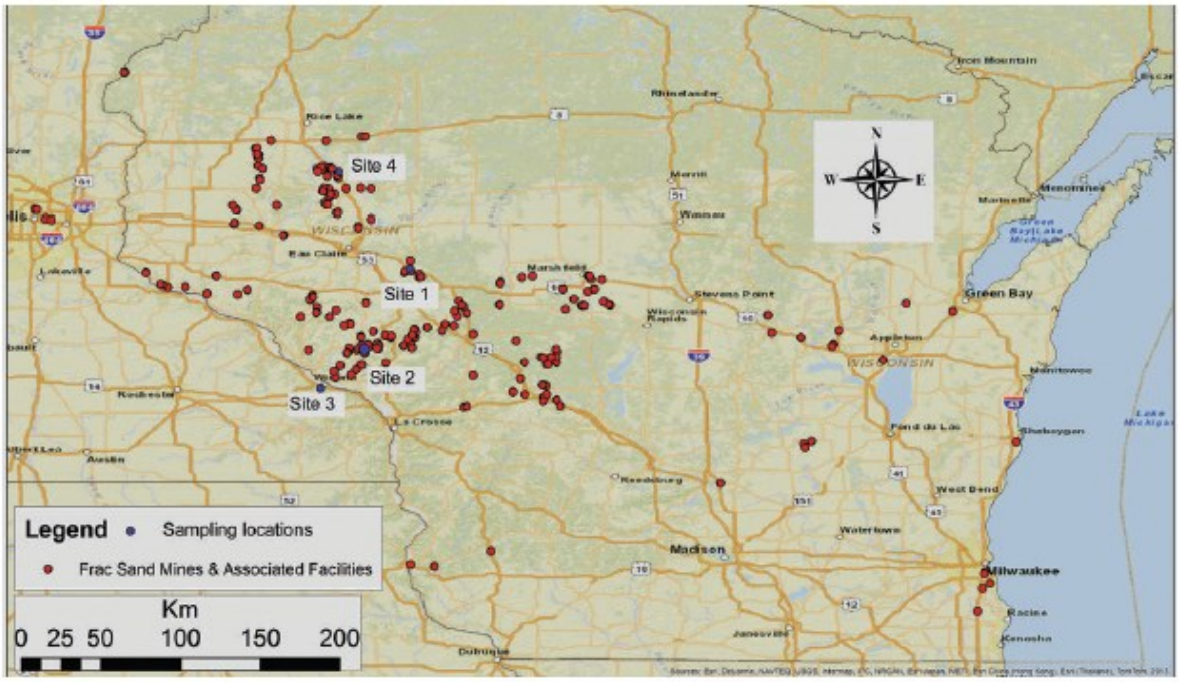
- a 4% to 14% increased risk of death from all natural causes;
- a 6% to 26% increased risk of death from cardiopulmonary/cardiovascular disease (including stroke); and
- an 8% to 37% increased risk of death from lung cancer (Lepeule, Laden, Dockery, & Schwartz, 2012; Martinelli, Olivieri, & Girelli, 2013; Pope et al., 2002).

In recognition of this particulate size toxicity, the U.S. EPA recently reduced the annual $PM_{2.5}$ public exposure standard from 15 to 12 µg/m³.

Crystalline silica (quartz) is a particularly important component of the $PM_{2.5}$ size range and is occupationally associated with silicosis and lung cancer (Collins, Salmon, Brown,

FIGURE 1

Sampling Locations and Wisconsin Frac Sand Facilities



Base map from FracTracker.org.

Marty, & Alexeeff, 2005; Park et al., 2002). "Freshly fractured" silica appears to be two to five times more reactive with animal lung tissue compared to "weathered" silica, though weathering occurs within several days and with exposure to water (Vallyathan et al., 1995). Respirable (PM_4) quartz has recently been measured at levels above occupational standards at hydraulic fracturing sites (Esswein, Breitenstein, Snawder, Kiefer, & Sieber, 2013).

Our examination of Mine Safety and Health Administration inspection reports (www.msha.gov/drs/drshome.htm) found that in 41 measurements of respirable particulates, crystalline silica comprised an average of 14.5%. By enforcing the U.S. EPA $PM_{2.5}$ annual standard of 12 µg/m^3, communities would then be expected to be exposed to a maximum of 12 µg/m^3 x 14.5% = 1.74 µg/m^3 crystalline silica, about half of the 3 µg/m^3 standard now used by California, New Jersey, and Minnesota (Collins et al., 2005); New York, Texas, and Vermont have more stringent standards (Wisconsin Department of Natural Resources, 2011).

Statistically verified public health effects from long-term exposure to fine particulates including silica would likely require decades of surveillance and costly "federal reference method (FRM)" particulate monitors. The rapid proliferation of frac sand plants and corresponding public concern, however, as well as the dearth of available ambient particulate air quality monitoring, mandate systematic new efforts to quantify public health risks. To address this imminent need for data, our pilot study focused on 24-hour "snapshots" of $PM_{2.5}$ concentrations around frac sand plants in Wisconsin and Minnesota. Shared interest in this topic has led to collaborations with environmental science faculty at the University of Wisconsin–Stout and the University of Iowa Environmental Health Sciences Research Center.

Methods

Four sampling sites of convenience in Wisconsin and Minnesota were chosen based on proximity to frac sand operations and protection of monitors on private property (Figure 1). Six nominal 24-hour ambient air samples were collected with an SKC DPS (deployable) sampler using the $PM_{2.5}$ sampling head (Patterson et al., 2010). Sampling conditions included calm and high wind flow, rain, and snow, at distances of 30–1,300 m from operations (Table 1). PVC filters were weighed pre- and post-exposure six times using a Mettler Toledo AT261 DeltaRange balance. Field blanks accompanied the DPS sampler and demonstrated no net mass changes. Filter conditioning was considered unnecessary after filters showed no mass changes after

several days in desiccators or humidified chambers. DPS flow rate was calibrated to 10 L/min using a field rotameter. The $PM_{2.5}$ sample inlet was mounted 2 m high and away from buildings and trees as described in U.S. EPA sampling protocol (U.S. EPA, 2007).

Airborne $PM_{2.5}$ concentrations were calculated as follows:

$$PM_{2.5}\ (\mu g/m^3) = (\text{Filter mass}_{end} - \text{Filter mass}_{start})/(\text{Sample duration} * \text{Flow rate})$$

Sample standard deviations (*SD*) were calculated as follows:

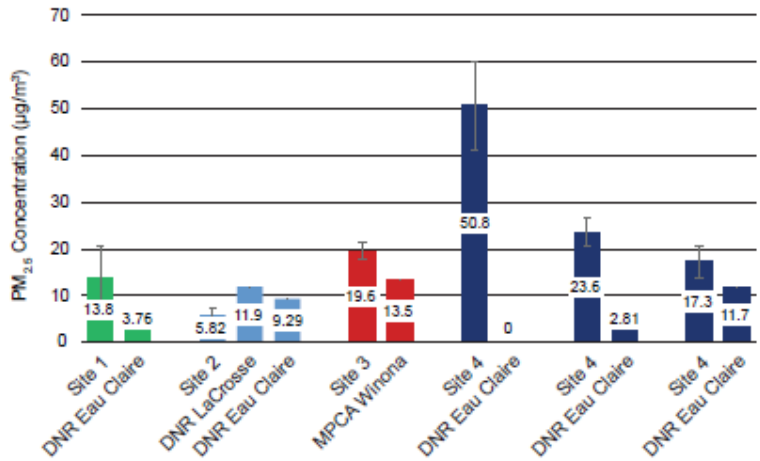
$$s.d._{sample} = (\sqrt{s.d.^2_{pre\text{-}weight} + s.d.^2_{post\text{-}weight}})/(\text{Sample duration} * \text{Flow rate})$$

Temperature, humidity, wind speed and wind direction, and GPS coordinates were also recorded at each site.

Measured $PM_{2.5}$ concentrations were compared to the nearest Wisconsin Department of Natural Resources (DNR, 2014) and/or Minnesota Pollution Control Agency (MPCA, 2014) reported $PM_{2.5}$ levels, matched hour-for-hour to sampling times.

FIGURE **2**

Six Measured and Simultaneous Department of Natural Resources (DNR)-Reported Regional $PM_{2.5}$ Concentrations at Four Frac Sand Sites



$PM_{2.5}$ = particulate matter ≤2.5 µm in diameter; MPCA = Minnesota Pollution Control Agency. Error bars represent mean +/- *SD*.

Results

$PM_{2.5}$ levels of the six samples ranged from 5.82 to 50.8 µg/m³ (Table 1). One location (site 4) that was sampled three times on different days had threefold different levels (50.8 vs. 17.3 µg/m³). This observation is consistent with increased precipitation and wind speed causing lower levels of $PM_{2.5}$. Extent of frac sand facility activity also appears to affect measured fine particulates, with lowest levels near a small inactive mine (site 2, Table 1).

Five of the six samples had $PM_{2.5}$ levels higher than corresponding DNR or MPCA regional background levels. Variability among sample sites, between measured and DNR/MPCA reported values, and standard deviations from multiple filter weighings within measurements are visible in Figure 2.

Discussion

The U.S. EPA regulates ambient $PM_{2.5}$ both as the three-year annual average level of 12 µg/m³ to protect against long-term health effects as well as the 98th percentile level of 35 µg/m³ to protect against short-term effects (U.S. EPA, 2009). Our limited data set found that five of the six samples were above the 12 µg/m³ average value (Table 1) and the 98th percentile value for the three site 4 measurements was 49.7 µg/m³, higher than the U.S. EPA value of 35 µg/m³.

Higher wind conditions (site 1), heavy snowing (site 3), and heavy rain conditions (site 4 on May 19–20, Table 1) may have contributed to lower $PM_{2.5}$ levels. The site with the smallest, inactive mine (site 2) had the lowest $PM_{2.5}$ concentration. Measured fine particulate levels are likely due to a combination of regional pollution, car and diesel truck exhaust, local industrial pollution, and frac sand particulate emissions.

Results from our study are limited due to the small sample size, and longer-term sampling both at the same site and across sites is needed to better establish chronic exposure levels of $PM_{2.5}$ to residents, workers, and commuters around frac sand sites. Colocation and testing of direct-reading instruments with U.S. EPA FRM instruments would provide options for testing of air quality by local health departments using less-expensive and easy-to-interpret instruments. We are currently testing the TSI DustTrak 8520 and 8530 aerosol monitors (battery-operated, portable light-scattering laser photometers) used extensively in particulate measurement (Chang et al., 2001; Kim, Magari, Herrick, Smith, & Christiani, 2004) as well as the Dylos DC1100 consumer air monitor. These, along with the SKC DPS, are being tested against Andersen dichotomous filter-based FRM monitors in control and frac-sand ambient environments.

Conclusion

With rapidly increasing frac sand mining, processing, transportation, and use in hydraulic fracturing, health departments and elected officials face unanswered questions about potential health risks. This research, together with other data of a similar nature we have collected, is suggestive of an increase of ambient $PM_{2.5}$ levels as a result of these activities. We propose the establishment of longer-term $PM_{2.5}$ monitoring with both direct reading and FRM particulate samplers, as well as silica-specific monitoring efforts, to ensure regulatory compliance, inform nearby communities, and protect public health.

TABLE 1

Locations, Sampling Times, and Measured $PM_{2.5}$[a] Concentrations Near Frac Sand Mines and Processing Plants

Location	Date	Time	$PM_{2.5}$ (μg/m³ +/- *SD*)	Coefficient of Variation	Field Notes
Site 1	April 19–20, 2013	13:30–14:00	13.8+/- 6.79	49%	30 m from enclosed conveyor. Windy/snowing (4/19), clear/slight wind (4/20).
Site 2	July 13–14, 2013	0:00–0:00	5.82+/-1.30	22%	~1000 m from small inactive mine. One hour light rain.
Site 3	January 17–18, 2014	20:46–18:57	19.6+/-1.74	8.9%	500 m from inactive plant. Heavy snow.
Site 4	August 3, 2013	12:00–17:47	50.8+/-9.48	19%	200 m and 1300 m from two active plants. Sampled 347 min.
Site 4	November 22–23, 2013	15:09–16:44	23.6+/-3.16	13%	200 m and 1300 m from two active plants.
Site 4	May 19–20, 2014	16:50–17:15	17.3+/-3.48	20%	200 m and 1300 m from two active plants. Heavy rain on May 19.

[a]$PM_{2.5}$ = particulate matter ≤2.5 μm in diameter.

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Corresponding Author: Crispin Pierce, Professor and Program Director, Environmental Public Health Program, University of Wisconsin-Eau Claire, 105 Garfield Ave., Eau Claire, WI 54702. E-mail: PIERCECH@uwec.edu.

References

Chang, L.T., Suh, H.H., Wolfson, J.M., Misra, K., Allen, G.A., Catalano, P.J., & Koutrakis, P. (2001). Laboratory and field evaluation of measurement methods for on-hour exposures to O3, $PM_{2.5}$, and CO. *Journal of the Air & Waste Management Association, 51*(10), 1414–1422.

Collins, J.F., Salmon, A.G., Brown, J.P., Marty, M.A., & Alexeeff, G.V. (2005). Development of a chronic inhalation reference level for respirable crystalline silica. *Regulatory Toxicology and Pharmacology*, 43(3), 292–300.

Esswein, E.J., Breitenstein, M., Snawder, J., Kiefer, M., & Sieber, W.K. (2013). Occupational exposures to respirable crystalline silica during hydraulic fracturing. *Journal of Occupational and Environmental Hygiene, 10*(7), 347–356.

Frac Tracker. (2014). *U.S. frac sands locations and silica geology.* Retrieved from http://maps.fractracker.org/latest/?webmap=2f382d5fcdb748deba89e6104b59551d

Kim, J.Y., Magari, S.R., Herrick, R.F., Smith, T.J., & Christiani, D.C. (2004). Comparison of fine particle measurements from a direct-reading instrument and a gravimetric sampling method. *Journal of Occupational and Environmental Hygiene, 1*(11), 707–715.

Lepeule, J., Laden, F., Dockery, D., & Schwartz, J. (2012). Chronic exposure to fine particles and mortality: An extended follow-up of the Harvard six cities study from 1974 to 2009. *Environmental Health Perspectives, 120*(7), 965–970.

Martinelli, N., Olivieri, O., & Girelli, D. (2013). Air particulate matter and cardiovascular disease: A narrative review. *European Journal of Internal Medicine, 24*(4), 295–302.

Minnesota Pollution Control Agency. (2014). *Minneapolis-St. Paul real-time air quality reporting page.* Retrieved from http://www.smogwatch.com/minn/realtimedata.cfm

Park, R., Rice, F., Stayner, L., Smith, R., Gilbert, S., & Checkoway, H. (2002). Exposure to crystalline silica, silicosis, and lung disease other than cancer in diatomaceous earth industry workers: A quantitative risk assessment. *Occupational and Environmental Medicine, 59*(1), 36–43.

Patterson, S.L., Rusiecki, J.A., Barnes, S.L., Heller, J.M., Sutphin, J.B., & Kluchinsky, T.A., Jr. (2010). Effectiveness, suitability, and performance testing of the SKC deployable particulate sampler (DPS) as compared to the currently deployed airmetrics minivol portable air sampler. *Journal of Environmental Health*, 73(3), 16–22.

Pope, C.A., III, Burnett, R.T., Thun, M.J., Calle, E.E., Krewski, D., Ito, K., & Thurston, G.D. (2002). Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. *Journal of the American Medical Association, 287*(9), 1132–1141.

U.S. Environmental Protection Agency. (2007). *Sampling protocol: Title 40: Protection of environment, part 58—ambient air quality*

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References *continued from page 11*

surveillance, subpart G—federal monitoring, appendix E to part 58—probe and monitoring path siting criteria for ambient air quality monitoring. Retrieved from http://www.gpo.gov/fdsys/pkg/CFR-2007-title40-vol5/pdf/CFR-2007-title40-vol5-part58-appE.pdf

U.S. Environmental Protection Agency. (2009). *2009 final report: Integrated science assessment for particulate matter* (Doc. No. EPA/600/R-08/139F). Retrieved from http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=216546

U.S. Environmental Protection Agency. (2014). *Fine particle ($PM_{2.5}$) designations, frequent questions.* Retrieved from http://www3.epa.gov/pmdesignations/faq.htm

Vallyathan, V., Castranova, V., Pack, D., Leonard, S., Shumaker, J., Hubbs, A.F., Shoemaker, D.A., Ramsey, D.M., Pretty, J.R., McLaurin, J.L., Kahn, A., & Teass, A. (1995). Freshly fractured quartz inhalation leads to enhanced injury and inflammation. Potential role of free radicals. *American Journal of Respiratory and Critical Care Medicine, 152*(3), 1003–1009.

Wisconsin Center for Investigative Journalism. (2013). *Frac sand mines and plants, October 2013 update* [Data file]. Retrieved from http://www.wisconsinwatch.org/wi-frac-sand/

Wisconsin Department of Natural Resources. (2011). *Report to the natural resources board: silica study* (AM-407). Retrieved from http://dnr.wi.gov/files/pdf/pubs/am/am407.pdf

Wisconsin Department of Natural Resources. (2012). *Silica sand mining in Wisconsin.* Retrieved from http://dnr.wi.gov/topic/Mines/documents/SilicaSandMiningFinal.pdf

Wisconsin Department of Natural Resources. (2014). *Wisconsin Department of Natural Resources air quality reports.* Retrieved from https://dnrx.wisconsin.gov/wisards/webreports/advancedReports.do

Wisconsin Geological and Natural History Survey, University of Wisconsin–Extension. (2013). *Frac sand in Wisconsin.* Retrieved from http://wgnhs.uwex.edu/pubs/000908/

Did You Know? You can find information on credentials, certifications, education and training, e-Learning, and careers under the professional development tab of NEHA's Web site at www.neha.org/professional-development.

President's Message

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mental Health Specialist/Registered Sanitarian (REHS/RS) exam, there are 13 Environmental Public Health Online Courses totaling over 45 hours of training on the South Central Public Health Partnership Web site. For NEHA members there are now more than 300 hours of courses and presentations available online through NEHA e-Learning.

ACTION ITEM: Seek out a new training opportunity to deepen your knowledge or sharpen your skills. Below are links to some of the training opportunities described above.

- IFPTI Fellowship in Food Protection Program: www.ifpti.org/fellowship
- CDC EHTER Ops Course: https://cdp.dhs.gov/training/program/hh
- Toastmasters International: www.toastmasters.org
- FDA ORAU: www.fda.gov/Training/ForStateLocalTribalRegulators/ucm119016.htm
- Environmental Assessment of Foodborne Illness Outbreaks: www.cdc.gov/nceh/ehs/eLearn/EA_FIO/index.htm
- Environmental Public Health Online Courses: www.cdc.gov/nceh/ehs/eLearn/EPHOC.htm
- NEHA e-Learning: www.nehacert.org

Build Your Credentials

Top-notch professionals know that credentials give them credibility with the people they work with. NEHA offers several environmental health credentials including the REHS/RS, the Healthy Homes Specialist (HHS), the Certified Professional-Food Safety (CP-FS), and the new Certified in Comprehensive Food Safety (CCFS) credential.

Every environmental health professional working independently in the field should hold the REHS/RS credential. It reflects demonstrated knowledge of the full range of environmental health issues that one might encounter in the course of one's career. Even in states where an REHS/RS is not required to practice, it is the recognized standard for our profession.

Additional credentials beyond the REHS/RS are important to demonstrate in-depth knowledge of particular areas of practice. In states that require an REHS/RS to practice, these credentials identify one as someone who is motivated to do more than the minimum that is required of them.

ACTION ITEM: Earn a new credential. Credentials are evidence of demonstrated knowledge of a particular area of environmental health and one's commitment to excellence.

For information on NEHA credentials, go to www.neha.org/professional-development/credentials.

Seneca, a first-century Roman philosopher, famously said, "Luck is what happens when preparation meets opportunity." What are you doing to prepare for your next career opportunity?

Bob Custard
NEHA.Prez@comcast.net

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August 27, 2015

Kristin Hart and John Roth
Wisconsin Department of Natural Resources
101 S. Webster St.
Madison, WI 53703

Re: Comments on the DNR's proposed guidance: "2015 Approach to Dispersion Modeling for Permits," "Air Dispersion Modeling Guidelines," and "Guidance for Including PM2.5 in Air Pollution Control Permit Applications"

Dear Ms. Hart and Mr. Roth:

Thank you for accepting and considering comments regarding the Wisconsin Department of Natural Resources' ("DNR") proposed guidance for its regulation and permitting of PM2.5. I submit these comments on behalf of Midwest Environmental Advocates ("MEA"). MEA is a nonprofit environmental law center working for clean air, clean water, and clean government for this generation and the next.

The DNR's new approach to regulating PM2.5 emissions is based on a faulty premise, lacks a factual basis, and runs counter to the DNR's own data on PM2.5. The policy outlined in the four separate guidance documents on public notice will allow industrial sources of PM2.5 to violate the National Ambient Air Quality Standards ("NAAQS") and will expose the citizens of Wisconsin to serious health threats posed by PM2.5 emissions.

We do not dispute that secondary formation of PM2.5 is responsible for a significant component of PM2.5 in the ambient air. That does not, however, support the DNR's conclusion that mechanical sources of PM2.5[1] can be ignored. Existing research and data demonstrates that mechanical processes emit PM2.5. Even if mechanical sources of PM2.5, such as industrial sand mines, emit a smaller amount of PM2.5 as individual direct sources, in the aggregate, these sources are significant. This is especially true given the dramatic increase in mechanical sources such as industrial sand mines.

[1] When we refer to "mechanical sources" of PM2.5 we include all non-combustion sources that the DNR describes in its guidance document as insignificant sources of PM2.5.

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Further, the regional ambient air monitoring data the DNR relies on does not reflect localized "hot spots" of PM2.5 concentrations in the ambient air. The DNR needs additional air quality monitoring and further research on the impact of PM2.5 emissions to establish that PM2.5 emissions from mechanical processes do not have a significant impact on ambient air quality.

Failing to regulate mechanical sources of PM2.5 emissions may put Wisconsin back in nonattainment with PM2.5 NAAQS and will jeopardize public health. These DNR guidance documents lack adequate factual support for the conclusion that direct emissions of PM2.5 will not cause or exacerbate violations of the PM2.5 NAAQS. Likewise, air pollution control permits issued in reliance on this guidance document will not have an adequate factual basis for the finding that the source will not cause or exceed the PM2.5 ambient air standards.[2]

There are two main problems with DNR's new policy for regulating PM2.5. First, the DNR incorrectly concludes that only combustion sources directly emit significant amounts of PM2.5. Second, despite the DNR's finding that combustion sources emit significant amounts of PM2.5, the DNR concludes that it is not appropriate to perform air quality modeling for *any* direct sources of PM2.5. To obviate the need for PM2.5 modeling, the DNR finds that direct emissions of PM2.5 do not cause or exacerbate a violation of the ambient air quality standards or increment. These conclusions lack a factual basis and the DNR's own data undermines these conclusions.

I. It is inappropriate to ignore direct PM2.5 emissions from mechanical sources because they emit significant amounts of PM2.5 individually and in the aggregate.

The DNR proposes the following change to its policy for regulating PM2.5: ***"Examination of the science behind particle pollution leads to the conclusion that only combustion and high temperature industrial sources directly emit significant amounts of PM2.5. PM2.5 emissions will not be estimated in an air permit review for fugitive dust sources, mechanical handling, grain handling, and other low temperature sources."*** Sections A & B address this proposed change.

A. The DNR's conclusion that mechanical sources are not a source of PM2.5 emissions is based entirely on EPA documents that do not support this finding.

The DNR supports its conclusion with a technical support document ("TSD"), which details the DNR's analysis of direct PM2.5 emissions from industrial sources. Rather than gathering or reviewing actual data on PM2.5 emissions from mechanical sources in Wisconsin, the DNR relies *entirely* on two EPA technical documents to establish that mechanical sources do not emit PM2.5.[3] Specifically, the DNR relies on the well-established distinctions between fine and coarse particles.[4]

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[2] Wis. Stat. § 285.63(1)(b).

[3] "Guidance for PM2.5 Permit Modeling Appendix A", EPA-454/B-14-001, May 2014, *available at*

We agree with the following assertions:

1. PM2.5 should not be treated solely as a directly emitted compound;
2. Particle pollution science has commonly divided particles into two *general* categories, fine mode particles (< 2.5μm) and coarse mode particles (< 10μm); and
3. Fine mode and coarse mode particles can differ in numerous respects, such as, how they are formed, what their source is, what they are composed of, and how they behave in the atmosphere.

These statements are correct, and supported by the cited EPA documents, but they do not lead to the conclusion that mechanical sources do not emit PM2.5. In fact, several facts in the EPA technical documents contradict the DNR's conclusion in that regard for the following reasons.

In the Technical Support Document, the DNR provides Figure 1, which is an EPA graph showing the idealized bi-modal distribution of the division between fine mode and coarse mode particles. This figure shows that fine mode and coarse mode particles overlap in the intermodal region between 1 and 3μm.[5] In other words, coarse mode particles can be as small as 1μm, which is included in PM2.5 as particles smaller than 2.5μm.[6] The EPA technical document also discusses a study that provides the amount of PM2.5 in coarse mode particles can be significant and varies on a day-to-day basis. The study EPA cites provides that PM2.5 may dominate the total mass of coarse mode particles on a given day.[7] This demonstrates that some—a potentially significant portion of—PM2.5 comes from what EPA calls coarse mode particles, which are formed from mechanical processes.

The DNR acknowledges that mechanical sources emit course mode particles in another table that it borrowed from the EPA documents.[8] This table indicates that course mode particles are formed through processes including "*Mechanical disruption (crushing, grinding, abrasion of surfaces, etc.), Evaporation of sprays, and Suspension of Dust.*" These are the mechanical processes that the DNR claims do not produce any PM2.5. For these reasons, the evidence that the DNR relies upon—these EPA technical documents—do not provide a factual basis for its conclusion that mechanical sources do not emit PM2.5.

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http://www.epa.gov/scram001/guidance/guide/Guidance_for_PM25_Permit_Modeling.pdf ; "Air Quality Criteria for Particulate Matter Chapters 3 & 5", EPA/600/P-95/001aF, April 1996, *available at* http://www.epa.gov/ncea/pdfs/partmatt/VOL_I_AQCD_PM_2nd_Review_Draft.pdf.

[4] Each EPA figure cited in the TSD's "Background" section as support for DNR's conclusions about particle pollution comes from the following EPA technical paper: "Fine Particles and Coarse Particles: Concentration Relationships Relevant to Epidemiologic Studies," Wilson WE, Suh HH (1997), *available at* http://www.tandfonline.com/doi/pdf/10.1080/10473289.1997.10464074.

[5] *Id.* at 1239.

[6] *Id.* at 1240.

[7] *Id.* at 1241.

[8] *Id.* at 1241.

B. The DNR lacks a factual basis for its conclusion that mechanical sources are not sources or are insignificant sources of PM2.5.

The DNR does not provide and does not have any evidence of its own to demonstrate that mechanical sources do not emit PM2.5. In fact, the DNR has monitoring data that demonstrates the opposite. Mechanical sources do emit PM2.5 and can cause an exceedence of the ambient air standard or NAAQS.

It is important to note that a facility violates the law, sec. 285.63(1)(b), when it "causes or exacerbates a violation of any ambient air quality standard." Even though a facility's emissions are a small percentage of the total concentration of PM2.5 in the ambient air, if the facilities emissions along with background concentrations violate ambient air standards, then that facility violates the law. Thus, the DNR is off base when it relies on its conclusion that mechanical sources do not emit significant amounts of PM2.5 relative to background conditions.

The DNR's decision to ignore entire categories of what it deems insignificant sources of PM2.5 also ignores a fact that the DNR previously acknowledged—PM2.5 is a regional pollutant with a long residence time. This means PM2.5 pollution from mechanical sources will stay in the ambient air for a long time, combining with other sources of PM2.5. The DNR should have, but did not consider, the total impact of PM2.5 emissions from all mechanical sources of PM2.5. Given that Wisconsin only recently came into attainment for PM2.5, this step backward could send us back into nonattainment for PM2.5.

This is especially concerning given the increase in mechanical sources of PM2.5 such as industrial sand mines. According to the EPA, fugitive dust is the primary form of emissions from sand and gravel operations. The DNR does not and has not monitored PM2.5 emissions from fugitive dust. EPA data on direct PM2.5 emissions shows that emissions from *On-Road, Wind Erosion, and Fugitive Dust*, which are all present at industrial mining/processing operations, were responsible for 56.1% of total direct PM2.5 emissions.[9] Additionally, EPA collected sand and gravel dust samples show that the PM2.5 fraction of total suspended particles is approximately 30-40% higher in sand and gravel than in other soils.[10] Following a contested case hearing in 2014, the administrative law judge, Jeffrey Boldt, found that fine particulates such as PM2.5 and PM4 make up from 42% to 61% of PM10 sampled from fugitive dust emissions at an industrial sand processing operation, according to one study.[11]

The DNR's lack of monitoring data for PM2.5 emissions at industrial sand mining/processing operations is a fatal deficiency with the DNR's technical support document. Compounding the significance of the data the DNR is lacking, the DNR's stack testing data demonstrates that mechanical source do emit PM2.5, which can be a large

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[9] *See supra* note 1, *Air Quality Criteria for Particulate Matter*, Ch. 3 at 3-50.
[10] *Id.* at 3B-2.
[11] Exhibit A at 4 (Klafka comments); Exhibit C (FML Sand Decision).

component of total particulate matter. Three separate industrial sand operations found that all or a significant portion of particulate matter collected from stack emissions—100%, 75%, and 70%—was PM2.5.[12] This is an example of concrete data available to the DNR that demonstrates: (1) mechanical sources do in fact directly emit PM2.5; (2) stack emissions at mechanical sources such as industrial sand mines may include a significant amount of PM2.5; and (3) stack emissions combined with fugitive emissions of PM2.5 may have a significant impact on air quality standards.[13]

The technical support document discusses whether direct PM2.5 emissions are significant, but the DNR does not explain what it considers a "significant impact" for this analysis. The regulatory Significant Impact Level ("SIL") used for PM2.5 emissions from major sources is just 1.2μg/m³ for a 24-hour average. Synthetic minor sources routinely have estimated PM2.5 emissions well over the SIL, even though the DNR has not included fugitive emissions in these estimates.[14] In a contested case hearing on an air pollution permit issued to FML Sand, Judge Boldt ruled that FML was likely to have a significant impact on air quality and therefore it should not be exempt from ambient air monitoring for PM2.5.[15] The DNR's guidance appears to ignore this decision, which explicitly holds that a synthetic minor source can have a significant impact on PM2.5 concentrations in the ambient air.

Ambient air monitoring data also shows that mechanical sources may emit significant quantities of PM2.5, even if these sources are not currently causing violations at regional ambient air monitors. As part of the FML contested case hearing, Steven Klafka analyzed PM10 ambient air monitoring data submitted to the DNR from industrial sand mines and plants.[16] Of the 13 PM10 monitors located at industrial sand mining/processing operations, 11 of the monitors measured PM10 concentrations would exceeded the 24-hour average PM2.5 ambient air standard of 35μg/m³, assuming conservatively, as the DNR has in the past, that all PM10 is PM2.5.[17] As established above, in some cases all PM10 emitted from industrial sand plant stacks has been PM2.5. Additionally, the maximum concentration at one monitor was 3 times the PM2.5 standard. These monitoring results may not be evidence that industrial sand mines and processing facilities are definitely violating ambient air standards. But this data clearly shows the potential for significant impacts to ambient air quality from mechanical sources' PM2.5 emissions.

Moreover, considering background concentrations, a relatively small quantity of PM2.5 could cause a violation of PM2.5 ambient air standards. The current PM10 background

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[12] Exhibit A at 3 (Klafka comments).
[13] Additionally, see, DNR's Preliminary Determination for the FTS industrial sand mining/processing operation (now FML), in which DNR's modeling analysis showed that stack emissions alone would have off-site impacts which are as great as the ambient air quality standards for PM2.5 and that was without even considering additional impact by fugitive sources.
[14] *See e.g.*, Exhibit B (FML Sand preliminary determination).
[15] *See e.g.*, Exhibit C (FML Sand decision).
[16] Exhibit D (excerpt of Steven Klafka prefiled testimony and referenced exhibit).
[17] *Id.*

concentration of 29.4μg/m³ allows the DNR to permit industrial facilities to emit PM10 emissions up to the 24-hour ambient air standard of 120.6μg/m³. In contrast, using the *conservative*[18] background concentration of 19.82g/m³ for PM2.5, industrial facilities must limit their PM2.5 emissions so the maximum air pollution impact is no greater than 15.2μg/m³. This means that if 13% or more of allowable PM10 emissions are composed of PM2.5 that could cause or contribute to an exceedence of the 24-hour PM2.5 ambient air standard. As previously discussed, actual PM10 sampling data demonstrates that mechanical sources often emit PM10 that is composed of much more than 13% PM2.5.

The evidence that the DNR is ignoring is clear. Mechanical sources emit PM2.5. The amount of PM2.5 is often significant under any measure, especially if you apply the DNR's SIL. It is not enough for the DNR to dismiss this data with the general conclusion discussed above and outlined in the EPA documents the DNR relies on. To justify its new PM2.5 policy, the DNR must disclose and analyze the data that it has on PM2.5 from actual sources. Further, if not enough is actually known about PM2.5 emissions, the DNR should conduct ambient air monitoring, not ignore PM2.5 emissions.

II. The DNR lacks a factual basis for its conclusions that (1) it is not useful to model PM2.5 emissions from direct sources, and (2) direct PM2.5 emissions do not cause or exacerbate a violation of the ambient air standards.

The second change proposed by the DNR is as follows: *"The PM2.5 TSD concludes that it is not appropriate or informative to perform air quality modeling for direct emissions of PM2.5 from individual sources and, instead, makes a finding using a weight of evidence approach, that direct emissions of PM2.5 do not cause or exacerbate a violation of the ambient air quality standards or increment."* Subsections A & B address this proposed change.

A. It is improper to use regional air monitoring results to draw conclusions about the impacts of emissions from individual stationary sources on local ambient air quality.

To conclude that direct emissions of PM2.5 would not ever cause a violation of PM2.5 ambient air standards, the DNR relied on regional ambient air monitoring data. The DNR reasoning appears to be this: If PM2.5 emissions from industrial stationary sources do not correlate with the ambient concentrations of PM2.5 measured by regional ambient air monitors, then direct emissions of PM2.5 will not ever cause or exacerbate a violation of ambient air quality standards. This reasoning is flawed for many reasons.

Regional air monitors are limited in what they evaluate. It is important to distinguish between regional air quality impacts and local site-specific air quality impacts. Emissions are going to have the greatest impact on air quality near the source, where the greatest concentration of the pollutant will exist. Thereafter the emissions inevitably mix with the ambient air and disperse. It is only after a great deal of atmospheric mixing and dispersion that the emissions contribute to regional concentrations measured by regional ambient air

[18] As recent as 2012, in the FML permitting, DNR used a background concentration of 25.6.

quality monitors. Even a regional ambient air monitor located only a few miles away from a source will only be able to measure emissions from the source once they have been well dispersed in the atmosphere, and only if the wind is blowing from the industrial source towards the monitor.[19] Therefore, measurements from regional ambient air monitors are a very poor indication of the air quality in the immediate vicinity of the source.

It is also important to emphasize the fact that this line of reasoning essentially ignores any localized impact or hot spots that might occur in certain atmospheric conditions. Numerous other small particle air pollutants, such as SO2, NOX, and CO, are capable of mixing with ambient air and traveling long distances, but monitoring and regulation is still required for those pollutants because of the documented threat they pose to human health. PM2.5 is a pollutant, similar to those others, and should be treated as such.

B. The DNR lacks factual support to conclude that PM2.5 air dispersion modeling does not provide useful information to ensure that direct sources of PM2.5 will not cause or contribute to a violation of PM2.5 ambient air standards.

The DNR criticizes PM2.5 emission factors and, largely on that basis, concludes there is no reason to model PM2.5 emissions. Having collected only minimal monitoring data for PM2.5 DNR lacks the source-specific data required to draw reliable conclusions about whether EPA's AP-42 emission factors reliably estimate PM2.5 emissions. It is well-established that emission factors are not perfect and are intended to be conservative estimates so that sources do not violate air standards under the *worst case scenario* (e.g. highest emissions, least dispersion). It is not unreasonable that the more uncertainty that exists for a source of pollution (such as industrial sand mining/processing) the more conservative and overestimated emissions are likely to be in order to ensure the protection of air quality.

As long as the AP-42 emission factors are the best available option for modeling emissions, they should still be used to ensure that sources do not cause or contribute to a violation of air standards.[20] The only way to truly determine the quality of PM2.5 emission factors, and if need be to establish new and improved factors, is to require air pollution sources to conduct the tests needed to better estimate PM2.5 emissions. The DNR even acknowledges as much in the technical support document, saying, "As facilities utilize the correct stack testing methods, both the national emission estimates and the permit allowable direct

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[19] This is a significant point because, as Figure 6 in the TSD indicates, only one regional ambient air quality monitor is even relatively close to the large concentration of industrial sand mining/processing operations in west central Wisconsin and that is the monitor in La Crosse, which is still not even located in any of the counties that have the highest concentration of industrial sand mining/processing operations.

[20] The DNR was correct that the PM2.5 emission factors are mostly ranked "D" or "E." However, the fact that the emission factors ranking for all source categories involved in sand and gravel processing is a "D" is somewhat deceiving, because all of the emission factors were developed from only A- and B-rated test data and the primary reason for the low overall ranking is the small number of test facilities.

PM2.5 emissions will be greatly reduced." Yet, with this guidance, the DNR is proposing to eliminate PM2.5 emission limits and monitoring for direct sources. Without such tests and data the DNR has no factual basis for its conclusions about the value of using AP-42 emission factors in dispersion modeling for PM2.5 emissions from non-combustible industrial sources and will not get the data it needs for more reliable emission factors.[21]

The DNR's criticism of the PM2.5 emission factors is based on a study conducted at a natural gas power plant, which produces PM2.5 emissions as the result of combustion. Additionally, natural gas combustion sources are one of the most difficult sources to monitor for PM2.5 emissions because of the low emissions levels and small particles size (generally <1μm). Therefore, such sources should not be considered representative of the reliability of PM2.5 emission factors when applied to other sources of PM2.5 emissions.

Any conclusions drawn about PM2.5 emission factors for a natural gas combustion source should not be extrapolated to apply to industrial sources that use mechanical processing because the two sources have different emission factors that were prepared using data from different sources. Moreover, the ultimate conclusion drawn by the study, which the DNR relies on entirely for its conclusions about the unreliability of PM2.5 emission factors, is that more PM2.5-specific monitoring data is needed to develop more reliable modeling capable of assessing impacts on ambient air quality..

It is also worth noting that even though the DNR concluded that use of AP-42 emission factors for dispersion modeling is not appropriate or informative for direct emissions of PM2.5, it still proposes to require modeling for PSD major/combustion sources, yet it does not provide any discussion about what alternative estimation tools should be used.

Comment: The DNR's proposed guidance documents are based on conclusions that are not adequately supported by the evidence relied on. Existing data demonstrates that direct PM2.5 emissions may cause or contribute to an exceedence of ambient air standards. The DNR has irrefutable evidence that mechanical sources contribute PM2.5 emissions. Thus, we respectfully request that the DNR decline to finalize this guidance until it obtains sufficient data to support its conclusions. Further monitoring of PM2.5 is required before the DNR can so dramatically change its regulation of this pollutant.

Sincerely,

/s/

Kellan McLemore
Staff Attorney

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[21] It can be assumed that DNR's conclusions about the use of PM2.5 emission factors specifically apply to non-combustible industrial sources, such as industrial sand mining/processing operations, since the guidance says "Permit applicants should continue to include estimates of primary PM2.5 emissions for combustion processes, and high temperature industrial processes."

REVIEW OF DNR PROPOSAL TO NO LONGER REGULATE PM2.5

Steven Klafka, Wingra Engineering, S.C.

(August 3, 2015)

DNR air pollution control staff released several draft memoranda at the end of July which proposes to exclude numerous industrial air pollution sources from evaluation of compliance with the National Ambient Air Quality Standards or NAAQS for fine particles less than 2.5 microns or PM2.5.

In the draft memorandum, DRAFT 2015 Approach to Dispersion Modeling for Permits, addressed to Permit Writers and Compliance Staff by Kristin Hart – Chief, Permits & Stationary Source Modeling Section, it states throughout:

> *The Department has concluded that direct, primary PM2.5 emissions will not cause or exacerbate a violation of the PM2.5 NAAQS {link}, and therefore no modeling is performed for PM2.5.*

In the draft memorandum, Guidance for Including PM2.5 in Air Pollution Control Permit Applications, addressed to Air Permit Applicants, Kristin Hart – Chief, Permits & Stationary Source Modeling Section, proposes that PM2.5 emissions will no longer be estimated, emission limitations will not be established and dispersion modeling will be not conducted for numerous types of industrial sources.

