

NATIONAL STONE, SAND & GRAVEL ASSOCIATION



Natural building blocks for quality of life

April 17, 2006

Air & Radiation Docket and Information Center
U.S. Environmental Protection Agency
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Washington, DC 20460

Docket ID No. OAR-2001-0017

TO EPA'S DOCKET MANAGER:

The National Stone, Sand & Gravel Association (NSSGA) submit the attached comments on EPA's proposal to revise the national ambient air quality standards (NAAQS).

Based near the nation's capital, NSSGA is the world's largest mining association by product volume. Its member companies represent more than 90 percent of the crushed stone and 70 percent of the sand and gravel produced annually in the U.S. and approximately 117,000 working men and women in the aggregates industry. During 2005, a total of about 3.2 billion tons of crushed stone, sand and gravel, valued at \$17.4 billion, were produced and sold in the United States.

On the basis of the record that EPA has compiled, NSSGA believes that deferral of the Coarse PM standards pending additional research and ambient air test method development is a reasonable regulatory option. If EPA proceeds with coarse PM standards on the basis of the current record, NSSGA believes that crustal material of geologic origin should be exempted and that the concentration limit should be set at a level no more stringent than the current standard for PM₁₀. For areas dominated by crustal material of geologic origin from natural, agricultural, construction, unpaved road, and industrial sources, the "reasonably equivalent" standards would be in the range of 100 to 145 $\mu\text{g}/\text{M}^3$. These attached comments address these technical recommendations and conclusions.

As a founding member of the Coarse Particle Coalition, NSSGA also hereby endorses the Coalition comments and incorporates them by reference into these comments.

Please contact me if you have any questions.

Sincerely,

A handwritten signature in black ink that reads "John S. Hayden". The signature is written in a cursive, flowing style.

John S. Hayden, PG, REM
Vice President, Environmental Services

**WRITTEN COMMENTS ON BEHALF OF THE
NATIONAL STONE, SAND & GRAVEL ASSOCIATION**
April 17, 2006

These comments are submitted on behalf of the National Stone, Sand & Gravel Association (NSSGA) regarding EPA's proposed change to the national ambient air quality standard for particulate matter. NSSGA is the world's largest mining association by product volume. Its member companies represent more than 90 percent of the crushed stone and 70 percent of the sand and gravel produced annually in the U.S. and approximately 117,000 working men and women in the aggregates industry. During 2005, a total of about 3.2 billion tons of crushed stone, sand and gravel, valued at \$17.4 billion, were produced and sold in the United States.

NSSGA has been active in the compilation of PM₁₀, coarse PM, and fine PM emission factors since 1991 and in the compilation of upwind-downwind studies of PM₁₀ and fine PM concentrations since 1997. All relevant data compiled by NSSGA concerning coarse and fine PM emissions, concentrations, and characteristics have been previously provided to the appropriate organizations in EPA. NSSGA has also participated in PM coarse data evaluation efforts as part of the Coarse Particulate Coalition. These technical comments are being submitted on behalf of NSSGA. As a member of the Coarse Particle Coalition, NSSGA hereby endorses the Coalition comments and incorporates them by reference into these comments.

On the basis of the record that EPA has compiled, NSSGA believes that deferral of the coarse PM standards, pending additional research and ambient air test method development, is a reasonable regulatory option. If EPA proceeds with coarse PM standards on the basis of the current record, NSSGA believes that crustal material of geologic origin should be exempted and that concentration limit should be set at a level no more stringent than the current standard for PM₁₀. For areas dominated by crustal material of geologic origin from natural, agricultural,

construction, unpaved road, and industrial sources, the “reasonably equivalent” standards would be in the range of 100 to 145 $\mu\text{g}/\text{M}^3$. These comments address these technical recommendations and conclusions.

1. Deferral of Coarse PM Standards

EPA’s proposal asks for comments on the deferral of coarse PM standards pending additional research. NSSGA believes that deferral of the coarse PM NAAQS would be a reasonable regulatory option at this time. The record that EPA has compiled demonstrates: (1) the lack of an ambient air reference method that accurately indicates coarse particulate matter concentrations, (2) the lack of adequate estimates of coarse particulate matter concentrations, especially in arid regions in the Western U.S. and rural areas throughout the U.S., (3) information demonstrating that crustal materials of geologic origin are the dominant constituents in coarse PM, (4) the lack of adequate scientific information in the Particulate Matter Criteria Document¹ (“CD”) concerning the speculated role of coarse PM as a carrier for toxic constituents in urban areas, (5) the major regional differences in the levels of crustal material in coarse PM and in the ratios of fine and coarse PM, and (6) the technical difficulty in preparing effective coarse PM control strategies for a pollutant for which the emission inventories are very incomplete and uncertain. Each of these six issues is discussed in the following subsections.