In the document, DRAFT - Wisconsin Air Dispersion Modeling Guidelines - June 2015, prepared by John Roth and the Stationary Source Modeling Team, it states in several places:

> *Special Note Regarding PM2.5 - Pursuant to Section 285.63(1)(b), Wisconsin Statutes, WDNR has concluded that direct emissions of PM2.5 from existing sources, minor new sources, and minor modifications of sources will not cause or exacerbate violations of any PM2.5 standard or increment. The details of this determination are available in the Technical Support Document titled Air Quality Review of Industrial PM2.5 Emissions from Stationary Sources in Wisconsin, dated June 2015 and attached as Appendix B.*

Appendix B of the draft guidelines, PM2.5 Technical Support Document, provides the basis for which the DNR concludes it will no longer regulate PM2.5 emissions from some industrial sources. The TSD states:

> *Therefore, the WDNR concludes that direct emissions of PM2.5 from a single, direct stationary source will not cause or exacerbate violation of any PM2.5 air quality standard or increment. For existing sources, minor new sources, and minor modifications of sources dispersion modeling of PM2.5 is not necessary to demonstrate whether the emissions from the source cause or exacerbate an exceedance of the air quality standard for PM2.5 and will no longer be performed for this purpose. Wisconsin will continue to regulate emissions of NOx and SO2 and will follow*

Exhibit A

USEPA guidance on assessing the impact of direct PM2.5 and secondarily formed PM2.5 under the Prevention of Significant Deterioration permit program.

RESPONSE

Importance of the Enforcing the NAAQS for PM2.5 for All Industrial Sources

As required by the Clean Air Act, EPA strengthened the National Ambient Air Quality Standard for fine particles by adopting a new 24-hour fine particle standard in 2006 and a new annual standard in 2012. EPA stated that long- and short-term exposures to fine particle pollution or PM2.5, can cause premature death and harmful effects on the cardiovascular system, including increased hospital admissions and emergency department visits for heart attacks and strokes, and respiratory effects such as asthma attacks. When adopting the air standards for PM2.5, EPA noted that people most at risk from particle pollution exposure were those with heart, lung disease and asthma, older adults, children, people of lower socioeconomic status, pregnant women, newborns and people with certain health conditions, such as obesity or diabetes. By proposing to not enforce the NAAQS for PM2.5 for some industrial sources, the DNR will not protect many Wisconsin residents, including the most sensitive members of the public, from exposure to unhealthy concentrations of PM2.5.

Need to Address NAAQS Violation Hot Spots Caused by Industrial Emissions of PM2.5

Any air pollutant emitted by an industrial source can create unsafe and unhealthy concentrations immediately downwind in adjacent neighborhoods. The DNR plans to continue to estimate emissions, establish emission limitations in permits, and conduct dispersion modeling for other air pollutants such as PM10, SO2, NOx, CO, lead and hazardous air pollutants. The DNR will continue to conduct dispersion modeling for these air pollutants to assure their concentrations immediately downwind of an industrial facility will not exceed air quality standards.

The DNR does not know if PM2.5 emissions from an industrial facility will result in concentrations immediately downwind of an industrial facility above the NAAQS for PM2.5. There has not been any monitoring of PM2.5 concentrations immediately downwind of industrial facilities. There are not sufficient measurements or tests to estimate the PM2.5 emissions from industrial facilities. The background concentration of PM2.5 relative to the air quality standard is very high because there are numerous contributors to PM2.5 including direct emissions and sources of PM2.5 precursors such as SO2 and NOx. This high background concentration leaves little room for additional impact for the direct PM2.5 emissions from an industrial source immediately downwind of the facility where an exceedance hot spot may occur.

Earlier this year, the DNR had a back log of 478 unprocessed NR 407 operation permits that are waiting for their renewal. Almost every permit issued by the DNR has emission limitations which were found necessary to stop the facility from exceeding the older and less protective 24-hour average NAAQS for larger particles (i.e. TSP and PM10) of 150 ug/m3. With a PM10 background concentration of 29.4 ug/m3, industrial facilities have been allowed TSP/PM10 emissions which cause a maximum air pollution impact of 120.6 ug/m3. The new 24-hour average NAAQS for PM2.5 is 35 ug/m3. With a background

concentration of 19.8 ug/m3, industrial facilities must limit their PM2.5 emissions so the maximum air pollution impact is no greater than 15.2 ug/m3. This means that only 13% of the current TSP/PM10 emission limitations need to be fine particles or PM2.5, before an exceedance of the NAAQS for PM2.5 will occur. There have been insufficient measurement and testing of PM2.5 emissions from most industrial operations to know whether or not their PM2.5 emissions are more than 13% of the PM10 emissions. Every industrial facility which has been issued an operation permit is a potential hot spot where the NAAQS for PM2.5 may be exceeded.

Earlier this year, the DNR had issued a total of 696 registration permits. These are simple permits with generic requirements for smaller industrial sources. The underlying requirement for the dispersion of air pollutants from these facilities is that their stacks exceed the roof height. This requirement is not sufficient to assure air pollutants, including PM2.5, will be dispersed well enough to protect nearby residents. Every industrial facility which has been issued a registration permit is a potential hot spot where the NAAQS for PM2.5 can be exceeded.

Current PM2.5 Emission Estimates from Industrial Operations

In its draft guidance to permit applicants, the DNR states:

> *Examination of the science behind particle pollution leads to the conclusion that only combustion and high temperature industrial sources directly emit significant amounts of PM2.5. PM2.5 emissions will not be estimated in an air permit review for fugitive dust sources, mechanical handling, grain handling, and other low temperature particulate sources.*

The DNR has failed to provide any factual evidence to support this conclusion that some industrial operations will not have PM2.5 emissions. Most emission factors were developed many decades ago before there was any interest in PM2.5 emissions. Little new testing for PM2.5 has been conducted.

This situation is similar to the regulation of hazardous air pollutants. When air quality standards under Chapter NR 445, Wis. Adm. Code, were adopted, there were few emission factors for the regulated air pollutants. In that case, the DNR did not simply assume there were no emissions, as it is now doing for PM2.5, but began a program of careful research and testing to confirm the release of hazardous air emissions from industrial operations.

Many of the operations which will not be evaluated for PM2.5 emissions are controlled with fabric filter baghouses. These filters will remove the coarse particulate and will only release the fine particles including PM2.5. A review of compliance stacks conducted at sand mining operations from 2012 to 2014 found that most were tested only for total PM because the DNR assumed all PM was fine particles or PM2.5. Some tests included both total PM and PM2.5. The May 4, 2012 compliance stack test at Carbo Ceramics on its P01 and P02, Sand Dryer, Handling, and Silos found that 100% of the total PM was PM2.5. The May 28, 2012 compliance stack test at Chippewa Sand Company on its P02A - Sand Screening & Conveying operation found that 75% of the total PM was PM2.5. The February 13, 2012 compliance stack test at EOG Resources on its P06 - Rail Loading operation found that 70% of the total PM was PM2.5.

The DNR relies on the fugitive dust emission factors in the USEPA reference, *Compilation of Air Pollutant Emission Factors*. These factors are based on tests conducted over 30 years ago before there was little interest in PM2.5. The DNR has failed to research the availability of more recent measurements and stack tests for PM2.5 on mechanical type industrial operations. In Judge Jeffrey Bolt's contested case hearing decision for Permit Number 12-POY-079 issued to FML Sand LLC, he reiterated evidence showing fine particulates, such as PM2.5 and PM4, constitute from 42% to 61% of PM10 emissions from fugitive dust generated by sand processing operations. This range was taken from a 2009 technical paper summarizing measurements on sand screening, crushing and conveyor transfer operations.

PM2.5 TSD Makes Inaccurate Conclusions

In its PM2.5 Technical Support Document, DNR has not provided any factual evidence to show that industrial operations are complying with the NAAQS for PM2.5 and no regulation is needed.

The DNR concludes that its TSD demonstrates that direct emissions of PM2.5 from any individual stack or source have little influence on ambient concentrations of PM2.5 and therefore PM2.5 emissions from any individual stack or source do not cause or exacerbate violation of any PM2.5 increment or standard. This is a flawed conclusion. The TSD does not demonstrate that direct emissions of PM2.5 from any individual stack or source have little influence on ambient concentrations of PM2.5. An industrial source of air pollutants will have its maximum impact on air quality at a downwind location close to the source. To determine if an individual stack or source of PM2.5 emissions has an impact on air quality, the ambient monitors should be located at the point of maximum impact of the stack or source so the monitor measures the maximum impact of the facility.

The DNR presents a flawed argument using measurements from a regional ambient monitor located far from an individual source of emissions to determine if the source has a significant impact on air quality. Using the same approach as the TSD, it could be argued that no industrial source ever impacts air quality by selecting ambient monitors that are not close to the source. There are only 20 ambient monitors for PM2.5 in Wisconsin. This is approximately one monitor for every 29,000 state residents or 3,300 square miles of state land area. Such a small number of monitors are not sufficient to characterize public exposure. This is especially true for people living near NAAQS violation hot spots where industrial emissions create higher concentrations.

The DNR states that emissions of PM2.5 derive from different sources than those of PM10 and therefore PM2.5 emissions cannot be characterized simply as a subset of total particulate matter. While this is true, there has not been a sufficient number of measurements or tests to determine which industrial operations release a significant amount of PM2.5 emissions. As noted earlier, only 13% of the PM10 emissions need to be PM2.5 before a violation of the NAAQS for PM2.5 could occur. Rather than rely on outdated emission factors, the DNR should research and test for new PM2.5 emission estimates.

The DNR notes that PM2.5 in the ambient air is composed of directly emitted PM2.5, and is also composed for PM2.5 formed in the atmosphere from SO2, NOx and organic carbon. This is true and is the reason background concentrations PM2.5 are so high relative to the NAAQS. With so many more air

pollution sources contributing to the emission and formation of PM2.5, there is less impact available to an industrial source before a violation of a the NAAQS for PM2.5 could occur.

The DNR states that emissions of PM2.5 have long lifetimes in the atmosphere and travel long distances from the emission source thus becoming well-mixed in ambient air. This is true, but it is also true for gaseous air pollutants such as SO2, NOx, CO, VOC and hazardous air pollutants. The DNR continues to recognize that these gaseous air pollutants can create unsafe concentrations downwind of industrial facilities and will continue to use dispersion modeling to assure air quality standards are not exceeded near these facilities. Similarly, the DNR needs to use dispersion modeling to assure PM2.5 emissions from industrial facilities do not exceed the NAAQS for PM2.5.

The DNR states that national emissions estimates of PM2.5 from direct sources have remained steady from year-to-year, yet monitored concentrations have steadily decreased at both rural and urban locations bolstering the conclusion that directly emitted PM2.5 is not affecting monitored concentrations of the pollutant. This is an incorrect conclusion. The decrease in PM2.5 concentrations measured at regional ambient monitors reflects the combination of directly emitted PM2.5 and PM2.5 formed in the atmosphere SO2, NOx and organic carbon. Regional ambient monitors cannot be used to draw conclusions about the localized elevated concentrations of directly emitted PM2.5. Regional ambient monitors do not reflect the concentrations PM2.5 which can occur directly downwind of an industrial facility where the general public can be exposed.

The DNR states that both national and Wisconsin emission estimates of the PM2.5 precursors SO2 and NOx from direct sources have decreased year-to-year, similar to PM2.5 monitored concentrations. If background concentrations of PM2.5 are partially due to the formation of PM2.5 precursors of SO2 and NOx, it is reasonable that monitored concentration would be lower. However, regional ambient monitors cannot be used to draw conclusions about the localized elevated concentrations of directly emitted PM2.5. Regional ambient monitors do not reflect the concentrations PM2.5 which can occur directly downwind of an industrial facility where the general public can be exposed.

The DNR states that the true level of direct, primary PM2.5 emissions may be at least nine times lower than previously reported due to errors in stack testing methods that were used to develop emission factors. The DNR has failed to provide the specific stack test results which are used to draw this conclusion. There may be errors in stack testing procedures and emission factors associated with specific types of air pollution sources like coal fired boilers. But these errors should not be assumed to be the same for all stack tests and all emission factors for all air pollution sources. The error in testing methods requires that additional measurements and tests are needed to verify the amount of PM2.5 emitted by all air pollution source types.

The DNR states that concentrations of ambient PM2.5, as measured by monitors in Wisconsin, are below the NAAQS and continue to steadily decrease with time. While this may true, use of measurements by regional ambient monitors should not be used to estimate the localized impacts of directly sources of PM2.5 located far from the monitor. If regional ambient monitors were representative of air quality around all industrial sources of air pollution, there would be no need to

ever conduct dispersion modeling for any air pollutant. Regional ambient monitors cannot be used to draw conclusions about the localized elevated concentrations of directly emitted PM2.5. Regional ambient monitors do not reflect the concentrations PM2.5 which can occur directly downwind of an industrial facility where the general public can be exposed.

The DNR states that all of Wisconsin is considered in attainment for both the 24-hour and annual NAAQS for PM2.5 due to the steady decrease of ambient levels of PM2.5 as monitored by DNR's air monitoring network. While this may be true, the attainment status as measured by regional ambient monitors. These do not provide information on the localized impacts of directly sources of PM2.5 located far from the monitor.

The DNR states that comparison of ambient PM2.5 concentrations from monitors both in close proximity of each other and far apart show strong correlations, indicating that broad regional factors, such as weather patterns and long-range transport from distant sources have a greater effect on ambient air than direct emissions from stationary sources. While this may be true, regional ambient monitors reflect regional emissions from all direct and indirect sources of PM2.5. These regional ambient monitors do not provide information on the localized impacts of direct sources of PM2.5 located far from the monitor.

The DNR states that examination of component substances captured by PM2.5 speciation monitors illustrates that concentration of elemental carbon (corresponding to directly emitted PM2.5 from fuel combustion) are not a major contributor to ambient PM2.5 concentrations and are not increasing. While this may be true, the composition of PM2.5 measured by regional ambient monitors do not provide information on the localized impacts of direct sources of PM2.5 located far from the monitor.

The DNR states that sulfate, nitrate, and organic carbon, produced by secondary reactions in the atmosphere, comprise most of the ambient PM2.5 in Wisconsin. While this may be true, it explains why background concentrations of PM2.5 are very high relative to the air quality standard and leave very little room for the additional impact by direct emissions of PM2.5 by industrial sources.

The DNR states that decreased concentrations of ambient PM2.5 correlate to national technology improvements such as fuel efficiency and reductions in sulfur content of fuels for both industry and mobile sources. While this may be true, it will result in lowering the background concentration of PM2.5 but does not eliminate the need to assure that localized impacts of direct sources of PM2.5 do not exceed the air quality standards for PM2.5.

DNR DOCUMENT

DATE: Draft released by email on July 29, 2015
TO: Air Permit Applicants
FROM: Kristin Hart, Chief, Air Permits and Stationary Source Modeling Section
SUBJECT: Guidance for Including PM2.5 in Air Pollution Control Permit Applications

DNR prepared a technical support document for PM2.5 and this memorandum summarizes the proposed changes to its air permit program:

1. PM2.5 is assumed to be only directly emitted by combustion and high temperature industrial sources such as smelters, foundries, aluminum production, glass manufacturing and sulfate pulping.

2. PM2.5 emission estimates are no longer necessary for air permit reviews of fugitive dust sources, mechanical handling, grain handling, and other lower temperature sources.

3. DNR concludes it is no longer appropriate or informative to conduct air dispersion modeling for direct emissions of PM2.5 from individual sources.

4. All major or minor permit applications for mechanical processes such crushing, grinding, sanding, sizing, evaporation of sprays, suspension of dusts are no longer considered sources of PM2.5 and no emission estimates are required.

5. If the USEPA publication Compilation of Air Pollutant Emission Factors provides emission estimates for PM2.5, the DNR can still conclude there are no emissions of PM2.5.

6. Permit emission limitations for PM2.5 will not be established for mechanical processes which are not considered sources of PM2.5.

7. Permit emission limitations for PM2.5 can be established if used to: 1) avoid major source permits, 2) repeat previously established limits, 3) establish a BACT or LAER limit, or 4) repeat a limitation in a federal NSPS or NESHAPS.

8. For the issuance of operation permits, dispersion modeling will no longer be used for PM2.5 emissions to verify compliance with the NAAQS.

9. For PSD major source construction permits, PM2.5 limitations will be established if the project is subject to the federal requirements for Pm2.5 since PM2.5, SO2 or NOx are significant. It will be assumed that mechanical processes have no emissions of PM2.5.

10. For minor construction permits, dispersion modeling will not be conducted even if there are significant PM2.5 emissions. DNR concludes these emissions do not affect ambient air quality. PM2.5 emission limits will be established only if needed to avoid PSD major source construction permits.

COMMENTS

1. This is a significant step backwards in protection of air quality. Without conducting any emissions measurements or monitoring ambient concentrations, the DNR concludes that industrial facilities comply with the air quality standards for PM2.5.

2. As required by the Clean Air Act, EPA strengthened the National Ambient Air Quality Standard for particles less than 2.5 microns in diameter or PM2.5 by adopting a new 24-hour fine particle standard in 2006 and a new annual standard in 2012. EPA stated that long- and short-term exposures to PM2.5 can cause premature death and harmful effects on the cardiovascular system, including increased hospital admissions and emergency department visits for heart attacks and strokes, and respiratory effects such as asthma attacks. People most at risk from particle pollution exposure are those with heart, lung disease and asthma, older adults, children, people of lower socioeconomic status, pregnant women, newborns and people with certain health conditions, such as obesity or diabetes.

3. The DNR will no longer require that industrial operations prove they are complying with the air quality standards for PM2.5.

4. Even if the most commonly used USEPA reference for emission estimates, Compilation of Air Pollutant Emission Factors, provides PM2.5 emission estimates for an industrial process, the DNR will assume there at no emissions from most approved industrial operations. Since the DNR requires very little emissions testing, it relies heavily on this USEPA reference to estimate emissions and issue permits. It is ironic that the DNR would assume this reference is incorrect for estimating PM2.5 emissions before conducting its own emission tests. Since PM2.5 has only recently been regulated an air pollutant, there has not been extensive testing to determine which types of industrial operations emit PM2.5. There is not enough information for the DNR to conclude there are no emissions without conducting actual tests at industrial facilities.

5. Dispersion modeling, a common tool used by environmental professionals to verify compliance with air quality standards, will no longer be used to determine if an industrial facility complies with the air quality standards for PM2.5.

6. The majority of construction and operation permits issued by the DNR currently contain emission limitations which have been found necessary for the facility to comply with air quality standards and protect surrounding residents. These emission limitations were established based on dispersion modeling analyses. Few permits have considered whether or not PM2.5 emissions are emitted or if the facility complies with the air quality standards for PM2.5. Without a similar analysis for PM2.5 emissions, residents in neighborhoods surrounding these facilities may be exposed to unsafe concentrations of PM2.5 with no protection.

7. The DNR draft guidance, "Air Dispersion Modeling Guidelines" says:

   For a permit to be approvable by the Department, it must be shown that the permit action will not cause or exacerbate a violation of any National Ambient Air Quality Standard or Prevention of Significant Deterioration increment.

How can the DNR verify the air standard for PM2.5 will not be violated if it does not conduct a dispersion modeling analysis?

8. The DNR limits PM2.5 emission estimates to combustion sources and high temperature industrial processes such as smelters, foundries, aluminum production, glass manufacturing and sulfate pulping. Other potential sources of PM2.5 emissions that are not mentioned but should be evaluated for PM2.5 emissions include those generating liquid aerosols such as wood dryers, web offset printing presses, and aluminum die casting operations.

DNR DOCUMENT

DRAFT - Wisconsin Air Dispersion Modeling Guidelines - June 2015
APPENDIX B - PM2.5 Technical Support Document

This is the Technical Support Document or TSD used by the DNR to conclude that it is unnecessary to use dispersion modeling for PM2.5 emissions. This TSD concludes:

Therefore, the WDNR concludes that direct emissions of PM2.5 from a single, direct stationary source will not cause or exacerbate violation of any PM2.5 air quality standard or increment. For existing sources, minor new sources, and minor modifications of sources dispersion modeling of PM2.5 is not necessary to demonstrate whether the emissions from the source cause or exacerbate an exceedance of the air quality standard for PM2.5 and will no longer be performed for this purpose. Wisconsin will continue to regulate emissions of NOx and SO2 and will follow USEPA guidance on assessing the impact of direct PM2.5 and secondarily formed PM2.5 under the Prevention of Significant Deterioration permit program.

COMMENTS

This TSD draws illogical conclusions from available information on direct PM2.5 emissions, ambient monitoring measurements of PM2.5, and the composition of ambient PM2.5. It would be good to know who wrote this document and their qualifications. Since this TSD will be used to stop discontinue evaluating if industrial operations from comply with the PM2.5 air quality standards, this document should be peer reviewed by qualified engineers and scientists.

Here are responses to the SUMMARY section of the TSD:

1. This analysis demonstrates that direct emissions of PM2.5 from any individual stack or source have little influence on ambient concentrations of PM2.5 and therefore PM2.5 emissions from any individual stack or source do not cause or exacerbate violation of any PM2.5 increment or standard.

This is a flawed conclusion. The TSD <u>does not</u> demonstrate that direct emissions of PM2.5 from any individual stack or source have little influence on ambient concentrations of PM2.5. An industrial source of air pollutants will have its maximum impact on air quality at a downwind location close to the source. To determine if an individual stack or source of PM2.5 emissions has an impact on air quality, the ambient monitors should be located at the point of maximum impact of the stack or source.

It is a flawed argument to use measurements from a regional ambient monitor located far from an individual source of emissions to determine if the source has a significant impact on air quality. Using the same approach as the TSD, it could be argued that no industrial source ever impacts air quality by selecting ambient monitors that are not close to the source.

2. Emissions of PM2.5 derive from different sources than those of PM10 and therefore PM2.5 emissions cannot be characterized simply as a subset of total particulate matter.

This is true. PM2.5 in the ambient air is composed of directly emitted PM2.5. It is also composed for PM2.5 formed in the atmosphere from SO2, NOx and organic carbon.

3. Emissions of PM2.5 have long lifetimes in the atmosphere and travel long distances from the emission source thus becoming well-mixed in ambient air.

This is true. It is also true for gaseous air pollutants such as SO2, NOx, CO, VOC and hazardous air pollutants.

4. National emissions estimates of PM2.5 from direct sources have remained steady from year-to-year, yet monitored concentrations have steadily decreased at both rural and urban locations bolstering the conclusion that directly emitted PM2.5 is not affecting monitored concentrations of the pollutant.

The decrease in PM2.5 concentrations measured at regional ambient monitors reflects the combination of directly emitted PM2.5 and PM2.5 formed in the atmosphere SO2, NOx and organic carbon. Regional ambient monitors cannot be used to draw conclusions about the localized elevated concentrations of directly emitted PM2.5.

5. Both national and Wisconsin emission estimates of the PM2.5 precursors SO2 and NOx from direct sources have decreased year-to-year, similar to PM2.5 monitored concentrations.

This is true.

6. The true level of direct, primary PM2.5 emissions may be at least nine times lower than previously reported due to errors in stack testing methods that were used to develop emission factors.

There may be errors in stack testing procedures and emission factors associated with specific types of air pollution sources like coal fired boilers. But these errors should not be assumed to be the same for all stack tests and all emission factors for all air pollution sources.

7. Concentrations of ambient PM2.5, as measured by monitors in Wisconsin, are below the NAAQS and continue to steadily decrease with time.

While this may true, use of measurements by regional ambient monitors should not be used to estimate the localized impacts of directly sources of PM2.5 located far from the monitor. If regional ambient monitors were representative of air quality around all industrial sources of air pollution, there would be no need to conduct dispersion modeling for any air pollutant.

8. All of Wisconsin is considered in attainment for both the 24-hour and annual NAAQS for PM2.5 due to the steady decrease of ambient levels of PM2.5 as monitored by DNR's air monitoring network.

While this may be true, the attainment status as measured by regional ambient monitors does not provide information on the localized impacts of directly sources of PM2.5 located far from the monitor.

9. Comparison of ambient PM2.5 concentrations from monitors both in close proximity of each other and far apart show strong correlations, indicating that broad regional factors, such as weather patterns and long-range transport from distant sources have a greater effect on ambient air than direct emissions from stationary sources.

While this may be true, regional ambient monitors do not provide information on the localized impacts of direct sources of PM2.5 located far from the monitor.

10. Examination of component substances captured by PM2.5 speciation monitors illustrates that concentration of elemental carbon (corresponding to directly emitted PM2.5 from fuel combustion) are not a major contributor to ambient PM2.5 concentrations and are not increasing.

While this may be true, the composition of PM2.5 measured by regional ambient monitors do not provide information on the localized impacts of direct sources of PM2.5 located far from the monitor.

11. Sulfate, nitrate, and organic carbon, produced by secondary reactions in the atmosphere, comprise most of the ambient PM2.5 in Wisconsin.

While this may be true, it explains why background concentrations of PM2.5 are very high relative to the air quality standard and leave very little room for the additional impact by direct sources of PM2.5.

12. Decreased concentrations of ambient PM2.5 correlate to national technology improvements such as fuel efficiency and reductions in sulfur content of fuels for both industry and mobile sources.

While this may be true, it does not eliminate the need to assure that localized impacts of direct sources of PM2.5 do not exceed the air quality standards for PM2.5.

DNR DOCUMENT

DATE: Draft released by email on July 29, 2015
TO: Permit Writers and Compliance Staff
FROM: Kristin Hart – Chief, Permits & Stationary Source Modeling Section
SUBJECT: DRAFT 2015 Approach to Dispersion Modeling for Permits

This memorandum updates the DNR dispersion modeling requirements for the issuance of construction and operation permits. It states:

As new standards are incorporated into the Wisconsin Administrative Code and the Wisconsin State Implementation Plan, they will be addressed during dispersion modeling performed in support of air pollution control permits. During 2015, Air Management staff and supervisors discussed options, and formulated the attached policy.

For air pollutants other than PM2.5 which include PM10, NOx, SO2, CO and Pb, modeling requirements will continue. For each type of permit, the DNR specifically states that:

The Department has concluded that direct, primary PM2.5 emissions will not cause or exacerbate a violation of the PM2.5 NAAQS {link}, and therefore no modeling is performed for PM2.5.

COMMENTS

The majority of construction and operation permits issued by the DNR currently contain emission limitations which have been found necessary for the facility to comply with air quality standards and protect surrounding residents. These emission limitations were established based on dispersion modeling analyses. Few permits have considered whether or not PM2.5 emissions are emitted or if the facility complies with the air quality standards for PM2.5. There is no basis for the DNR to conclude that facilities which receive air permits are complying with the air standards for PM2.5.

DNR DOCUMENT

DATE: Draft released by email on July 29, 2015
TO: Air Management Permit Team, Air Management Compliance Team, Air Management Monitoring Section, Kendra Fisher, LS/5, Mike Szabo, LS/5
FROM: Andrew Stewart, AM/7
SUBJECT: Variance Request Procedures for Industrial Sources Subject to NR 415.075 (4), Wis. Adm. Code

This memorandum summarizes the procedures that can be used by ledge rock quarries and industrial sand mines to obtain a variance from the requirement to operate an air monitoring system as specified under NR 415.075, Wis. Adm. Code.

For new sources, the applicant needs to demonstrate that the general public will not be exposed to significant levels of particulate matter from the source. This information can include:

- Proximity of nearest residents
- Proximity to sensitive receptors (schools, hospitals, etc.)
- Topography and ground cover (surrounding land topography, vegetative cover, other buffer to the wind)
- Permit modeling results (predictive permit modeling for the applicable particulate matter standard)
- Particulate data collection at other facilities that has demonstrated emissions below the applicable particulate ambient standard.
- Demonstrate that the source's particulate matter emissions units and processes will be controlled to a level which meets all applicable statutory, regulatory code and permit requirements.

For existing sources, the applicant can provide the same information as a new source, but can also provide the following information:

- Facility compliance history, including citizen and municipality complaints and WDNR compliance surveillance findings, indicate a facility operating without significant non-compliance issues.
- Show that ambient air monitoring system for particulate was conducted for two years.
- Twenty four months of quality assured monitoring data that shows no cause of source-driven exceedances of the applicable National Ambient Air Quality Standard (NAAQS).

DNR may rescind the variance based on the future compliance history of the facility.

COMMENTS

In his decision on the contested case hearing for the construction permit #12-POY-079 issued to FML Sand, LLC (Case No. DNR-13-043), Judge Bolt concluded that a monitoring variance should not have been issued since there was a significant impact on nearby residents. He said:

The petitioners have demonstrated that the preliminary variance from required ambient air monitoring should be revoked because the modeled results themselves demonstrate a "significant" level of particulate matter emissions within the meaning of NR 415.075(4)(b).

and

However, the results of the air dispersion modeling, along with certain input assumptions reflected in the modeling but not required in the permit, indicated that under a worst case scenario this source could produce emissions that come very close to an exceedance of the 24-hour PM2.5 ambient air standard.

Following Judge Bolt's decision, the DNR should require ambient monitoring if the dispersion modeling results show the facility impacts will be close to the air quality standard for PM2.5. Without any modeling for PM2.5, it can be concluded that any sand plant or quarry will have similar impacts as FML and ambient monitoring is necessary.

The DNR relies on previously ambient monitoring for PM10 to justify variances for future monitoring. However, this monitoring hasn't verified that air quality standards are met. There are too many shortcomings to make conclusions. The following changes are needed:

- Expand to monitor PM2.5 in addition to PM10.
- Expand to include both upwind and downwind monitors to measure the facility impact.
- Expand the frequency from every 6 days to every 3 days to avoid missing days of operation.
- Expand the use of non-EPA certified fugitive monitors which are less expense, operate continuously, measure both PM2.5 and PM10, upload measurements to the internet, and can be placed at more locations around a plant or quarry.

ANALYSIS AND PRELIMINARY DETERMINATION
FOR THE PROPOSED CONSTRUCTION
OF A SAND MINE AND PROESSING PLANT

AND

ANALYSIS AND PRELIMINARY DETERMINATION FOR THE
OPERATION PERMIT FOR A SAND MINE AND PROESSING PLANT

FOR
FTS INTERNATIONAL PROPANTS, LLC,
TO BE LOCATED AT
HWY 95,
ARCADIA, TREMPEALEAU COUNTY, WISCONSIN

Construction Permit No.: 12-POY-079
Operation Permit No.: 662031150-F01
Facility ID No. 662031150

This review was performed by the Wisconsin Department of Natural Resources, Bureau of Air Management in accordance with Chapter 285, Wis. Stats., and Chapters NR 400 to NR 499, Wis. Adm. Code.

Reviewed by: Paul O. Yeung Date: 2/22/13

Peer review conducted by: Jeffery Johnson Date: 2/22/13

Preliminary Determination Approved by:	Signature	Date
Regional Supervisor or Central Office Designee:	/s/ Jeffery Johnson	2/22/13
Stationary Source Modeling Team Leader:	Emily Houtler	2/22/13
Compliance Engineer (reviewed/approved):	poy for Marty Sellers	2/22/13

cc: Martin F. Sellers - West Central Region Air Program, LaCrosse Area Office
Arcadia Free Public Library, 406 E. Main St., Arcadia, WI 54612-4612

Exhibit B

INTRODUCTION

Stationary sources that are not specifically exempt from the requirement to obtain a construction permit under s. 285.60(5), Wis. Stats. or ch. NR 406, Wis. Adm. Code may not commence construction, reconstruction, replacement, relocation or modification unless a construction permit for the project has been issued by the Department of Natural Resource's (DNR's) Air Management Program. Owners or operators subject to the construction permit requirements must submit a construction and operation permit applications to the DNR. The applications are reviewed following the provisions set forth in ss. 285.60 to 285.67, Wis. Stats. The criteria for permit issuance vary depending on whether the source is major or minor and whether the source is or proposed to be located in an attainment or nonattainment area.

Subject sources are to be reviewed with respect to the equipment and facility description provided in the applications and for the resulting impact upon the air quality. The review ensures compliance with all applicable rules and statutory requirements. The preliminary determination will show why the source(s) should be approved, conditionally approved, or disapproved. It will encompass emission calculations and an air quality analysis using US EPA models, if applicable. Emissions from volatile organic compound (VOC) sources and small sources whose emissions are known to be insignificant are normally not modeled. As a precautionary note, the emission estimates are based on US EPA emission factors (AP-42) or theoretical data and can vary from actual stack test data.

The sources included in this construction permit are also required to obtain an operation permit under s. 285.60(1)(b), Wis. Stats. This review constitutes the Department's review of applications for both the construction permit and the operation permit for these units.

A final decision on the construction permit and operation permit will not be made until the public has had an opportunity to comment on the Department's analysis, preliminary determination and draft permit. The conditions proposed in the draft permit may be revised in any final permit issued based on comments received or further evaluation by the Department.

GENERAL APPLICATION INFORMATION

Owner/Operator: FTS International Proppants, LLC
2003 Nine Road
Brady, TX 76825

Responsible Official: Ronald Jordan, Vice President

Application Contact Person: Jim Rabideau, Consultant

Application Submitted By: Jim Rabideau, Consultant

Application submittal date: March 30, 2012

Additional Information Submitted: April 19, 2012 through February 18, 2013

Date of Complete Application: February 18, 2013

PROJECT DESCRIPTION

The company has applied for a construction permit and an operation permit for an industrial sand mine and sand processing plant. The facility is subject to the NSPS in s. NR 440.688 and NR 440.73. As such, a construction permit and an operation permit are required.

The applicant has requested that the hours of operation for the dryer be limited to 8,200 hours per year (683.3 hours per month) in order to avoid being a Part 70 major source of carbon monoxide emissions.

Other Actions:

This construction permit will also be processed as an operation permit (662031150-F01) which covers operations at the entire facility.

This is a greenfield source. The applicant has provided the results of a cultural resource site study including the review of the Wisconsin Historical Society's Wisconsin Historic Preservation Database. It was concluded that no archeological or burial/cemetery resources have been recorded within the project's area of potential effect.

SOURCE DESCRIPTION

The company is proposing a new sand mining and processing operations which will include mining sand, transport and hauling, washing, drying and sorting. There will be one crusher rated at 200 tons per hour. All equipment will run on 3 phase electricity provided by the public utility.

The operation will include extracting and processing sand, including mining, crushing, washing, drying, sorting, and hauling. There will be a combination of raw and washed sand stockpiles as well as overburden stockpiles present on the mine. Most, if not all overburden, will be used for berming and will be seeded according to the reclamation plan. The sand will be a product used for the oil/gas industry.

The site is located within a rural area and occupies 315 acres along the north side of State Highway 95. The City of Arcadia is located about 1 mile west of the operation with few farms and rural residence located nearby. An existing mine is located to the southwest of the subject mine.

The terrain is rolling with the highest local elevations present on or near the proposed processing plant. Turton Creek and a tributary to North Creek are located to the south and north of the mine operation, respectively. Both water bodies are tributaries of the Trempealeau River. The proposed mine is located on a ridge thus the land surface slopes to the south and north toward Turton Creek and North Creek, respectively.

The following describes each process.

<u>F01 (01-02) Loading and Dumping Haul Trucks 300 ton/hr</u>

This includes loading mine haul trucks and the trucks dumping into a grizzly feeder.

<u>F01 (03-06) Crusher 200 tons/hr</u>

A primary crusher (F01-06) will be used to break-down the cemented sandstone extracted from the mining operation. The material will be dropped through a grizzly feeder (F01-03) which will separate the

material based on size – 200 tons per hour will go the crusher conveyor (F01-04) and 100 tons per hour will go to the wash plant conveyor (F01-05). The crushed material will then be conveyed to the wash plant.

F02 (01-02) Haul Roads

The unpaved mine haul roads (F02-01), include transporting of sand from the mine to the grizzly feeder (F01-01) using a front end loader. The paved customer loadout (F02-02) includes trucks transporting finished sand from the dry plant to the public roadway. All emission calculations assume round trips, one loaded, the other empty. Emission factors for the unpaved roadways were obtained from AP-42, 13.2.4 and 13.2.2 and paved roads from AP-42, 13.2.1. Fifty percent control of fugitive emissions is assumed for the emissions calculations, as allowed in the "Nonmetallic Mining Guidance of the 1998 Air Emission Inventory."

F03 (01) Blasting Sandstone

All of the sandstone on the mine will need to be blasted. The average thickness of the sandstone deposit is approximately 60 feet covering 315 acres. The maximum tonnage of sand blasted is based on 300 tons per hour for 8760 hours per year or 2,628,000 tons with an estimated actual production of 1,123,200 tons. The limitation to this process is the wash plant also rated at 300 tons per hour. Shale is present above the sandstone and will have to be blasted for its removal. FTS estimates that for every ton of sandstone blasted a half ton of shale will need to be blasted.

The NO_x and CO emission factors were obtained from AP-42, Section 13.3 Explosives Detonation and PM emission factors from AP-42, Section 11.9 Western Surface Coal Mining. All of the emission data for PM is based on square footage of material to be blasted and is a direct correlation between the aerial extent of the deposit and its depth. The blasting data for the NO_x and CO are related to the pounds of explosives used.

P01 Drying Plant 150 tons/hr

The drying plant (P01) will be controlled with a cyclone (C01) and baghouse (C02). The dryer is rated at 150 tons per hour. The sand is conveyed to the rotary kiln and dried using a 50 mmbtu hour natural gas/propane burner. The dried sand is then conveyed to screening plant (P02). The baghouse manufacturer has provided that the emission limits in the draft permit for PM, PM_{10} and $PM_{2.5}$ can be met.

P02 Dry Plant Processes for Sand Screening, Conveying and Silos

The dried sand is moved through a series of elevators and conveyors to the four 6 deck screeners, and then moved through a series of elevators and conveyors to six silos. These are enclosed in a building. Displaced air from silo loading goes back to the screening room via the enclosed conveyor/elevator system. Sand is then loaded into trucks to be taken off the property. All of the emission from the sources listed above vent to a baghouse (C03) and vented to stack S02. The baghouse manufacturer has provided that the emission limits in the draft permit for PM, PM_{10} and $PM_{2.5}$ can be met.

The facility is covered under NR 440.73 Calciners and Dryers in Mineral Industries (CDMI) and NR 440.688 Nonmetallic Mineral Processing Plants (NMMPP).

In addition, there are other processes with negligible emissions, which shall be identified and included in the insignificant emission units listing:

Wash Plant maximum 342 tons/hr, sustainable 300 tons/hr

The conveyor supplying sand from the crusher and grizzly feeder is totally enclosed including at the drop point. The conveyor drops to a wet scalping screener and follows through numerous pieces of equipment before being stockpiled as wastes or usable product. There is a crusher (42 ton/hr) used for resizing material during the wash process and the sand would be saturated with water, thus no emission would be expected. These processes are wet and present within a totally enclosed building.

Dry Plant Indoor Fugitive maximum 150 tons/hr

This includes loading sand into a hopper which is then fed to a conveyor. The hopper and conveyor are located within a building and not controlled, thus all of the emissions would be considered indoor fugitive.

Description of New or Modified Units.

Emission Unit Information.

Boiler/furnace number [or process line, etc.]:	P01
Unit description:	Rotary Sand Dryer
Control technology status:	C01 (cyclone) and C02 (baghouse)
Maximum continuous rating (mmBTU/hr):	150 tons per hour and 50 mmbtu per hour
Date of construction or last modification:	2013
Construction Permit Requirements:	12-POY-079

Stack Information.

Stack identification number:	S01
Exhausting unit(s):	P01
This stack has an actual exhaust point:	Y
Discharge height above ground level (ft):	70
Inside dimensions at outlet (ft):	3.33
Exhaust flow rate (normal) (ACFM):	26,000
Exhaust flow rate (maximum) (ACFM):	26,000
Exhaust gas temperature (normal) (°F):	250
Exhaust gas temperature (maximum) (°F):	250
Exhaust gas discharge direction:	Up
Stack equipped with any obstruction:	No

Control Device Information.

Control Device identification number:	C01
Exhausting emissions unit(s):	P01
Control device type [baghouse, ESP, etc.]:	Cyclone

Control Device Information.

Control device description:	Cyclone
Manufacturer and model number:	-
Date of construction:	2013

Control Device Information.

Control Device identification number:	C02
Exhausting emissions unit(s):	P01
Control device type [baghouse, ESP, etc.]:	Baghouse
Control device description:	Baghouse
Manufacturer and model number:	-
Date of construction:	2013

	Fuel name	Higher heating value	Max. hourly consumtion	Actual yearly consumption
Primary Fuel	NG	1000 btu/10^6 ft^3	0.05 10^6 ft^3	438 10^6 ft^3
Backup fuel	Propane	91.7 btu/10^3 gal	0.545 10^3 gal	4,774 10^3 gal

Emission Unit Information.

Boiler/furnace number [or process line, etc.]:	P02
Unit description:	Dry Plant Processes for Sand Screening, Conveying and Silos
Control technology status:	C03 (baghouse)
Maximum continuous rating (tons/hr):	150 tons per hour
Date of construction or last modification:	2013
Construction Permit Requirements:	12-POY-079

Stack Information.

Stack identification number:	S02
Exhausting unit(s):	P02
This stack has an actual exhaust point:	Y
Discharge height above ground level (ft):	70
Inside dimensions at outlet (ft):	3.33
Exhaust flow rate (normal) (ACFM):	26,000
Exhaust flow rate (maximum) (ACFM):	26,000
Exhaust gas temperature (normal) (°F):	75
Exhaust gas temperature (maximum) (°F):	75
Exhaust gas discharge direction:	Up
Stack equipped with any obstruction:	No

Control Device Information.

Control Device identification number:	C03
Exhausting emissions unit(s):	P02
Control device type [baghouse, ESP, etc.]:	Baghouse
Control device description:	Baghouse
Manufacturer and model number:	-
Date of construction:	2013

Stack Parameter Summary.

Stack ID	Actual Exhaust Point or Fugitive	Circular or Rectangular	Discharge Direction U, D, H	Exhaust Obstacle Yes/No	Diameter or Width (if rect.) ft (m)	Length (if rect.) ft (m)	Height ft (m)	Temp. °F	Normal Flow Rate ACFM	Maximum Flow Rate ACFM
S01	A	C	U	N	3.33	-	70	250	26,000	26,000
S02	A	C	U	N	3.33	-	70	75	26,000	26,000

Insignificant Emissions Units.

Description **Number**

☒ Maintenance of Grounds, Equipment, and Buildings (lawn care, painting, etc.)

☒ Pollution Control Equipment Maintenance

☒ Fire Control Equipment

☒ Janitorial Activities

☒ Office Activities

☒ Convenience Water Heating

☒ Convenience Space Heating (< 5 million BTU/hr Burning Gas, Liquid, or Wood)

☒ Fuel Oil Storage Tanks (< 10,000 gal.)

☒ Sanitary Sewer and Plumbing Venting

☒ 4 to 6 percent moisture Sand Piles

☒ Septic Tank

☒ Excavating using a backhoe

☒ Blasting formation

☒ Enclosed and skirted conveyors with no dust control

☒ Enclosed elevators with no dust control

☒ Silos (non vented) vent to screening rooms

☒ Enclosed and nonvented screeners

☒ wet screeners/conveyors/stackers

CROSS MEDIA IMPACTS

Stacy Rowe of the Department's Endangered Resource Program has performed a detailed Endangered Resource Review for this project. Her conclusion was that no action is needed to comply with state and/or federal endangered species laws.

EMISSION CALCULATIONS.

Process P01 / Control Devices C01 and C02 / Stack S01

In the permit application, the applicant estimated the maximum theoretical PM emissions from the dryer to be 2 pounds per ton of sand dried, prior to entering the baghouse. The applicant proposed to use the same emission factor for PM_{10} and $PM_{2.5}$ emissions as well, as there is no such emission factor for these pollutants given in FIRE, the on-line EPA emission factor data base. At 150 tons per hour capacity, the maximum theoretical PM, PM_{10} and $PM_{2.5}$ emissions will be 300 pounds per hour, and

300 #/hr * 8760 hrs/yr / 2000 #/ton = 1314 tons per hour.

It should be noted that the emission factor is for filterable PM. As such, based on the definition for particulate matter, PM_{10} and $PM_{2.5}$ emissions, condensable particulates must be included. That means that the maximum theoretical PM, PM_{10} and $PM_{2.5}$ emissions will be > 300 pounds per hour and 1314 tons per year.

Particulate matter (PM) emissions from S01 are subject to the more restrictive limitation in s. NR 415.05(1)(m) and (2), Wis. Adm. Code. Section NR 415.05(1)(m), Wis. Adm. Code limits the PM emissions to less than 0.2 pound per 1000 pounds of exhaust gas. The exhaust gas rate is 26000 cf/min at 250°F. At 0.2 pound per 1000 pounds of exhaust gas, the allowable PM emissions would be:

0.2 #/1000 # * 26000 cf/min * 60 min/hr * (460+68)/(460+250) * 0.075 #/cf = 17.4 #/hr

Section NR 415.05(2), Wis. Adm. Code limits the PM emissions based on the process weight rate equation $17.31P^{0.16}$ #/hr, where P is the process weight rate in tons per hour, and in this case, P = 150.

$E = 17.31P^{0.16}$ #/hr

$E = 17.31\ (150)^{0.16}$

E = 38.6 #/hr

So the PM limit 0.2 #/1000# exhaust gas is more restrictive. This PM limit is based on Method 5 and Method 202, and includes condensable particulates. At 17.4 #/hr, the annual potential to emit based on this limit based on 8200 hours/yr (the applicant has proposed to be limited to 8200 hours of operation per year, see the calculations for CO emissions) would be:

17.4 #/hr * 8200 hrs/yr / 2000 #/ton = 71.34 tons/yr

The NSPS PM emission limit for the dryer is 0.025 gr/dscf. The maximum flow rate is 26000 scfm. Thus the NSPS PM emission limit from the dryer will be:

0.025 gr/dscf * 26000 cf/min * 60 min/hr / 7000 gr/# = 5.57 #/hr

On an annual basis, with 8200 hours per year of operations (the applicant has proposed to be limited to 8200 hours of operation per year, see the calculations for CO emissions), that is the same as

5.57 #/hr * 8200 hrs/yr / 2000 #/ton = 22.84 tons/yr

The NSPS limit is for filterable particles only and the compliance test method is Method 5.

To limit the particulate matter (PM) emissions from the entire facility to less than 100 tons per year so that no environmental assessment is required under chapter NR 150, Wis. Adm. Code, the company proposed to limit the PM emissions from S01 to 2.05 pounds per hour. At 2.05 #/hr, the annual potential to emit based on this limit based on 8200 hours/yr (the applicant has proposed to be limited to 8200 hours of operation per year, see the calculations for CO emissions) would be:

2.05 #/hr * 8200 hrs/yr / 2000 #/ton = 8.41 tons/yr

There is no applicable PM_{10} or $PM_{2.5}$ emission limit in state or federal regulations for industrial sand dryers in a PSD minor source, other than meeting the ambient air standard. At the maximum theoretical emission rate (without the requirement of operating a baghouse to control particulate matter), the facility will be a major source for Part 70 for PM_{10} and $PM_{2.5}$ emissions. One may argue that the applicable regulations in s. NR 415.05 and NR 440.73, Wis. Adm. Code for PM emission may actually limit the allowable emission rates of PM_{10} or $PM_{2.5}$. (It should be noted that the NR 440.73 limit only applies to filterable particulates, and does not include condensable particulates.) The company requested the PM_{10} limit of 2.05 #/hr, and a $PM_{2.5}$ emission limit on the dryer as 1.05 pounds per hour. At these emission limits, together with the other limitations and requirements in the draft permit (see the calculations for the haul roads), the facility will be a minor source of PM_{10} and $PM_{2.5}$ emissions. Moreover, at these emission limits for PM_{10} and $PM_{2.5}$ the applicable ambient air standards will be met.

On an annual basis, with 8200 hours per year of operations, the PM_{10} potential to emit is

2.05 #/hr * 8200 hrs/yr / 2000 #/ton = 8.41 tons/yr

On an annual basis, with 8200 hours per year of operations, the $PM_{2.5}$ potential to emit is

1.05 #/hr * 8200 hrs/yr / 2000 #/ton = 4.31 tons/yr

The dryer will have a maximum heat input of 50 million Btu per hour using natural gas and propane as fuel.

According to the dryer vendor, the CO emissions will be 0.303 pound per million BTU heat input for natural gas and 0.312 pound per million BTU heat input for propane.

Thus the maximum potential emissions for CO when burning natural gas will be:

0.303 pound per million BTU * 50 million BTU/hr = 15.15 #/hr

Thus the maximum potential emissions for CO when burning propane will be:

0.312 pound per million BTU * 50 million BTU/hr = 15.6 #/hr

Based on 8200 hours per year of operation, that would be:

15.6 #/hr * 8760 hrs/yr / 2000 #/ton = 68.33 tons/yr

Adding to the other CO emissions, the facility would be a Part 70 source without other limits.

To make the source synthetic minor, the company requested the dryer be limited to 8200 hours per year (683.3 hours per month) of operation.

15.6 #/hr * 8200 hrs/yr / 2000 #/ton = 63.96 tons/yr

SO_2, NO_x and VOC emission factors (EF) for Natural Gas and propane combustion in commercial boilers (AP-42, Tables 1.4-1, 1.4-2 and 1.5-1) can be used for the dryer.

	SO_2	VOC	NO_x
lb/10^6 ft^3 (NG)	0.6	5.5	100
lb/10^3 gal (Propane)	0.1S*	0.3	19

* S is the sulfur content expressed in gr/100 ft^3. AP-42 listed the sulfur content of butane as 0.18 gr/ft^3. Propane is a lighter fraction than butane in the petrochemical series, thus we can assume that to be the sulfur content for propane as well. Thus SO_2 emission factor is 0.1 x 0.18 = 0.018 #/1000 gal.

The NO_x emission factor for propane combustion in USEPA's FIRE (Factor Information Retrieval) with SCC 10201002 is higher at 19 pounds per 1000 gallon.

The maximum fuel usage: (50 mmBtu/hr)/(1027 Btu/ft^3) = 0.0487 x 10^6 ft^3/hr NG
(50 mmBtu/hr)/(91.7 mmBtu/1000 gal) = 0.545 x 10^3 gal/hr

Natural gas usage emissions

E (lb/hr)=EF x 0.0487 10^6 ft^3 /hr (multiply by [8200/2000] for TPY)

	SO_2	VOC	NO_x
lb/hr	0.029	0.268	4.87
TPY	0.12	1.1	19.97

LPG usage emissions

E (lb/hr)=EF x 0.545 x 10^3 gal/hr (multiply by [8200/2000] for TPY)

	SO_2	VOC	NO_x
lb/hr	0.01	0.08	10.36
TPY	0.04	0.33	42.48

The potential to emit for the other pollutants from combustions will be

	SO_2	VOC	NO_x
lb/hr	0.029	0.268	10.36
TPY	0.12	1.1	42.48

Emission factor for carbon dioxide for the natural gas burning is 117 #/mmbtu, and that for propane burning is 137 #/mmbtu. The maximum carbon dioxide emission rate, from burning propane, equals:

50 mmbtu/hr * 137 #/mmbtu = 6850 #/hr

6850 #/hr * 8200 hrs/yr / 2000 #/ton = 28,085 tons/yr

In addition, the applicant stated that the plant will have up to 1 million BTU per hour heat input of space and water heating using natural gas.

The maximum fuel usage: (1 mmBtu/hr)/(1027 Btu/ft^3) = 0.001 x 10^6 ft^3/hr NG

Emission factors for natural gas combustion would be:

	PM	VOC	SO_2	CO	NO_x
lb/10^6 ft^3 (NG)	7.6	5.5	0.6	84	100

E (lb/hr)=EF x 0.001 10^6 ft^3 /hr (multiply by [8760/2000] for TPY)

	PM	VOC	SO_2	CO	NO_x
lb/hr	0.008	0.006	0.0006	0.084	0.1
tons/yr	0.03	0.02	0.003	0.37	0.44

Process P02 / Control Devices C03 / Stack S02

Particulate matter (PM) emissions from S02 are subject to the more restrictive limitation in s. NR 415.05(1)(m) and (2), Wis. Adm. Code. Section NR 415.05(1)(m), Wis. Adm. Code limits the PM emissions to less than 0.2 pound per 1000 pounds of exhaust gas. The exhaust gas rate is 26000 cf/min at 75°F. At 0.2 pound per 1000 pounds of exhaust gas, the allowable PM emissions would be:

0.2 #/1000 # * 26000 cf/min * 60 min/hr * (460+68)/(460+75) * 0.075 #/cf = 23.1 #/hr

Section NR 415.05(2), Wis. Adm. Code limits the PM emissions based on the process weight rate equation $17.31P^{0.16}$ #/hr, where P is the process weight rate in tons per hour, and in this case, P = 150.

E = $17.31P^{0.16}$ #/hr

E = $17.31\ (150)^{0.16}$

E = 38.6 #/hr

So the PM limit 0.2 #/1000# exhaust gas is more restrictive. This PM limit is based on Method 5 and Method 202, and includes condensable particulates. At 23.1 #/hr, the annual potential to emit based on this limit based on 8200 hours/yr (the applicant has proposed to be limited to 8200 hours of operation per year, see the calculations for CO emissions) would be:

23.1 #/hr * 8200 hrs/yr / 2000 #/ton = 94.71 tons/yr

There will be crusher on site. Thus, the NSPS in 40 CFR Part 60 Subpart OOO for nonmetallic mineral

handling is applicable. The NSPS emission limit for the screens and conveyors and other sand handling processes vented to S02 is 0.014 gr/dscf. (Note, the NSPS in in 40 CFR Part 60 Subpart OOO has been updated in 2009 and 2011 and the PM limit is more restrictive than that in s. NR 440.688.). The maximum flow rate is 26000 cfm. Thus the NSPS PM emission limit from the stack S02 will be:

0.014 gr/dscf * 26000 cf/min * 60 min/hr / 7000 gr/# = 3.12 #/hr

The NSPS limit is for filterable particles only and the compliance test method is Method 5.

To limit the particulate matter (PM) emissions from the entire facility to less than 100 tons per year, the company proposed to limit the PM emissions from S02 to 2.05 pounds per hour. At 2.05 #/hr, the annual potential to emit based on this limit based on 8200 hours/yr (the applicant has proposed to be limited to 8200 hours of operation per year, see the calculations for CO emissions) would be:

2.05 #/hr * 8200 hrs/yr / 2000 #/ton = 8.41 tons/yr

The company requested the PM_{10} limit of 2.05 #/hr, and a $PM_{2.5}$ emission limit for S02 as 1.0 pounds per hour. At these emission limits, together with the other limitations and requirements in the draft permit, the facility will be a minor source of PM_{10} and $PM_{2.5}$ emissions. Moreover, at these emission limits for PM_{10} and $PM_{2.5}$ the applicable ambient air standards will be met.

On an annual basis, with 8200 hours per year of operations, the PM_{10} potential to emit is

2.05 #/hr * 8200 hrs/yr / 2000 #/ton = 8.41 tons/yr

On an annual basis, with 8200 hours per year of operations, the $PM_{2.5}$ potential to emit is

1.0 #/hr * 8200 hrs/yr / 2000 #/ton = 4.1 tons/yr

Non-Stack Emissions (50% control by following fugitive control plan, as per DNR 1998 guidance on fugitive dust emissions from non-metallic mineral mining operations).

Mining and crusher PM Emissions, emission factors from FIRE, SCC 305020003-305020032

Process #	Process	Action	Ton/hr maximum	lb/ton (uncontrolled)	lb/hr (controlled)	ton/yr (controlled)
F01-01	Loader	Loader dump to haul truck	300	0.000273	0.041	0.18
F01-02	Truck	Drop from truck to grizzly feeder	300	0.00004368	0.00655	0.02869
F01-03	Grizzly Feeder	Drop to two conveyors (100 and 200 tons/hr)	300	0.003	0.45	1.97
F01-04	Conveyor	Drop to Crusher	200	0.003	0.3	1.31
F01-05	Conveyor	Drop to Crusher	100	0.003	0.15	0.66
F01-06	Crusher	Crushing sandstone	200	0.0054	0.54	2.37
		Total			1.48755	6.51547

Mining and crusher PM_{10} Emissions, emission factors from FIRE, SCC 305020003-305020032

Process #	Process	Action	Ton/hr maximum	lb/ton (uncontrolled)	lb/hr (controlled)	ton/yr (controlled)

F01-01	Loader	Loader dump to haul truck	300	0.0001	0.015	0.066
F01-02	Truck	Drop from truck to grizzly feeder	300	0.000016	0.0024	0.0105
F01-03	Grizzly Feeder	Drop to two conveyors (100 and 200 tons/hr)	300	0.0011	0.165	0.723
F01-04	Conveyor	Drop to Crusher	200	0.0011	0.11	0.48
F01-05	Conveyor	Drop to Crusher	100	0.0011	0.055	0.241
F01-06	Crusher	Crushing sandstone	200	0.0024	0.24	1.05
		Total			0.5874	2.5728

Mining and crusher $PM_{2.5}$ Emissions

Process #	Process	Action	Ton/hr maximum	lb/ton (uncontrolled)	lb/hr (controlled)	ton/yr (controlled)
F01-01	Loader	Loader dump to haul truck	300	0.0001	0.015	0.066
F01-02	Truck	Drop from truck to grizzly feeder	300	0.000016	0.0024	0.0105
F01-03	Grizzly Feeder	Drop to two conveyors (100 and 200 tons/hr)	300	0.000013	0.00195	0.00854
F01-04	Conveyor	Drop to Crusher	200	0.000013	0.00195	0.00854
F01-05	Conveyor	Drop to Crusher	100	0.000013	0.00195	0.00854
F01-06	Crusher	Crushing sandstone	200	0.0001	0.01	0.04
		Total			0.03325	0.14564

No specific $PM_{2.5}$ emission factor for the loader and truck loading, so the PM_{10} emission factors are used.

The wet screener, wet sand conveyors and drop to stock pile at wet plant is for handling wet to saturated materials, so no fugitive dust emission will be expected from these processes.

Dry plant non-stack processes will be enclosed inside the dry plant building.

Unpaved Road truck traffic calculations
Equation in AP-42 13.2.2

$E=k*(s/12)^{a}*((W/3)^{b})*((365-p)/365)$

		Internal Haul Roads		
Where:		PM	PM-10	PM-2.5
k = particle size multiplier	k =	4.9	1.5	0.15
s = surface material silt content (%)	s =	4.80	4.80	4.80
W = mean vehicle weight (tons)	W =	58.00	58.00	58.00
p = wet days per year (115)	p =	115	115	115
a = empirical constant	a =	0.7	0.9	0.9
b = empirical constant	b =	0.45	0.45	0.45
E = size-specific emission factor (lb/VMT)	E =	6.7	2.0	0.2

VMT on internal unpaved haul roads will be a maximum of 70000. The control efficiency of 75% is assumed, and the draft permit will include requirements for haul roads that when these requirements are followed will result in 75% control of fugitive dust emissions.

Maximum annual PM emissions: 6.7 *(1-0.75) * 70000 #/yr / 2000 #/ton = 58.63 tons/yr
Without control, the PM emissions will be: 6.7 * 70000 #/yr / 2000 #/ton = 234.5 tons/yr

Maximum annual PM_{10} emissions: 2.0 *(1-0.75) * 52036 #/yr / 2000 #/ton = 17.5 tons/yr
Without control, the PM_{10} emissions will be: 2.0 * 70000 #/yr / 2000 #/ton = 70.0 tons/yr

Maximum annual $PM_{2.5}$ emissions: 0.2 *(1-0.75) * 5203.6 #/yr / 2000 #/ton = 1.75 tons/yr
Without control, the $PM_{2.5}$ emissions will be: 0.2 * 70000 #/yr / 2000 #/ton = 7.0 tons/yr

For loadout paved roads, mean vehicle weight is 45 tons each.

$E=k*(sL)^{0.91}*W^{1.02}*(1-p/4N)$

Where

	PM	PM-10	PM-2.5
k =	0.011	0.0022	0.00054
sL =	8.2	8.2	8.2
W =	45	45	45
p =	115	115	115
N =	365	365	365
E =	3.34	0.67	0.16

VMT on loadout paved haul roads will be a maximum of 28250. The control efficiency of 75% is assumed, and the draft permit will include requirements for haul roads that when these requirements are followed will result in 75% control of fugitive dust emissions.

Without controls, PM and PM_{10} emissions will be over 100 tons per year when combined with the emissions from the other units and processes at the facility, if those emission units or processes would not be controlled.

Maximum annual PM emissions: 3.34 *(1-0.75) * 28250 #/yr / 2000 #/ton = 11.79 tons/yr
Without control, the PM emissions will be: 3.34 * 28250 #/yr / 2000 #/ton = 47.18 tons/yr

Maximum annual PM_{10} emissions: 0.67 *(1-0.75) * 28250 #/yr / 2000 #/ton = 2.37 tons/yr
Without control, the PM_{10} emissions will be: 0.67 * 28250 #/yr / 2000 #/ton = 9.46 tons/yr

Maximum annual $PM_{2.5}$ emissions: 0.16 *(1-0.75) * 28250 #/yr / 2000 #/ton = 0.565 tons/yr
Without control, the $PM_{2.5}$ emissions will be: 0.16 * 28250 #/yr / 2000 #/ton = 2.26 tons/yr

Total PM emissions from haul roads: 58.63 + 11.79 = 69.42 tons/yr
Total PM emissions, without control, from haul roads: 234.5 + 47.18 = 281.68 tons/yr

Total PM_{10} emissions from haul roads: 17.5 + 2.37 = 19.87 tons/yr
Total PM_{10} emissions, without control, from haul roads: 70.0 + 9.46 = 79.46 tons/yr

Total $PM_{2.5}$ emissions from haul roads: 1.75 + 0.565 = 2.315 tons/yr
Total $PM_{2.5}$ emissions, without control, from haul roads: 7.0 + 2.26 = 9.26 tons/yr

Blasting Emissions

				PM	PM 10	PM 2.5	CO	NOx
Process #	**Process**	**Action**	**Comment**	**Emission Factor (lbs/ft2)**	**Emission Factor (lbs/ft2)**	**Emission Factor (lbs/ft2)**	**Emission Factor (lb/ton)**	**Emission Factor (lb/ton)**
F05-01	Blasting Sandstone	Blasting	None	$0.000014(A)^{1.5}$	$0.000014(A)^{1.5}(.52)$	$0.000014(A)^{1.5}(.03)$	67	17
F05-02	Blasting Shale	Blasting	None	$0.000014(A)^{1.5}$	$0.000014(A)^{1.5}(.52)$	$0.000014(A)^{1.5}(.03)$	67	17

	Blast Area		Explosive Usage		PM	PM 10	PM 2.5	CO	NOx	PM	PM 10	PM 2.5	CO	NOx
	Max. Area (ft2)/hr	Max. Area (ft2)/yr	Maximum (tons)/hr	Maximum (tons)/yr	Lbs/hr	Lbs/hr	Lbs/hr	Lbs/hr	Lbs/hr	Tons/yr	Tons/yr	Tons/yr	Tons/yr	Tons/yr
F05-01	7455	489808	10	657	9.01	4.69	0.27	670.00	170.00	2.40	1.25	0.07	22.01	5.58
F05-02	7455	489808	5	310	9.01	4.69	0.27	335.00	85.00	2.40	1.25	0.07	10.38	2.63
Total	14910	979616	15	967	18.02	9.38	0.54	1005	255	4.8	2.5	0.14	32.39	8.21

The blasting potentials to emit are calculated based on the area necessary to be blasted to provide the capacity of the plant. To avoid being a major source under Part 70 for CO, the company proposed to limit the explosive used to 967 tons in any 12 consecutive months.

Total facility Emissions

PTE Hourly (lbs/hr) Pollutant	PM	PM10	PM2.5	SOx	NOx	VOC	CO	CO_2
P01 Sand Drying	2.05	2.05	1.05	0.029	10.36	0.268	15.6	6850
P02 Screening Plant	2.05	2.05	1.0					
Space heating	0.008	0.008	0.008	0.0006	0.1	0.006	0.084	117
F01, 01-06 Mining and Primary Crusher	1.49	0.59	0.033					
F02 Haul Roads	16.91	4.84	0.56					
F03 Blasting	18.02	9.38	0.54		255.00		1005.00	
Total	38.398	18.918	3.191	0.0296	265.46	0.274	1020.684	6967

PTE Hourly (tons/yr) Pollutant	PM	PM10	PM2.5	Sox	NOx	VOC	CO	CO_2
P01 Sand Drying	8.41	8.41	4.1	0.12	42.48	1.1	63.96	28085
P02 Screening Plant	8.41	8.41	4.1					
Space heating	0.03	0.03	0.03	0.003	0.44	0.02	0.37	512.46
F01, 01-06 Mining and Primary Crusher	6.53	2.57	0.15					
F02 Haul Roads	69.42	19.87	2.31					
F03 Blasting	4.80	2.5	0.14		8.21		32.39	
Total	97.6	41.79	11.04	0.123	51.13	1.12	96.72	28598

WISCONSIN HAZARDOUS AIR POLLUTANT (NR 445) REVIEW

The fuels used for combustion in the dryers are natural gas and propane. These are virgin fossil fuels. The hazardous air pollutants emitted due to the combustion of these virgin fossil fuels are exempt from the emission limitations and standards in NR 445.

The mined and processed sand is silica, and it is not a federal regulated hazardous air pollutant listed under section 112(b) of the Clean Air Act. Further, it is not a hazardous air pollutant regulated under Chapter NR 445, Wis. Adm. Code.

COMPLIANCE AND TECHNOLOGY REVIEW

Particulate matter will be emitted from the rotary sand dryer, and the screening, conveying and elevator operations inside the dryer buildings. These emissions will be controlled using fabric filter baghouses.

The dryer will have a capacity of 150 tons per hour. It will use natural gas and propane as fuel, at an estimated 50 mmBtu per hour. Particulate matter (PM) emissions will be controlled by a baghouse. The particulate matter emissions from the sand dryer (P01, S01) will be subject to New Source Performance Standard (NSPS) in 40 CFR Part 60, Subpart UUU (s. NR 440.73, Wis. Adm. Code) for Calciners and Dryers in non-metallic mineral industries. The NSPS PM emission limit is 0.025 gr/dscf, and the limit is only for filterable particulates with a compliance stack test method of Method 5. To limit the PM (filterable and condensable particulates combined) potential to emit from the entire facility to less than 100 tons per year so as to avoid the requirement of an environmental assessment, the company proposed a PM emission limit of 2.05 pounds per hour from the dryer stack. The company also requested a PM_{10} limit of 2.05 #/hr, and a $PM_{2.5}$ emission limit on the dryer as 1.05 pounds per hour. There is no applicable emission limit for PM_{10} or $PM_{2.5}$ in state or federal rule for S01, and the maximum theoretical PM_{10} and $PM_{2.5}$ emissions prior to the baghouse serving S01 together with the other maximum theoretical emissions from equipment and processes will exceed 100 tons per year. Thus, the PM_{10} and $PM_{2.5}$ emission limits will be required with the other limitations and requirements in the draft permit to make the facility synthetic minor for PM, PM_{10} and $PM_{2.5}$ emission for Part 70. The company proposed to use a single compliance test using Method 5 and Method 202 for compliance demonstration of PM, PM_{10} and $PM_{2.5}$ emission limits in the draft permit. PM_{10} and $PM_{2.5}$ are particulate matter with aerodynamic diameters less than 10 microns and 2.5 microns, respectively. So PM_{10} and $PM_{2.5}$ emissions are subsets of PM emissions. If the test results would show an emission rate of 1.04 pounds per hour, the emission limits for all of PM, PM_{10} and $PM_{2.5}$ will be met. If emission test results using Method 5 and Method 202 are greater 1.05 pounds per hour, further testing for the subsets of particulate (PM10 and PM2.5) will be required.

The dryer is subject to NSPS visible emission limit of 10% opacity, and continuous monitoring of opacity is required in s. NR 440.73(5)(a). Since it is a rotary industrial sand dryer, the continuous opacity monitoring requirements do not apply. The company will be required to perform an initial opacity compliance testing.

There will be crusher on site. Thus, the NSPS in 40 CFR Part 60 Subpart OOO for nonmetallic mineral

handling is applicable. The NSPS emission limit for the screens and conveyors and other sand handling processes vented to S02 is 0.014 gr/dscf. (Note, the NSPS in in 40 CFR Part 60 Subpart OOO has been updated in 2009 and 2011 and the PM limit is more restrictive than that in s. NR 440.688.). The NSPS limit is only for filterable particulates with a compliance stack test method of Method 5. To limit the PM (filterable and condensable particulates combined) potential to emit from the entire facility to less than 100 tons per year so as to avoid the requirement of an environmental assessment, the company proposed a PM emission limit of 2.05 pounds per hour from the stack S02. The company also requested a PM_{10} limit of 2.05 #/hr, and a $PM_{2.5}$ emission limit on the dryer as 1.0 pounds per hour. There is no applicable emission limit for PM_{10} or $PM_{2.5}$ in state or federal rule for S02, and the maximum theoretical PM_{10} and $PM_{2.5}$ emissions prior to the baghouse serving S02 together with the other maximum theoretical emissions from equipment and processes will exceed 100 tons per year. Thus, the PM_{10} and $PM_{2.5}$ emission limits will be required with the other limitations and requirements in the draft permit to make the facility synthetic minor for PM, PM_{10} and $PM_{2.5}$ emissions for Part 70. The company proposed to use a single compliance test using Method 5 and Method 202 for compliance demonstration of PM, PM_{10} and $PM_{2.5}$ emission limits in the draft permit. PM_{10} and $PM_{2.5}$ are particulate matter with aerodynamic diameters less than 10 microns and 2.5 microns, respectively. So PM_{10} and $PM_{2.5}$ emissions are subsets of PM emissions. If the test results would show an emission rate of 0.099 pound per hour, the emission limits for all of PM, PM_{10} and $PM_{2.5}$ will be met. If emission test results using Method 5 and Method 202 are greater 1.05 pounds per hour, further testing for the subsets of particulate (PM10 and PM2.5) will be required.

AIR QUALITY REVIEW

Emily Houtler has performed the air quality review for this project. The following are her finding and conclusion.

A. INTRODUCTION

This dispersion analysis for a New Source Construction Permit compares model results to Significant Impact Levels (SIL) and National Ambient Air Quality Standards (NAAQS) for criteria pollutants. The facility has a physical location address of: State Highway 95, 1 mile west of the city of Arcadia with UTM coordinates: 625236, 4901407. Trempealeau County, Wisconsin. PSD baselines HAVE NOT been set in Trempealeau County.

B. MODELING ANALYSIS

- FTS supplied and Joseph Brehm verified the emission parameters used in this analysis. Building dimensions were determined using USEPA's Building Profile Input Program Prime (BPIP-Prime) with measurements taken on plot plans provided with the application and compared against aerial photography.
- Five years (2006 - 2010) of preprocessed meteorological data was used in this analysis. The surface data was collected in Hayward, and the upper air meteorological data originated in Minneapolis, MN.
- The AERMIC (AMS/EPA Regulatory Model Improvement Committee) Model (AERMOD v 11103) was also used in the analysis. The model used rural dispersion coefficients with regulatory default and beta options where applicable. These options allow for calm wind and missing data correction, buoyancy induced dispersion, and building downwash including recirculation cavity effects.
- The receptors used in this analysis consisted of a grid conforming to the physical layout of the building and grounds about the facility (714 receptors) with 25-meter resolution near the facility and extending some 400 meters from a point identified as (0,0) of the Cartesian axis on which this facility was placed via supplied plot plans. Points within known fences or on top of buildings were not considered. Terrain is a factor in the area, so receptor elevations were considered via application of the AERMOD terrain processor (AERMAP) with USGS National Elevation Dataset (NED) tiles.
- All sources vent vertically and without obstruction except as noted elsewhere within this document.
- Before operation of this facility can begin, FTS will erect a physical barrier that will conform to the following specifications:
- The Northwest corner of the barrier will rest 25 m West and 150 m North of stack S01 and extend 175 m to the east, terminating at the property line.
- The Northeast corner of the barrier will rest on the property line, 175 m east of the Northwest corner and extend along the property line for 175 m to the south.
- The Southeast corner of the barrier will rest along the property line, 175 m south of the Northeast corner and extend 175 m to the west.
- The Southwest corner of the barrier will rest 175 m west of the Southeast corner and extend 175 m to the north to meet the Northwest corner.
- This physical barrier will form a square inclosing approximately 8 acres including Stacks S01 & S02.

C. MODEL RESULTS

SIL Comparison Analysis Results (All Concentrations in $\mu g/m^3$)										
	SO_2 3 – hour	SO_2 24 - hour	SO_2 Annual	NO_2 Annual	CO 1- Hour	CO 8 - Hour	PM_{10} 24 hour	PM_{10} Annual	$PM_{2.5}$ 24 hour	$PM_{2.5}$ Annual
Comparative Results	P	P	F	F	P	P	F	F	F	F
Sig. Impact Level	25.0	5.0	1.0	1.0	2000.0	500.0	5.0	1.0	1.2	0.3

P = SIL is met. No further analysis required for pollutant.
F = SIL is exceeded. Additional analysis may be required for pollutant.

D. SIL CONCLUSION

The results of the modeling analysis demonstrate that the Significant Impact Level (SIL) will be satisfied for all pollutants with the exception of $PM_{2.5}$, NO_2 and PM_{10}. Additional air quality analysis is required.

NAAQS Analysis	SO_2 Annual	PM_{10} 24-hr	$PM_{2.5}$ 24-hr	$PM_{2.5}$ Annual	NO_2 Annual
Facility Impact	1.3	32.1	9.3	1.3	20.8
Background	5.4	29.4	25.6	8.7	8.0
Total	6.7	61.5	34.9	10.0	28.8
NAAQS	80	150.0	35.0	15.0	100.0
% NAAQS	8	41	100	67	29

F. NAAQS CONCLUSION

The results of the modeling analysis demonstrate that ALL applicable air quality standards will be satisfied assuming the emissions rates, stack parameters and all other restrictions listed in this document.

G. RECOMMENDATION

The results of the modeling analysis recommends allowing the permit application to move forward through approval process assuming the emissions rates, stack parameters and all other restrictions listed in this document.

Stack Parameters

ID	PHYSICALS			
	Height	Temp	Vel	Dia
	(m)	(K)	(m/s)	(m)
S01	21.33	394.26	15.31	1.01
S02	21.33	297.04	15.31	1.01

ID	Description	LOCATION			EMISSION RATES				
		UTM NAD83 Zone 15			Grams per Second				
		X	Y	Z	PM10	PM2.5	NO2	SO2	CO
S01	P01 Dryer	625347	4901347	263.92	0.258	0.132	1.305	0.082	1.966
S02	P02 Screener	625348	4901344	266.04	0.258	0.126	0	0	0

EMISSIONS FROM NEW EQUIPMENT OR MODIFICATION

Stack Emissions

Stack S01 - Criteria Pollutants Emissions (Stack Height - 70 feet).

Pollutant	Potential to Emit (PTE)	
	Pounds per hour	Tons per year
PM/PM_{10}	2.05	8.41
$PM_{2.5}$	1.05	4.31
SO_2	0.029	0.13
NO_x	10.36	42.48
CO	15.6	63.69
CO_2	6850	28085
VOC	0.27	1.1

Stack S02 - Criteria Pollutants Emissions (Stack Height - 70 feet).

Pollutant	Potential to Emit (PTE)	
	Pounds per hour	Tons per year
PM/PM_{10}	2.05	8.41
$PM/PM_{10}/PM_{2.5}$	1.0	4.1

Facility non-stack emissions

F01 - Criteria Pollutants Emissions [Mine and Crusher]

Pollutant	Potential to Emit (PTE)	
	Pounds per hour	Tons per year
PM	1.49	6.53
PM_{10}	0.59	2.57
$PM_{2.5}$	0.033	0.15

F02 - Criteria Pollutants Emissions [Paved and Unpaved Haul Roads]

Pollutant	Potential to Emit (PTE)	
	Pounds per hour	Tons per year
PM	16.91	69.42
PM_{10}	4.84	19.87
$PM_{2.5}$	0.56	2.315

F03 - Criteria Pollutants Emissions [Blasting]

Pollutant	Potential to Emit (PTE)	
	Pounds per hour	Tons per year
PM	18.02	4.80
PM_{10}	9.38	2.5
$PM_{2.5}$	0.54	0.14
CO	-	32.39
NO_x	-	8.21

Total Facility Emissions

Pollutant	Potential Annual Emissions (Ton/yr)	PSD Threshold (Ton/yr)	Title V Threshold (Ton/yr)	Over 80%?	Class Code
Carbon Monoxide	96.72	250	100	Y	SM80
Nitrogen Oxides	51.13	250	100	N	B
Volatile Organic Compounds	1.12	250	100	N	B
Carbon Dioxide	28,598	100,000	100,000	N	B
Sulfur Dioxide	0.123	250	100	N	B
Particulate Matter	97.6	250	-	N	B
PM_{10}	41.79	250	100	N	SM
$PM_{2.5}$	11.04	250	-	N	SM
Hazardous Air Pollutants	negligible	-	10 tpy single HAP 25 tpy all HAPs	N	B

A. FACILITY AND PROJECT CLASSIFICATION

1 Project Status.

The potential to emit from the facility for each of the other criteria pollutant will be less than 100 tons per year. The potential to emit from the facility for any one hazardous air pollutant will be less than 8 tons per year, and that for the total of all HAPs combined will be less than 8 tons per year. So the project is minor for PSD and HAPs. (Please also see facility status in 2.)

2. Facility Status After the Permit is Issued.

The facility's potentials to emit are as follows:

Pollutant	Potential Annual Emissions (Ton/yr)	PSD Threshold (Ton/yr)	Title V Threshold (Ton/yr)	Over 80%?	Class Code
Carbon Monoxide	96.72	250	100	Y	SM80
Nitrogen Oxides	51.13	250	100	N	B
Volatile Organic Compounds	1.12	250	100	N	B
Carbon Dioxide	28,598	100,000	100,000	N	B

Sulfur Dioxide	0.123	250	100	N	B
Particulate Matter	97.6	250	-	N	B
PM_{10}	41.79	250	100	N	SM
$PM_{2.5}$	11.04	250	-	N	SM
Hazardous Air Pollutants	negligible	-	10 tpy single HAP 25 tpy all HAPs	N	B

So the facility is minor for PSD, Part 70 and HAPs with the class code of SM80. The class code for each pollutant has also been given in the above table. It should be noted that, in accordance with s. NR 405.07(4)(a), Wis. Adm. Code, for sand mines and processing plants, fugitive emissions as defined in s. NR 405.02(15) are not included when determining whether the facility is major or minor for PSD. However, it should also be noted that, in accordance with s. NR 407.02(4)(a)27., Wis. Adm. Code, for sand mines and processing plants, fugitive emissions as defined in s. NR 407.02(3)(e) are included when determining whether the facility is major or minor for Part 70.

3. EPA Class Code After the Permit is Issued.

☐ **"A"** [Means the source's maximum theoretical emissions *and* potential to emit for one or more pollutants are greater than major source thresholds. The source is a major source (will have a FOP)];

☒ **"SM80"** [Means the source's maximum theoretical emissions of one or more pollutants are greater than major source thresholds and potential to emit is at least 80% but less than 100% of major source thresholds. The source is a non-major source (will have a FESOP)];

☐ **"SM"** [Means the source's maximum theoretical emissions of one or more pollutants are greater than major source thresholds but potential to emit for all pollutants is less than 80% of major source thresholds. The source is a non-major source (usually will have a FESOP)];

☐ **"B"** [Means the source's maximum theoretical emissions and potential to emit for all pollutants are less than major source thresholds. The source is a non-major source (will have a SOP)].

4. Summary.

NSR Applicability	After Permit Issuance	
	Major	Minor
PSD		X
Non-Attainment	NA	
Federal HAP		X

Part 70 Applicability	Facility After Permit Issuance		
	Part 70	FESOP (Syn. Minor)	non-part 70
Status		X	

EPA Class Code	EPA Class Code After Permit Issuance			
	A	SM80	SM	B
Status		X		

ENVIRONMENTAL ANALYSIS

The proposed project is a Type III action under Chapter NR 150, Wis. Adm. Code, because there is a potential increase in hazardous emissions and the potential to emit of the project is less than 100 TPY for each criteria pollutant.

A news release is required for this proposal and is included in the public comment notice. It is proposed that an environmental assessment not be completed.

RULE APPLICABILITY

The facility is subject to the NSPS for Non-Metallic Mineral Processing Plants, 40 CFR 60, Subpart OOO, and the dryers are subject to the NSPS for Calciners And Dryers In Mineral Industries, 40 CFR 60, Subpart UUU (s. NR 440.73).

The sand dryers are subject to the NSPS under s. NR 440.73, Wis. Adm. Code. The applicable PM emission limit is 0.057 gram per dry standard cubic meter. The applicable visible emission limit is 10% opacity.

The dry plant baghouse, the loadout baghouse and the storage silo fabric filters are subject to the NSPS in 40 CFR Part 60, Subpart OOO. The applicable emission limit is 0.032 gram per dry standard cubic meter. No visible emission standard is applicable for stack emissions from units, except for the storage silos constructed after April 22, 2008. The storage silo fabric filters are subject to a visible emission limit of 7% opacity.

40 CFR 60, Subpart OOO has been revised and updated on April 28, 2009 with a more restrictive particulate matter stack emission limitations compared to the NSPS in s. NR 440.688, Wis. Adm. Code. Subpart OOO also has a more restrictive visible emission for non-captured particulate matter emissions.

The wet sand processes starting from the crushers are subject to the NSPS in Subpart OOO.

The mining of the sand is at or below the water table. As such, the wet mining operations themselves are not subject NSPS in Subpart OOO as per 40 CFR §60.670(a)(2). However, the fugitive dust emissions from the mining operations are subject to s. NR 415.075, Wis. Adm. Code. Visible emission limit will be 20% opacity. Implementation of a fugitive dust control plan will be necessary.