1.1 Lack of a Reference Method

It is claimed by EPA that coarse PM concentrations estimated by the difference between collocated PM_{10} and a $\text{PM}_{2.5}$ monitors provide a sufficiently precise estimate of the coarse PM concentration. There is insufficient information provided in the CD to justify this claim. In fact, studies such as that by Vanderpool et. al.² simply demonstrate that EPA studies conducted by experienced researchers from EPA and from instrument vendors can operate $\text{PM}_{2.5}$ and PM_{10}

¹ Particulate Matter Criteria Document, EPA Publication 600/P-99/002aF, October 2004

² Vanderpool, R. et. al. “Coarse PM Methods Evaluation Study, Study Design and Results” Paper available at epa.gov/ttnamti/files/ambient. April 22, 2004.

monitors in a manner sufficient to provide reasonable data by the difference method. These studies do not demonstrate that State and local agencies with limited budgets and staff can compile accurate data over long time periods. Information concerning the capability of State and local agencies to compile coarse PM monitoring data over a long time period is only available after a monitoring method is adopted, instruments are deployed, and data are compiled by State and local agencies over a multi-year period.

1.2 Lack of Adequate PM Coarse Data

Due to the use of PM_{10} minus $PM_{2.5}$ “difference” estimates of coarse PM concentrations, data concerning the coarse PM are available only for those monitoring locations having both types of monitors. This approach inherently limits the available coarse PM monitoring data mainly to urban sites. There are insufficient coarse PM estimated concentration data applicable to rural areas in the Southwest, Upper Midwest, and arid areas throughout the U.S. The lack of data is clearly indicated by the relatively few coarse PM concentration values listed in Schmidt (2005)³ for the Southwest and the Upper Midwest.

1.3 Dominance of Crustal Material in PM Coarse

Data provided in the PM Criteria Document and in supporting information such as Schmidt (2005) demonstrate that crustal material of geologic origin is the dominant material in the coarse PM fraction.

1.4 Insufficient Data and Information in the CD Concerning Coarse PM as a Carrier of Toxic Contaminants

The proposed coarse PM standards are based on epidemiological studies of exposure in urban areas. Interpretation of much of the epidemiological data has been significantly complicated by (1) the lack of a coarse PM concentration measurement reference method, (2) insufficient directly measured coarse PM data, and (3) insufficient coarse PM particle

³ Schmidt, M. et. al. Memorandum (with Attachments) titled, “Draft Analysis of Particulate Matter (PM) Data for the PM NAAQS Review. January 31, 2005.

compositional analyses. Data summarized in the CD indicate that crustal materials of geologic origin are not likely to be harmful. However, there has been speculation that coarse PM in urban areas could serve as a carrier for toxic organic compounds, metals compounds, and/or biological materials from sources other than the source of crustal particulate matter of geologic origin.

The issue concerning chemical and/or biological contaminants as material carried on the surfaces of coarse PM particles is addressed only indirectly in the CD. Reviewers of draft versions of the CD and the EPA Staff Paper have not had an opportunity to evaluate the validity and representativeness of any data concerning toxic constituents carried on the surfaces of urban coarse PM. This lack of information is probably due primarily to (1) the lack of technical information concerning the quantities and characteristics of “carried” contaminants in the atmosphere and (2) the lack of health effects studies directly concerning “carried” contaminants. Considering that particulate matter speciation in general remains at a relatively early stage of technical sufficiency, it is not surprising that this more difficult-to-quantify aspect of the speciation issue has not been addressed in detail. Atmospheric aerosol physics studies and health effects studies would be helpful in determining if the “carrier” issue is significant with respect to fine particles or even coarse particles. Until these technical studies are conducted and published, any discussion of “carried” contaminants is premature.

NSSGA would like to emphasize that the role of coarse particles of geologic origin as carriers of toxic materials emitted from other sources is highly unlikely. This conclusion is based on the following.