The facility is subject to the ambient air monitoring requirements under s. NR 415.075(4), Wis. Adm. Code. The facility will be required to set up, operate, and report the results obtained with a particulate matter ambient air monitoring system which complies with the requirements of s. NR 415.075(4)(a)1. – 5., Wis. Adm. Code. These requirements are contained in the air pollution control permit. However, the facility may apply for, and the Department may grant, a variance from the monitoring requirements of s. NR 415.075(4), Wis. Adm. Code, if the applicant demonstrates that the general public will not be exposed to significant levels of particulate matter from the source, and that the source's emissions units and processes are controlled to a level which meets all applicable requirements, per s. NR 415.075(4)(b), Wis. Adm. Code.

The sand processing plant is subject to s. NR 415.076, Wis. Adm. Code for the control of fugitive dust emissions. Precautions are required to be taken to prevent particulate matter from becoming airborne.

NEW SOURCE PERFORMANCE STANDARDS (NSPS) APPLICABILITY

For proposed construction of a source:

1. Is the proposed source in a source category for which there is an existing or proposed NSPS?
   ☒ Yes ☐ No ☐ Not applicable. (If yes, identify the source category.) The facility is subject to the NSPS for Non-Metallic Mineral Processing Plants, 40 CFR 60, Subpart OOO. The sand dryer is subject to the NSPS in NR 440.73.

2. Is the proposed source an affected facility?
   ☒ Yes ☐ No ☐ Not applicable. (Explain if necessary to clarify.)

For the proposed modification of an existing source:

1. Is the existing source, which is being modified, in a source category for which there is an existing or proposed NSPS?
   ☐ Yes ☐ No ☒ Not applicable. (If yes, identify the source category.)

2. Is the existing source, which is being modified, an affected facility (prior to modification)?
   ☐ Yes ☐ No ☒ Not applicable. (Explain if necessary to clarify here and in the following items)

3. Does the proposed modification constitute a modification under NSPS to the existing source?
   ☐ Yes ☐ No ☒ Not applicable.

4. Will the existing source be an affected facility after modification?
   ☐ Yes ☐ No ☒ Not applicable.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS) APPLICABILITY

Part 61 NESHAPS:

1. Will the proposed new or modified source emit a pollutant controlled under an existing or proposed NESHAPS?
   ☐ Yes ☒ No (if yes, identify the pollutant).

2. Is the proposed new or modified source subject to an existing or proposed NESHAPS?
   ☐ Yes ☒ No (if yes, identify NESHAPS).

Part 63 NESHAPS:

1. Will the proposed new or modified source emit a pollutant controlled under an existing Part 63 NESHAPS?
   ☐ Yes ☒ No (if yes, identify the pollutant).

2. Is the proposed new or modified source subject to an existing Part 63 NESHAPS?
   ☐ Yes ☒ No (if yes, identify NESHAPS).

3. Is the proposed project subject to s. 112(g) of the Clean Air Act?
   ☐ Yes ☒ No.

The section 112(g) rules only apply to case-by-case MACT standards that are developed for new construction or reconstruction of sources that (by themselves) constitutes a new major source of federal hazardous air pollutants (for source categories not covered under an existing Part 63 MACT standard).

CRITERIA FOR PERMIT APPROVAL

Section 285.63, Wis. Stats., sets forth the specific language for permit approval criteria. The Department finds that:

1. The source will meet emission limitations.

2. The source will not cause nor exacerbate a violation of an air quality standard or ambient air increment.

3. The source is operating or seeks to operate under an emission reduction option. Not Applicable.

4. The source will not preclude the construction or operation of another source for which an air pollution control permit application has been received.

PRELIMINARY DETERMINATIONS FOR CONSTRUCTION PERMIT NO. 12-POY-079 AND OPERATION PERMIT NO. 662031150-F01

The Wisconsin Department of Natural Resources has reviewed the construction permit application and other materials submitted by FTS International Services, LLC and hereby makes a preliminary determination that this project, when constructed and operated consistent with the application and subsequent information submitted, will be able to meet the emission limits and conditions included in the attached Draft Permit. Furthermore, the Department hereby makes a preliminary determination that an operation permit may be issued with the following Draft Applicable Limits and Draft Permit Conditions. A final decision regarding emission limits and conditions will be made after the Department has reviewed and evaluated all comments received during the public comment period. The proposed emission limits and other proposed conditions in the Draft Permit are written in the same form that they will appear in the construction permit and the operation permit. These proposed conditions may be changed as a result of public comments or further evaluation by the Department. The United States Environmental Protection

Agency will be given the opportunity to comment on the operation permit of any Part-70 source prior to the Department making a final decision on the operation permit.

PERMIT FEE CALCULATION

BASIC FEES.

Construction or replacement of a PSD or NAA minor source or the PSD or NAA minor modification of a Part 70 minor source. [$3,000]	$3,000.00
TOTAL BASIC FEES	$3,000.00

ADDITIONAL FEES.

The permit application required review and analysis of two or more basic emissions units.	$9,600.00
The permit application is for a PSD or NAA minor source or minor modification to a major PSD or NAA source whose projected air quality impact requires a detailed air quality modeling analysis. [$1,000]	$1,000.00
The application is for a source not reviewed under ch. NR 405 or 408, Wis. Adm. Code, where the applicant requested in writing and received the permit within 50 days of receipt of a complete application [$5,000].	$5,000.00
The construction permit requires emission testing.	$5,000.00
TOTAL ADDITIONAL FEES	$20,600.00
TOTAL FEES (Total Basic Fees + Total Additional Fees)	$23,600.00

CREDITS.

The initial fee submitted with the application. [$7,500]	-$7,500.00
TOTAL CREDITS	-$7,500.00
TOTAL AMOUNT DUE (Total Fee + Total Credit)	$16,100.00

Before The
State Of Wisconsin
DIVISION OF HEARINGS AND APPEALS

In the Matter of an Air Pollution Control Construction Permit Issued to FTS International Services, LLC, Located in Trempealeau County, Arcadia, Wisconsin

Case No. DNR-13-043

Permit Number 12-POY-079

FINDINGS OF FACT, CONCLUSIONS OF LAW AND ORDER

Pursuant to due notice, hearing was held at Madison, Wisconsin on April 8, 9 and 10, 2014, in Madison, Wisconsin, and at Whitehall, Wisconsin on April 11, 2014, Jeffrey D. Boldt, Administrative Law Judge presiding. The parties requested an opportunity to submit written closing arguments, and the last was received on August 1, 2014.

In accordance with Wis. Stat. §§ 227.47 and 227.53(1)(c), the PARTIES to this proceeding are certified as follows:

FML Sand, LLC (previously known as FTS International Services)(FML), by

Attorney Eric McCloud
Eric McLeod Law, LLC
146 Lakewood Blvd.
Madison, WI 53704

Midwest Environmental Advocates and Paul Winey, Nancyanne Winey, Kary Jonas, Peter Jonas, Margaret Olsen, Beth Killian, Donna Brogan, Bert Hodous, Rebecca Larsen and Shirley Roberts (Petitioners), by

Attorney Sarah Williams
Midwest Environmental Advocates, Inc.
612 West Main Street, Suite 302
Madison, WI 53703

Wisconsin Department of Natural Resources (DNR or Department), by

Attorney Michael G. Szabo
DNR – Office of Legal Services
P. O. Box 7921
Madison, WI 53707-7921

Exhibit C

ISSUES FOR HEARING AND SUMMARY OF RULINGS

The Department granted a contested case hearing on Issue Number One on the following disputes of material fact:

a. Whether, as permitted in the air pollution control [construction] permit, fugitive dust sources will contribute to FTS's total particulate matter emissions, and
b. Whether it was reasonable for the DNR to refuse to include fugitive dust sources in its modeling for compliance with particulate matter ambient air standards.

Ruling: Fugitive dust emissions will contribute to total particulate matter emissions but are unlikely to cause or exacerbate a violation of any ambient air standard. It was reasonable for the DNR to exclude fugitive particulate emissions from its air dispersion modeling because the permit requires a Fugitive Dust Control Plan, and this complied with the Department's Guidance document on this issue.

The Department granted a contested case hearing on Issue Number Two on the following disputes of material fact:

a. Whether the FTS facility will cause air pollution because of nitrogen dioxide emissions.
b. Whether the FTS facility will cause air pollution because of particulate matter emissions.
c. Whether the pollutant controls selected by FTS, baghouses, are able to achieve the low emission limits for particulate matter in FTS's air pollution control [construction] permit; and
d. Whether the pollutant controls selected by FTS, baghouses, lose efficiency over time.

Ruling: The petitioners have not shown that the facility will cause a violation of ambient air standards for nitrogen dioxide or particulate matter emissions. The baghouse emission limits are achievable. While baghouse technology does lose efficiency over time, the petitioners have not carried their burden of demonstrating that any deterioration in control efficiency will cause or exacerbate an ambient air standard.

The Department granted a contested case hearing on Issue Number Three on the following disputes of material fact:

a. Whether compliance emission tests are necessary to assure compliance with the terms and conditions of the permit, and
b. Whether site-and facility-specific conditions—including impacts from nearby facilities and the fact that the PM limits are unachievable—warrant ambient air monitoring for both types of particulate matter and more stringent and specific requirements for ambient air monitoring in the permits.

Ruling: The construction air permit does have sufficient and necessary compliance emission tests. The petitioners have demonstrated that the preliminary variance from

required ambient air monitoring should be revoked because the modeled results themselves demonstrate a "significant" level of particulate matter emissions within the meaning of NR 415.075(4)(b).

The Department's permit as issued met all legal requirements and, in terms of the complexity of its analysis, exceeded what was necessary for this minor source for air permitting purposes. The Department reviewed air dispersion modeling which was not required for a minor source of air pollution for Prevention of Significant Deterioration (PSD) purposes. However, the results of the air dispersion modeling, along with certain input assumptions reflected in the modeling but not required in the permit, indicated that under a worst case scenario this source could produce emissions that come very close to an exceedance of the 24-hour PM2.5 ambient air standard.

Accordingly, the permit is modified to revoke the variance from Wis. Admin. Code ch. NR 415.075(4)(a) air monitoring requirements. The ambient air monitoring program requirements as set forth therein should be followed until such time as the permit holder can demonstrate through compliance emission testing that air monitoring requirements are no longer necessary.

All other provisions of the permit shall remain in full force and effect.

FINDINGS OF FACT

1. FTS International Proppants, LLC (FTS International), applied to the DNR for both construction and operation air pollution control permits. (Ex. 200)

2. Following DNR's issuance of the construction permit to FTS International, FML Sand, LLC (FML) became a successor-in-interest to FTS International

3. The FML is proposing a new sand mining and processing operation which will include mining sand, transport and hauling, washing, drying and sorting. There will be one crusher rated at 200 tons per hour. All equipment will run on 3 phase electricity provided by the public utility. The operation will include extracting and processing sand, including mining, crushing, washing, drying, sorting, and hauling. There will be a combination of raw and washed sand stockpiles as well as overburden stockpiles present on the mine. Most, if not all overburden, will be used for making berms and will be seeded according to the reclamation plan. The sand will be a product used for the oil/gas industry.

The site is located within a rural area and occupies 315 acres along the north side of State Highway 95. The City of Arcadia is located about 1 mile west of the operation with few farms and rural residence located nearby. An existing mine is located to the southwest of the subject mine. The terrain is rolling with the highest local elevations present on or near the proposed processing plant. Turton Creek and a tributary to North Creek are located to the south and north of the mine operation, respectively. Both water bodies are tributaries of the Trempealeau River.

The proposed mine is located on a ridge thus the land surface slopes to the south and north toward Turton Creek and North Creek, respectively. (Ex. 101)

4. On June 24, 2013, the DNR issued an air pollution control (the FML Permit) to FTS International. (Exs. 217 and 218)

5. The petition for a contested case was filed on July 24, 2013, and granted on August 13, 2013. A subsequent grant letter was issued on August 29, 2013, that included the individual petitioners by name.

6. On October 17, 2013, the DNR filed a Request for Hearing with the Division of Hearings and Appeals. A hearing was held in Madison, Wisconsin from April 8-10, 2014, followed by a public hearing in Trempealeau County, Wisconsin on April 11, 2014.

7. The DNR conducted an analysis that included air dispersion modeling and made a preliminary determination that the project, when constructed and operated consistent with the application, permit limits, and other parameters set forth in the preliminary determination, would not cause or exacerbate a violation of any ambient air quality standard. (Exs. 202 and 203)

8. FML is a minor source for air permitting purposes. (Hart Pre-filed at 4)

9. DNR's emission modeling uses the highest potential emission rate, based on the worst case scenario conditions, to prescribe limits. (Roth Pre-filed at 10)

10. A stack is modeled with its highest possible emission rate along with a typical flow rate for all allowable hours of operation in each day. Modeled conditions are generally higher than real world conditions in most circumstances. (Roth Pre-filed at 10)

11. The DNR has not found a reliable modelling approach for fugitive emissions. It relies on a non-modelling based approach to minimize fugitive emissions to assure compliance and protect air quality.

12. Numerous DNR witnesses testified that the Department uses means other than modeling to account for fugitive emissions. Results of modeling fugitive dust cannot always predict accurately whether those emissions would cause or exacerbate a violation of an ambient air quality standard. However, fugitive emissions will likely be generated by the crusher, hopper, drilling and blasting process, transport and wind. (Klafka) The primary method used by DNR for addressing fugitive dust from fugitive sources is the preparation and implementation of a fugitive dust control plan. (Yeung Pre-filed at 16)

13. DNR Senior Air management Specialist Jeffrey Sims conducted an analysis that demonstrated compliance with the National Ambient Air Quality Standards (NAAQS). Mr. Sims relied on FML's emission parameters, building heights, a barrier fence and other related modeling inputs via the permit application.

14. The NAAQS are designed to protect the environment and public health. NAAQS are generally not applicable to all fugitive emissions, since a large portion of these emissions occur close to its point of origin, often on company property without public access. Emissions that do not leave company property would not impact ambient air for regulatory purposes. (Sims Pre-filed at 7)

15. A barrier fence can restrict fugitive emissions to company property. There was no binding permit condition that required the barrier fence be constructed as part of the project. (Klafka Pre-filed at 20; Ex. 218) The Petitioners expert, Mr. Klafka, testified that he has seen DNR require fences in conjunction with other air permits.

16. Air dispersion modeling is not a requirement of minor source permit issuance under any state or federal air pollution requirement. (Wis. Stat. § 285.63(11); Johnson Pre-filed at 7)

17. Numerous DNR air program experts testified that no applicable law requires fugitive emission modeling. DNR presented extensive testimony about the shortcomings of fugitive emission modeling framework as the Petitioners propose to apply it here. DNR experts also testified extensively about the permitting approach it uses in place of fugitive modeling, including the requirement for a fugitive dust control plan to regulate fugitive emissions. The DNR's modeling guidance does provide for modeling fugitive emissions in some circumstances: "Non-PSD fugitive sources are not usually modeled by WDNR, but such an analysis could be performed should it be requested by the permit review engineer or an air management supervisor." (Ex. 25 at 22)

18. A Fugitive Dust Control Plan is required for all industrial sand mining operations by Wis. Admin. Code ch. NR 415.075(6) and is required in the FML Permit. (Yeung Pre-filed at 16; Ex. 218)

19. Most fugitive dust does not travel far from its point of generation and is therefore not likely to affect the same locations as the point of maximum impact of stack locations. (Roth)

20. The sand mining operation it is not likely to create large amounts of fine particulate matter during the processing of the industrial sand. At the points in the process where the sand is dry, it is enclosed in structures and mechanical controls are utilized to capture the particulate matter. Fugitive dust tends to be larger particles, which tend to settle out sooner than smaller particles. (Schneider Pre-filed at 4) Only approximately 3 % of fugitive dust emissions are likely to be less than 2.5 micrometers in size. (Schneider Pre-filed at 4)

21. "Frac sand" from these sand operations are "not likely to fracture." (Klafka Test. at 1:39:26)

22. DNR does not model instantaneous releases such as an explosion, blasting, or spill, and testified that no suitable model exists that is approved for regulatory use. FML restricted the amount of blasting by limiting explosives to certain tons per any 12 consecutive

month period. The DNR considers that restriction to limit annual emissions from nitrogen oxides and to ultimately limit all other pollutants associated with that activity.

23. DNR witnesses testified that nitrogen dioxides would not impede attainment of an annual standard because the emissions from blasting would occur in a few seconds and then disperse. The DNR considers nitrogen dioxide to be insignificant in terms of modeling. Mr. Johnson testified persuasively that nitrogen dioxide from blasting sources is of a very short term nature, and would be considered insignificant for purposes of the annual standard. (Johnson hr'g test., Pre-filed at 9)

24. DNR witnesses testified that baghouses are a commonly used and accepted control measure and the Permit allows baghouses only insofar as they yield the required air emissions.

25. The permit specifically establishes an emission limit that the baghouse must achieve.

26. A properly operated and maintained baghouse will effectively control emissions.

27. The construction air permit requires the permittee to adopt measures that will yield compliance with air permit limits.

28. A construction permit performs a different function than an operation permit. The DNR testified that its permitting scheme allows the source to construct and initially operate, conduct the required stack testing, and demonstrate compliance and provide the actual emission rates of those sources.

29. The construction permit requires FML to conduct emissions testing of its stack sources. Specifically, the permit requires FML to conduct compliance emission testing within 90 days after the start of initial operation. The Department may not issue an operation permit until the source has demonstrated compliance as required by the construction permit. The Department has the authority to revise permit conditions after a source has been constructed and if the source failed their initial compliance demonstration testing.

30. The FML Facility was modeled to take up 100% of the 24-hour PM2.5 ambient air standard and 67% of the annual average PM2.5 ambient air standard. (Ex. 3 at 15, 20; Klafka Pre-filed at 22-23)

31. The modeling included only stack sources, and did not consider fugitive sources, which according to the DNR's own emission estimates were approximately 30% of the total PM2.5 emissions from the FML Facility. (Ex. 3 at 15; Klafka Pre-filed at 23)

32. The DNR's modeling review may not have fully taken into account the impact of PM2.5 and PM10 emissions from other nearby facilities because the background concentrations used in the modeling were calculated using ambient air quality data gathered before many of the nearby industrial sand mines and processing facilities were permitted or constructed. (Klafka

hr'g test.) Numerous members of the public testified about their health concerns about air quality in the area in the context of the rapidly growing frac sand mining and processing industry. (Whitehall hearing record on April 11, 2014)

33. Even if the initial stack test—the only compliance emission testing currently required in the FML Permit—shows compliance with the emission limits at startup, as baghouses decline in efficiency over time, they may not continue to meet the low emission limits for PM2.5. (Klafka hr'g test; Klafka Pre-filed at 51)

34. The FML Permit includes a requirement to install and operate a pressure drop monitor for the baghouses at both stacks. (Ex. 4 at 2-3, 7-8)

35. The DNR relies on the pressure drop monitors to determine ongoing compliance with the stack source emission limits. (Ex. 4 at 2-3, 7-8; Klafka Pre-filed at 48-49; Stoffel Pre-filed at 3-4; *See* Wis. Admin. Code ch. NR 439.055(1)(a).

36. Facilities operating with pressure drop monitors for baghouses have failed compliance emission tests where there was no indication from the pressure drop monitor that the baghouses were not functioning properly. (Klafka Pre-filed at 48-49; Klafka hr'g test.; Schneider hr'g test.)

37. Even properly maintained baghouses can develop small holes or tears. (Stoffel hr'g test.)

38. Regular compliance emission testing—or stack testing—is necessary to confirm that the baghouses continue to function at a level that achieves compliance with emission limits. (Klafka Pre-filed at 52)

39. Continuous emission monitors are a reliable method that would provide continuous data regarding the efficiency and function of baghouses, unlike pressure drop monitors, which are examined only periodically. (Klafka hr'g test.; Klafka Pre-filed at 52)

40. Bag leak detection is another sufficiently sensitive method to continuously monitor emissions from the stacks to ensure that any small leaks, tears, or reduced baghouse efficiency are not causing a violation of the emission limits. (Klafka hr'g test.; Klafka Pre-filed at 49-51)

41. The DNR relies on the regulatory authority in Wis. Admin. Code ch. NR 415.075 as a basis to require certain facilities to operate ambient air monitors for PM10. (Roth hr'g test.)

42. The DNR requires other industrial sand mines and processing facilities to install ambient air monitors to sample for PM10. (Klafka Pre-filed at 63)

43. The DNR granted a variance from the particulate matter ambient air monitoring requirement for the FML Facility on August 13, 2013. (Ex. 76) However, on its face the Air

Monitoring Variance indicated that the Department would review the Variance during the operation permit review.

44. Results from PM10 ambient air monitors at other industrial sand mines and processing facilities, assuming conservatively that all PM10 is PM2.5, demonstrates that there are impacts from PM2.5 emissions from industrial sand mines and processing facilities on the ambient air. (Klafka Pre-filed at 63)

45. Studies from similar facilities demonstrate that fine particulates, such as PM2.5 and PM4 constitute between 42% and 61% of PM10 emissions from those facilities. (Klafka hr'g test.; Exs. 77-78)

46. Mr. Klafka's modeling of facility impacts showed impacts above the Significant Impact Level up to 4 miles from the FML Facility. (Klafka Pre-filed at 22; Klafka hr'g test.)

47. Smaller particulate matter particles "can travel very long distances" of nearly 600 kilometers. (Klafka hr'g test.; Ex. 108)

48. It is feasible to develop an effective and enforceable ambient air monitoring system for PM10 and PM2.5, using upwind and downwind monitors to understand the background and the facility impact. (Klafka hr'g test.)

49. Filter-based ambient air monitors allow the facility and the DNR to analyze the particulate matter captured to identify whether it came from the facility being monitored. (Klafka hr'g test.)

50. Given how close the modelling results are to an exceedance of the 24-hour PM2.5 ambient air standard, the petitioners have demonstrated by a preponderance of the credible evidence that the variance from required ambient air monitoring, which was incorporated into the permit, should be revoked. The FML Facility was modeled to take up 100% of the 24-hour PM2.5 ambient air standard and 67% of the annual average PM2.5 ambient air standard. (Ex. 3 at 15, 20) The modeled numbers represent inherently "significant" levels of particulate matter from this facility within the meaning of Wis. Admin. Code ch. NR 415.075.

51. The permit is accordingly modified to retain the required ambient air monitoring as set forth in Wis. Admin. Code ch. NR 415.075(4)(a). The preliminary Variance must be revoked.

52. The permit holder can apply for another Variance from ambient air modeling requirements pursuant to the administrative code if it has results from compliance emission testing that demonstrate that actual emission limits are not as close to an exceedance as the modeled results from air dispersion modeling.

DISCUSSSION

All parties agree that the FML Sand plant is a minor source for purposes of Prevention of Significant Deterioration (PSD) review. The Department typically does not require air dispersion modelling for minor sources. However, it did for this permit review.

The result of the modelling established that the FML Facility was modeled to take up 100% of the 24-hour PM2.5 ambient air standard and 67% of the annual average PM2.5 ambient air standard. (Ex. 3 at 15; 20; Klafka Pre-filed at 22-23) This does not warrant denial of the permit or any major changes to the permit other than to revoke the Variance from the established ambient air monitoring requirements set forth in Wis. Admin. Code ch. NR 415.075 (4)(a).

Revocation of the Variance is appropriate for several reasons. First, the air dispersion modeling results—taking up 100 % of the 24-hour PM2.5 ambient air standard and 67% of the annual average PM2.5 ambient air standard—clearly demonstrate as a matter of law that "the general public will be exposed to significant levels of particulate matter from the source." A single source taking up to 100 percent of any standard applicable to the general public is inherently significant within the meaning of Wis. Admin. Code ch. NR 415.075(4)(b).

Second, the modeling did not take into account fugitive emissions. This was appropriate given both the Fugitive Dust Control plan and the problems with modeling these emissions. But the fact remains that, according to the DNR's own emission estimates, fugitive emissions were approximately 30% of the total PM2.5 emissions from the FML Facility. (Ex. 3 at 15; Klafka Pre-filed at 23) It is also true that most fugitive particulate emissions are likely to be larger than 2.5 micrometers in size. (Ex. 108) However, some portion—3 percent on average according to evidence at hearing-- are likely to be smaller particles that get off-site and into the ambient air.

Third, the modelling inputs included the assumption of a fence barrier around the facility which is not required as part of the air pollution construction permit. (See: Exs.104 and 218) The fence would have helped to restrict fugitive dust emissions to on-site areas which are not part of the regulated ambient air. (Wis. Admin. Code ch. NR 400.02(24)) If the fence barrier is in fact constructed it will help to keep fugitives on site.

Finally, the modeling may not fully take into account the impact of PM2.5 and PM10 emissions from other nearby facilities because the background concentrations used in the modeling were calculated using ambient air quality data gathered before many of the nearby industrial sand mines and processing facilities were permitted or constructed. Numerous members of the public testified about their concerns about air quality in the area in the context of the rapidly growing frac sand mining and processing industry.

The DNR and FML Sand experts suggested that maximum stack and fugitive emissions would not occur at the same time and that the modelling results demonstrating emissions at the brink of a potential exceedance would be the worst case scenario. However, it seems prudent

given the air dispersion modeling results to revoke the Variance to required air emission monitoring. The modeled results are very close to an exceedance. This represents a "significant level" of particulates and warrants revocation of the Variance which was incorporated into the permit. It is premature to grant a variance from air monitoring requirements at this time. The permit holder can apply for another variance after construction is complete and if compliance testing establishes that modeled results reflect real world conditions and input assumptions. The permit should be modified to require that FML Sand NR undertake air monitoring as required by Wis. Admin. Code ch. NR 415.075(4)(a).

Petitioners argue that the Department should have also applied the federal 1-hour NO2 NAAQS and an annual average PM2.5 NAAQS that have been promulgated by the U.S. EPA, even though these standards have not been promulgated yet by the Department. (Pet. Brief at 28-32) There is a well-established process for the Department to promulgate new federal standards into the state regulations, and this process has not yet been completed for the 1-hour NO2 NAAQS or the annual average PM2.5 NAAQS. (Hart hr'g test.) The Department, as a state administrative agency, may not implement or enforce any standard, requirement, or threshold, including as a term or condition of a permit issued by the agency, unless that standard, requirement, or threshold is explicitly required or explicitly permitted by statute or by a rule that has been properly promulgated. (*See* Wis. Stat. § 227.10(2m)) Therefore, the Department applied the appropriate standard as part of this permit review even if it has other obligations to comply with federal law.

All other provisions of the permit shall remain in full force and effect.

CONCLUSIONS OF LAW

1. The Division of Hearings and Appeals has the authority to hear contested cases and issue necessary orders in reviews of air permit cases pursuant to Wis. Stat. §§ 227.43(1)(b) and 283.63. Following the hearing the department's action may be affirmed, modified or withdrawn. (Wis. Stat. § 283.63(1)(b))

2. The DNR complied with Wis. Stat. § 285.63(1)(b) in issuing an air pollution control construction permit to FML. However, to ensure that the project does not cause or exacerbate a violation of an ambient air standard, the variance to the ambient air monitoring requirements of Wis. Admin. Code ch. NR 415.075(4)(a) must be revoked.

3. "Ambient air" means the portion of the atmosphere external to buildings and to which the general public has access. (Wis. Admin. Code ch. NR 400.02(24))

4. "Particulate" or "particulate matter" means any airborne finely divided solid or liquid material with an aerodynamic diameter smaller than 100 micrometers. (Wis. Admin. Code ch. NR 400.02(118)) The project will generate particulate or particulate matter within the meaning of this definition.

5. "Particulate matter emissions" means all finely divided solid or liquid material, other than uncombined water, emitted to the ambient air as measured by an applicable reference method or an equivalent or alternative method specified by the department. (Wis. Admin. Code ch. NR 400.02(119)) The project will generate "particulate matter emissions" within this definition.

6. "PM2.5" means particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers as measured in the ambient air by a reference method based on Appendix L of 40 CFR part 50, incorporated by reference in Wis. Admin. Code. ch. NR 484.04 (6g), and designated in accordance with 40 CFR part 53, incorporated by reference in Wis. Admin. Code ch. NR 484.03(5), or by an equivalent method. (Wis. Admin. Code ch. NR 400.02(123e)) The project will generate "PM2.5" within the meaning of this definition.

7. "PM2.5 emissions" means PM 2.5 emitted to the ambient air as measured by an applicable reference method or an equivalent or alternative method specified by the department. PM2.5 emissions include filterable emissions and gaseous emissions from a source or activity that condense to form particulate matter at ambient temperatures. (Wis. Admin. Code ch. NR 400.02(123m)) The project will generate "PM2.5 emissions" within the meaning of this definition.

8. "PM10" means particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers as measured in the ambient air by a reference method based on Appendix J of 40 CFR part 50, incorporated by reference in Wis. Admin. Code ch. NR 484.04(5), and designated in accordance with 40 CFR part 53, incorporated by reference in Wis. Admin. Code ch. NR 484.03(5), or by an equivalent method. (Wis. Admin. Code ch. NR 400.02(123s)) The project will generate "PM10" within the meaning of this definition.

9. "PM10 emissions" means finely divided solid or liquid material, with an aerodynamic diameter less than or equal to a nominal 10 micrometers, emitted to the ambient air as measured by an applicable reference method or an equivalent or alternative method specified by the department. PM10 emissions include filterable emissions and gaseous emissions from a source or activity that condense to form particulate matter at ambient temperatures. (Wis. Admin. Code ch. NR 400.02(124)) The project will generate "PM10 emissions" within the meaning of this definition.

10. The permit's prohibition on causing or exacerbating a violation of an ambient air quality standard applies to fugitive as well as stack sources.

11. DNR reasonably refused to include fugitive dust sources in its modeling for compliance with particulate matter ambient air standards. Wisconsin law accounts for the shortcomings of fugitive modeling by establishing other means of setting permit terms. Specifically, the DNR considered FML fugitive emissions by a Fugitive Dust Control Plan, not modeling. However, it is also appropriate to consider modelling results in conjunction with fugitive emissions in the context of the variance to required ambient air monitoring for the facility

12. Wisconsin law does not require air dispersion modeling for minor sources, such as FML.

13. DNR considered air dispersion modeling in accordance with the authority granted to it by the legislature.

14. The DNR complied with Wis. Stat. § 285.63(1)(a) in issuing an air pollution control construction permit to FML.

15. The FML facility permit includes the required limit on nitrogen dioxide emissions. Nitrogen dioxide from blasting sources is of a very short term nature, and would be considered insignificant for purposes of the annual standard.

16. The pollutant controls selected by FML, baghouses, are able to achieve the low emission limits for particulate matter in FML's air pollution control construction permit.

17. The Permit requires compliance emissions testing that will reveal whether FML complies with its emission limits.

18. The permit requires the facility to prepare a Malfunction, Prevention and Abatement Plan to address how the facility will maintain a baghouse to preserve its efficiency.

19. The Permit requires compliance with its terms and conditions including conducting emission tests.

20. Wisconsin Admin. Code ch. NR 415.075(4)(a) relating to particulate matter emission limitations for ledge rock quarries and industrial sand mines requires ambient air monitoring in the absence of a variance under sub. (b) The petitioners have established as a matter of law that the required ambient air monitoring is appropriate given "the significant particulate matter that the general public will be exposed" to will be generated from the facility as established by air dispersion modeling and that the variance should be revoked.

21. The permit holder retains the right to re-apply for a Variance from ambient air monitoring requirements if the results of compliance emission testing show the general public is exposed to a less significant level of particulate matter than that reflected in air dispersion modeling results.

ORDER

WHEREFORE, IT IS HEREBY ORDERED, the permit be MODIFIED as follows:

The Variance from Wis. Admin. Code ch. NR 415.075(4)(a) air monitoring requirements is HEREBY REVOKED, and the permit (at p.14 of 29) should be modified to reflect this and that the permit holder can re-apply for a Variance if it has compliance emission testing results which support suspending ambient air monitoring requirements.

IT IS FURTHER ORDERED, that all other portions of the permit remain in full force and effect except as modified above.

Dated at Madison, Wisconsin on December 1, 2014.

STATE OF WISCONSIN
DIVISION OF HEARINGS AND APPEALS
5005 University Avenue, Suite 201
Madison, Wisconsin 53705
Telephone: (608) 266-7709
FAX: (608) 264-9885

By: Jeffrey D. Boldt
Jeffrey D. Boldt
Administrative Law Judge

NOTICE

Set out below is a list of alternative methods available to persons who may desire to obtain review of the attached decision of the Administrative Law Judge. This notice is provided to insure compliance with Wis. Stat. § 227.48 and sets out the rights of any party to this proceeding to petition for rehearing and administrative or judicial review of an adverse decision.

1. Any party to this proceeding adversely affected by the decision attached hereto has the right within twenty (20) days after entry of the decision, to petition the secretary of the Department of Natural Resources for review of the decision as provided by Wisconsin Administrative Code NR 2.20. A petition for review under this section is not a prerequisite for judicial review under Wis. Stat. §§ 227.52 and 227.53.

2. Any person aggrieved by the attached order may within twenty (20) days after service of such order or decision file with the Division of Hearings and Appeals a written petition for rehearing pursuant to Wis. Stat. § 227.49. Rehearing may only be granted for those reasons set out in Wis. Stat. § 227.49(3). A petition under this section is not a prerequisite for judicial review under Wis. Stat. §§ 227.52 and 227.53.

3. Any person aggrieved by the attached decision which adversely affects the substantial interests of such person by action or inaction, affirmative or negative in form is entitled to judicial review by filing a petition therefore in accordance with the provisions of Wis. Stat. §§ 227.52 and 227.53. Said petition must be served and filed within thirty (30) days after service of the agency decision sought to be reviewed. If a rehearing is requested as noted in paragraph (2) above, any party seeking judicial review shall serve and file a petition for review within thirty (30) days after service of the order disposing of the rehearing application or within thirty (30) days after final disposition by operation of law. Since the decision of the Administrative Law Judge in the attached order is by law a decision of the Department of Natural Resources, any petition for judicial review shall name the Department of Natural Resources as the respondent and shall be served upon the Secretary of the Department either personally or by certified mail at: 101 South Webster Street, P. O. Box 7921, Madison, WI 53707-7921. Persons desiring to file for judicial review are advised to closely examine all provisions of Wis. Stat. §§ 227.52 and 227.53, to insure strict compliance with all its requirements.

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Before the
STATE OF WISCONSIN
DIVISION OF HEARINGS AND APPEALS

In the Matter of an Air Pollution Control Construction Permit Issued to FML Sand, LLC (previously known as FTS International Services, LLC), Located in Trempealeau County, Arcadia, Wisconsin

Case No. DNR-13-043

Permit Number 12-POY-079

PRE-FILED DIRECT TESTIMONY OF STEVEN KLAFKA
ON BEHALF OF PETITIONERS

List of Attachments

Exhibit 1	Resume of Steven Klafka, P.E., BCEE, March 2014.
Exhibit 2	Bay Environmental Strategies, Inc., Construction & Operation Permit Application, FTS International Proppants, LLC, State Highway 95, Arcadia, Wisconsin. March 29, 2012.
Exhibit 3	Wisconsin Department of Natural Resources, Preliminary Determination for Construction Permit No.: 12-POY-079 and Operation Permit No.: 662031150-F01, February 22, 2013.
Exhibit 4	Wisconsin Department of Natural Resources, Permit #12-POY-079, June 24, 2013.
Exhibit 5	Wisconsin Center for Investigative Journalism spreadsheet, frac sand mines and processing facilities in Wisconsin (Oct. 2013).
Exhibit 6	Email dated March 26, 2014, from Deborah Dix – DNR to S. Klafka – Wingra Engineering, Current List of Frac Sand Mining and Processing Facilities.
Exhibit 7	Public hearing appearances and testimony from April 16, 2013, public hearing on draft Construction Permit No.: 12-POY-079 and Operation Permit No.: 662031150-F01 for FTS International Proppants, LLC.
Exhibit 8	Wisconsin Department of Natural Resources, Memorandum, John Roth – Station Source Modeling Team to Air Dispersion Modeling Team, PM2.5 Regional Background Concentrations (Apr. 15, 2011).
Exhibit 9	Wisconsin Administrative Code Chapter NR 404.
Exhibit 10	USEPA, Figure Comparing the Size of Particulate Matter with Human Hair and Sand.
Exhibit 11	USEPA, Overview of EPA's Revisions to the Air Quality Standards for Particle Pollution (Particulate Matter) (Dec. 14, 2012).

Exhibit D

Exhibit 12	USEPA, Final Revisions to the National Ambient Air Quality Standards for Nitrogen Dioxide (Jan. 22, 2010).
Exhibit 13	USEPA, Revisions to the Primary National Ambient Air Quality Standard, Monitoring Network, and Data Reporting Requirements for Sulfur Dioxide (June 2, 2010).
Exhibit 14	Wingra Engineering, S.C., Figures from Modeling Analysis for FML Sand, LLC, completed March 28, 2014.
Exhibit 15	Email dated March 13, 2014, from J. Sims – DNR to S. Klafka – Wingra Engineering, S.C., Supporting Modeling Files for FTS International Services Permit #12-POY-079.
Exhibit 16	USEPA, WebFIRE Emissions Factors Applicability.
Exhibit 17	USEPA, Compilation of Air Pollutant Emission Factors, Section 11.2.2 – Unpaved Roads (Nov. 2006).
Exhibit 18	USEPA, WebFIRE Emission Factor Glossary of Terms.
Exhibit 19	USEPA, Compilation of Air Pollutant Emission Factors, Section 11.19.2 - Crushed Stone Processing and Pulverized Mineral Processing (Aug. 2004).
Exhibit 20	USEPA, Compilation of Air Pollutant Emission Factors, 11.19.1 Sand and Gravel Processing (Nov. 1995).
Exhibit 21	USEPA, Compilation of Air Pollutant Emission Factors, 13.2.4 Aggregate Handling and Storage Piles (Nov. 2006).
Exhibit 22	Wisconsin Department of Natural Resources, Nonmetallic Mining Air Emissions Guidance for the Development of the 1998 Air Emissions Inventory (Jan. 15, 1999).
Exhibit 23	USEPA, Compilation of Air Pollutant Emission Factors, 13.2.5 Industrial Wind Erosion (Nov. 2006).
Exhibit 24	Wisconsin Department of Natural Resources, Response to Comments on the Preliminary Determination for FTS International Services, LLC, Permit 12-POY-079 and 662031150-F01 (June 24, 2013).
Exhibit 25	Wisconsin Department of Natural Resources, Dispersion Modeling Guidelines (July 2009).
Exhibit 26	Wingra Engineering, S.C., NR 406 Construction Permit Application for Midwest Energy Resources Company, Superior, Wisconsin (Oct. 14, 2003).
Exhibit 27	Email dated July 23, 2009, from J. Roth – WDNR to S. Klafka – Wingra Engineering, S.C., Current Modeling Procedures for Midwest Energy.
Exhibit 28	Michigan Department of Natural Resources, Air Dispersion Modeling Guidance Document (Sept. 2009).
Exhibit 29	Email, C. Smith – MDEQ to S. Klafka – Wingra Engineering, S.C., Modeling Fugitive Dust Emissions for Non-PSD Permits in Michigan (Mar. 18, 2014).
Exhibit 30	Iowa Department of Natural Resources, Air Dispersion Modeling Guidelines For Non-PSD, Pre-Construction Permit Applications, (Dec. 30, 2013).
Exhibit 31	Email, B. Ashton – IDNR to S. Klafka – Wingra, Modeling Fugitive Dust Emissions for Non-PSD Permits in Iowa (Mar. 18, 2013).

Exhibit 32	Minnesota Pollution Control Agency, Air Dispersion Modeling Guidance (July 2013).
Exhibit 33	Email dated March 26, 2014, from J. Sullivan – MPCA to S. Klafka – Wingra Engineering, Modeling Fugitive Dust Emissions for Non-PSD Permits in Minnesota.
Exhibit 34	USEPA, User's Guide for the AMS/EPA Regulatory Model – AERMOD (Sept. 2004).
Exhibit 35	40 CFR Part 51 Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule Federal Register / Vol. 70, No. 216 / Wednesday, November 9, 2005 / Rules and Regulations.
Exhibit 36	Madison Gas & Electric Company, Blount Street Heating Station, 2012 Air Emissions Inventory Report (June 7, 2013).
Exhibit 37	Wingra Engineering, S.C., Comments on Draft Permit #12-POY-079, FTS International Proppants, LLC, Acadia, Trempealeau, Wisconsin (Mar. 15, 2013).
Exhibit 38	Wisconsin Department of Natural Resources, Aarrocast, Inc., Permit #11-POY-262 (June 7, 2012).
Exhibit 39	Wisconsin Department of Natural Resources, Permit #12-POY-127 (Dec. 14, 2012).
Exhibit 40	Wisconsin Department of Natural Resources, Preliminary Determination, FID No. 469033840, Permit No. 13-JJW-103 (Nov.12, 2013).
Exhibit 41	Wisconsin Department of Natural Resources, Permit #13-JJW-103, (Dec.18, 2013).
Exhibit 42	Wingra Engineering, S.C., Comments on Draft Permit #11-JGB-183, Highway 10 Sand Processing Plant, Township of Union, Wisconsin (Nov. 9, 2012).
Exhibit 43	Wisconsin Department of Natural Resources, Preliminary Determination for Permit #11-JGB-183 (Oct. 9, 2012).
Exhibit 44	Midwest Environmental Advocates, Comments on Air Pollution Draft Construction and Operation Permit Nos. 12-MHR-157 & 603108330-F01 (Dec. 14, 2012).
Exhibit 45	Wisconsin Department of Natural Resources, Preliminary Determination for Permit #12-MHR-157 (Nov. 9, 2012).
Exhibit 46	Wingra Engineeering, S.C., Comments on Draft Permit #12-JGB-148, Preferred Sands Sand Processing Plant, Blair, Trempealeau, Wisconsin (Dec. 19, 2012).
Exhibit 47	Wisconsin Department of Natural Resources, Preliminary Determination for Permit #12-JGB-148 (Nov.12, 2012).
Exhibit 48	Wisconsin Department of Natural Resources, Letter to Waupaca Foundry, Inc. – Plants 2 / 3 regarding Permit No. 13-JJW-103 (June 28, 2013).
Exhibit 49	Wisconsin Department of Natural Resources, Notice of Violation Issued to Preferred Sands, Blair, Wisconsin (June 5, 2012).
Exhibit 50	Wisconsin Department of Natural Resources, Preliminary Determination for Construction Permit No.: 10-JGB-238 and Operation Permit No.: 662028620-F01 (Apr. 18, 2011).

Exhibit 51	Wisconsin Administrative Code Chapter NR 439.
Exhibit 52	USEPA, Air Pollution Training Institute, Course SI 412A - Fabric Filter Operation Review, Lesson 6: Fabric Filter Operation and Maintenance, 1995.
Exhibit 53	USEPA, Office of Air Quality Planning and Standards, Fabric Filter Bag Leak Detection Guidance, 1997.
Exhibit 54	Wisconsin Department of Natural Resources, Operation Permit # 469033840-P10 (Mar. 25, 2011).
Exhibit 55	Wisconsin Statutes Chapter 285.
Exhibit 56	Wisconsin Administrative Code Chapter NR 407.
Exhibit 57	FTS International, Inc. Permit Application, Daily Fugitive Dust Control Inspection Log, March 29, 2012.
Exhibit 58	Wisconsin Department of Natural Resources, Letter of Noncompliance to Preferred Sands of Wisconsin LLP (Mar. 19, 2012).
Exhibit 59	Wisconsin Department of Natural Resources, Responses to Discovery by Midwest Environmental Advocates (Mar. 17, 2014).
Exhibit 60	Wisconsin Department of Natural Resources, Permit # 816013330-F10 Issued to Midwest Energy Resources Company (Oct. 16, 2007).
Exhibit 61	Wisconsin Department of Natural Resources, News Release, New online air monitoring map and data for industrial sand mines and processing plants (Feb. 4, 2014).
Exhibit 62	Wisconsin Department of Natural Resources, Sand Mine Monitoring Data (Downloaded from WDNR Web Site on March 17, 2014).
Exhibit 63	Wisconsin Administrative Code Chapter NR 415.
Exhibit 64	NAQS, NR 415.075 (4) Ambient Air Monitoring Program for PM10 for Preferred Sands of Wisconsin, LLC, Blair Facility (Apr. 2013).
Exhibit 65	Pace Analytical, Air Quality Testing Proposal to Wingra Engineering, S.C. (July 17, 2013).
Exhibit 66	Wind Rose from Modeling Analysis for FTS International Permit No. 12-POY-079.
Exhibit 67	Article, WVU Scientist Designs Novel System to Monitor Air Around Marcellus Wells (Feb. 2, 2012).
Exhibit 68	Email, J. Greivell – Raeco to S. Klafka – Wingra Engineering, S.C., Perimeter Monitoring Solution (Mar. 20, 2014).
Exhibit 69	Raeco Brochure – The New Dust Trak II and DRX Aerosol Monitors.
Exhibit 70	Raeco Brochure – Dusttrak DRX Aerosol Monitors Models 8533, 8533EP and 8534.
Exhibit 71	Raeco Brochure – Dusttrak Aerosol Monitor Environmental Enclosure Model 8535.
Exhibit 72	Raeco Brochure – Dusttrak DRX Aerosol Monitor Theory of Operation.
Exhibit 73	Raeco Brochure – Mass Concentration Comparison Between the Dusttrak DRX Aerosol Monitor and TEOM.
Exhibit 74	Raeco Brochure – Dusttrak DRX Aerosol Monitor in Environmental Applications.
Exhibit 75	Letter from J. Rabideau – Bay Environmental to M. Sellers – WDNR, Ambient Air Monitoring Variance Request (July 12, 2013).

1 Exhibit 76 Wisconsin Department of Natural Resources, Decision to Approve Air
2 Monitoring Variance for FTS International Services (Aug. 13, 2013).
3

A: Under Section C.3. of the FML permit, the company is required to submit a plan to the DNR that describes the ambient air monitoring program for particulates. The company can also apply for a variance from the monitoring requirement. The requirement for operating an ambient particulate monitor is a particulate matter emission control requirement for ledge rock quarries and industrial sand mines unique to Wisconsin under s. NR 415.075(4), Wis. Adm. Code.

Q: Is the ambient air monitoring required by the FML Sand Permit adequate to demonstrate that FML Sand is in compliance with the FML Sand Permit?

A: No, the ambient air monitoring required in the permit is not adequate to demonstrate compliance with the permit for the following reasons:

The requirement is voluntary. FML can, and in fact did receive from the DNR, a waiver of the ambient monitoring requirement. Unlike other sand mines, FML will not be using a monitor to verify compliance with ambient air quality standards.

As discussed, adequate control of fugitive emissions is difficult to assess. The use of an ambient monitor to measure actual dust and particulate concentrations can be used to verify compliance with ambient standards.

In its June 24, 2013, response to public comments on the draft FML permit, the DNR relied heavily on the expectation that FML would be conducting ambient monitoring. In response to the question: What is the cumulative effect of multiple mines in the area?, the DNR responded,

> *Each of the sand mines will have to comply with the regulations in s. NR 415.075, Wis. Adm. Code with regards to the ambient air monitoring of particulate matter.*

(Exh. 24.)

In response to Ms. Winey's concern at the public hearing about the cumulative effect of multiple mines in the area, the DNR responded,

> *Each of the sand mine will have to comply with the regulations in s. NR 415.075, Wis. Adm. Code with regards to the ambient air monitoring of particulate matter.*

(Exh. 24.)

In response to my question in public comments concerning the accuracy of the modeling analysis since it did not include fugitive emissions, the DNR responded:

> *...state administrative rules may require the applicant to demonstrate compliance with ambient air standards by ambient air monitoring, or through other demonstration methods such as the minimization of fugitive dust through prevention planning and implementation.*

And the DNR went on to say:

> *Where modeling does not account for fugitive emissions, ambient monitoring will collect actual particle emissions. Ambient monitoring reflects actual conditions rather than projected impacts via air dispersion modeling.*

(Exh. 24.)

The only demonstration provided by the DNR that FML will comply with ambient air quality standards is its modeling analysis. As discussed, the modeling analysis is flawed for the following reasons:

Only emissions from the two facility stacks were evaluated. The impacts of fugitive emissions were not considered.

The modeled emissions from the facility stacks were based on stringent emission limitations. The DNR conducted no evaluation to determine if these limitations were achievable and did not require suitable long-term compliance demonstration methods

such as testing and Bag Leak Detection to verify these stringent limitations will be met in the future.

While the DNR does have the authority to include the fugitive emissions in its modeling analysis, and has done so in the past, it has justified not modeling fugitive emissions by relying on the fugitive dust control plan and the anticipation that FML would conduct ambient particulate monitoring. The plan allows FML to create visible emissions and does not contain enough methods to verify its compliance with the plan. FML has already received a variance from the DNR and will not be conducting an ambient monitoring program.

Based on the DNR modeling analysis, emissions from the two facility stacks will consume 100% of ambient air quality standard for PM2.5. No room is left to account for the air quality impacts from fugitive emissions.

No acceptable analysis has been conducted which verifies that FML will comply with ambient air quality standards. Ambient monitoring is necessary to measure actual off-site concentrations and verify compliance with ambient air quality standards.

Measurements from existing sand mines and processing plants also suggest that ambient air quality standards can be exceeded. In its June 24, 2013, response to public comments, the DNR stated:

> *Current ambient air monitoring systems are monitoring for PM10. Monitoring data collected has demonstrated no exceedance of the PM10 standards. Furthermore, using a worse-case assumption of all PM10 collected being PM2.5, there is little to no evidence of the PM2.5 ambient standards being exceeded by these operations.*

(Exh. 24.)

1 This is not true. Measurements from existing ambient monitors at sand mines
2 indicate the ambient air quality standard for PM2.5 could be exceeded. In its 2014 news
3 release, the DNR announced the on-line availability of ambient monitoring data from
4 existing industrial sand mines and processing plants. (Exh. 61.) In its March 17, 2014,
5 response to discovery, the DNR referred me to that same web site.
6 I reviewed the ambient monitoring data provided by the DNR from existing sand
7 mines and plants. (Exh. 62.) There were 13 monitors, which measured concentrations of
8 PM10, but not PM2.5. The measurement of PM10 rather than PM2.5 is noteworthy since
9 the ambient air quality standard for PM10 is much higher than the more current and
10 protective health-based standards for PM2.5. The 24-hour average standard for PM10 is
11 150 ug/m3. The 24-hour average standard for PM2.5 is 35 ug/m3 and the annual average
12 standard is 12 ug/m3 (as adopted by USEPA in 2012).
13 Of the 13 monitors, 11 measured PM10 concentrations that exceeded the 24-hour
14 average PM2.5 ambient air standard of 35 ug/m3. The maximum concentration at one
15 monitor was 3 times the PM2.5 standard.
16 The measurements from each monitor were averaged to obtain a long-term
17 average. Of the 13 monitors, 11 measured PM10 concentrations that exceeded the annual
18 average PM2.5 ambient standard of 12 ug/m3. The average for one monitor was 2 times
19 the PM2.5 standard.
20 Based on available monitoring data, it is possible that existing sand mines and
21 processing plants are currently exceeding the ambient air standards for PM2.5.
22 Unfortunately, the DNR has chosen to require monitoring of PM10 rather than PM2.5.

1 It is worth noting that many of the fugitive emission control requirements
2 enforced by the DNR were developed prior to USEPA adoption of ambient air quality
3 standards for PM2.5. Section NR 415.075, Wis. Adm. Code—Particulate matter emission
4 limitations for ledge rock quarries and industrial sand mines—was first enacted in 1994
5 and last updated in 2001. (Exh. 63.) The ambient air quality standards for PM2.5 were
6 first adopted 1997, then lowered in 2006, and then lowered again in 2012.
7 It is likely the quarry and sand mine regulations applicable to FML did not foresee
8 adoption of the PM2.5 air quality standards. As a result, adoption of suitable dust control
9 measures beyond those under NR 415.075 would need to be determined based on the
10 DNR evaluation of compliance with the new ambient air quality standards for PM2.5.
11 When interpreting the monitoring results from existing sand mines, it is important
12 to recognize the shortcomings of these results. Existing ambient monitors at sand mines
13 and plants only operate every 6 days, so no information is available for 304 days or 83%
14 of the year.
15 It is also important to note, that while there may be over 140 sand mining and
16 processing operations, there are only 10 facilities that operate monitors. The lack of
17 monitors limits the amount of information from which to conclude that ambient air
18 quality standards can be met by sand mines and plants.
19 Proper placement of the ambient monitor is important so that it provides an
20 accurate assessment of mine and plant impacts. I recently reviewed the ambient
21 monitoring plan submitted to the DNR for a sand mine and processing plant. I found the
22 approved monitor location was located far from the processing activities and the location
23 where the DNR had predicted the highest air quality impacts in its modeling analysis.

(Exh. 64.) While this monitor will provide measurements of PM10 concentration near the facility, these measurements will not represent the highest off-site concentrations.

Q: Is additional ambient air monitoring necessary to demonstrate compliance with the FML Sand Permit?

A: Yes. Ambient monitoring is necessary to verify that FML will comply with ambient air quality standards and implement the control measures in its fugitive dust control plan.

While the DNR recommended that FML conduct monitoring for PM10, it is also appropriate to require the monitoring of PM2.5 for the following reasons:

- The standards for PM2.5 are the most recent and protective. The PM10 standard was adopted in 1987. The PM2.5 standards were adopted in 1997 and updated in 2006 and 2012.
- The DNR modeling analysis shows that emissions from the two facility stacks, without any consideration of fugitive emissions, will consume 100% of the available 24-hour average PM2.5 standard.
- Existing ambient monitors at sand mines and processing plants have measured PM10 concentrations above the PM2.5 standards, some 2 to 3 times higher.

A shortcoming of existing ambient monitoring programs is the 6-day schedule which does not provide measurements for 304 days or 84% of the year. Without an additional monitor, filter-based ambient monitors used at current sand mines need a day to retrieve and change the filter after a 24-hour period of monitoring. A minimum 3-day monitoring schedule should be required to provide twice the number of measurements but allow time to change the filter.

If PM2.5 is measured, it allows the use of a continuous ambient monitor. These are currently used by the DNR and other regulatory agencies to help evaluate compliance with the PM2.5 ambient air quality standards. The equipment cost of a continuous

Exhibit 62

AIRS ID	Facility Name	City	FID	Parameter
55-005-1001	Superior Silica Sands	Dovre	603106130	PM10
55-005-1002	Great Northern Sand LLC	Dovre	603106680	PM10
55-005-1003	Superior Silica Sand - Barron Plant	Barron	603108330	PM10
55-005-1004	Chieftain Sand and Proppant, LLC	Dovre	603107010	PM10
55-017-0100	EOG Resources, Inc.	Chippewa Falls	609072860	PM10
55-017-1001	Chippewa Sand Company	New Auburn	609128960	PM10
55-053-1001	Taylor Frac, LLC	Taylor	627021670	PM10
55-081-1001	Will Logisitcs LLC	Oakdale	642078030	PM10
55-081-1002	U.S. Silica Company	Sparta	642078800	PM10
55-081-1003	Unimin Corporation - Tunnel City Plant	Greenfield	642078580	PM10
55-081-1004	Unimin Corporation - Tunnel City Plant	Greenfield	642078580	PM10
55-081-1005	Unimin Corporation - Tunnel City Plant	Greenfield	642078580	PM10
55-121-1001	Preferred Sands of Wisconsin, LLC	Blair	662028620	PM10

Header	Definition
State, County, and ID Codes	Together identify an individual monitoring location
Parameter	Monitored pollutant.
Sample Duration	Monitoring period.
Unit	Units of measurement
Sample Date	Date of Sample
Start Time	Sample start time (0:00 to 24:00)
Sample Value	Measured pollutant concentration
Null Data	Explanation for missing or invalid sample
Collection Frequency	Sample frequency

Table 1. Null Code Qualifers

Qualifier Code	Qualifier Description
FSA	Failed Sample Attempt
QAI	Data Quality Assurance Issue
SNC	Scheduled but not Collected

Comments
List of facilities located under 'Sand Mine Monitoring' tab.
81102 = PM10 (particulate matter 10 micrometers in diameter or smaller)
7 = 24 hours
001 = micrograms per cubic meter

See code table below (Table 1).
6 = every 6 days

Site ID	Parameter	Sample Duration	Unit	Sample Date	Sample Value	Null Data	Collection Frequency	Start Time
1001	81102	7	001	12/5/2011	25		6	00:00
1001	81102	7	001	12/11/2011	13		6	00:00
1001	81102	7	001	12/17/2011	16		6	00:00
1001	81102	7	001	12/23/2011	15		6	00:00
1001	81102	7	001	12/29/2011	12		6	00:00
1001	81102	7	001	1/4/2012	15.0		6	00:00
1001	81102	7	001	1/10/2012	22.0		6	00:00
1001	81102	7	001	1/16/2012		SNC	6	00:00
1001	81102	7	001	1/18/2012	15.0		6	00:00
1001	81102	7	001	1/22/2012	10.0		6	00:00
1001	81102	7	001	1/28/2012	32.0		6	00:00
1001	81102	7	001	2/3/2012	32.0		6	00:00
1001	81102	7	001	2/9/2012	22.0		6	00:00
1001	81102	7	001	2/15/2012	38		6	00:00
1001	81102	7	001	2/21/2012	22.0		6	00:00
1001	81102	7	001	2/27/2012	13.0		6	00:00
1001	81102	7	001	3/4/2012	21		6	00:00
1001	81102	7	001	3/10/2012	19.0		6	00:00
1001	81102	7	001	3/16/2012	15.0		6	00:00
1001	81102	7	001	3/22/2012	4.0		6	00:00
1001	81102	7	001	3/28/2012	5.0		6	00:00
1001	81102	7	001	4/3/2012	13.0		6	00:00
1001	81102	7	001	4/9/2012		FSA	6	00:00
1001	81102	7	001	4/15/2012	1.0		6	00:00
1001	81102	7	001	4/21/2012	8.0		6	00:00
1001	81102	7	001	4/27/2012	14.0		6	00:00
1001	81102	7	001	5/3/2012	10.0		6	00:00
1001	81102	7	001	5/9/2012	6.0		6	00:00
1001	81102	7	001	5/15/2012	14.0		6	00:00
1001	81102	7	001	5/21/2012	10.0		6	00:00
1001	81102	7	001	5/27/2012	19.0		6	00:00
1001	81102	7	001	6/2/2012		QAI	6	00:00
1001	81102	7	001	6/8/2012	26.0		6	00:00
1001	81102	7	001	6/14/2012		SNC	6	00:00
1001	81102	7	001	6/15/2012	21.0		6	00:00

1001	81102	7	001	6/20/2012	19.0	6	00:00
1001	81102	7	001	6/26/2012	16.0	6	00:00
1001	81102	7	001	7/2/2012	37.0	6	00:00
1001	81102	7	001	7/8/2012	17.0	6	00:00
1001	81102	7	001	7/14/2012	21.0	6	00:00
1001	81102	7	001	7/20/2012	21.0	6	00:00
1001	81102	7	001	7/26/2012	13.0	6	00:00
1001	81102	7	001	8/1/2012	32	6	00:00
1001	81102	7	001	8/7/2012	12	6	00:00
1001	81102	7	001	8/13/2012	10	6	00:00
1001	81102	7	001	8/19/2012	6	6	00:00
1001	81102	7	001	8/25/2012	22	6	00:00
1001	81102	7	001	8/31/2012	12	6	00:00
1001	81102	7	001	9/6/2012	18.0	6	00:00
1001	81102	7	001	9/12/2012	15.0	6	00:00
1001	81102	7	001	9/18/2012	7.0	6	00:00
1001	81102	7	001	9/24/2012	21.0	6	00:00
1001	81102	7	001	9/30/2012	15.0	6	00:00
1001	81102	7	001	10/6/2012	6.0	6	00:00
1001	81102	7	001	10/12/2012	13.0	6	00:00
1001	81102	7	001	10/18/2012	3.0	6	00:00
1001	81102	7	001	10/24/2012	10.0	6	00:00
1001	81102	7	001	10/30/2012	6.0	6	00:00
1001	81102	7	001	11/5/2012	10.0	6	00:00
1001	81102	7	001	11/11/2012	15.0	6	00:00
1001	81102	7	001	11/17/2012	21.0	6	00:00
1001	81102	7	001	11/23/2012	5.0	6	00:00
1001	81102	7	001	11/29/2012	18.0	6	00:00
1001	81102	7	001	12/5/2012	10.0	6	00:00
1001	81102	7	001	12/11/2012	15.0	6	00:00
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1001	81102	7	001	1/10/2013	21.0	6	00:00
1001	81102	7	001	1/16/2013	11	6	00:00
1001	81102	7	001	1/22/2013	14.0	6	00:00

1001	81102	7	001	1/28/2013	17.0		6	00:00
1001	81102	7	001	2/3/2013	27.0		6	00:00
1001	81102	7	001	2/9/2013	37.0		6	00:00
1001	81102	7	001	2/15/2013	17.0		6	00:00
1001	81102	7	001	2/21/2013	5		6	00:00
1001	81102	7	001	2/27/2013		SNC	6	00:00
1001	81102	7	001	3/5/2013	3.0		6	00:00
1001	81102	7	001	3/11/2013	3		6	00:00
1001	81102	7	001	3/17/2013	5.0		6	00:00
1001	81102	7	001	3/23/2013	7.0		6	00:00
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1001	81102	7	001	4/22/2013	5		6	00:00
1001	81102	7	001	4/28/2013	50		6	00:00
1001	81102	7	001	5/4/2013	13		6	00:00
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1001	81102	7	001	6/3/2013	20		6	00:00
1001	81102	7	001	6/9/2013	21		6	00:00
1001	81102	7	001	6/15/2013	21		6	00:00
1001	81102	7	001	6/21/2013	20		6	00:00
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1001	81102	7	001	7/21/2013		FSA	6	00:00
1001	81102	7	001	7/27/2013	8		6	00:00
1001	81102	7	001	8/2/2013	22		6	00:00
1001	81102	7	001	8/8/2013	15		6	00:00
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1001	81102	7	001	8/20/2013	43		6	00:00
1001	81102	7	001	8/26/2013	31		6	00:00
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1002	81102	7	001	2/15/2013	3.3		6	00:00
1002	81102	7	001	2/21/2013	1.0		6	00:00
1002	81102	7	001	2/27/2013	0.9		6	00:00
1002	81102	7	001	3/5/2013	1.6		6	00:00
1002	81102	7	001	3/11/2013	0.0		6	00:00
1002	81102	7	001	3/17/2013	2.5		6	00:00
1002	81102	7	001	3/23/2013	2.0		6	00:00

1002	81102	7	001	3/29/2013	25.5		6	00:00
1002	81102	7	001	4/4/2013	10.5		6	00:00
1002	81102	7	001	4/10/2013	3.1		6	00:00
1002	81102	7	001	4/16/2013	1		6	00:00
1002	81102	7	001	4/22/2013	3.3		6	00:00
1002	81102	7	001	4/28/2013	20.8		6	00:00
1002	81102	7	001	5/4/2013	8.2		6	00:00
1002	81102	7	001	5/10/2013	14.4		6	00:00
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1002	81102	7	001	10/19/2013	2		6	00:00
1002	81102	7	001	10/25/2013	10		6	00:00
1002	81102	7	001	10/31/2013	0		6	00:00

1002	81102	7	001	11/6/2013	1.4		6	00:00
1002	81102	7	001	11/12/2013	7.9		6	00:00
1002	81102	7	001	11/18/2013	5.3		6	00:00
1002	81102	7	001	11/24/2013	17.1		6	00:00
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1003	81102	7	001	6/27/2013		SNC	6	00:00
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1003	81102	7	001	7/3/2013	15		6	00:00

1003	81102	7	001	7/9/2013	14		6	00:00
1003	81102	7	001	7/15/2013	24		6	00:00
1003	81102	7	001	7/21/2013	10		6	00:00
1003	81102	7	001	7/27/2013		FSA	6	00:00
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1003	81102	7	001	10/25/2013	14		6	00:00
1003	81102	7	001	10/31/2013	5		6	00:00
1003	81102	7	001	11/6/2013	8		6	00:00
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1003	81102	7	001	11/24/2013	6		6	00:00
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1003	81102	7	001	12/24/2013	10		6	00:00
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1004	81102	7	001	9/7/2013	36		6	00:00
1004	81102	7	001	9/13/2013	17.7		6	00:00
1004	81102	7	001	9/19/2013	20.3		6	00:00

1004	81102	7	001	9/25/2013	19.7	6	00:00
1004	81102	7	001	10/1/2013	28.1	6	00:00
1004	81102	7	001	10/7/2013	10	6	00:00
1004	81102	7	001	10/13/2013	10	6	00:00
1004	81102	7	001	10/19/2013	7.5	6	00:00
1004	81102	7	001	10/25/2013	18.4	6	00:00
1004	81102	7	001	10/31/2013	6.1	6	00:00
1004	81102	7	001	11/6/2013	15.1	6	00:00
1004	81102	7	001	11/12/2013	11	6	00:00
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1003	81102	7	001	10/13/2013	6.1		6	00:00
1003	81102	7	001	10/19/2013	9.4		6	00:00
1003	81102	7	001	10/25/2013	19.5		6	00:00
1003	81102	7	001	10/31/2013	13.8		6	00:00
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1003	81102	7	001	11/12/2013	7.2		6	00:00
1003	81102	7	001	11/18/2013	4.8		6	00:00
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1001	81102	7	001	12/24/2013	10	6	00:00
1001	81102	7	001	12/30/2013	15	6	00:00

909	**Reported Sample Values**
13.8	**Average Value**
0	**> 150 ug/std m3**
909	**<= 150 ug/std m3**
103.4	**Max Value**

AIRS ID	Facility Name	City			PM10 Maximum 24-hour Average (ug/m3)	PM2.5 NAAQS 24-hour Average (ug/m3)	PM10 Maximum 24-hour Average > NAAQS for PM2.5	PM10 Average All 24-hour Values (ug/m3)	PM2.5 NAAQS Annual Average (ug/m3)	PM10 Average All 24-hour Values > NAAQS for PM2.5
55-005-1001	Superior Silica Sands	Dovre	5-Dec-11	30-Dec-13	63.0	35	Yes	18.5	12	Yes
55-005-1002	Great Northern Sand LLC	Dovre	17-Dec-12	30-Dec-13	47.1	35	Yes	12.8	12	Yes
55-005-1003	Superior Silica Sand - Barron Plant	Barron	27-Feb-13	30-Dec-13	34.0	35	No	14.1	12	Yes
55-005-1004	Chieftain Sand and Proppant, LLC	Dovre	20-Aug-13	30-Dec-13	64.7	35	Yes	21.7	12	Yes
55-017-0100	EOG Resources, Inc.	Chippewa Falls	4-Nov-10	30-Dec-13	35.5	35	Yes	10.2	12	No
55-017-1001	Chippewa Sand Company	New Auburn	3-Apr-12	30-Dec-13	100.4	35	Yes	18.6	12	Yes
55-055-1001	Taylor Frac, LLC	Taylor	25-Aug-12	30-Dec-13	36.4	35	Yes	12.4	12	Yes
55-081-1001	Will Logistics LLC	Oakdale	1-Jul-12	30-Dec-13	34.0	35	No	9.7	12	No
55-081-1002	U.S. Silica Company	Sparta	8-Sep-12	30-Dec-13	36.0	35	Yes	13.6	12	Yes
55-081-1003	Unimin Corporation - Tunnel City Plant	Greenfield	22-May-12	30-Dec-13	35.8	35	Yes	12.7	12	Yes
55-081-1004	Unimin Corporation - Tunnel City Plant	Greenfield	29-Mar-13	30-Dec-13	47.4	35	Yes	13.3	12	Yes
55-081-1005	Unimin Corporation - Tunnel City Plant	Greenfield	29-Mar-13	30-Dec-13	37.1	35	Yes	12.9	12	Yes
55-121-1001	Preferred Sands of Wisconsin, LLC	Blair	16-May-13	30-Dec-13	40.0	35	Yes	15.3	12	Yes

AIRS ID	Facility Name	City	Start Date	End Date	PM10 Maximum 24-hour Average (ug/m3)	PM2.5 NAAQS 24-hour Average (ug/m3)	PM10 Maximum 24-hour Average > NAAQS for PM2.5	PM10 Average All 24-hour Values (ug/m3)	PM2.5 NAAQS Annual Average (ug/m3)	PM10 Average All 24-hour Values > NAAQS for PM2.5
55-005-1001	Superior Silica Sands	Downe	5-Dec-11	30-Dec-13	83.0	35	Yes	18.5	12	Yes
55-005-1002	Great Northern Sand LLC	Downe	17-Dec-12	30-Dec-13	47.1	35	Yes	12.8	12	Yes
55-005-1003	Superior Silica Sand - Barron Plant	Barron	27-Feb-13	30-Dec-13	34.0	35	No	14.1	12	Yes
55-005-1004	Chieftain Sand and Proppant, LLC	Downe	20-Aug-13	30-Dec-13	84.7	35	Yes	21.7	12	Yes
55-017-0100	EOG Resources, Inc.	Chippewa Falls	4-Nov-10	30-Dec-13	35.5	35	Yes	10.2	12	No
55-017-1001	Chippewa Sand Company	New Auburn	3-Apr-12	30-Dec-13	109.4	35	Yes	18.6	12	Yes
55-053-1001	Taylor Frac, LLC	Taylor	25-Aug-12	30-Dec-13	36.4	35	Yes	12.4	12	Yes
55-081-1001	Will Logistics LLC	Oakdale	1-Jul-12	30-Dec-13	34.0	35	No	9.7	12	No
55-081-1002	U.S. Silica Company	Sparta	6-Sep-12	30-Dec-13	36.0	35	Yes	13.8	12	Yes
55-081-1003	Unimin Corporation - Tunnel City Plant	Greenfield	29-May-12	30-Dec-13	35.8	35	Yes	12.7	12	Yes
55-081-1004	Unimin Corporation - Tunnel City Plant	Greenfield	29-Mar-13	30-Dec-13	47.4	35	Yes	13.3	12	Yes
55-081-1005	Unimin Corporation - Tunnel City Plant	Greenfield	29-Mar-13	30-Dec-13	37.1	35	Yes	12.9	12	Yes
55-121-1001	Preferred Sands of Wisconsin, LLC	Blair	16-May-13	30-Dec-13	40.0	35	Yes	15.3	12	Yes

Summary prepared by S. Klafka on March 17, 2014.

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COMMUNITY SHARES

October 14, 2015

Kristin Hart
Wisconsin Department of Natural Resources
101 S. Webster St.
Madison, WI 53703

Re: Response and production of PM2.5 data after DNR consultation with Ho Chunk Nation regarding DNR's proposed guidance: "2015 Approach to Dispersion Modeling for Permits," "Air Dispersion Modeling Guidelines," and "Guidance for Including PM2.5 in Air Pollution Control Permit Applications"

Dear Ms. Hart:

Thank you for taking the time to meet with MEA and Ho Chunk Nation and for your willingness to accept and consider additional information regarding PM2.5 emissions in Wisconsin. We had briefly discussed existing research and data on PM2.5, which we feel provides some evidence of at least the potential for significant emissions of PM2.5 from mechanical sources. The following pieces of information are attached:

(1) A summary of compliance stack tests for PM conducted at 15 sand plants using baghouses or scrubbers to control the PM emissions from their sand dryers or other sand plant operations. Notably, the tests at Carbo Ceramics and Chippewa Sand Company reported PM2.5 to be 100% of the total PM emissions, and the test at EOG Resources reported PM2.5 to be 69% of the total PM emissions.
(2) Judge Bolt's decision in the FML Sand contested case hearing, a binding legal decision, which concludes that industrial sand mining operations are capable of emitting significant amounts of PM2.5. Also attached are documents, which support Judge Bolt's decision – PM measurements from sand and gravel operations and an Air & Waste Management Association technical paper submitted during the contested case hearing, both of which were produced by John Richards who also conducted the air monitoring at EOG Resources.
(3) The abstract for Crispin Pierce's scientific paper, which will be published in November, 2015.

MIDWESTADVOCATES.ORG

612 W MAIN STREET, SUITE 302 P 608.251.5047
MADISON, WISCONSIN 53703 F 608.268.0205

MEA is a nonprofit environmental law center working for clean air, clean water, and clean government for this generation and the next. If you have any questions or would like to further discuss any of the information we have provided you with today we would be more than happy to sit down with you for a follow up discussion.

Sincerely,

/s/

Kellan McLemore
Staff Attorney
kmclemore@midwestadvocates.org
Kimberlee Wright
Executive Director
kwright@midwestadvocates.org
MIDWEST ENVIRONMENTAL ADVOCATES

Cc: Kevin L. Gunderson, Environmental Specialist
Ho-Chunk Nation Environmental Health Department
PO Box 636
Black River Falls, WI 54615

Report Date	Test Date(s)			Stack	Control	Process	Thruput (tph)	All PM-FH (gr/dscf)	All PM-FH (lbs/hr)	All PM-Total (gr/dscf)	All PM-Total (lbs/hr)	All PM2.5 (gr/dscf)	All PM2.5 (lbs/hr)	All Moisture (%)	All Flow (dscfm)	Dryer PM-FH (gr/dscf)	Dryer PM-Total (gr/dscf)
31-Oct-12	19-Jun-12	Badger Mining Corporation	Taylor, WI	S21A	C21A - Baghouse	P41 - Sand Dryer	350	0.002	1.1							0.002	
				S21B	C21B - Baghouse	P41 - Sand Handling	315	0.0005	0.1								
				S19B	C19B - Scrubber	P41 - Sand Handling, P39 - Screening	410	0.002	0.6								
				S10A	C10A - Scrubber	P42 - Screening	240	0.006	2.2								
5-Dec-12	4-May-12	Carbo Ceramics	Marshfield	S01	C01 - Baghouse	P01 - Sand Dryer, Handling, Silos	140.3	0.0009	0.21				0.21	14.7%		0.0009	
				S02	C02 - Baghouse	P02 - Sand Dryer, Handling, Silos	151.3	0.0005	0.15				0.15	1.6%			
29-Jul-13	29-May-12	Chippewa Sand Company	New Auburn	S01A	C01A - Baghouse	P01A - Fluidized Bed Dryer	150	0.003	0.18				0.18			0.003	
				S02A	C02A - Baghouse	P02A - Sand Screening & Conveying	150		0.17				0.128				
	30-Oct-13	Completion Industrial Minerals	Marshfield	S01	C01 - Baghouse	P01 - Fluidized Bed Dryer	137	0.002	1				-		48,157	0.002	
				S02	C02 - Baghouse	P04 - Dry Plant Sand Handing	137	0.003	0.58				-		22,047		
2-May-12	13-Feb-12	EOG Resources	Chippewa Falls	S01	C01 - Baghouse	P01 - Fluidized Bed Dryer #1	166	0.0004	0.09	0.0011	0.24			16.0%	25,797	0.0004	0.0011
				S02	C02 - Baghouse	P02 - Fluidized Bed Dryer #2	166	0.0008	0.19	0.0014	0.31			16.1%	26,551	0.0008	0.0014
				S04	C04 - Baghouse	P04 - Dryer Building East	147	0.0026	0.42					0.8%	19,339		
				S05	C05 - Baghouse	P05 - Drying Building West	147	0.0032	0.59	0.0043	0.81			0.4%	21,568		
				S06	C06 - Baghouse	P06 - Rail Loading	1229	0.0016	0.23			0.0011	0.16	0.2%	17,011		
4-Feb-13	12-Nov-12	Great Northern Sand	New Auburn	S04	C04 - Baghouse	P04 - Sand Dryer	135	0.0002			0.25		0.56	7.0%	38,429	0.0002	
				S05	C05 - Baghouse	P05 - Sand Handling		0.0006	0.18				0.12	0.2%	35,119		
1-May-14	12-Feb-14	Hi-Crush	Augusta	S01B	C01B - Baghouse	P01B - Fluidized Bed Dryer	92.6	0.0006	0.16							0.0006	
16-Aug-12	30-May-12	Hi-Crush	Tomah	S04		P04 - Sand Screening & Conveying	96	0.0043	0.21								
				S05		P05 - Fluidized Bed Sand Dryer											
23-Jul-12	21-Jun-12	Preferred Sands of WI	Blair	S01	C01 - Baghouse	P01 - Sand Dryer	150	0.0018			0.49				30,505	0.0018	
26-Oct-11	20-Jul-11	Proppant Specialist - Oakdale	Tomah	S01		P01 - Rotary Sand Kiln	90	0.006	0.55							0.006	
						P02/P03 - Screening & Conveying	90		1.47								
8-Jan-14	24-Jul-13	Superior Silica Sand - Baron Plant	Baron	S01	C01 - Baghouse	P01 - Sand Dryer		0.0005			0.275					0.0005	
				S02	C02 -Baghouse	P02 - Dry Plant					0.794						
5-Apr-13	14-Mar-13	Taylor Frac LLC	Taylor	S01	C01 - Scrubber	P1 - Fluidized Bed Sand Dryer	83.6	0.0011			0.53				34536	0.0011	
24-Oct-13	29-May-13	U.S. Silica Company	Sparta	S10		P10 - Fluidized Bed Sand Dryer		0.0034	0.82	0.0068	1.72			8.8%	29377	0.0034	0.0068
				S30	Cartridge	P30 - Dry Plant		0.0002	0.07	0.002	0.64			1.6%	38869		
8-Jan-13	7-Nov-12	Will Logistics - Smart Sand Inc.	Oakdale	S10		P10 - Fluidized Bed Sand Dryer		0.004			1.6					0.004	
				S30		P30 - Dry Plant		0.0009			0.48						
						Rail Loadout Bin Vent		0.0006									
13-Aug-12	10-May-12	Wisconsin Industrial Sand Co.	Maiden Rock	S10	C02 - Scrubber	P03 - Rotary Sand Dryer	280	0.0001	0.017	0.0007	0.106			22.1%	17934	0.0001	0.0007
															Minimum	0.0001	0.0007
															Maximum	0.0060	0.0068
															Average	0.0018	0.0025

Summary of PM10 and PM4 Emission Factors				
2009 Measurements at Sand and Gravel Plants in California				
Facility	Sand and Gravel Plant	PM10	PM4	Ratio
	Operation	(lbs/ton)	(lbs/ton)	PM4/PM10
Barstow	Screen	0.000167	0.000079	47%
	Crusher	0.002581	0.001270	49%
	Transfer	0.000575	0.000352	61%
Facility	Sand and Gravel Plant	PM10	PM4	Ratio
	Operation	(lbs/ton)	(lbs/ton)	PM4/PM10
Carroll Canyon	Screen	0.000831	0.000356	43%
	Crusher	0.001232	0.000593	48%
	Transfer	0.000525	0.000236	45%
Facility	Sand and Gravel Plant	PM10	PM4	Ratio
	Operation	(lbs/ton)	(lbs/ton)	PM4/PM10
Vermalis	Screen	0.001693	0.000882	52%
	Crusher	0.001677	0.000767	46%
	Transfer	0.001090	0.000457	42%

PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California

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PM_4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California

John R. Richards and Todd T. Brozell
Air Control Techniques, P.C., Cary, NC

Charles Rea
California Construction and Industrial Minerals Association, Sacramento, CA

Geoff Boraston
Granite Construction, Inc., Watsonville, CA

John Hayden
National Stone, Sand, & Gravel Association, Alexandria, VA

ABSTRACT

The California Construction and Industrial Minerals Association and the National Stone, Sand, & Gravel Association have sponsored tests at three sand and gravel plants in California to compile crystalline silica emission factors for particulate matter (PM) of aerodynamic diameter of 4 μm or less (PM_4) and ambient concentration data. This information is needed by industrial facilities to evaluate compliance with the Chronic Reference Exposure Level (REL) for ambient crystalline silica adopted in 2005 by the California Office of Environmental Health Hazard Assessment. The REL applies to PM_4 respirable PM. Air Control Techniques, P.C. sampled for PM_4 crystalline silica using a conventional sampler for PM of aerodynamic diameter of 2.5 μm or less ($PM_{2.5}$), which met the requirements of 40 *Code of Federal Regulations* Part 50, Appendix L. The sample flow rate was adjusted to modify the 50% cut size to 4 μm instead of 2.5 μm. The filter was also changed to allow for crystalline silica analyses using National Institute for Occupational Safety and Health (NIOSH) Method 7500. The particle size-capture efficiency curve for the modified Appendix L instrument closely matched the performance curve of NIOSH Method 0600 for PM_4 crystalline silica and provided a minimum detection limit well below the levels attainable with NIOSH Method 0600. The results of the tests indicate that PM_4 crystalline silica emissions range from 0.000006 to 0.000110 lb/t for screening operations, tertiary crushers, and conveyor transfer points. The PM_4 crystalline silica emission factors were proportional to the crystalline silica content of the material handled in the process equipment. Measured ambient concentrations ranged from 0 (below detectable limit) to 2.8 μg/m³. All values measured above 2 μg/m³ were at locations upwind of the facilities being tested. The ambient PM_4 crystalline silica concentrations measured during this study were below the California REL of 3 μg/m³. The measured ambient concentrations in the PM_4 size range are consistent with previously published ambient crystalline silica data applicable to the $PM_{2.5}$ and PM of aerodynamic diameter of 10 μm or less (PM_{10}) size ranges.

IMPLICATIONS

Mineral processing facilities need PM_4 crystalline silica emission factor data to evaluate compliance with the 3 μg/m³ Chronic REL for PM_4 ambient crystalline silica adopted in 2005 by the California Office of Environmental Health Hazard Assessment. Emission tests at three sand and gravel plants have provided PM_4 crystalline silica data for screens, crushers, and conveyors. Mineral processing facilities can use the emission factor data to evaluate compliance with the stringent ambient PM_4 crystalline silica limit.

INTRODUCTION

Crystalline Silica Emission Factors of Particulate Matter of Aerodynamic Diameter of 4 μm or Less

There are no previously published data concerning particulate matter (PM) of aerodynamic diameter of 4 μm or less (PM_4) crystalline silica emissions from aggregate producing plants or other mineral industry sources. The PM_4 crystalline silica emission factors can be estimated based on published data concerning emission factors for PM of aerodynamic diameter of 10 μm (PM_{10}) or 2.5 μm ($PM_{2.5}$) or less for aggregate producing plants.[1–9] The U.S. Environmental Protection Agency (EPA) AP42 Section 11.19-2 emission factors for tertiary crushers, screens, and conveyor transfer points indicate that the $PM_{2.5}$ emissions range from 0.000013 to 0.000100 lb/t of stone. The AP42 Section 11.19-2 PM_{10} emission factors for these three types of processing equipment range from 0.000046 to 0.00074 lb/t.