- Coarse mode particles have less capability than fine mode particles of serving as a carrier because (i) coarse particles have much less surface area per unit of mass than fine mode particles, (ii) the surfaces of most coarse particles, especially crustal particles of geologic origin, are not effective adsorbents, (iii) coarse mode particles are available for mass transfer for much shorter time periods, and (iv) most mechanisms for mass transfer of chemical contaminants to the surfaces of particles are much more effective for fine mode particles.

- Coarse mode particles have less capability than fine mode particles to initiate adverse health effects because (i) coarse particles have a limited atmospheric residence time and have less opportunity to reach people in both outdoor and indoor areas, and (ii) coarse mode particles are captured and removed from the respiratory tract with much greater efficiency than fine mode particulate matter.
- Any attempt to minimize the delivery of urban area contaminants should focus directly on the source of contaminants and/or the concentrations of fine mode particulate matter because any reduction in coarse mode particulate matter levels (in the unlikely event that these do serve as important carriers) would simply shift these “carried” contaminants to the fine particle mode where these contaminants will have (i) longer atmospheric residence times and travel distances and (ii) greater opportunity to penetrate lung defenses.

This section summarizes each of these three main subject areas. The information briefly reviewed in this section is consistent with technical information provided in the CD concerning the physical characteristics, transport, and atmospheric removal of fine and coarse mode particulate matter.

Unfortunately, Chapters 2 and 3 of the CD do not directly address the carrier issue, and NSSGA has not yet found any information in the health effects literature cited in the CD that quantifies the concentrations or characteristics of chemical and/or biological contaminants on the surfaces of coarse particulate matter. One health effect article that has been cited by others, namely Batalha et. al⁴, as a source of information concerning coarse particulate matter “carriers” actually concerns only particulate matter in the fine mode of 0.1 to 2.5 micrometers and does not include any single particle analyses to demonstrate that these fine mode particles are serving as carriers. The article by Batalha et. al. does not address coarse mode particulate matter.

Considering that the technology for single particle chemical analyses has been available for some time and is discussed in Section 2 of the CD, the very limited amount of scientific information concerning carrier agents on the surfaces of atmospheric particles (fine and coarse mode) is unfortunate.

⁴ Batalha, J.R.F. et. al. Environmental Health Perspectives. Volume 110, Number 12, Pages 1191-1197, December 2002.

There are three primary mechanisms for mass transfer of chemical contaminants (e.g. metals) and biological contaminants to the surfaces of particles: (1) gas phase and liquid phase contaminant adsorption on the surfaces of particles, (2) heterogeneous condensation of vapor phase contaminants on the surfaces of primary particles in the effluent gas streams of combustion processes, and (3) absorption of gas phase contaminants into water layers and chemical reactions of absorbed contaminants within water layers on the surfaces of atmospheric particles. All of these mechanisms are much more active in the fine mode than in the coarse mode due to the particle surface areas available for mass transfer, the particle surface chemical characteristics, and the atmospheric residence times available for both mass transfer and for atmospheric transport.

Information provided in aerosol physics texts⁵ and in the CD (e.g. Figure 2-1, page 2-8) demonstrates that the surface area per unit of mass is considerably greater for fine mode particulate matter than for coarse particulate matter. This can also be demonstrated by calculating the total surface area available on particles of various sizes from 1 to 10 micrometers. Figure 1 of these comments presents the total surface area in square centimeters of one cubic meter of air having a 1 microgram per cubic meter concentration of 0.1, 0.5, 1.0, 2.5 and 10 micrometer-sized particles. For simplicity, Figure 1 is based on the assumption that all of these particles are spherical. The specific gravity of the particles has been assumed to be 1.0 gram per cubic centimeter.

It is clear that the surface area per $1 \mu\text{g}/\text{M}^3$ of particulate matter having a particle size of 0.5 micrometers is approximately six times higher than a $1 \mu\text{g}/\text{M}^3$ concentration of 2.5 micrometer sized particles. The surface area per $1 \mu\text{g}/\text{M}^3$ of particulate matter having a particle size of 0.1 micrometers is approximately sixty times higher than particles having a particle size of 10 micrometers. It is clear that the surface area of fine mode particulate matter is substantially

⁵ See Hinds, W., Aerosol Technology, Second Edition, Wiley-Interscience. 1999.

greater than the surface area of coarse mode particulate matter. The available surface area to serve as a carrier of chemical and/or biological contaminants is much greater for fine mode particles than for coarse mode particles.

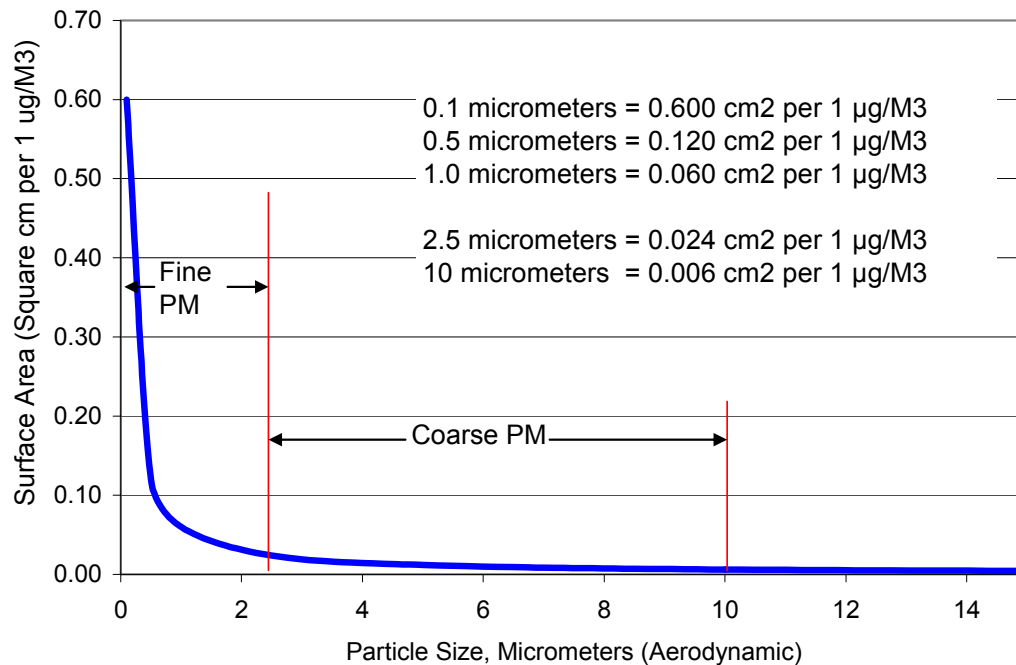


Figure 1. Particle Surface Area for 1 Microgram per Cubic Meter Concentration

The adsorption of gas phase and/or liquid phase contaminants on particles (mass transfer mechanism 1 listed earlier) is fundamentally and directly related to the surface area available on the surfaces of the particles and any macro- and micro-pores leading into the bulk particle. It is clear from the general aerosol physics literature, Figure 2-1 of the PM CD, and Figure 1 above, that the particle surface area for fine mode particles greatly exceeds that of the coarse mode. Furthermore, coarse mode particles, especially crustal particles of geologic origin formed due to attrition⁶, do not have substantial macro- or micro-pore levels. The CD indicates that attrition is one of the main formation mechanisms for coarse mode particulate matter.

⁶ Attrition is the reducing of two surfaces together. It is one of the main mechanical processes responsible for the formation of primary coarse particles.

In addition to surface area, the chemical characteristics of the surface of the particle strongly influence the extent of adsorption. The chemical characteristics of the adsorbent are well recognized as an important design issue in adsorption-based air pollution control systems, including the relatively new systems based on micro-pulverized adsorbent materials. Some of the best adsorbents for organic contaminants (probably including some biological materials) are elemental and organic carbon. Elemental and organic carbon are mainly present as fine mode particulate matter as indicated by Figure 2-7 (Page 2-102) and Table 2-2 (Page 2-52) of the PM CD. To the extent that tire wear forms coarse particles, some organic and elemental carbon is also in the coarse mode. Adsorption of vapor phase organic compounds in the atmosphere or liquid phase oils and lubricants from motor vehicles should occur primarily on the fine mode particles with surface organic or elemental carbon, rather than crustal coarse particles.

Crustal elements and compounds are not believed to be effective adsorbents for metal compounds, organic compounds, or biological materials. This is demonstrated by fact that only specific forms of these materials, such as calcium hydroxide, are used in commercial adsorption processes. Crustal compounds of calcium, potassium, aluminum, iron, and titanium are not effective adsorbents in the physical and chemical forms available in atmospheric coarse mode particulate matter.