These emission factors provide a starting point for evaluating possible PM_4 crystalline silica emission factors. It is reasonable to expect the PM_4 total emission factors to be between the $PM_{2.5}$ and PM_{10} emission factors. The PM_4

crystalline silica emission factors will depend on the crystalline silica content of the PM_4 total PM.

Ambient Crystalline Silica Concentrations

No PM_4 ambient concentration or emission factor data have been published. All previous crystalline silica ambient concentration data applied to the $PM_{2.5}$, PM_{10}, and/or PM of 15-μm or less (PM_{15}) size ranges.

One of the first studies of ambient crystalline silica concentrations was conducted by Davis et al.[10] This study focused on urban areas. Ambient crystalline silica concentrations were measured in 22 urban areas using dichotomous samplers that separate ambient PM into the 0- to 2.5-μm range ("fine PM") and the 2.5- to 15-μm range (termed here as "coarse/supercoarse PM"). Davis et al. measured mean 24-hr average ambient crystalline silica concentrations ranging from 0.9 to 8 $\mu g/M^3$ in the coarse/supercoarse size range. Crystalline silica was 1–9% of the coarse/supercoarse PM and 0–2.6% of the fine (<2.5 μm) PM.

EPA[11] used the data of Davis et al. to derive estimates of the annual average crystalline silica levels in urban areas. The city-specific crystalline silica content values were multiplied by annual average PM_{10} concentrations in these areas to estimate the annual average PM_{10} crystalline silica levels. EPA also calculated an annual average of 1.9 $\mu g/m^3$ with a range of 0.8–5 $\mu g/m^3$ in the PM_{10} size range. The crystalline silica content in the $PM_{2.5}$ size range was consistently less than 1 $\mu g/m^3$ because of the low crystalline silica content of the $PM_{2.5}$ PM and the low total concentration of $PM_{2.5}$ PM.

In 2000, the National Stone, Sand, & Gravel Association (NSSGA) sponsored upwind-downwind studies of ambient crystalline silica concentrations at four stone crushing plants processing high-quartz-content rock.[12] Air Control Techniques, P.C. used Rupprecht & Patashnick Co, Inc. Federal Reference Method (FRM)-2000 samplers that fully met the stringent design and operating specifications of 40 *Code of Federal Regulations* (CFR) Part 50, Appendix L.[13] The measured 8-hr working-shift PM_{10} crystalline silica concentrations at the collocated downwind PM_{10} samplers ranged from 1 to 10.9 $\mu g/m^3$. These values are similar to the range of mean 24-hr concentration values of 0.9–8 $\mu g/m^3$ for 24-hr concentrations measured by Davis et al. in the coarse/supercoarse size range. The measured upwind and downwind concentrations were similar. The crystalline silica levels of 5.07–6.24% by weight of the PM_{10} were similar to the 4.9 ± 2.3% levels in coarse/supercoarse PM reported by Davis et al.

Various other studies have provided limited data for urban, rural, and industrial areas. Puledda[14] measured PM_{10} crystalline silica levels in Rome, Italy of 0.11–2.27 $\mu g/m^3$. These levels were 1.7–3.4% of the measured PM_{10}. Norton and Gunter[15] measured PM_{10} crystalline silica levels averaging 10% in Moscow, ID. They also extracted PM from PM_{10} samples from numerous areas throughout Idaho and estimated crystalline silica levels to be between 7 and 16% of PM_{10} in various urban and rural areas in Idaho. Various other studies described by EPA[11] at urban, rural, and industrial areas indicated 24-hr average crystalline silica levels and crystalline silica contents in PM_{10} that were similar to those in Davis et al.,[10] Air Control Techniques, P.C.,[12] Puledda,[14] and Norton and Gunter.[15] These other studies include Schipper,[16] Goldsmith,[17] Chow et al.,[18] Chow,[19] and Chow.[20] Only the study of Shakari and Holmen[21] reported crystalline silica levels and PM_{10} crystalline silica contents outside of the range of the various papers summarized above. There are insufficient data in Shakari and Holmen to identify the possible reasons for the differences between their data and other studies.

On the basis of the available ambient crystalline silica data, the study participants concluded that there was a need for a monitoring technique having a minimum detectable limit of 0.3 $\mu g/m^3$. This is at or below the concentrations anticipated in this project. This minimum detectable concentration is also 10% of the California Relative Exposure Limit. An evaluation of National Institute for Occupational Safety and Health (NIOSH) Method 0600 used for in-plant industrial hygiene tests indicated that this method was not sufficiently precise at the necessary detection limit. Accordingly, the California Construction and Industrial Minerals Association (CalCIMA) and NSSGA sponsored the development of a more accurate and precise PM_4 crystalline silica monitoring method for this project. Information concerning the development of the PM_4 crystalline silica monitoring method on the basis of the validated $PM_{2.5}$ test method is described in the project report.[22]

TEST LOCATIONS AND PROCEDURES

PM_4 Crystalline Silica Measurement Test Locations

Study participants selected facilities for testing on the basis of (1) the representativeness of a vibrating screen, tertiary crusher, and conveyor transfer point of other California plants; (2) the representativeness of the crystalline silica content of the minerals processed; (3) the accessibility of the equipment for testing; (4) the capability to isolate the process unit tested from adjacent process units; and (5) the geographical location. The plants included the Service Rock Products, Inc. plant in Barstow; the Vulcan Materials, Inc. Carroll Canyon plant near San Diego; and the Teichert Aggregates, Inc. Vernalis plant near Tracy. These plants had crystalline silica levels ranging from 16.5 to 35.3% by weight in the minerals being processed.

PM_{10} data were compiled to provide a comparison of measured PM_4 crystalline silica emissions with measured PM_{10} emissions. The scope of the programs at each of these three facilities included PM_{10} emission factor tests on the crushers, vibrating screens, and conveyor transfer points.

The specific sources tested at Barstow included (1) a 16- by 5-ft flat vibrating screening operation, (2) a shorthead crusher, and (3) a conveyor transfer point. The equipment tested at Carroll Canyon included (1) a 16- by 8-ft flat vibrating screen, (2) a set of two cone crushers, and (3) a conveyor transfer point. The sources tested at Vernalis included (1) a 20- by 8-ft triple deck sloped vibrating screen, (2) a set of two cone crushers, and (3) a conveyor transfer point. Water sprays controlled all of the units with the exception of the Carroll Canyon cone

crushers. A fabric filter supplemented wet suppression control at the Carroll Canyon cone crushers.

PM_4 Crystalline Silica Measurement Procedures

The PM_4 crystalline silica emission concentrations were measured using TECO Model 2000 FRMs modified to have a 50% cut point of 4 μm rather than 2.5 μm. This monitoring method was developed for CalCIMA and NSSGA by Air Control Techniques, P.C. in accordance with a protocol submitted to the California Air Resources Board in July 2005. The authors consider this method to be an extension of the $PM_{2.5}$ ambient monitoring procedures specified by EPA in 40 CFR Part 50, Appendix L because of the use of identical sampling equipment, sampling procedures, and quality assurance procedures.

The main adjustment necessary to an Appendix L qualifying instrument is a change in the 50% cut size of this instrument from $PM_{2.5}$ to PM_4. The 50% cut size was adjusted by reducing the sample airflow rate into the TECO sharp cut cyclone to 11.1 L/min from the 16.67 L/min used for $PM_{2.5}$ monitoring. The adequacy of the cut size was confirmed using National Institute for Standards and Technology (NIST) traceable microspheres.

A calculated sampling time of 1–3 hr was required to meet the minimum detection limits of NIOSH 7500 for crystalline silica during tests on the process equipment. These sampling time estimates were based on (1) the NIOSH Method 7500 detection limit of 5 μg, (2) the TECO FRM 2000 sample gas flow rate of 11.1 L/min that was used to collect PM_4, and (3) the estimated crystalline silica content of the stone material being processed. Crystalline silica was detected in all but one filter sample, which confirmed the adequacy of the 1- to 3-hr sampling periods used in the study. The filter samples were weighted at R.J. Lee Group, Inc. using a microbalance and analyzed for crystalline silica using NIOSH Method 7500.

The fugitive PM_{10} PM emissions from the process equipment sources tested in Barstow were measured using a TECO tapered element oscillating microbalance (TEOM) in accordance with EPA Reference Method IO-3. For the tests at Carroll Canyon and Vernalis, the fugitive PM_{10} PM emissions were measured using TECO Model 2000 FRMs modified for PM_{10}.

Sampling arrays designed based on EPA Method 5D (40 CFR Part 60, Appendix A) captured process equipment PM_4 crystalline silica emissions. The mass fluxes

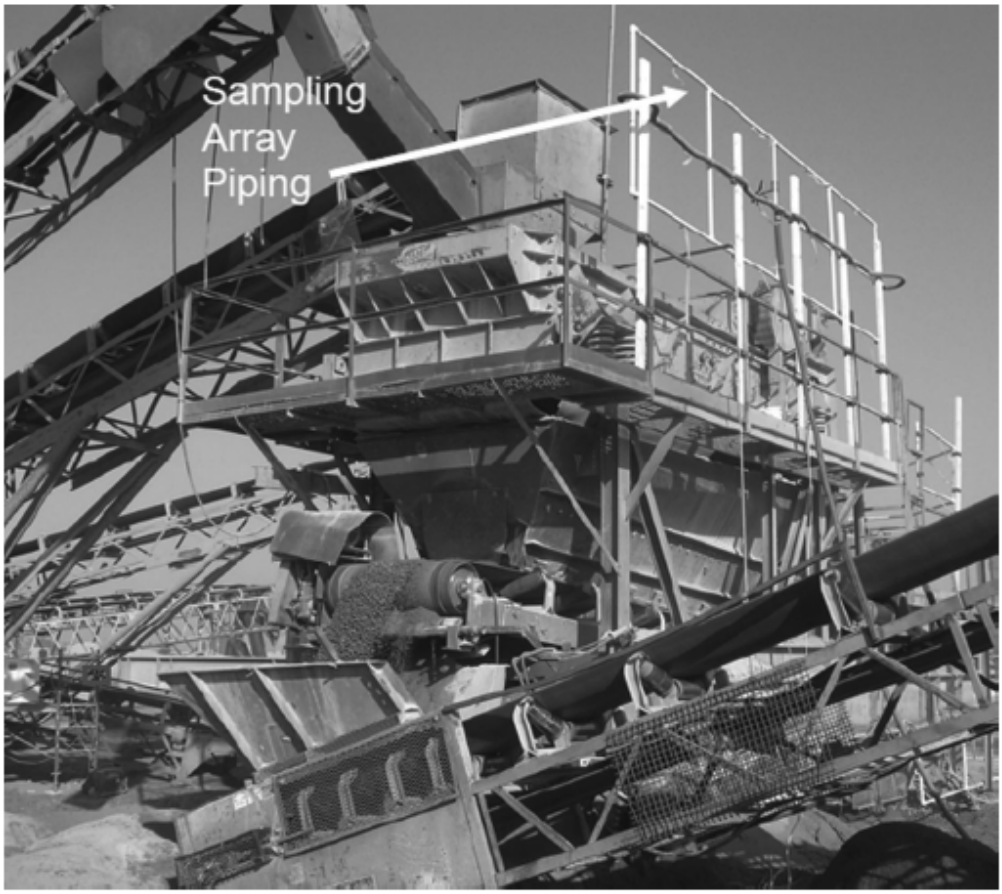

Figure 1. Side view of the sampling array on the downwind side of the vibrating sizing screen at the Barstow plant.

Figure 2. South-side view of sampling array on downwind side of the conveyor transfer point at the Barstow plant.

of PM_4 and PM_{10} fugitive PM through the arrays were calculated by multiplying the total area of the array by the ambient wind speed and the measured PM_4 and PM_{10} concentrations.

The arrays for the vibrating screens, tertiary crushers, and conveyor transfer points were mounted within 5 ft of the locations of PM entrainment by ambient air. Because of this close spacing of the arrays to the source, the "plume" did not have time to substantially disperse in the horizontal or vertical direction. Accordingly, the dispersing PM was captured from the sources even as the ambient winds shifted direction within an angle of approximately 90°.

Each sampling array had more than 100 sampling points. This substantially exceeds the 30 sampling points specified in EPA Method 5D for testing open-top sources. The area monitored by the sampling array exceeded the area subject to dispersion of the PM on the downwind side of the process unit being tested. Each array consisted of manifolds having equally spaced nozzles for air sampling. The gas transport velocities through all sampling tubes and ductwork were above a minimum of 3200 ft/min to prevent any gravitational settling of dust. The sampling manifolds and ductwork were visually inspected after each test run. Following each set of emission tests, the sampling array piping and flex ducts were disassembled and checked for solids deposits. No deposits were present in any sections of the sampling system. Wind speed data and wind direction data demonstrated that each test run was consistent with study requirements.

Each of the array sampling manifolds was ducted together to yield a single sample gas stream. This gas stream flowed through a round duct 12 in. in diameter with sampling ports for a TECO FRM 2000 (modified for PM_4) sampling head and a PM_{10} sampling head. This duct size was the minimum necessary to accommodate the relatively large inlet heads for the TECO FRM 2000 and the TEOM. The gas velocity through the portion of the duct with the sampling ports for the monitoring instruments was less than 10 mph to be consistent with typical ambient wind velocities.

The actual sample gas flow rates through the sampling arrays provided near-isokinetic sampling velocities in the nozzles of the sampling arrays. The nozzles provided isokinetic sampling velocities equal to or lower than 110% at an average ambient wind speed of 5 mph. At isokinetic sampling rates below 100%, there is a slight bias to higher-than-true PM_4 concentrations because of the inertia of the PM_4 particles; however, this isokinetic effect is small for PM_4 particles because of their extremely low mass. Figures 1–3 show the sampling array arrangements.

The ambient airflow rate through each array was calculated based on the area of the array and the measured ambient wind speed. The tests were conducted only when the ambient winds were moving across the process being tested and through the downwind array. The adequacy of fugitive dust capture by the array was documented on a continuous basis using visible wind direction indicators and on an intermittent basis using a nephelometer continuous PM concentration analyzer inside and outside of the array.

Figure 3. Close-up view of the sampling orifices in the conveyor transfer point array at the Carroll Canyon plant.

As part of this testing program, meteorological monitoring stations were installed to measure the following parameters during the process equipment test programs.

- Average and peak wind speeds
- Wind direction
- Ambient temperature

The sample gas velocities and volumetric flow rates through the main sampling duct during the PM_4 and PM_{10} tests were determined according to the procedures outlined in EPA Reference Method 2.

The authors believe that this fugitive dust capture technique provides the most accurate means possible to quantify fugitive dust emissions without affecting the rate of fugitive dust emissions and without interfering with safe plant operations.

PM_4 Emission Factor Test Program Process Data

During each of the test runs, study participants compiled data concerning the process operating conditions and the characteristics of the materials being handled.

- Crystalline silica content of aggregate being processed through the tested units
- Material moisture content (% wt)
- Material particle size distribution (sieve analyses)
- Material throughput (t/hr)

Ambient PM_4 Crystalline Silica Measurements

The PM_4 crystalline silica ambient concentrations were measured using TECO Model 2000 FRMs adjusted for PM_4 monitoring. Two Model 2000 FRMs were located

Table 1. PM_{10}, PM_4, and PM_4 crystalline silica emission factors at Barstow.

		Emission Factor Values (lb/t) of Stone Throughput		
Equipment Tested	Emission Factor	Measured Value	Ambient Upwind Equivalent[b]	Emission Factor
Vibrating screen	PM_{10}	0.000167[a,c]	NA[c]	0.000167[a,c]
	PM_4	0.000079[c]	NA[c]	0.000079[c]
	PM_4 crystalline silica	0.000006[c]	NA[c]	0.000006[c]
Crusher	PM_{10}	0.002753	0.000172	0.002581
	PM_4	0.001442	0.000172	0.001270
	PM_4 crystalline silica	0.000111	0.000028	0.000083
Conveyor transfer point	PM_{10}	0.000625	0.000050	0.000575
	PM_4	0.000402	0.000050	0.000352
	PM_4 crystalline silica	0.000035	0.000006	0.000029

Notes: [a]PM_{10} emission factors were calculated based on TEOM data. [b]Ambient levels of PM_4 PM and PM_4 crystalline silica upwind of the units tested were subtracted from the emission factors to account for material not emitted by the source. [c]Ambient levels of PM and crystalline silica upwind of the vibrating screens were not subtracted because the upwind samplers were below the elevation of the screens; therefore, the air quality at this elevation was not necessarily representative of air quality on the inlet side of the screen.

Table 2. PM_{10}, PM_4, and PM_4 crystalline silica emission factors at Carroll Canyon.

Equipment Tested	Emission Factor	Emission Factor Values (lb/t) of Stone Throughput		
		Measured Value	Ambient Upwind Equivalent	Emission Factor
Vibrating screen	PM_{10}	0.000930	0.000100	0.000831
	PM_4	0.000386	0.000029	0.000356
	PM_4 crystalline silica	0.000048	0.000001	0.000046
Crusher	PM_{10}	0.001271	0.000039	0.001232
	PM_4	0.000611	0.000017	0.000593
	PM_4 crystalline silica	0.000099	0.000002	0.000098
Conveyor transfer point	PM_{10}	0.000552	0.000026	0.000525
	PM_4	0.000245	0.000009	0.000236
	PM_4 crystalline silica	0.000031	0.00000	0.000031

Table 3. PM_{10}, PM_4, and PM_4 crystalline silica emission factors at Vernalis.

Equipment Tested	Emission Factor	Emission Factor Values (lb/t) of Stone Throughput		
		Measured Value	Ambient Upwind Equivalent	Emission Factor
Vibrating screen	PM_{10}	0.001754	0.000061	0.001693
	PM_4	0.000888	0.000006	0.000882
	PM_4 crystalline silica	0.000083	0.000002	0.000081
Crusher	PM_{10}	0.001767	0.000089	0.001677
	PM_4	0.000788	0.000021	0.000767
	PM_4 crystalline silica	0.000110	0.000001	0.000110
Conveyor transfer point	PM_{10}	0.001193	0.000103	0.001090
	PM_4	0.000476	0.000019	0.000457
	PM_4 crystalline silica	0.000088	0.000003	0.000085

Table 4. Comparison of measured PM_{10} PM emission factors and PM_4 crystalline silica emission factors.

Source	Plant	PM_{10} Emission Factors (lb/t)	Crystalline Silica PM_4 Factors (lb/t)	Ratio, Percent PM_4 Crystalline Silica to PM_{10}
Screen	Barstow	0.000167	0.000006	3.59
	Carroll Canyon	0.000831	0.000046	5.54
	Vernalis	0.001693	0.000081	4.78
Crusher	Barstow	0.002581	0.000083	3.21
	Carroll Canyon	0.001232	0.000098	7.95
	Vernalis	0.001677	0.00011	6.56
Conveyor transfer point	Barstow	0.000575	0.000029	5.04
	Carroll Canyon	0.000525	0.000031	5.90
	Vernalis	0.00109	0.000085	7.80

on the downwind side of the facility at a location immediately adjacent to the plant fence line. A single upwind Model 2000 FRM was located on the upwind side of the facility.

These instruments were operated for 24 hr and obtained sample volumes of 16 m^3. R.J. Lee Group, Inc. (RJL) weighed the filter samples using a microbalance and analyzed for crystalline silica using NIOSH Method 7500.

RESULTS

Emission Factor Test Results

The PM_{10}, PM_4, and PM_4 crystalline silica emission factors for the equipment sources measured at the three facilities are presented in Tables 1–3. The emission factors presented in the column on the right were calculated by subtracting the measured downwind concentrations from the measured upwind (ambient) concentrations.

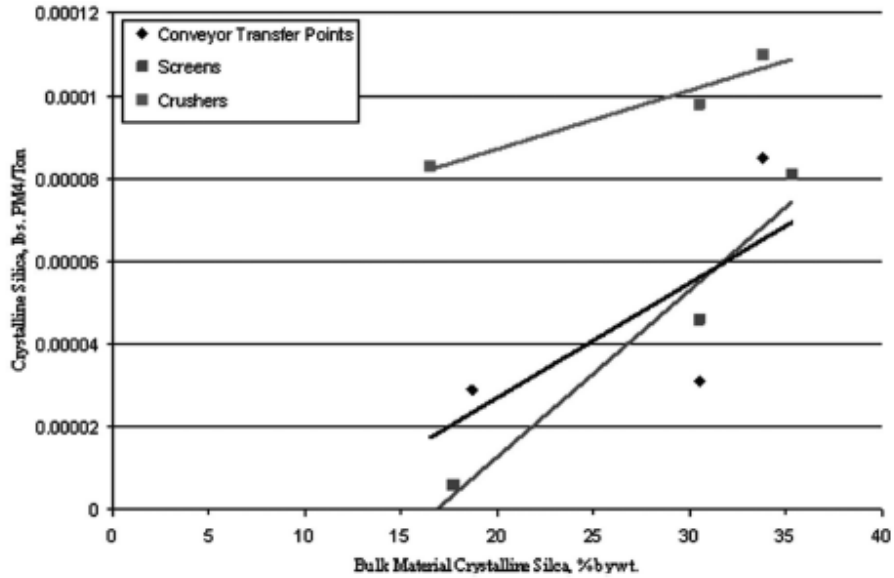

Figure 4. Relationship between bulk material crystalline silica content and the PM_4 crystalline silica emission factor.

As indicated in Table 4, the crystalline silica PM_4 emission factors range from 3.21 to 7.95% of the PM_{10} emission factors. This is a useful ratio because it compares the PM_4 crystalline silica emissions with PM_{10} emissions for which data are often available.

The plant-to-plant differences in PM_4 crystalline silica emission factors are primarily due to the crystalline silica content of the material being handled. As indicated in Figure 4, the bulk material crystalline silica content is responsible for most of the variance in the data. However, it is important to note that because of the small number of test values (three), it is not possible to demonstrate that the relationship between PM_4 crystalline silica emission factors and bulk crystalline silica content is significant at the 90% confidence level.

A less consistent relationship was observed for the conveyor transfer point tests. The reduced emission factor value for the Carroll Canyon plant (30.5% crystalline silica point) is probably due to the high aggregate throughput of this unit. It is theorized that at very high throughputs, some of the stone in the flowing material stream is shielded from attrition and, therefore, does not contribute to emissions. Despite this one test value, there appears to be a relationship between PM_4 crystalline silica emission factors and the crystalline silica content of the bulk material.

An alternative approach for summarizing the PM_4 crystalline silica concentrations is to compile average values for the datasets for the crushers, screens, and conveyor transfer points tested. Table 5 includes average values based on the data from the three plants provided in Tables 1–3.

Table 6 summarizes the crystalline silica fraction of the total PM_4. These data demonstrate that the crystalline silica content of the PM_4 material is considerably lower than the crystalline silica content measured in the bulk samples recovered from each unit tested. On the basis of an average of the tests at the three plants, the PM_4 crystalline silica content is 44% of the bulk material crystalline silica content. It is apparent that the crystalline silica content of the rock is not as prone to attrition size reduction as other constituents in the aggregate.

The process equipment PM_4 crystalline silica emission factors summarized in Tables 1–6 are consistent with previously published emission factors for $PM_{2.5}$ and PM_{10} from similar process units. The PM_4 crystalline silica emission factors are intended for use as input data to dispersion models to evaluate annual average PM_4 concentrations at plant fence lines.

Ambient PM_4 Crystalline Silica Concentrations

Ambient concentrations of PM_4 crystalline silica were measured during 3 consecutive 24-hr periods at the

Table 5. Average emission factors from Barstow, Carroll Canyon, and Vernalis: combined dataset.

Source	Analyte	Emissions (lb/t)
Vibrating screen	PM_{10}	0.00090
	PM_4	0.00044
	PM_4 crystalline silica	0.000044
Crusher	PM_{10}	0.00183
	PM_4	0.00088
	PM_4 crystalline silica	0.000097
Conveyor transfer point	PM_{10}	0.00073
	PM_4	0.00035
	PM_4 crystalline silica	0.000048

Table 6. Crystalline silica fraction of PM_4 PM.

Plant	Source	Crystalline Silica Content (percent weight of total PM_4)	Crystalline Silica Content (percent weight of material samples)
Barstow	Screen	7.5	17.7
	Crusher	6.5	16.5
	Conveyor transfer point	8.3	18.7
	Average	6.9	17.3
Carroll Canyon	Screen	12.5	30.5
	Crusher	15.4	30.4
	Conveyor transfer point	12.8	30.6
	Average	13.6	30.5
Vernalis	Screen	9.6	35.3
	Crusher	21.9	33.9
	Conveyor transfer point	18.4	33.8
	Average	16.6	34.3

Carroll Canyon and Vernalis plants. Two collocated TECO FRM samplers modified for PM_4 crystalline silica measurement operated at a location downwind of the quarry and processing equipment. A single TECO FRM instrument for PM_4 crystalline silica monitoring operated at a location upwind of the entire facility being tested. Meteorological monitoring stations were placed at the upwind and downwind locations. The results of the ambient monitoring tests demonstrated that the plants operated at levels well below the 3-$\mu g/m^3$ REL value. Tables 7 and 8 summarize the results for the Carroll Canyon and Vernalis plants, respectively.

The differences between the upwind and downwind ambient PM_4 crystalline silica concentrations are small. The slightly higher upwind values observed during several of the test days are due to emissions from unpaved roads near the upwind monitoring sites.

Quality Assurance/Quality Control Procedures for PM_4 and PM_{10} Sampling

All of the PM_4 crystalline silica concentration tests conducted with modified Appendix L samplers included quality assurance (QA)/quality control (QC) procedures established by EPA for IO-1.3 (TEOMs) and 40 CFR Part 50, Appendix L (TECO FRM 2000s). The QA/QC data indicated that the TECO PM_4 samplers, the TECO PM_{10} samplers, and the TECO TEOM monitor used for PM_4 and PM_{10} monitoring performed extremely well throughout the three test programs.

All of the PM_4 concentration samplers used for emission factor testing and ambient air monitoring met all of the pre- and post-test requirements concerning filter temperature, ambient temperature, barometric pressure, sample flow, and sample gas stream leak rates.

A TEOM monitor was used during the tests at Barstow for the emission factor tests of the tertiary crusher, the vibrating screen, and the conveyor transfer point. The TEOM monitor satisfied the pre- and post-test QA requirements concerning ambient temperature, barometric pressure, sample flow, and sample gas stream leak rates.

SUMMARY

PM_4 crystalline silica emission factors measured using an Appendix L-based filter sampler ranged from 0.000006 to 0.000110 lb/t of stone processed in vibrating screens, tertiary crushers, and conveyor transfer points. The measured PM_4 crystalline silica emissions ranged from 3.21 to 7.95% of the simultaneously measured PM_{10} emission factors. The PM_4 crystalline silica emissions measured in this study appeared to be related to the crystalline silica content of the mineral being handled. The concentration of crystalline silica in PM_4 PM averaged 44% of the crystalline silica content of the bulk mineral.

Ambient concentrations of PM_4 crystalline silica were measured upwind and downwind of the facilities during the emission factor test programs. The measured ambient concentrations of PM_4 crystalline silica ranged from below the detectable limit of 0.3 $\mu g/m^3$ to 2.8 $\mu g/m^3$. These concentrations are well below the California REL of 3 $\mu g/m^3$.

Table 7. Plant upwind-downwind ambient monitoring at Carroll Canyon.

	PM_4 Crystalline Silica ($\mu g/m^3$)		
Date	Upwind	Downwind (primary)	Downwind (collocated)
September 17	1.3	1.1	1.0
September 18	1.4	0.7	0.8
September 19	0.6	0.5	0.4

Table 8. Plant upwind-downwind ambient monitoring at Vernalis.

	PM_4 Crystalline Silica ($\mu g/m^3$)		
Date	Upwind	Downwind (primary)	Downwind (collocated)
September 24	0.8	0.6	0.9
September 25	2.8	0.9	0.8
September 26	2.5	0.0	1.2

REFERENCES

1. Richards, J.; Brozell, T.; Kirk, W. *PM_{10} Emission Factors for a Stone Crushing Plant Deister Vibrating Screen*; EPA Contract No. 68-DI-0055, Task 2.84, U.S. Environmental Protection Agency: Research Triangle Park, NC, 1992.
2. Richards, J.; Brozell, T.; Kirk, W. *PM_{10} Emission Factors for a Stone Crushing Plant Tertiary Crusher*; EPA Contract No. 68-D1-0055, Task 2.84; U.S. Environmental Protection Agency: Research Triangle Park, NC, 1992.
3. Kirk, W.; Brozell, T.; Richards, J. PM_{10} Emission Factors for a Stone Crushing Plant Deister Vibrating Screen and Crusher; National Stone Association, Washington, DC, 1992.
4. Brozell, T.; Richards, J.; Kirk, W. *PM_{10} Emission Factors for a Stone Crushing Plant Tertiary Crusher and Vibrating Screen*; EPA Contract No. 68-DO-0122; U.S. Environmental Protection Agency: Research Triangle Park, NC, 1992.
5. Brozell, T. *PM_{10} Emission Factors for Two Transfer Points at a Granite Stone Crushing Plant*; EPA Contract No. 68-DO-0122; U.S. Environmental Protection Agency: Research Triangle Park, NC, 1994.
6. Brozell, T. *PM_{10} Emission Factors for a Stone Crushing Plant Transfer Point*; EPA Contract No. 68-DO-0122; U.S. Environmental Protection Agency: Research Triangle Park, NC, 1993.
7. Brozell, T.; Richards, J. *PM_{10} Emission Factors for a Limestone Crushing Plant Vibrating Screen and Crusher for Bristol, Tennessee*; EPA Contract No. 68-D2-0163; U.S. Environmental Protection Agency: Research Triangle Park, NC, 1993.
8. Brozell, T.; Richards, J. *PM_{10} Emission Factors for a Limestone Crushing Plant Vibrating Screen and Crusher for Marysville, Tennessee*; EPA Contract No. 68-D2-0163; U.S. Environmental Protection Agency: Research Triangle Park, NC, 1993.
9. Brozell, T.; Holder, T.; Richards, J. *Measurement of PM_{10} and $PM_{2.5}$ Emission Factors at a Stone Crushing Plant*; National Stone Association: Washington, DC, 1996.
10. Davis, B.L.; Johnson, R.K.; Stevens, R.K.; Courtney, W.J.; Safriet, D.W. The Quartz Content and Elemental Composition of Aerosols from Selected Sites of the EPA Inhalable Particulate Network; *Atmos. Environ.* **1984**, *18*, 771-782.
11. *Ambient Levels and Noncancer Health Effects of Inhaled Crystalline and Amorphous Silica: Health Issue Assessment*; EPA 600/R-95-115; U.S. Environmental Protection Agency: Washington, DC, 1996.
12. Richards, J.; Brozell, T. *Crystalline and Amorphous Silica Concentration in PM_{10} samples at Stone Crusting Plants*; National Stone, Sand & Gravel Association: Alexandria, VA, 2000.
13. Reference Method for the Determination of Fine Particulate Matter as PM2.5 in the Atmosphere. CFR, Part 50, Title 40, Appendix L, 1997.
14. Puledda, S; Paoletti, L.; Ferdinandi, M. Airborne Quartz Concentration in an Urban Site; *Environ. Poll.* **1999**, *104*, 441-448.
15. Norton, M.R.; Gunter, M.E. Relationships between Respiratory Diseases and Quartz-Rich Dust in Idaho, USA; *Am. Mineral.* **1999**, *84*, 1009-1019.
16. Schipper, L.B., III.; Chow, J.C.; Frazier, C.A. Particulate Air Toxic Emission Estimates of the PM_{10} Fraction in Natural Aggregate Processing Facilities. Presented at the 86th Annual Meeting and Exhibition of the Air & Waste Manage Association; A&WMA: Pittsburgh, PA, 1993.
17. Goldsmith, D.F. *Quail Hollow Special Investigation for the Monterey Bay Unified Air Pollution Control District*; University of California–Davis, Davis, CA, 1991.
18. Chow J.C.; Watson, J.G.; Lowenthal, D.H.; Solomon, P.A.; Magliano, K.L.; Ziman, S.D.; Richards, L.W. PM_{10} Source Apportionment in California's San Joaquin Valley; *Atmos. Environ.* **1992**, *26*, 3335-3354.
19. Chow, J.C.; J.G. Watson, Richards, L.W.; Haase, C.; McDade, C.; Dietrich, D.L.; Moon, D.; Sloane, C. *The 1989–90 Phoenix PM_{10} Study, Volume II. Source Apportionment, Final Report*; Report no. 8931.6F1, Prepared for the Arizona Department of Environmental Quality by Desert Research Institute: Reno, NV, 1991.
20. Chow, J.C.; Watson, J.G.; Fujita, E.M. Temporal and Spatial Variations of $PM_{2.5}$ and PM_{10} Aerosol in the Southern California Air Quality Study; *Atmos. Environ.* **1994**, *28*, 2061-2080.
21. Shiraki, R.; Holmen, B.A. Airborne Respirable Silica near a Sand and Gravel Facility in Central California: XRD and Elemental Analysis to Distinguish Source and Background Quartz; *Environ. Sci. Technol.* **2002**, *36*, 4956-4961.
22. Richards, J.; Brozell, T. *PM_4 Crystalline Silica and PM_{10} Particulate Matter Emission Factors for Aggregate Producing Sources, 2005 and 2006 Test Programs, Combined Report*; Prepared for the Coalition for the Responsible Regulation of Naturally Occurring Substances: Sacramento, CA, 2007.

About the Authors

John Richards is president and Todd Brozell is vice president of Air Control Techniques, P.C. Charles Rea is executive director of CalCIMA in Sacramento, CA. Geoff Boraston is director of Environmental Affairs of Granite Construction, Inc., in Sacramento, CA. John Hayden is vice president, Environment, Safety and Health, of NSSGA in Alexandria, VA. Please address correspondence to: John Richards, Air Control Techniques, P.C., 301 East Durham Road, Cary, NC 27513; phone +1-919-460-7811; fax: +1-919-460-7897; e-mail: john.richards@aircontroltechniques.com.

$PM_{2.5}$ Airborne Particulates near Frac Sand Operations

Crispin Pierce, Kristin Walters, Jeron Jacobson and Zachary Kroening
University of Wisconsin–Eau Claire

Abstract: The rapid growth of hydraulic fracturing for oil and gas extraction in the U.S. has led to more than 140 permitted "frac" sand mines and processing plants in Wisconsin. Potential environmental health risks include increased truck traffic, ecosystem loss, and groundwater and air pollution. Emitted air contaminants include fine particulate matter ($PM_{2.5}$) and respirable crystalline silica. Inhalation of fine dust particles causes increased mortality, cardiovascular disease, lung disease, and lung cancer. In this pilot study, use of a filter-based ambient particulate monitor found $PM_{2.5}$ levels of 5.82–50.8 $\mu g/m^3$ in six 24-hour samples around frac sand mines and processing sites. Enforcement of the existing U.S. EPA annual $PM_{2.5}$ standard of 12 $\mu g/m^3$ is likely to protect the public from silica exposure risks as well. $PM_{2.5}$ monitoring around frac sand sites is needed to ensure regulatory compliance, inform nearby communities, and protect public health.

Accepted for publication in the Journal of Environmental Health (Nov. 2015, in press).

Correspondence concerning this article should be addressed to Crispin Pierce, Watershed Institute for Collaborative Environmental Studies, University of Wisconsin-Eau Claire, Eau Claire, WI 54702. E-mail: piercech@uwec.edu

FW: Request For Comments, Information, and Advice On Potential Economic Impacts Of Proposed Rules - Message (HTML)

You replied to this message on 08/29/2015 6:02 PM.

From: Hart, Kristin L - DNR
Sent: Sat 08/29/2015 11:44 AM
To: Roth, John A - DNR
Cc:
Subject: FW: Request For Comments, Information, and Advice On Potential Economic Impacts Of Proposed Rules

From: Bill McMurtry [mailto:BMcMurtry@darlingii.com]
Sent: Tuesday, August 11, 2015 4:16 PM
To: Hart, Kristin L - DNR
Subject: RE: Request For Comments, Information, and Advice On Potential Economic Impacts Of Proposed Rules

Hey Kristin,

Thanks for the time on the phone today. Darling supports the DNR's policy approach to addressing the compliance challenges associated with the current PM 2.5 regulatory activity. As an industry with high temp boilers, driers, and oxidizers we are concerned about the regulation of PM 2.5 primarily because of the lack of real data to predict and mitigate the impacts. We fear this regulatory activity could create significant delays in the permit approval process and has the potential to present a significant economic to industry. Call with any questions.

Bill McMurtry
VP of Environmental Affairs
972-281-4409

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See more about: Hart, Kristin L - DNR.

FairmountSantrol

Ms. Kristin Hart
Wisconsin Department of Natural Resources
1010 South Webster Street
Madison, WI 53703

Re: Comments on $PM_{2.5}$ and Air Dispersion Modeling Draft Guidance Documents

Dear Ms. Hart:

Fairmount Santrol has been operating responsibly in the state of Wisconsin for decades. As a member of the WDNR Green Tier Program, Fairmount strives to collaborate with other responsible industry members, and with the WDNR. In fact, we were the first mining facility to be awarded the Green Tier certification. A key part of Fairmount Santrol's operating philosophy is to continuously look for ways to reduce our footprint, and ensure the protection of our environment, the health and safety of our workers, and the well-being of our neighbors in the communities where we operate.

Through coordination with the DNR, and with data collected through private studies that Fairmount has conducted, we promote transparent communication between industry and the Department, on air-related subjects. Fairmount appreciates the opportunity to provide input on the guidance documents that the WDNR has drafted.

As a member of the Wisconsin Industrial Sand Association (WISA), Fairmount Santrol supports the statements submitted by WISA regarding the WDNR's guidance documents. In addition, we believe that this guidance will help alleviate unnecessary regulatory burdens previously in place on our industry. WDNR's determination that "direct emissions of PM2.5 from a single, direct stationary source will not cause or exacerbate violation of any PM2.5 air quality standard or increment" is a refreshing perspective that is backed by scientific data both in this state and others. We at Fairmount, feel that this is a step in the right direction in regards to air permitting in Wisconsin. Through both required and voluntary fence-line monitoring programs, our facilities, as well as others, have demonstrated that industrial sand mining operations do not cause adverse air quality impacts.

N5628 580th Street
Menomonie, WI 54751
PHONE 715.235.0942 FAX 715.235.3584

FairmountSantrol.com

In regards to costly air dispersion modeling, Fairmount supports the WDNR on their current changes in guidance, recognizing the limitations of the modeling itself. We however, believe that in consistency with the Clean Air Act, this modeling should not be required for the renewal of minor and major source operating permits, or for new minor source construction permits. Appropriate regulation can be taken without the need for this modeling for minor sources, and has been demonstrated successfully in other states.

Fairmount would also like to express its support for the Variance Request Procedures proposed guidance. This proposed guidance document provides insight and clarity for companies looking to request a variance from ambient air monitoring requirements. This recognizes that the type of monitoring data that has been collected thus far will help better inform variance decisions in the future. This should be helpful to not only industry members, but should help streamline applications for the WDNR as well.

We understand the WDNR has been tasked with examining our industry objectively. The decisions outlined by the WDNR within these guidance documents are based on fact and science. While updating guidance documents are a start towards improved rulemaking, there is still a long way to go. This approach of utilizing proven scientific information, with repeatable results, needs to be carried into future rule making processes.

As a company actively involved in fact based discussions with other industry members and the WDNR, Fairmount would like to thank the WDNR for their efforts to help improve the air permitting process here in Wisconsin by ensuring that industry is not burdened by unsubstantiated and unnecessarily restrictive regulations.

Respectfully,

Aaron Scott
Northern Region Mine Manager

Via Email

Ms. Gail Good, gail.good@wisconsin.gov
Ms. Kristin Hart, kristin.hart@wisconsin.gov
Mr. John Roth, john.roth@wisconsin.gov
Wisconsin Department of Natural Resources
101 S. Webster Street
P.O. Box 7921
Madison, WI 53707-7921

RE: Comments on WDNR Draft Guidance Documents on Air Management

Dear Ms. Good, Ms. Hart and Mr. Roth:

Wisconsin Transportation Builders Association (WTBA) appreciates the opportunity to provide comments on the following Wisconsin Department of Natural Resources' (WDNR) proposed guidance documents:

- "Air Dispersion Modeling Guidelines";
- "2015 Approach to Dispersion Modeling for Permits";
- "Guidance for Including $PM_{2.5}$ in Air Pollution Control Permit Applications"; and
- "Variance Request Procedures under NR 415.075(4), Wis. Admin. Code."

Wisconsin Transportation Builders Association ("WTBA") is a statewide association of approximately 250 companies that plan, design, construct and maintain all types of transportation facilities. Its members are an essential component of creating and maintaining the necessary infrastructure to support a vibrant Wisconsin economy. Many of its members own and operate non-metallic mining facilities. Its members have been actively involved in monitoring ambient air from those facilities and developing the technical foundation underlying the WDNR's conclusion that direct emissions of $PM_{2.5}$ do not cause or exacerbate violations of the $PM_{2.5}$ National Ambient Air Quality Standard ("NAAQS").