Heterogeneous condensation of metal vapors in combustion processes (e.g. metallurgical operations, coal-fired boilers, and to a lesser extent automobiles), occurs preferentially on small particles in the fine mode. These vapors condense on the surfaces as the combustion gas stream cools to the dewpoint temperatures of each of the metal elements or metal compounds. The preferential condensation of vapor phase metals on the surfaces of fine mode particles is usually termed condensation “enrichment.”

Enrichment of toxic materials preferentially on fine particles has been well documented in the research literature concerning coal-fired boilers and other combustion processes⁷ for over twenty years.

Water layers forming on the surfaces of particles provide an opportunity for soluble gases and vapors to absorb and possibly react in the aqueous phase. Some of the absorbing species or their reaction products could remain as “carried” material on the surfaces of these particles after the water evaporates. Fine mode particles, especially those with hygroscopic constituents, are considerably more likely to have condensed water layers than coarse mode particles.

All three of the mechanisms for mass transfer of contaminants to the surfaces of particles depend on (1) the extent of contact between the contaminants and the particles and (2) the time available for mass transfer. As summarized in the CD, the atmospheric residence time for coarse particles is substantially lower than for fine mode particles. Accordingly, the capture of vapor phase contaminants during atmospheric transport should be lower for coarse mode particles than for fine mode particles. Because coarse mode particles travel smaller distances before depositing on the ground, the spatial area of deposition of coarse mode particles is also lower than the deposition area of an equivalent source of fine mode particles. Due to the lower deposition area, there is a reduced opportunity for adsorption of liquid engine oil or lubricants onto deposited particles.

Coarse mode particles can not effectively compete with fine mode particles as carriers of chemical and/or biological contaminants due to (1) the limited surface area of coarse mode particles, (2) the poor adsorptive properties of most coarse particles, especially crustal coarse

⁷ See (1) Markowski, et. al, “A Submicron Aerosol Mode in Flue Gas from a Pulverized Coal Utility Boiler.” *Environmental Science and Technology*, Vol. 14, No. 11, Pages 1400-1402, 1980; (2) Barton, R.G. and W.R. Seeker, “Behavior of Metals in Medical Waste Incinerators.” 83rd Annual Meeting & Exhibition of the Air & Waste Management Association, Paper 90-38.5, 1990.; (3) DeVito, M. and B. Jackson, “Trace Element Partitioning and Emissions in the Coal-Fired Utility Systems, 87th Annual Meeting & Exhibition of the Air & Waste Management Association, Paper 94-WA73.03, 1994; (4) McMurry, P.H. and S.K. Friedlander, “New Particle Formation in the Presence of an Aerosol.” *Atmospheric Environment*, Vol. 13, Pages 1635-1651, 1979.

particles, (3) the inherent tendencies of heterogeneous condensation and particle bound water accumulation to occur on fine mode particles rather than coarse mode particles, and (4) the limited contact time for mass transfer of contaminants to coarse particles. Accordingly, the carrier issue, if important, concerns primarily fine mode particles.

The conclusion that coarse particles are not effective carriers of other contaminants is not intended to imply that coarse particles containing contaminants are not present, especially in urban areas. Coarse particles could be released as primary emissions into the urban atmosphere due to some types of stationary sources (e.g. fuel combustion, metallurgical processes, surface coating, and waste burning), motor vehicles (e.g. tire wear, brake lining wear), and building surface erosion. Any regulation of coarse particulate matter should focus directly on the sources of these coarse particles rather than on a speculated role of coarse particles in general as carriers. Speculation concerning coarse particles as carriers does not appear to be in the interests of EPA, the public, or the regulated community of conventional and non-conventional emission source operators.

At the present time, there is no indication that a reduction of either fine or coarse particle concentrations will have an impact on the total quantity of “carried” material. It is possible that the reduction of airborne particulate matter will simply mean that there is more “carried” material on a smaller number of particles. Based on the very limited data presently available, there is no reason to believe that ambient particulate matter is at some adsorption equilibrium limit and that the reduction of the particulate matter concentration will result in a proportional drop in the quantity of “carried” contaminants.

Substantial information provided in the CD demonstrates that fine mode particulate matter has a substantially greater adverse health impact than coarse mode particulate matter. It is logical to extend that fact to conclude that any contaminants carried on fine particles would have a substantially greater health impact than contaminants carried on coarse mode particles. The

fine mode particles remain airborne substantially longer and are distributed over a much wide area. Fine mode particles are also more likely to penetrate to indoor areas where people spend most time. Once inhaled, fine mode particles can more easily penetrate the lung defenses and reach the deep lung. Conversely, coarse particles are captured more efficiently and are expelled from the respiratory system. For these reasons, chemical and/or biological contaminants on the surfaces of fine mode particles are more important than on coarse mode particles.