WTBA fully supports WDNR's above conclusion. Accordingly, WTBA supports the proposed guidances as it eliminates the need for costly, burdensome and unnecessary modeling associated with the permitting of minor sources such as non-metallic mining facilities.

WTBA appreciates WDNR's efforts to improve and streamline Wisconsin's air permitting process by issuing guidance that reflects sound technical conclusions.

If you have any questions, please contact Pat Goss at WTBA (608) 256-6891 / pgoss@wtba.org.

1 S Pinckney St # 300 Madison, WI 53703 (608) 256-6891

August 27, 2015

Ms. Kristin Hart
Mr. John Roth
Wisconsin Department of Natural Resources
101 South Webster Street
Madison, WI 53703

Re: Comments on Draft Guidance Documents Concerning $PM_{2.5}$ and Air Dispersion Modeling

Dear Ms. Hart:

The Wisconsin Paper Council (WPC) submits these comments on the following draft WDNR guidance documents:

- 2015 Approach to Dispersion Modeling for Permits
- Air Dispersion Modeling Guidelines
- Guidance for Including $PM_{2.5}$ in Air Pollution Control Permit Applications

In summary, WPC believes there is a critical need for these new policies/guidance documents and strongly supports DNR's finalization and immediate implementation.

Background of WPC

The WPC advocates for and represents the state's pulp and papermaking industry. Wisconsin is the #1 papermaking state in the United States and its members provide family supporting jobs for over 31,000 employees throughout Wisconsin. Papermakers are dedicated to providing well-paying jobs as well as being environmentally responsible community partners. Members of WPC continue to be key factors in our state's economic well-being.

General Comment

WDNR may approve an air permit application after finding, among other things, that "[t]he source will not cause or exacerbate a violation of any ambient air quality standard or ambient air increment under s. 285.21(1) or (2)." Although not a requirement, air dispersion modeling has been the predominant mechanism for demonstrating compliance with this criterion. However, air modeling has its limitations and presents challenges.

For example, air modeling currently requires using very conservative emission rates, meteorological data and receptor assumptions that are developed independent of one another. This results in the modeling assessment analyzing a very conservative and highly improbable

hypothetical situation. This level of conservatism is becoming increasingly difficult to manage and inappropriate for regulatory decision making as ambient air standards are being lowered by EPA.

More stringent ambient air standards have also highlighted the policy shortcomings and technical limitations of air modeling techniques used for performing air quality assessments on a permit-by-permit basis. Over the last 30 years, stationary sources have greatly reduced their emissions resulting in a greater proportion of ambient pollution concentrations being attributable to area and mobile sources. Pollution control strategies imposed on individual stationary sources have little, if any, demonstrable effect on lowering overall pollution concentrations, particularly $PM_{2.5}$. As a result, broader pollution control strategies are necessary to lower these concentrations while preserving equity and shared responsibility amongst all emission sectors (area, mobile, minor stationary and major stationary) in achieving air quality standards in Wisconsin.

WPC is aware of independent studies of $PM_{2.5}$ sources from the forest products sector and other industry[1] sectors that support WDNR's proposed guidance by confirming WDNR's principal findings that mechanical processes and material handling operations are negligible sources of fine particulate matter and have historically been significantly overestimated. In addition to WDNR's own assessment of emissions source profiles, emissions trends, ambient measurements of PM_{10} and $PM_{2.5}$, and the NCASI study on EPA performance test methods that WDNR cites in the draft Technical Support Document, more recent NCASI studies have reached the same conclusion: "the silt fractions for chip and bark samples collected in this study would indicate that $PM_{2.5}$ emissions from these solids handling operations would be negligible."[2] WPC understands that NCASI intends to provide WDNR with this report to substantiate these conclusions as part of its review of the draft guidance documents.

WPC thanks WDNR for taking the initiative to address these issues. The policies set forth in the draft guidance documents have the potential to mitigate these shortcomings and improve the air quality assessment process associated with issuing air permits in Wisconsin, which, in turn, will help Wisconsin remain competitive with other states by eliminating or mitigating certain permitting requirements that may be preventing prompt permitting for worthwhile and environmentally benign economic projects.

General Comment on Equity

WPC member companies generally operate large stationary sources, many of which are subject to the PSD program. Some of the draft guidance enhancements are limited to permitting of minor sources and minor modifications (*i.e.*, permits that do not trigger PSD obligations). As a consequence, care must be taken to implement these policies in a manner that is equitable to larger PSD sources and consistent with the Congressional directive that PSD permitting programs ensure continued economic growth. See, 42 U.S.C. § 7470(3).

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[1] Richards, J. and T. Brozell. Assessment of Community Exposure to Ambient Respirable Crystalline Silica near Frac Sand Processing Facilities. *Atmosphere* 2015, *6*, 960-982.

[2] National Council for Air and Stream Improvement, Inc. Estimating the Potential for $PM_{2.5}$ Emissions from Wood and Bark Handling. Special Report No. 15-01, January 2015.

Draft "2015 Approach to Dispersion Modeling for Permits" Guidance

- WDNR should clarify that when issuing or renewing operation permits (Part 70 and Non-Part 70 Sources), modeling will be limited to NAAQS that have been promulgated as a state rule in accordance with Wis. Stat. ch. 227.

- WDNR has concluded that no $PM_{2.5}$ modeling is required for minor construction permits because direct, primary $PM_{2.5}$ emissions do not cause or exacerbate exceedances of the applicable NAAQS. WDNR should clarify that this conclusion also applies to minor modifications or sources that would insignificantly increase precursors to the secondary formation of $PM_{2.5}$.

- WDNR should clarify that no $PM_{2.5}$ modeling is required if a project which itself has significant $PM_{2.5}$, NO_2, or SO_2 emissions, nonetheless nets out of PSD review. In these circumstances, the net emissions increases are of a similar magnitude as a minor construction permit project and therefore should be treated in a similar fashion.

Draft "Air Dispersion Modeling Guidelines" Guidelines

- Pages 8, 23 and 24 suggest that modeling should capture "all possible" emission load scenarios. Yet, this is an infinite set of possibilities. WDNR should consider limiting this to modeling only the worst case emission load scenario under all permitted alternative operating scenarios.

- Pages 8, 9 and 24 – WDNR suggests that fugitive emissions must now be included in modeling analyses if the emissions are either "considered in the permit" or "affected by the permit." Although unclear, this appears to be a significant departure from current permitting and modeling policy which provides WDNR with discretion on when and how to model fugitive emissions. Discretion is necessary given the uncertainty surrounding the emission rates associated with most fugitive sources, as well as the inherent inaccuracies with modeling such emissions.

  - Regardless of WDNR's general policy with respect to fugitive emissions, WDNR should exempt from modeling fugitive emissions associated with wood handling and processing operations (e.g., chipping debarking, material handling). The aforementioned NCASI Special Report demonstrates that the silt content of wood/bark/bark residues (a reliable surrogate for fugitive $PM_{2.5}$ emissions) are three orders of magnitude below those for aggregates and other materials.

- Pages 9 and 24 – The guidance suggest that a modeling analysis must include structures that are over 4' in height for purposes of building downwash considerations. This could include a large garbage dumpster and other ubiquitous structures. WPC suggest that the guidance increase this height to something less onerous and/or define "structure" so as to clarify that it only applies to higher, permanent buildings.

- Pages 10 and 25 – The guidance suggest that an onsite parking lot (inside a facility's fence line) is considered ambient air. Onsite parking lots are not generally available to the public and therefore should not be considered ambient air for purposes of modeling

compliance with AAQS. Moreover, the guidance should clarify that air quality assessments need only focus on locations where the public might reasonably be exposed to a pollutant for time periods that are consistent with the ambient standard for which the analysis is performed. In this regard, ambient air standards are based upon assumed long-term exposure periods at constant air pollution concentrations. Predicted short term exposure to ambient concentrations of a pollutant above a standard is not necessarily harmful. This approach is memorialized in NR 406.09 which states that, "The air quality impact of a proposed stationary source will be determined at such locations where members of the public might reasonably be exposed for time periods consistent with the ambient air quality standards for the pollutants for which analysis is carried out." Many of the areas identified by the guidance as "ambient air" fall outside of the areas defined by NR 406.09 for demonstrating compliance with AAQS. The guidance should be amended to define ambient air in a manner that is consistent with this directive. As such, modeling analyses should exclude receptor locations that fall on roadways, rail lines, easements which limit access, areas between fence and private property lines, cemeteries, waterways, and other generally inaccessible or uninhabited areas. Many other state modeling guidelines (e.g., Texas and South Carolina) have implemented this approach simply by relying on a facility's *property* line, rather than *fence* line, to determine the ambient air boundary for non-PSD modeling analyses. WPC encourages WDNR to make determinations about ambient air boundaries that reflect locations "to which the general public has *access*," interpreted as *legal* access, such that applicants are not obligated to presume illegal activity or access (*e.g.*, forced entry, trespassing, or loitering) to reasonably marked private property.

- Pages 11 and 13 – The guidance states that where credit is taken for permanent shutdown emissions, it should be shown that credited emissions from the shutdown would not have solely caused a modeled exceedance. This is unclear and should be clarified as only applying to a SIL analysis. The language inappropriately suggests that if a stationary source would have modeled above an AAQS and is then shut down, the source cannot take credit or otherwise recognize the emission reductions in a modeling analysis. The guidance should clarify that a regulated source should be allowed to shut down older, high-emitting emission units and use those reductions for modeling compliance, without first proving that the source would not have modeled above any AAQS.

- Page 28 - The guidance should clarify that modeling above the SIL does not, in turn, require modeling for the 1-hour SO_2, 1-hour NO_2, or $PM_{2.5}$ AAQS.

- Page 33 – The guidance states that applicants for an operation permit do not need to submit modeling results. However, any modeling that is submitted by the applicant must be consistent with the guidance and Appendix W. This statement seems to conflict with the other draft guidance. Operation permit application should comply with the new state guidance documents and Appendix W to the extent they do not conflict. If there is a conflict with Appendix W, an operation permit applicant should follow the state guidance.

- WPC offers the same comments on the operation permit section of the guidance as is discussed above for construction permits (e.g., fugitives, downwash, ambient air, etc.).

- As mentioned, modeling has historically required using very conservative emission rates, meteorological data and receptor assumptions. This results in the assessment analyzing a very conservative and highly improbable, hypothetical situation. WDNR might consider providing options for using more realistic and less conservative assumptions in the dispersion modeling analysis. Assumptions could be developed based on statistical probabilities that consider the relative likelihood that all of the assumed conservative conditions would occur at the same time. Emission rates used in the model could be established based on anticipated frequency determined from historic emission data, such as CEMS. Under this approach, an air impact assessment could focus on determining whether proposed permit limitations protect an ambient air standard to a predetermined range of certainty and/or frequency. The assumptions and data used in the assessment could be established at levels that are consistent with that range. WDNR might also consider allowing the use of a robust statistical technique - such as EMVAP - to estimate an upper limit design value that provides an acceptable degree of confidence in the results, yet avoids the level of conservatism that exists in the current approach to modeling. This approach might also be extended to off-site emission sources that make up the ambient background assumptions.

- WPC is aware – and assumes WDNR is also aware – that EPA has recently proposed substantial revisions to the federal *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) and hosted the 11th Conference on Air Quality Models[3] to discuss changes to prevailing federal modeling guidelines. Several of these changes in the federal guidance (e.g., tiered modeling approaches for NO_2 modeling) would affect aspects of WDNR's guidance. Recognizing that the federal modeling guidelines will not likely be finalized and effective for approximately one year (i.e., approximately July 2016), it is appropriate to proceed with necessary changes as proposed in the draft WDNR guidance at this time. We anticipate continuing to work closely with WDNR in 2016 to revise Wisconsin's modeling guidelines, as appropriate, to incorporate relevant aspects of revised federal guidance. In the meantime, WPC encourages WDNR to exercise flexibility and discretion to approve and implement improved modeling techniques that can be shown to be applicable on a case-by-case basis.

- WDNR should consider allowing for the use of seasonal, if not monthly, monitor values as the background concentration used in an air quality assessment. At a minimum, memorialize the permit applicant's ability to focus on the five-year average eighth highest reading for purposes of $PM_{2.5}$ analyses. EPA has already provided guidance indicating the appropriate application of seasonally variable background concentrations for $PM_{2.5}$ and seasonal/hour-of-day variable background concentrations for 1-hour SO_2 and NO_2.

- WDNR should allow for the subtraction of the field train blank from $PM_{2.5}$ test results for all $PM_{2.5}$ emissions analyses as allowed by EPA guidance.[4]

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[3] Proposed guideline revisions, technical presentations, and public hearing transcripts are available at http://www.epa.gov/ttn/scram/11thmodconf.htm.

[4] EPA Memorandum, "Interim Guidance on the Treatment of Condensable Particulate Matter Test Results in the Prevention of Significant Deterioration and Nonattainment New Source Review Programs," April 8, 2014. http://www.epa.gov/ttn/emc/methods/psdnsrinterimcmpmemo4814.pdf.

- WDNR should explicitly exempt sources with wet control devices from having to model because of the current absence of a method to measure $FPM_{2.5}$. Forcing sources to assume that all FPM is $FPM_{2.5}$ grossly overestimates emissions.

Guidance for Including $PM_{2.5}$ in Permit Applications

- The guidance concludes that stationary sources do not emit significant levels of $PM_{2.5}$ emissions, with the possible exception of combustion and high temperature industrial units. As such, we understand that permit applicants for a typical low temperature source can exclude emission calculations and regulatory analyses related to $PM_{2.5}$ (e.g., netting, BACT).

- The Department should clarify that if $PM_{2.5}$ modeling is required for an application (i.e., a major PSD permit), only direct $PM_{2.5}$ from combustion and high temperature industrial sources need be modeled. This is the only circumstance in which condensable PM would be quantified as part of the direct $PM_{2.5}$ emission rate and included in the assessment of ambient $PM_{2.5}$ concentrations.

- The guidance should more clearly indicate that sources can eliminate limitations that had been previously accepted to avoid causing or exacerbating a modeled exceedance of a $PM_{2.5}$ AAQS.

- WDNR has concluded that no $PM_{2.5}$ modeling is required for minor construction permits because direct, primary $PM_{2.5}$ do not cause or exacerbate exceedances of the applicable NAAQS. WDNR should clarify that this conclusion also applies to minor modifications or sources that would insignificantly increase precursors to the secondary formation of $PM_{2.5}$.

- Page 4 – The guidance should be clarified. It states that that $PM_{2.5}$ modeling is never required for minor construction permits, even if the emissions units are "significant" sources of $PM_{2.5}$. Please clarify that no $PM_{2.5}$ modeling would be required of project which nets out of PSD and is therefore a minor permit application.

WPC thanks WDNR for its efforts to improve the air permitting process in Wisconsin and specifically the draft guidance documents regarding modeling and the treatment of $PM_{2.5}$ in air permit application.

Sincerely,

Scott Suder

cc: Mr. Todd E. Palmer, Esq., Michael Best and Friedrich LLP

WMC

WISCONSIN MANUFACTURERS & COMMERCE

August 27, 2015

Ms. Gail Good
Ms. Kristin Hart
Mr. John Roth
Wisconsin Department of Natural Resources
101 S. Webster St.
P.O. Box 7921
Madison, WI 53707-7921

RE: Comments on WDNR Draft Guidance Documents

Dear Ms. Good, Ms. Hart, and Mr. Roth:

Wisconsin Manufacturers & Commerce (WMC) appreciates the opportunity to provide input on the Wisconsin Department of Natural Resources' (WDNR) proposed guidance documents (collectively referred to herein as the "guidance documents") entitled:

- "Air Dispersion Modeling Guidelines"
- "2015 Approach to Dispersion Modeling for Permits"
- "Guidance for Including $PM_{2.5}$ in Air Pollution Control Permit Applications"
- "Variance Request Procedures under NR 415.075(4), Wis. Adm. Code"

WMC is Wisconsin's Chamber of Commerce and Manufacturers' Association. We are the state's largest general business trade association, with roughly one-fourth of the state's private sector workforce employed by a WMC member company. We represent businesses of all sizes and across all sectors of our state's economy. WMC is dedicated to making Wisconsin the most competitive state in the nation to do business.

To that end, WMC is generally supportive of the guidance documents issued by WDNR and we believe this new guidance will help alleviate needless regulatory burdens on Wisconsin businesses.

WDNR's determination that "direct emissions of $PM_{2.5}$ from a single, direct stationary source will not cause or exacerbate violation of any $PM_{2.5}$ air quality standard or increment" represents a positive change to the air permitting regulatory framework, and is consistent with applicable statutes and regulations at both the state and federal levels. This proposed guidance is also consistent with what is being done in several other states. While we believe there is still more work that needs to be done in regards to air permitting here in Wisconsin, this change certainly improves the process and we thank WDNR for their work on this front.

501 East Washington Avenue Madison, WI 53703-2914 P.O. Box 352 Madison, WI 53701-0352
Phone 608.258.3400 • **Fax** 608.258.3413 • www.wmc.org • **Facebook** WisconsinMC • **Twitter** @WisconsinMC

Founded in 1911, WMC is Wisconsin's chamber of commerce and largest business trade association.

WMC recognizes that industry-specific comments to the guidance document will get into more detail as to how the guidance will impact those specific industries and ways in which the guidance could be improved upon. In particular, the Wisconsin Paper Council (WPC) will be submitting comments on the proposed guidance and WMC supports the WPC comments as well.

WMC, consistent with the requirements of the Clean Air Act (CAA), continues to believe that air dispersion modeling should not be required for the renewal of minor and major source operating permits, or for new minor source construction permits. We note that minor sources are not required to obtain operating permits under the CAA, and many states (including some of our neighboring states) have chosen not to do so, while still appropriately enforcing environmental standards. Still, WMC believes the draft guidance documents mentioned above help to alleviate some needless and burdensome air-quality modeling requirements, and we support these changes.

As ambient air standards are lowered by the Environmental Protection Agency (EPA), air modeling is becoming an increasingly costly and burdensome task for applicants to endure. Requiring air modeling of $PM_{2.5}$ on a permit by permit basis is of little value, especially given that direct $PM_{2.5}$ emissions have no demonstrable impact on overall pollution concentrations. With this proposed guidance, this needlessly burdensome and costly modeling will no longer need to occur, and to that end this guidance is going to have a positive impact on businesses operating in Wisconsin.

WMC also wants to express our support for the "Variance Request Procedures under NR 415.075(4), Wis. Adm. Code" proposed guidance. Industrial sand mining is a major employer and growth industry in Wisconsin. The proposed guidance document provides additional transparency and clarity for industrial sand mining companies, whether existing sources or new, who are seeking a variance from the ambient air monitoring requirements under NR 415.075. The transparency and clarity provided by this proposed guidance will certainly be beneficial to both variance applicants as well as WDNR staff, and will have a positive impact on the business climate here in Wisconsin.

Importantly, the proposed variance procedure for industrial sand mining is also justified from an air quality protection standpoint, and is commensurate with protecting public health. Despite inflammatory and unfounded claims to the contrary from environmental groups and others, industrial sand mining is not a threat to air quality. A recent report by Dr. John Richards (attached) measured ambient crystalline silica concentrations (PM_4) at four facilities in Wisconsin over a two-year period. The data collection was done using EPA reference methods for collecting particulate matter samples.

Dr. Richards' study found mean concentrations of ambient PM_4 at these Wisconsin facilities to be less than ten percent of the California Office of Environmental Health Hazard Assessment (OEHHA) chronic exposure level of 3.0 micrograms per cubic meter – a standard that we believe is significantly overprotective in its own right. The PM_4 ambient concentrations were, according to the study, consistent with background levels and therefore not a threat to public health. The dire claims from environmental groups about the ambient air quality impacts associated with industrial sand mining are not grounded in science or data, and should be rejected

accordingly. Under no circumstances do their unsupported claims provide a legitimate legal or public policy basis to remove the industrial sand mining variance procedure from the guidance document.

Again, WMC generally supports the proposed guidance documents discussed above and thanks WDNR staff for their work in this area to help improve the air permitting process here in Wisconsin. We look forward to continuing to work with you on ways to ensure Wisconsin businesses are not unduly burdened by overly costly and restrictive regulations.

Sincerely,

Lucas J. Vebber

LUCAS VEBBER
Director, Environmental and Energy Policy
Wisconsin Manufacturers & Commerce

cc: Mr. Patrick Stevens, WDNR
Mr. Bart Sponseller, WDNR

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Article

Assessment of Community Exposure to Ambient Respirable Crystalline Silica near Frac Sand Processing Facilities

John Richards * and Todd Brozell

Air Control Techniques, P.C., 301 East Durham Road, Cary, NC 27513, USA;
E-Mail: todd.brozell@aircontroltechniques.com

* Author to whom correspondence should be addressed;
E-Mail: john.richards@aircontroltechniques.com; Tel.: +1-919-460-7811; Fax: +1-919-460-7897.

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Abstract: Due the rapid expansion of frac sand production, local residents, community leaders, and state regulatory authorities have expressed concerns regarding the lack of ambient respirable crystalline silica concentration data for areas near to these facilities. Long-term average data are needed to compare the fence line concentrations against chronic reference exposure guidelines such as the one adopted by the California Office of Environmental Health Hazard Assessment (OEHHA). This paper provides comprehensive sets of 24 h respirable crystalline silica concentration measurements compiled during multi-year sampling programs at the fence lines of four Wisconsin facilities—three frac sand mines and one frac sand processing plant. The authors adapted Environmental Protection Agency (EPA) reference method PM2.5 filter-based samplers to provide respirable (PM4) filter samples. Crystalline silica content of the PM4 particulate matter samples was measured using National Institute of Occupational Safety and Health (NIOSH) Method 7500 X-ray diffraction. The respirable crystalline silica limit of quantification was 0.31 $\mu g/m^3$. The geometric mean (GM) respirable crystalline silica concentrations at the fence lines of the frac sand-producing facilities were less than 10% of the 3.0 $\mu g/m^3$ California OEHHA chronic exposure level and were consistent with background concentrations throughout the upper Midwest of the U.S.

Keywords: respirable crystalline silica; fence line sampling; frac sand mines; frac sand processing plants; community air quality; ambient particulate matter; PM4 particulate matter; PM4 crystalline silica

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1. Introduction

OEHHA has adopted a 70-year chronic reference exposure level (REL) for ambient respirable (PM4) crystalline silica [1]. OEHHA based the REL on an extrapolation of occupational hygiene epidemiological studies, most of which used in-plant PM4 crystalline silica (The terms respirable crystalline silica and PM4 crystalline silica are used interchangeably in this paper and are consistent with common terminology in crystalline silica occupational hygiene literature) measurements. OEHHA defined the REL as an ambient concentration below which adverse, non-cancer health effects are not anticipated.

In 2005, when OEHHA published the ambient respirable crystalline silica REL, no technique for direct measurement was available. The personal samplers used for in-plant worker monitoring could not be adapted for the lower concentrations present in ambient air. To help compile data for direct comparison to the OEHHA REL, Richards and Brozell [2] developed an ambient PM4 crystalline silica sampling method that combined the high volume sampling capability of PM2.5 reference method samplers meeting the requirements of 40 CFR Part 50, Appendix L [3] with the sensitive crystalline silica analytical capabilities provided by the X-ray diffraction (XRD) analysis procedures in NIOSH Method 7500 [4]. The necessary sample flow rate to achieve a 50% cut size at four micrometers was determined to be 11.1 liters per minute based on a series of tests challenging a sharp cut cyclone equipped Rupprecht-Patashnick PM2.5 sampler (now sold under the trade name Partisol 2000i) with National Institute of Standards and Technology (NIST) traceable monodisperse microspheres.

The 50% cut point at 11.1 liters per minute sample flow rate is consistent with the 50% cut size of NIOSH Method 0600 used for industrial hygiene sampling. The sharpness of the size-efficiency curve for the modified PM2.5 filter samplers is also similar to NIOSH Method 0600 [5]. Accordingly, ambient respirable crystalline silica concentration data measured using this new method are comparable to data from health effects research studies conducted using NIOSH 0600 sampling procedures and NIOSH 7500 analytical procedures.

This new ambient sampling method provided a limit of quantification (LOQ) of 0.31 $\mu g/m^3$ based on (1) a sample volume of 15.98 m^3 over a 24 h sampling period and (2) a Method 7500 X-ray diffraction detection limit of 5 µg. This respirable crystalline silica measurement LOQ is approximately 10% of the California REL of 3.0 $\mu g/m^3$.

This sampling and analytical approach provides a direct measurement of crystalline silica in the respirable size range. The method uses readily available commercial equipment that can be easily adapted for PM4 particulate matter sampling by adjusting the sample flow rate and by using polyvinyl chloride (PVC) filter media that are compatible with X-ray diffraction analyses. The well-established quality assurance procedures for operating U.S. EPA reference method PM2.5 filter samplers are directly applicable to an adjusted sampler used for PM4 particulate matter. Furthermore, the ambient data compiled with this measurement method are directly comparable to the extensive health effects database compiled over the past 30 years concerning occupational exposure to respirable crystalline silica.

Richards *et al.* [6] used this new sampling method to conduct limited sampling for respirable crystalline silica concentrations upwind and downwind of two construction sand and gravel plants in California. The South Coast Air Quality Management District (SCAQMD) [7,8] independently

developed a sampling procedure similar to that developed by Richards and Brozell [2]. They used this method to measure respirable crystalline silica concentrations in Duarte, California in response to community concerns regarding respirable crystalline silica from sand and gravel plants and other sources near a school. The respirable crystalline silica sampling approaches developed independently by both Richards and Brozell [2] and the SCAQMD [7,8] provide sensitive techniques for measuring low concentrations in ambient air.

Prior to the start of this sampling program in 2012, very little ambient respirable crystalline silica data were available that were applicable to communities near frac sand-producing facilities. Both the Wisconsin Department of Natural Resources (WDNR) and the Minnesota Pollution Control Agency (MPCA) expressed concerns regarding this lack of relevant exposure data [9,10]. Sand mining and processing plants in Wisconsin decided to apply this new ambient respirable crystalline silica sampling technique to address questions and concerns raised in numerous communities near sand-producing facilities. The study presented in this paper is the first large-scale, long-term application of this measurement method.

2. Methods of Sampling and Analysis

2.1. Facility and Sampling Network Characteristics

EOG Resources, Inc. (EOG, Fort Worth, TX, USA) operates three sand mines and one processing plant in Wisconsin. These four facilities, described in Table 1, include the DS mine, S&S mine, and Chippewa Falls sand processing plant in Chippewa County and the DD mine in Barron County. Air Control Techniques, P.C. installed three respirable crystalline silica sampling sites at each of the four facilities. Two samplers were located at a site termed "Location 1" near the facility fence line at a position that was downwind of possible emission sources when the wind was from a common direction. One of these instruments served as the primary sampler, and the second served as a collocated unit for sampling precision analyses. The third sampler was installed at Location 2 on the other side of the facility. The sampler locations in the facilities and the wind roses for the study period are shown in Figures 1–8.

Table 1. Facilities conducting ambient respirable crystalline silica sampling in Wisconsin.

Facility	Number of Samplers	Sampling Dates	Operating Dates
Chippewa Falls Processing Plant Chippewa County, WI	3	Oct. 2012–Dec. 2014	All months
DS Mine, Chippewa County, WI	3	Oct. 2012–Dec. 2014	April to November each year
S&S Mine, Chippewa County, WI	3	Oct. 2012–Dec. 2014	November to April each year
DD Mine, Barron County, WI	3	Nov. 2012–Dec. 2014	November 2012 to April 2013
Total	12	-	-

As shown in Figure 1, the Location 1 sampling site at the Chippewa Falls sand processing plant was near the northern fence line at a spot approximately 10 m from the truck receiving building. This site was the only spot available that met the EPA siting requirements in 40 Code of Federal Regulations (CFR) Part 58, Appendix E [11] and had available electrical power. The wind direction and wind

speed sensors were mounted on a 10 m pole located to the southeast of the main plant buildings in the center of the plant. The plant buildings to the west of the wind direction sensor resulted in some bias in the indicated wind directions from the north-northwest, west, and west-southwest shown in Figure 2.

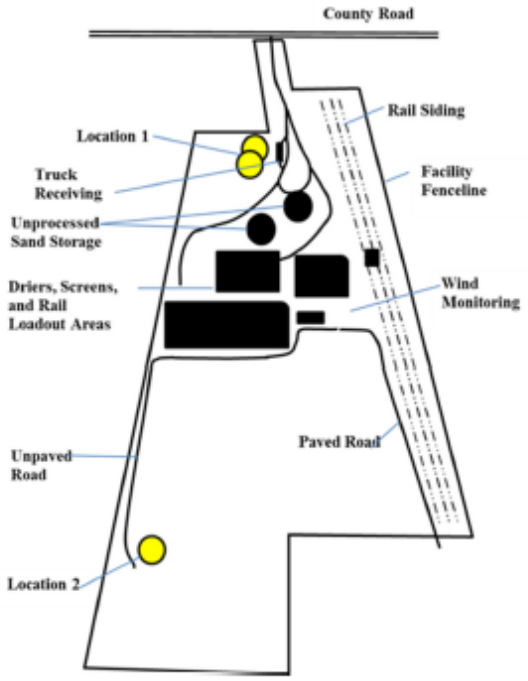


Figure 1. Chippewa Falls sampler locations.

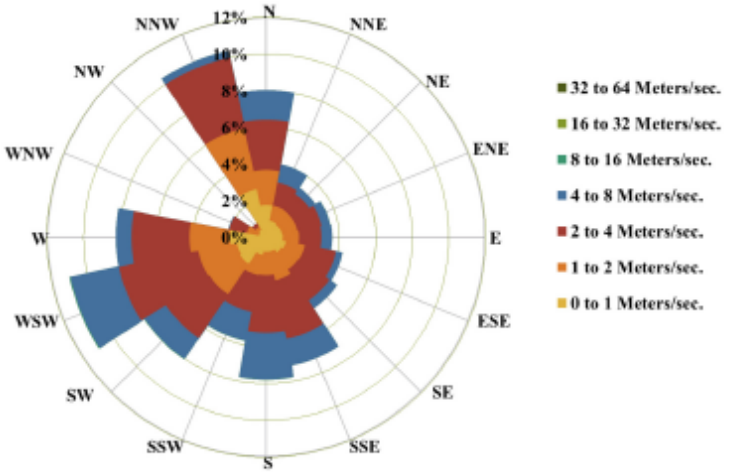


Figure 2. Chippewa Falls wind rose, October 2012–December 2014.

The samplers at the DS mine are shown in Figure 3. During most of 2013, the sampler positions were on the northeast side of all mine activity. During the latter part of 2013, the quarry activities were expanded to the east and northeast of the sampling site.

The measured wind directions at the DS mine were most frequently from the south. This was due primarily to the channeling of the winds by tall hills on the western side of the mine.

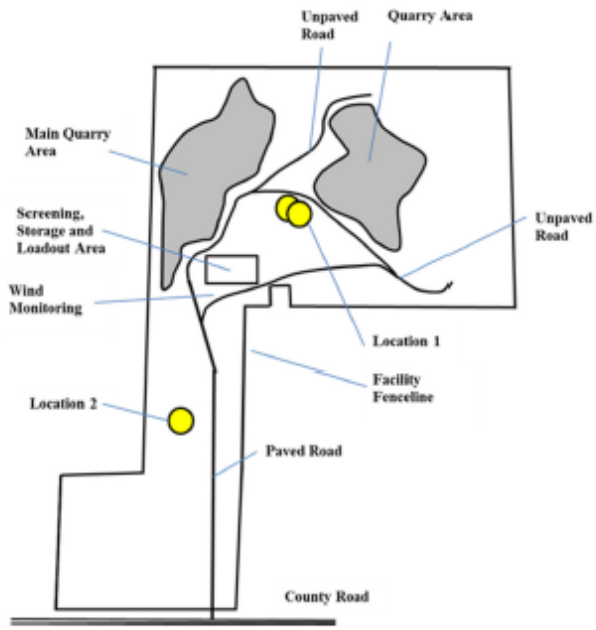


Figure 3. DS Mine sampler locations.

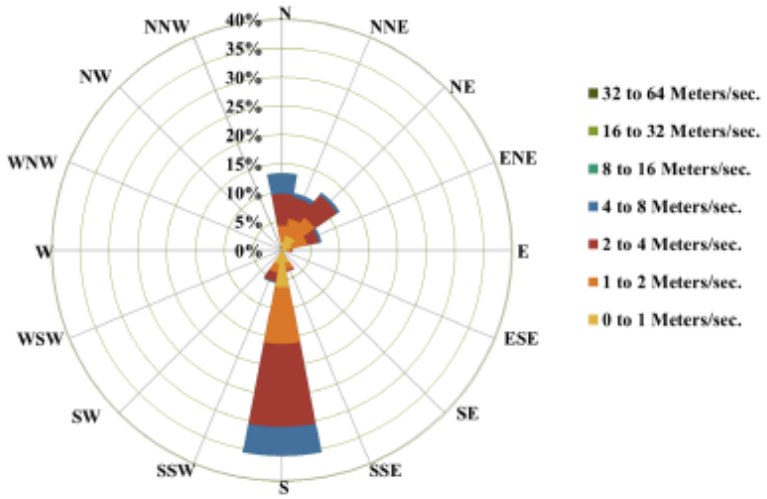


Figure 4. DS Mine wind rose, October 2012–December 2014.

The samplers at the S&S Mine are shown in Figure 5. Location 1 was selected due its downwind position when the winds were from the west, southwest, or south. Location 2 was next to the mine office on the southern edge of the mine.

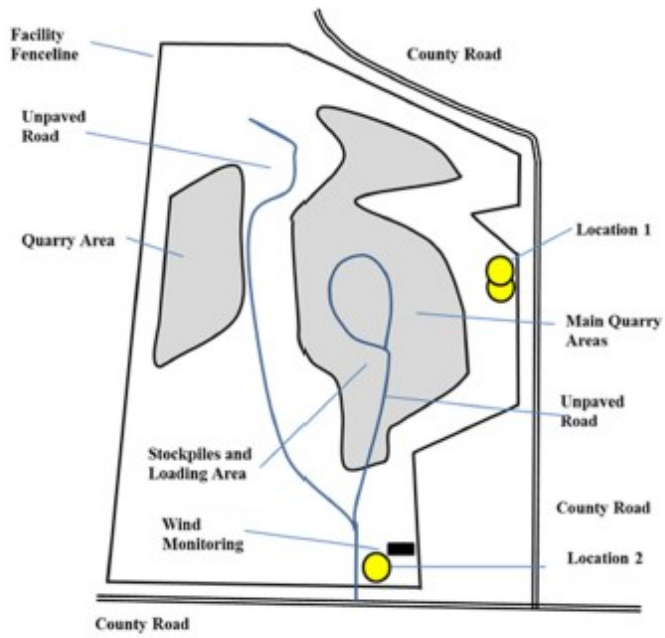


Figure 5. S&S Mine sampler locations.

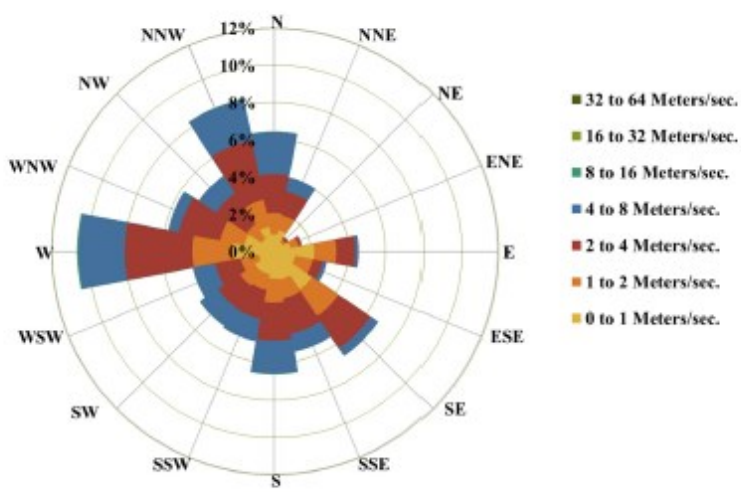


Figure 6. S&S Mine wind rose, October 2012–December 2014.

The sampling locations at the DD mine were oriented on a north-south axis. The Location 1 site was near the southern fence line. The Location 2 site was near the northern mine entrance. The wind

direction and wind speed sensors were near the plant office on the northern side of the mine. The land around this mine is relatively flat. The topography did not influence the measured wind directions.

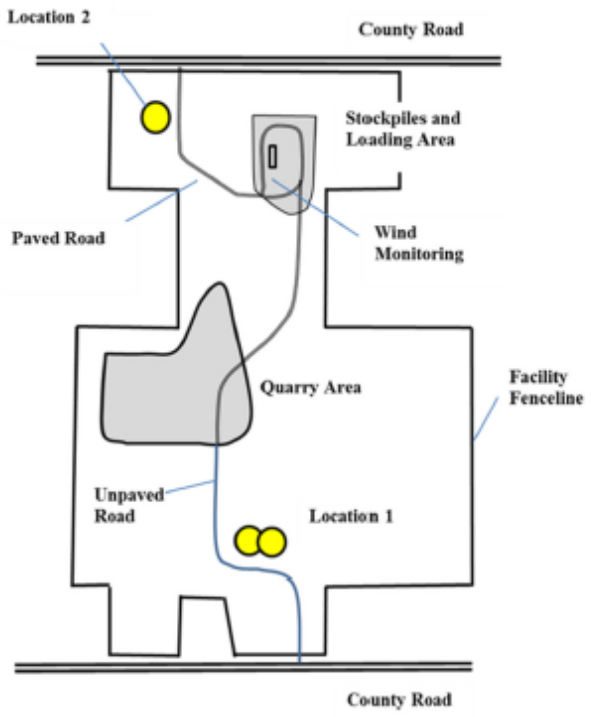


Figure 7. DD Mine sampling locations.

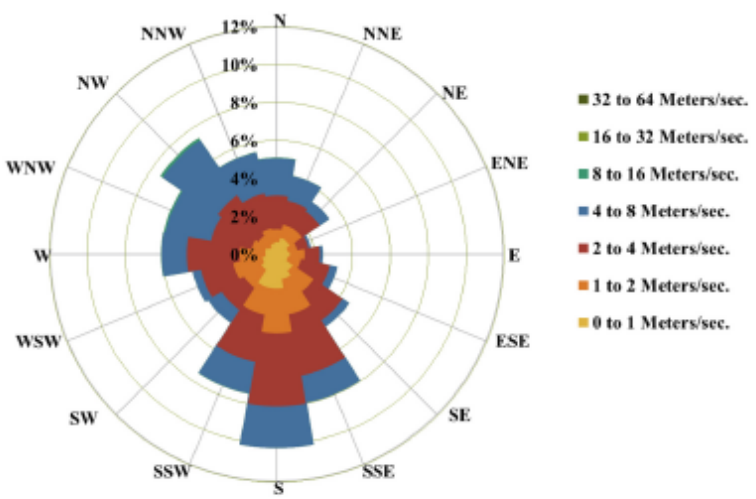


Figure 8. DD Mine wind rose, October 2012–December 2014.

A typical Location 1 site is shown in Figure 9. Each Location 1 site included a primary sampler and a collocated sampler. The samplers were mounted on platforms to avoid possible issues with snow accumulation. The sampler inlets were below the 7 m height limit specified by the U.S. EPA. The inlets of the primary and collocated samplers were 1 to 2 m apart. All of the sites with the exception of Chippewa Falls were surrounded by 2 m high chain link fence.

Figure 9. Primary and collocated Partisol 2000i samplers at the Chippewa Falls Location 1 site.

The distances between the two sampling locations ranged from 780 m at the processing plant to 690 to 1300 m at the three mines. All eight of the sampling locations satisfied the sampling site criteria specified by the U.S. EPA in 40 CFR Part 58, Appendix E [11]. The two sampling locations were 10 to 150 m from the closest fugitive dust source and 500 to 1000 m from the most distant fugitive dust source within each facility.

The processing plant in Chippewa Falls operated 24 h per day throughout the year with some days offline for maintenance and for inventory control. The three mines operated 8 to 12 h per day for four to eight months per year. The S&S mine operated during the winter from November through early April each year. The DS mine operated from early April to mid-November each year. The DD mine operated from November 2012 through April 2013. The production rates at the four facilities ranged from 500,000 to more than 2,000,000 short tons of sand per year. The operating periods are summarized in Table 1.

The samplers operated on a once-every-third-day schedule. The sampling days matched the once-every-third-day calendar schedule [12] published by the U.S. EPA and used in U.S. EPA and state agency air monitoring networks. Accordingly, the data generated using the ambient PM4 particulate matter samplers could be compared with data generated simultaneously with state agency PM2.5 samplers.

The presence of twelve PM4 particulate matter samplers at these facilities in two adjacent counties is an especially dense population of ambient air monitors. For comparison purposes, there are only twenty-three state-operated PM2.5 samplers in the entire state of Wisconsin.

2.2. Respirable Crystalline Silica Sampling Equipment

All four facilities used Thermo Scientific Partisol 2000i (Franklin, MA, USA) Federal Reference Method (RFPS-0496-117) filter samplers designed for PM2.5 sampling and adapted for PM4 crystalline silica sampling. The Partisol instruments operated in full accordance with U.S. EPA procedures specified in 40 CFR Part 50 Appendix L [3] except for (1) a sample flow rate of 11.1 liters per minute, (2) the use of a PVC filter as specified by NIOSH Method 7500, and (3) gravimetric analysis of the filters by NIOSH Method 0600. The PM4 sampling data were based on actual temperatures and pressures to be consistent with PM2.5 sampling data compiled in accordance with 40 CFR Part 50, Appendix L.

The sampler operator performed routine maintenance of the system's inlet and sharp cut cyclone. These maintenance activities occurred at the intervals consistent with U.S. EPA Quality Handbook [13].

The authors used the tare filter weight, final filter weight, crystalline silica weight, and sample volume to calculate the average mass concentration of respirable crystalline silica during each sampling period. The total sampling time ranged between 23 and 25 h to be consistent with 40 CFR Part 50 Appendix L Section 3.3 [3].

2.3. Crystalline Silica Analyses

The R.J. Lee Group, Inc. (R.J. Lee) laboratory in Monroeville, Pennsylvania conducted the NIOSH Method 0600 gravimetric analyses and the NIOSH Method 7500 X-Ray Diffraction (XRD) crystalline silica analyses of the filters. R.J. Lee is an accredited laboratory for NIOSH Method 7500 analyses and has extensive experience with this analytical method.

NIOSH Method 7500 for crystalline silica calls for digesting the filter media and re-depositing the dust onto a silver membrane filter for analysis. R.J. Lee is one of only a few laboratories that uses low-temperature plasma ashing. This procedure is more efficient and reliable than a muffle furnace and more effective than tetrahydrofuran digestion. The low temperature of the plasma also does not convert amorphous silica to cristobalite or induce other high-temperature chemical reactions that are possible in a muffle furnace.

R.J. Lee uses a custom filtration system that creates a small filter deposit onto the silver membrane. This small, concentrated deposit size increases the resolution of the scan by increasing the signal/noise ratio of the resulting diffraction pattern. R.J. Lee has two X-ray diffractometers—a PANalytical Cubix Pro unit dedicated to air silica analysis and a PANalytical X'Pert Pro unit, which handles both bulk and air silica analyses. R.J. Lee reported three forms of crystalline silica—quartz, cristobalite, and tridymite.

2.4. Data Analysis

The PM4 crystalline silica concentration data have been divided into sixteen sets, each comprised of the data obtained at one of eight sampling locations during the October 2012 to December 2013 period or the January 2014 to December 2014 period. The geometric means of these data sets of 120 to 150 samples were compared with the OEHHA REL of 3.0 μg/m^3. Values below the LOQ of 0.31 μg/m^3 were assigned a value of the LOQ/$\sqrt{2}$ as described by Hornung and Reed [14]. Due to the large

fraction of each data set below the LOQ, this substitution approach can introduce positive or negative bias into the calculation of the mean. The maximum possible bias to lower-than-true mean values was estimated by substituting the LOQ for below-LOQ values.

Upwind-to-downwind concentration differences across the facility were evaluated by compiling data for each of the four facilities from those sampling days in which the winds passed either from Location 2 to Location 1 or Location 1 to Location 2. Local background concentrations were calculated using data from both locations during days when the winds passed in a crossflow pattern to the axis of the samplers.

2.5. Program Organization

Air Control Techniques, P.C. designed the sampling program and trained the local operator of the samplers. R.J. Lee prepared the tared PVC filters and sent them to the on-site sampler operator on a routine basis. At the request of the WDNR ambient air monitoring group, the sample numbers were coded and scrambled so that R.J. Lee was blind concerning the specific facility and specific sampler providing each filter. On a biweekly basis, the filters were returned to R.J. Lee for analysis. Air Control Techniques, P.C. compiled the sampling and laboratory results.

Air Control Techniques, P.C. conducted audits of all of the samplers on a quarterly basis and three-point flow calibrations and ambient temperature, filter chamber temperature, ambient pressure, and filter chamber pressure calibrations on an annual basis. WDNR audited all twelve samplers once during the long-term sampling program.

3. Sampling Results

3.1. Average Respirable Crystalline Silica Concentrations

The primary focus in this study was on the comparison of long-term average respirable crystalline silica concentrations at the fence lines of frac-sand producing facilities and the OEHHA chronic exposure REL. The 2128 twenty-four hour average sample values measured from the eight different sampling locations (two per facility) at the four facilities have been divided into two sets: (1) October 2012–December 2013 and (2) January 2014–December 2014. This approach creates sixteen separate long-term measurements, each of which is at least twelve months in duration. Tables 2 and 3 provide summaries of these twelve and fifteen-month data sets, including (1) the number of samples below the LOQ, (2) the 99th percentile values, (3) the arithmetic means, (4) the 95th upper confidence intervals (UCL) of the arithmetic means, (5) the geometric means (GM), and (6) the geometric standard deviations (GSD).

The sixteen data sets had non-detectable concentrations ranging from 68.2% to 97.5% of the 24 h measurement values. Overall, 88% of the 2128 samples had concentrations below the LOQ of 0.31 μg/m^3. The geometric means calculated based on LOQ/$\sqrt{2}$ values substituted for the below-LOQ samples ranged from 0.22 to 0.29 μg/m^3. All of these geometric means were well below the OEHHA REL of 3.0 μg/m^3.

The possible uncertainty in the calculated geometric means using LOQ/$\sqrt{2}$ value substitution was estimated by re-calculating the geometric means by substituting the LOQ for below-LOQ sample

values. This has a strong bias to higher-than-true mean values considering that the histograms of the detectable values do not indicate that a large number of below-LOQ values were just below the LOQ. These maximum possible geometric means ranged from 0.41 μg/m³ at the Chippewa Falls plant to 0.32 μg/m³ at the DD Mine—values well below the REL. Accordingly, whatever biases are inherent in the LOQ/$\sqrt{2}$ approach in data sets with very high censored data levels do not have any significant impact on the comparison of the means with the chronic exposure REL.

Table 2. Respirable crystalline silica 24 h average concentration measurements, October 2012–December 2013.

Facility and Sampling Location	Number > LOQ	Number < LOQ	% <LOQ	99th%	(LOQ/$\sqrt{2}$) Substituted for < LOQ Values			
					Mean	Mean 95th% UCL	GM	GSD
				μg/m³	μg/m³	μg/m³	μg/m³	μg/m³
Chippewa Falls, Location 1	49	106	68.2	1.34	0.33	0.36	0.29	1.59
Chippewa Falls, Location 2	20	133	86.9	0.65	0.26	0.27	0.24	1.33
DS Mine, Location 1	19	134	87.6	0.72	0.25	0.27	0.24	1.30
DS Mine, Location 2	17	133	88.7	0.50	0.24	0.25	0.23	1.22
S&S Mine, Location 1	13	137	91.3	0.50	0.24	0.25	0.23	1.21
S&S Mine, Location 2	26	123	82.6	1.44	0.30	0.33	0.26	1.52
DD Mine, Location 1	18	121	82.1	0.60	0.25	0.26	0.24	1.26
DD Mine, Location 2	16	121	88.3	0.81	0.25	0.27	0.24	1.33

Table 3. Respirable crystalline silica 24 h average concentration measurements, January 2014–December 2014 PM4 Crystalline Silica Data.

Facility and Sampling Location	Number > LOQ	Number < LOQ	% < LOQ	99th%	(LOQ/$\sqrt{2}$) Substituted for < LOQ Values			
					Mean	Mean 95th% UCL	GM	GSD
				μg/m³	μg/m³	μg/m³	μg/m³	μg/m³
Chippewa Falls Location 1	31	85	73.3	1.06	0.31	0.34	0.28	1.55
Chippewa Falls, Location 2	4	114	96.6	0.31	0.22	0.28	0.22	1.09
DS Mine, Location 1	6	112	94.9	0.38	0.23	0.23	0.22	1.11
DS Mine, Location 2	7	111	94.1	0.56	0.24	0.25	0.23	1.23
S&S Mine, Location 1	9	109	92.4	0.73	0.24	0.26	0.23	1.27
S&S Mine, Location 2	19	99	83.9	0.81	0.27	0.29	0.25	1.39
DD Mine, Location 1	4	114	96.6	0.43	0.23	0.23	0.22	1.13
DD Mine, Location 2	3	115	97.5	0.42	0.22	0.23	0.22	1.11

The upper 99% percentile values ranged from 0.31 μg/m³ at Chippewa Falls Location 2 (2014 data set) to1.44 μg/m³ at S&S Mine Location 2 (Oct. 2012–Dec. 2013 data set). These values are independent of the LOQ and provide an indication of the limited variability of the 24 hour average data. The geometric standard deviations also indicated that the range of data was low.

3.2. Upwind-Downwind Concentration Differences

The contributions of the facilities to the downwind concentrations of respirable crystalline silica were evaluated using upwind-to-downwind data during days in which the ambient air moved across the facility either from Location 1 to Location 2 or from Location 2 to Location 1. All of the upwind-to-downwind analyses were conducted by assigning zero values to samples below the LOQ. Using LOQ/$\sqrt{2}$ values for below-LOQ samples potentially obscured slight differences between the concentrations measured at the two locations at each facility.

The upwind-to-downwind differences in the 24 h average concentrations ranged from approximately −1.4 μg/m³ to +1.5 μg/m³. The upwind-to-downwind differences in the respirable crystalline silica concentrations were very small at all four facilities sampled. There was no detectable change in the upwind-to-downwind concentrations on 78% of the days during which the winds moved in a consistent and identifiable upwind-to-downwind direction. Figure 10 provides examples of the upwind-to-downwind respirable crystalline silica concentrations.

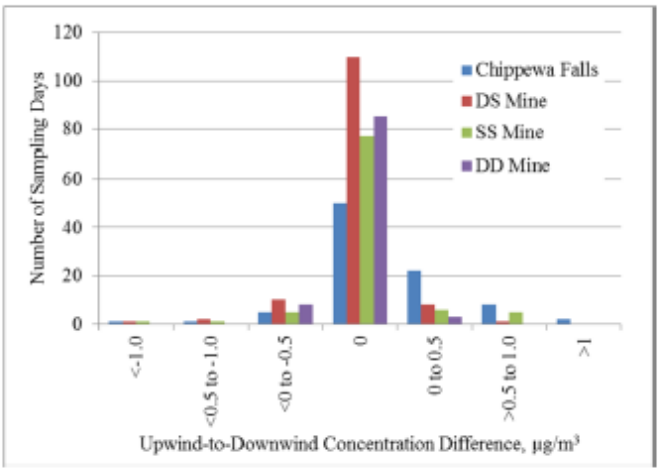


Figure 10. Upwind-to-downwind PM4 crystalline silica concentration differences, October 2012 to December 2013.

These very small upwind-to-downwind concentration increases and decreases indicate that the sand mining and processing facilities contribute very little, if anything, to the ambient respirable crystalline silica concentrations.

3.3. Local Background Concentrations

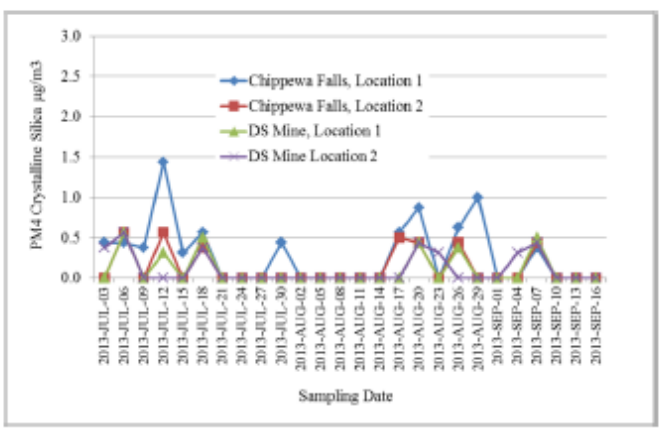
The local background concentrations of respirable crystalline silica summarized in Table 4 were determined based on concentrations measured by both the Location 1 and Location 2 samplers during days with dominant crosswinds. During these sampling days, the observed concentrations were due to local background concentrations of respirable crystalline silica. The three facilities clustered in Chippewa County had slightly higher background concentrations than the one mine (DD mine) located in the more rural Barron County.

The average local background concentrations listed in Table 4 are similar to the average concentrations summarized in Tables 2 and 3 for the entire data sets compiled from October 2012 through December 2013 and from January 2014 through December 2014. This similarity suggests that the fence line concentrations of respirable crystalline silica are within the local background concentration range.

Table 4. Local background concentrations.

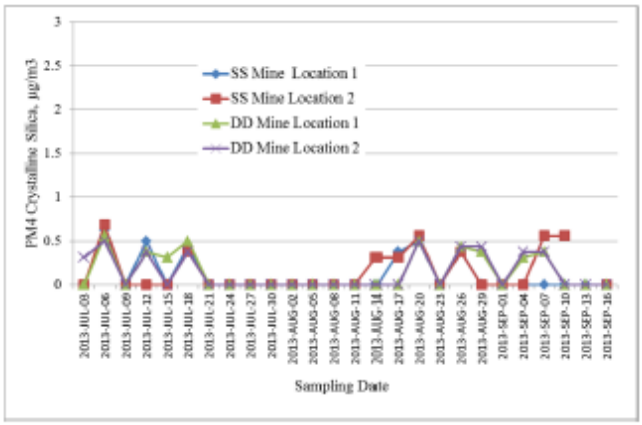
Facility	Number of 24 h Samples October 2012–December 2014	Respirable Crystalline Silica Concentrations		
		Average		Maximum μg/m³
		Values Below LOQ Treated as 0.0 μg/m³	Values Below LOQ Treated as LOQ/$\sqrt{2}$ μg/m³	
Chippewa Falls	194	0.043	0.236	0.56
DS Mine	58	0.052	0.249	0.88
S&S Mine	182	0.067	0.260	2.10
DD Mine	124	0.015	0.228	0.63

The local background range has been further evaluated by comparing day-by-day concentration variations observed in the entire network of eight primary samplers located across an area of more than 70 km in the two-county area. The relatively consistent variations in both the upwind and downwind location sampling data at all four facilities are most apparent during summer periods when the ambient respirable crystalline silica concentrations are at a maximum. For example, data from the period July 3, 2013 through September 16, 2013 are illustrated in Figure 11a. All measured concentrations values at the eight samplers varied together regardless of wind direction and facility-specific operations. These consistent variations observed throughout the multi-year sampling program in the network of samplers suggest that measured fence line concentrations are in the local background range for Western Wisconsin. This is further indicated by the fact that both the S&S and the DD mines (Figure 11b) did not operate during the two and one-half month period addressed in Figure 11b.



(a)

Figure 11. *Cont.*



(b)

Figure 11. Variations in PM4 Crystalline Silica Concentration at the (**a**) Chippewa Falls Plant and the DS Mine, July 3, 2013 to September 16, 2013; (**b**) the SS and DD Mines, July 3, 2013 to September 16, 2013.

The variations in the local background concentrations were further evaluated by comparing the measured PM4 particulate matter concentrations at the Chippewa Falls processing plant with a WDNR operated PM2.5 monitoring site in Eau Claire, Wisconsin twenty three kilometers away from Chippewa Falls.

Comparisons of the PM4 particulate matter data and the WDNR PM2.5 data [15] are provided in Figures 12 and 13. It is apparent that the variations in local PM2.5 particulate matter concentrations measured by WDNR at Eau Claire are very similar to the variations in PM4 particulate matter concentrations at both locations at Chippewa Falls. This suggests that most of the PM4 particulate matter measured at Chippewa Falls was background PM2.5 particulate matter.

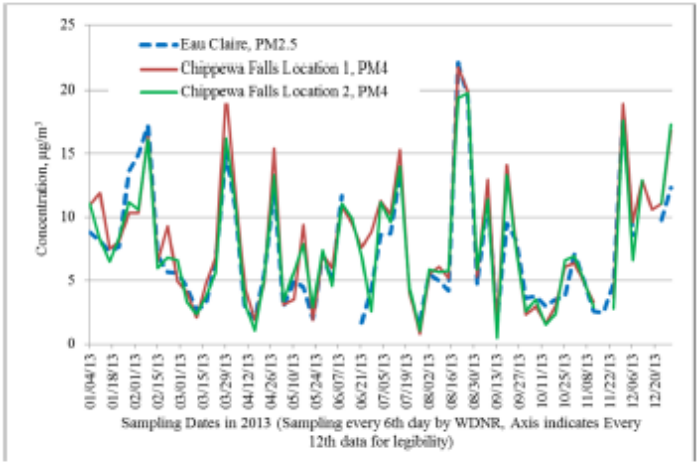


Figure 12. Comparison of the WDNR PM2.5 data from Eau Claire with the PM4 particulate matter data from Chippewa Falls Locations 1 and 2, October 2012–December 2013.

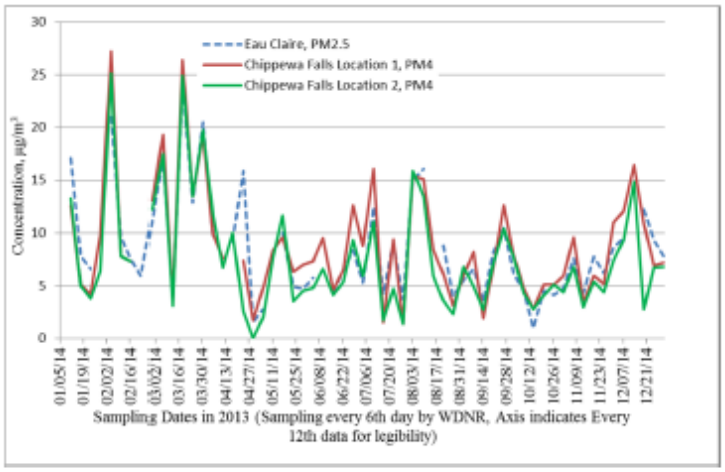


Figure 13. Comparison of the WDNR PM2.5 data from Eau Claire with the PM4 particulate matter data from Chippewa Falls Locations 1 and 2, January 2014–December 2014.

The PM4 particulate matter data compiled at Chippewa Falls were very similar to the PM2.5 particulate matter data compiled by WDNR. The relatively small differences observed during some sampling days appear to be due primarily to a nearby major highway and urban sources that affected PM2.5 particulate matter air quality near the WDNR Eau Claire PM2.5 sampler but not the Chippewa Falls PM4 particulate matter samplers.

As expected, the PM4 particulate matter concentrations at Chippewa Falls were slightly higher on average than the PM2.5 particulate matter concentrations at Eau Claire due to the fact that the PM4 size range extends further into the coarse mode of ambient particulate matter. The PM2.5–PM4 particulate matter comparison suggests that the daily variations in respirable crystalline silica regional air quality are primarily due to variations in the local background concentrations.

3.4. Sampling Method Performance

The sampling programs included frequent and comprehensive quality assurance procedures. The scope of the quality assurance (QA) analyses included (1) the use of collocated samplers along with the primary sampler at each of the four facilities, (2) biweekly audits of the sample flow rates, (3) yearly three-point sample flow rate calibrations, (4) yearly ambient pressure, filter chamber pressure, ambient temperature, and filter chamber calibrations,(5) filter blank analyses, and (6) review of the five min average sampler operating data recorded by the Partisol 2000i samplers.

The use of a collocated sampler at the primary sampling location was one of the main quality assurance checks. All four facilities operated sampler networks with a collocated sampler operating every twelfth day. All four facilities achieved coefficient of variance values for the PM4 particulate matter well within the maximum allowed 10% value limit specified in 40 CFR Part 58, Appendix A [16]. Due to the fact that 88% of the respirable crystalline silica concentrations were at or below the LOQ, it was not possible to calculate the coefficient of variance for the respirable crystalline silica concentrations at any of the four facilities.

The sampling network operator for all four facilities performed sampler audits every two weeks—a frequency that is twice as high as required by 40 CFR Part 50 Appendix L [3], the EPA quality assurance handbook [13], and the sampler manufacturer's recommendations. The purpose of the frequent audits was to confirm proper operation of the samplers as often as possible to identify problems related to sampler operation. All twelve samplers used in these studies successfully passed the sample flow rate, air temperature, filter temperature, ambient pressure, and sample gas pressure audits conducted during the long-term sampling programs.

In addition to the operator audits, Air Control Techniques, P.C. conducted an independent audit of each sampler on a quarterly basis. All twelve samplers used in these four sampling programs passed each of these quarterly audits. Each sampler also passed a WDNR audit.

Air Control Techniques, P.C. conducted three-point calibrations using an NIST traceable Chinook Engineering calibrator. The calibrations were conducted at the beginning of each study and at the twelve-month point in each study.

The Partisol instruments logged the sample flow rate, air temperature, sample gas temperature, air pressure, and electrical operating conditions every five minutes during sampling. The voluminous set of data downloaded from the eight primary samplers and the four collocated samplers demonstrated that the instruments worked extremely well throughout the long-term sampling programs.

Every tenth filter was installed in the sampler and immediately recovered. These blank filters were analyzed to check for any filter damage and contamination problems. More than 98% of the blanks had crystalline silica levels below the LOQ. There were small variations in the PM4 particulate matter levels in a small fraction of the blanks. The low blank values demonstrate that the filter handling procedures were good.

All twelve of the Partisol 2000i instruments provided data availability exceeding 98% despite an especially severe winter in 2012–2013. There were no problems with leak checks performed during routine audits. One sampling day at one site was lost due to heavy snow that prevented safe access to the sampling location. One of the instruments developed a problem with the display screen that resulted in the loss of data for three sampling days. Overall, the instruments performed extremely well.

4. Discussion

The results of this ambient respirable sampling program have been evaluated by (1) comparison of the long-term average data reported here with short-term data in previously published studies, (2) evaluation of the susceptibility of crystalline silica to form fragments in the respirable size range, and (3) evaluation of data concerning sources that could contribute to the observed background concentrations.

4.1. Comparison of Measured Data with Previous Studies

The long-term average respirable crystalline silica concentrations in this study are similar to those measured by the Minnesota Pollution Control Agency (MPCA) in Winona and Stanton, Minnesota [17]. The MPCA used sampling and analytical procedures similar to those of Richards and Brozell [2] while sampling at these two locations over an eight-month period in 2014. In the City of Winona, with a frac sand transloading operation, only two of the thirty 24 h measurements were above the LOQ of 0.31 $\mu g/m^3$. The maximum measured values at Winona were 0.4 $\mu g/m^3$. At the MPCA

background site of Stanton [17], nine of the thirty three 24 h measurements were above the LOQ. The maximum concentration at Stanton, MN was 1.3 μg/m^3. The Stanton area is dominated by agricultural sources and has no frac sand-producing facilities. Low respirable crystalline silica levels were also measured at Shakopee Sand [18] and Tiller-North Branch in Minnesota [19].

The long-term average concentration values measured in this study were lower than the shorter time period data of up to 2.8 μg/m^3 of respirable crystalline silica compiled by Richards *et al.* [6] at the fence lines of two large sand and gravel plants in San Diego and Tracy, California. The data summarized in the present paper were similar to the 0.4 to 1.1 μg/m^3 respirable crystalline silica concentrations measured by the SCAQMD [7,8] during a four-month sampling program at an elementary school close to four sand and gravel plants in Duarte, California. The concentrations measured in this study were slightly below those measured by the California Air Resources Board in Lompac, California [20]. These California-oriented studies reported slightly higher concentrations probably due to higher background concentrations in these semi-arid areas due to wind-entrained dust and also due to large agricultural operations close to several of the sampling locations.

The respirable crystalline silica concentrations measured in this study were slightly lower than the values measured by Stacey *et al.* [21] in communities close to construction sites in England and by the Environmental Health Board of Queensland Health at construction sites in Queensland, Australia [22]. The lower concentrations near frac sand producing facilities in Wisconsin were probably due to the lack of energy-intense frac sand handling equipment and especially hard characteristics of the grains of frac sand.

Shiraki and Holmen [23] measured higher concentrations of crystalline silica at a sand and gravel plant near Tracy, California; however, their data were limited to the analyses of PM10 samples. They could not detect crystalline silica in their PM2.5 particulate matter samples, and they did not measure respirable crystalline silica. Due to the size dependence of the crystalline silica content of particulate matter, it is difficult to convert PM10 crystalline silica concentration data to a PM4 respirable crystalline silica basis.

Saiyed *et al.* [24] reported high ambient crystalline exposure levels in the village of Ladakh, India at an elevation of 11,000 feet in desert air. He suspected high exposure to crystalline silica due to frequent desert wind storms and to venting of kitchen emissions. High concentrations of crystalline silica have also been reported by Bhagia [25] for slate-producing villages in India. The conditions studied by Sayied *et al.* and by Bhagia are not relevant to the types of possible exposures in communities near frac sand producing facilities in the Upper Midwest of the U.S.

The 24 h average respirable crystalline silica concentrations measured at the four facilities using data from days when the samplers were located crosswind were generally consistent with the 0 to 2.6% by weight crystalline silica content in PM2.5 particulate matter estimated by Davis *et al.* [26] for 22 urban areas in the U.S.. At annual average PM2.5 levels of 8 to 10 μg/m^3 in Wisconsin [27], the estimate of Davis *et al.* is equivalent to 0.21 to 0.26 μg/m^3. Slightly higher crystalline silica levels should be present in PM4 particulate matter considering that the PM4 size range extends slightly more than the PM2.5 size range into the coarse mode of atmospheric particulate matter.

The respirable crystalline silica concentrations measured in this study were less than the levels that could be estimated using a ratio of respirable crystalline silica of 0.1 times the PM10 concentration as discussed by EPA [28]. In 1996, when EPA published their ambient respirable crystalline silica

document, there were only very limited data on respirable crystalline silica concentrations. EPA relied primarily on the data of Davis *et al.* [26] for the 15 micrometer 50% cut size samples.

The limited short-term ambient respirable crystalline silica data in previous publications and reports are generally consistent with the low levels measured in this study at the fence lines of all four sand-producing facilities.

4.2. Susceptibility of Frac Sand to PM4 Particle Formation

Frac sand must meet American Petroleum Institute specification RP 19C for size distribution, roundness, and crush resistance. Frac sand is used due, in part, to its especially high resistance to pulverization. High energy is needed to fracture small particles from the large grains of crystalline silica particles. Quartz, the form of crystalline silica in frac sand, is considered one of the most difficult-to-grind minerals used in industry. Due to this especially high resistance to fragmentation, the handling of frac sand has a low vulnerability to the formation of particles in the respirable size range.

The smallest grain size of frac sand that satisfies API specifications is 105 micrometers—a size that is more than 40 times larger in diameter and more than 70,000 times larger in mass than a respirable 4-micrometer (aerodynamic size) particle. The extraction, screening, and drying processes used in frac sand mining and processing do not impose the energy needed for significant attrition of the crystalline silica grains to form PM4 particles.

The as-mined sand has a high moisture content, which suppresses the release of even the binding materials between the grains of crystalline silica. Once screened and dried, the large frac sand particles are handled in equipment with high efficiency ventilation and control systems. Accordingly, low emissions are expected.

4.3. Sources Contributing to Local Background Concentrations

The localized background concentrations measured using data from samplers during crosswind flow periods indicate that in Western Wisconsin, the combined set of natural and anthropogenic sources generate localized background respirable crystalline silica concentrations that average less than 0.26 $\mu g/m^3$ (values below the LOQ treated as $LOQ/\sqrt{2}$) and have maximum 24 h average concentrations that are usually below 2.1 $\mu g/m^3$. These levels are consistent with the probable contributions of respirable crystalline silica from the numerous farms and unpaved roads throughout the study area in Wisconsin. Contributions to ambient background concentrations are expected considering the very high respirable crystalline silica concentrations of more than 1000 $\mu g/m^3$ reported in studies of farmer exposure by Nieuwenhuijsen [29], Norton and Gunter [30], Syzkman *et al.* [31] and Archer *et al.* [32]. Stopford and Stopford [33] found quartz levels in farm soil particles less than 4.25 µm that ranged from 10.5% to 44.5% by weight, and Gillette [34] has suggested that global transport of soil dusts contributes to ambient levels of crystalline silica in distant urban areas. Agricultural sources almost certainly are a major contributor to local background concentrations in areas such as Wisconsin. All four facilities sampled in this project were bounded on at least two sides by active farms.

The long-term average PM4 crystalline silica concentrations measured at the four facilities were very similar to estimated maximum crystalline silica concentrations calculated by the WDNR [9] based on PM2.5 elemental silicon data compiled from 2001 to 2009 at three U.S. EPA-operated PM2.5

speciation sites in Wisconsin. WDNR calculated maximum crystalline silica concentrations of 0.10 μg/m^3 in Mayville (Dodge County), 0.14 μg/m^3 in Milwaukee (Milwaukee County), and 0.32 μg/m^3 in Waukesha (Waukesha County). In calculating these maximum concentrations, WDNR assumed that 100% of the elemental silicon was in the form of crystalline silica.

4.4. Additional Research Needed

Additional sampling is needed to evaluate respirable crystalline silica concentrations at the fence lines of other industrial, agricultural, and community sources. More long-term average concentration data are needed concerning the seasonal variability of background concentrations, especially in arid areas subject to wind entrainment of crystalline silica containing soil. Analysis of the respirable crystalline silica levels contributed by globally transported desert dust would be helpful in analyzing daily variations in measured concentrations. Procedures for characterizing concentration data below the LOQ of 0.31 μg/m^3 would be helpful in analyzing the data, especially the background concentrations.

The variability in the susceptibility to attrition of grains of sand in various soils and rocks would be helpful in evaluating site-to-site differences in respirable crystalline silica concentrations.

5. Conclusions

The geometric mean respirable crystalline silica concentration for the entire data set was 0.26 μg/m^3 when values below the limit of quantification were treated as LOQ/$\sqrt{2}$ concentrations. The long-term average concentrations for the entire data set of 2128 twenty-four hour respirable crystalline silica measurements and the long-term averages at each of the four facilities were less than 10% of the California OEHHA [1] 70-year chronic reference level of 3.0 μg/m^3.

All four facilities operated samplers in an upwind-downwind configuration. Analyses of the data during days when the air moved across the facilities over the samplers indicated that the respirable crystalline silica concentrations changed from −1.4 μg/m^3 to +1.5 μg/m^3. There were no significant differences in the upwind-to-downwind long-term concentrations for the three sand-producing mines and the processing plant. The measured respirable crystalline silica levels were in the background concentration range. Accordingly, these data indicate that the exposure to respirable crystalline silica near frac sand producing facilities is the same as exposures in areas throughout this region.

The PM2.5 U.S. EPA Federal Reference Method samplers adapted for PM4 particulate matter sampling worked well in all four sand mine and sand processing facility sampling programs. The sampling and analytical techniques provided a sensitive lower limit of quantification of 0.31 μg/m^3. Comparisons of the PM4 particulate matter data compiled from primary and collocated samplers demonstrated precise results. All twelve of the primary and collocated samplers passed routine audits conducted on both a biweekly and quarterly basis over more than a two-year period. Filter blank analyses confirmed proper field and laboratory procedures.

The sampling and analytical procedures used in this study are readily available to others wishing to evaluate ambient PM4 crystalline silica concentrations. Samplers meeting the design requirements of 40 CFR Part 50, Appendix L [3] and equipped with PM2.5 50% cut size sharp cut cyclones can be modified for respirable particulate matter sampling by adjusting the sample flow rate from 16.7 liters per minute to 11.1 liters per minute. The crystalline silica fraction of the PM4 particulate matter

samples can be measured using NIOSH Method 7500 X-Ray Diffraction analyses with an LOQ of 5 µg. PVC filters with an average pore size of five micrometers are used to facilitate the X-Ray Diffraction analyses. These filters are identical to those used for occupational exposure sampling. The respirable crystalline silica measurement technique uses commercially available EPA reference method samplers and well-established NIOSH analytical procedures.

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Author Contributions

John Richards and Todd Brozell jointly designed the sampling program and selected the sampling locations. John Richards prepared the test program protocols. Todd Brozell trained the operator and conducted the on-site quarterly audits. John Richards and Todd Brozell jointly reviewed the data and prepared the paper.

Conflicts of Interest

The authors have no financial interests in the facilities sampled. The authors served as independent contractors to the facilities to select the sampling equipment, select the sampling locations, prepare the test program protocols, train the sampler operator, conduct quarterly audits of all of the samplers, and reduce the data compiled throughout the sampling program.

References

1. California Office of Environmental Health Hazard Assessment. Chronic Toxicity Summary, Silica (Crystalline, Respirable), 2005. Available online: www//oehha.ca.gov/air/chronic_rels/pdf/SILICAcREL_Final.pdf (accessed on 31 May 2015).
2. Richards, J.; Brozell, T. *Ambient PM4 Crystalline Silica Monitoring Method Development*; Report to CalCIMA; California Construction and Industrial Materials Association: Sacramento, CA, USA, 2005.
3. U.S. Environmental Protection Agency. Reference Method for the Determination of Fine Particulate Matter as PM2.5 in the Atmosphere. 40 CFR Part 50, Appendix L. 1997. Available online: http://www.gpo.gov/fdsys/granule/CFR-2011-title40-vol2/CFR-2011-title40-vol2-part50-appL (accessed on 31 May 2015).

4. National Institute of Occupational Safety and Health. Method 7500, Silica, Crystalline by XRD (Filter Deposition), Issue 4, 2003. Available online: http://www.cdc.gov/niosh/docs/2003-154/pdfs/7500.pdf (accessed on 31 May 2015).
5. National Institute of Occupational Safety and Health. Method 0600, Particles Not Otherwise Regulated, Respirable; 1998. Available online: www.cdc.gov/niosh/docs/2003-154/pdfs/0600.pdf (accessed on 31 May 2015).
6. Richards, J.; Brozell, T.; Rea, C.; Boraston, G.; Hayden, J. PM4 crystalline silica emission factors and ambient concentrations at aggregate-producing sources in California. *Air Waste Manag. J.* **2005**, *59*, 1287–1296.
7. South Coast Air Quality Management District. *Sampling and Analysis of Samples Collected in the Cities of Duarte and Azusa*; Report MA 2006-01; South Coast Air Management District: Diamond Bar, CA, USA, 2006.
8. South Coast Air Quality Management District (2008). Sampling and Analysis of Samples Collected in the Cities of Duarte and Azusa, Follow-Up #4; Report MA 2008-03; 2008. Available online: http://www.azusarock.com/docs/AQMD2008FollowUp.pdf (accessed on 31 May 2015).
9. Wisconsin Department of Natural Resources. Report to the Natural Resources Board, Silica Study; August 2011. Available online: http://dnr.wi.gov/topic/AirQuality/documents/Final SilicaReport.pdf (accessed on 31 May 2015).
10. Minnesota Environmental Quality Board. Report on Silica Sand; March 20, 2003. Available online: https://www.eqb.state.mn.us/sites/default/files/documents/March%20Final%20Silica%20Sand%20report%20with%20award%20sticker.pdf (accessed on 12 July 2015).
11. U.S Environmental Protection Agency. Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring. 40 CFR Part 58, Appendix E. Amended 15 January 2013. Available online: http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr58_main_02.tpl (accessed on 13 July 2015).
12. U.S. Environmental Protection Agency. Sampling Schedule Calendar. Available online: www.epa.gov/ttnamti1/calendar.html (accessed on 12 July 2015).
13. U.S. Environmental Protection Agency. Quality Assurance Handbook for Air Pollution Measurement Systems Volume II Ambient Air Quality Monitoring Program. EPA Publication EPA-454/B-13-003 May, 2013. Available online: http://www.epa.gov/ttnamti1/files/ambient/pm25/qa/QA-Handbook-Vol-II.pdf (accessed on 13 July 2015).
14. Hornung, R.W.; Reed, L.D. Estimation of average concentration in the presence of nondetectable values. *Appl. Occup. Environ. Hyg.* **1990**, *5*, 46–51.
15. Jason Treutel (Wisconsin Department of Natural Resources); John Richards, (Air Control Techniques, P.C.). Personal communication, 2015.
16. U.S Environmental Protection Agency. Quality Assurance Requirements for SLAMS, SPMs, and PSD Air Monitoring. 40 CFR Part 58, Appendix A; Amended 15 January 2013. Available online: http://www.ecfr.gov/cgi-bin/text-idx?SID=84ef9f0996c2e59ff713c5ea7a8f4ffd&mc=true&node=ap40.6.58_161.a&rgn=div9 (accessed on 16 July 2015).
17. Minnesota Pollution Control Agency. Winona Community Air Monitoring, January 2014–September 2014; January 2015. Available online: Available online: http://www.pca.state.mn.us/index.php/view-document.html?gid=21302 (accessed on 16 July 2015).

18. Minnesota Pollution Control Agency. Shakopee Sand (Previously Great Plains Sand) Ambient Air Monitoring, July 2012–December 2013; April 2014. Available online: http://www.pca.state.mn.us/index.php/air/air-quality-and-pollutants/air-pollutants/silica-sand-mining/air-monitoring-data-at-minnesota-silica-sand-facilities.html#shakopee-sands (accessed on 31 May 2015).
19. Minnesota Pollution Control Agency. Tiller-North Branch Ambient Air Monitoring, November 2012–December 2013; April 2014. Available online: http://www.pca.state.mn.us/index.php/air/air-quality-and-pollutants/air-pollutants/silica-sand-mining/air-monitoring-data-at-minnesota-silica-sand-facilities.html#tiller-north-branch (accessed on 31 May 2015).
20. California Environmental Protection Agency, Air Resources Board. Pilot Monitoring Study of Crystalline Silica in Ambient Air in Lompoc, California, 2003. Available online: http://www.cdpr.ca.gov/docs/specproj/lompoc/arbsilica_0403.pdf (accessed on 31 May 2015).
21. Stacey, P.; A.; Thorpe, P.; Roberts, P. Levels of Respirable Dust and Respirable Crystalline Silica at Construction Sites. Report of the Health and Safety Laboratory, England; 2011. Available online: http://www.hse.gov.uk/research/rrpdf/rr878.pdf (accessed on 31 May 2015).
22. Environmental Health Board, Queensland Health. Health Risk Assessment of Community Exposure to Silica from Airport Link/Northern Busway Construction Activities, 2012. Available online: https://www.ehp.qld.gov.au/air/pdf/airportlink-qh-report.pdf (accessed on 31 May 2015).
23. Shiraki, R.; Holmén, B.A. Airborne respirable silica near a sand and gravel facility in central California: XRD and elemental analysis to distinguish source and background quartz. *Environ. Sci. Technol.* **2002**, *36*, 4956–4961.
24. Saiyed, H.N.; Sharma, Y.K.; Sadhu, H.G.; Norboo, T.; Patel, P.D.; Patel, T.S.; Venkaiah, K.; Kashyap, S.K. Non-occupational pneumoconiosis at high altitude villages in central Ladakh. *Br. J. Ind. Med.* **1991**, *48*, 825–829.
25. Bhagia, L.J. Non-occupational exposure to silica dust in vicinity of slate pencil industry, India. *Environ. Monit. Assess.* **2009**, *151*, 477–482.
26. Davis, B.; Johnson, R.; Stevens, R.; Courtney, W.; Safriet, D. The quartz content and elemental composition of aerosols from selected sites of the EPA Inhalable Particulate Network. *Atmos. Environ.* **1984**, *18*, 771–782.
27. Wisconsin Department of Natural Resources. Wisconsin Air Quality Trends; April 2014. Available online: http://dnr.wi.gov/files/PDF/pubs/am/AM523.pdf (accessed on 31 May 2015).
28. U.S. Environmental Protection Agency (EPA). *Ambient Levels of Noncancer Health Effects of Inhalable Crystalline and Amorphous Silica*; U.S. EPA: Washington, DC, USA, 1996.
29. Nieuwenhuijsen, M.J.; Noderer, K.S.; Schenker, M.B.; Vallyathan, V.; Olenchock, S. Personal exposure to dust endotoxin and crystalline silica in California agriculture. *Ann. Occup. Hyg.* **1995**, *32*, 24–31.
30. Norton, M.R.; Gunter, M.F. Relationships between respiratory diseases and quartz-rich dust in Idaho, U.S.A. *Am. Mineral.* **1999**, *84*, 1009–1019.
31. Syzkman, J.; Mintz, D.; Creilson, J.; Wayland, M. Impact of April 2001 Asian Dust Event on Particulate Matter Concentrations in the United States; U.S. EPA Trends Report; 2001. Available online: http://www.epa.gov/airtrends/aqtrnd03/pdfs/1_asiandust.pdf (accessed on 31 May 2015).
32. Archer, J.; Cooper, G.; Reist, P.; Storm, J.; Nylander-French, L. Exposure to respirable crystalline silica in Eastern North Carolina farm workers. *Am. Ind. Hyg. Assoc. J.* **2002**, *63*, 750–755.

33. Stopford, C.; Stopford, W. Respirable quartz content of farm soil. *Appl. Occup. Environ. Hyg.* **1995**, *10*, 196–199.
34. Gillette, D. Soil derived dust as a source of silica: Aerosol properties, emissions, deposition, and transport. *J. Expo. Anal. Environ. Epidemiol.* **1995**, *7*, 303–311.

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