1.5 Regional Differences in Crustal Levels in Coarse PM and in the Ratios Between Fine and Coarse PM Concentrations

EPA's proposed coarse PM 24-hour standard of $70 \mu\text{g}/\text{M}^3$ and fine PM 24-hour standard of $35 \mu\text{g}/\text{M}^3$ are justified, in part, as being reasonably equivalent to the current PM_{10} 24-hour standard of $150 \mu\text{g}/\text{M}^3$. That is certainly not the case for regions of the U.S. dominated by natural emissions of crustal particulate matter and by crustal particulate matter emissions from agricultural operations, construction activities, unpaved public roads, and mining. Information recently published by Pace (2005)⁸ with regard to fugitive emissions from natural, agricultural, construction, unpaved public roads, and industrial sources demonstrates that the coarse PM fraction represents 85% to 90% of the total PM_{10} emissions. A similar conclusion is appropriate based on the comprehensive summary of fugitive dust emissions and characteristics prepared by Watson and Chow (2000) of the Desert Research Institute⁹. Furthermore, emission factor tests sponsored by NSSGA at stone crushing plants and sand and gravel plants, including unpaved road tests in an arid portion of California, have consistently indicated that coarse PM emissions represent 75% to 90% of the total PM_{10} emissions. For these areas dominated by crustal material of geologic origin from natural, agricultural, construction, unpaved road, and industrial sources,

⁸ Pace, T., U.S. EPA. "Evaluation of the Multiplier Used to Estimate $\text{PM}_{2.5}$ Fugitive Dust Emissions from PM_{10} ." Paper presented at the EPA EI Conference. Las Vegas, NV, April 2005.

⁹ Watson, J., J. Chow, and T. Pace. "Fugitive Dust Emissions", Air Pollution Engineering Manual, Second Edition, Wayne Davis Editor. Air & Waste Management Association. 2000. Pages 117-135.

the “reasonably equivalent” standards would be in the range of 100 to 145 $\mu\text{g}/\text{M}^3$. Far from a reasonable equivalent, the proposed standard would be roughly twice as stringent as the current standard for regions dominated by crustal material of geologic origin. These regions include the Southwest, Upper Midwest, and arid portions of the Far West. The overly stringent limits for coarse PM are not attainable and are based only on exceptionally weak ambient data that are based exclusively on coarse PM concentration estimates primarily from urban areas.

1.6 Technical Difficulty of Implementing Coarse PM Control Strategies

The development of an effective control strategy for geologic crustal material would be exceptionally difficult. The main sources of the geologic crustal emissions include natural wind blown dust from exposed soil, entrainment of dust from agricultural operations and construction sites, and emissions from unpaved roads. There is considerable uncertainty with respect to the magnitudes of these emissions and the spatial and temporal variability of these emissions. Emission inventory data summarized in the CD further indicate that emissions from traditional stationary sources are small compared to these non-traditional sources, probably due, in part, to the controls imposed on traditional stationary sources in previously promulgated total particulate matter and PM_{10} particulate matter regulations during the last thirty years. Changes in the applicable SIP regulations to increase the degree of control for crustal particulate of geologic origin from stationary sources will have little impact on air quality.

The attempt to limit emissions of crustal material of geologic origin will be frustrated by the lack of control over natural emissions, the infeasibility of controls for agricultural and construction sources, and the prohibitive costs to local agencies with respect to controlling unpaved public roads. Furthermore, the unproductive effort to regulate crustal material of geologic origin will distract resource-limited agencies from the need to develop and implement control for sources of primary and secondary $\text{PM}_{2.5}$ compounds that the CD suggests may be related to adverse health effects.

When EPA adopts final standards for coarse PM, we believe that the proposed crustal material of geologic origin exclusion should be retained to ensure against regulation of emissions that have not been shown to be harmful. Based on the current scientific record, we believe that such an approach would provide complete public health protection while protecting against unnecessary economic disruption. We believe that is what Congress intended when it adopted the ambient standards program.

1.7 Summary - Deferral of Coarse PM NAAQS

The record compiled by EPA clearly supports deferral of the coarse PM NAAQS standards pending additional ambient air monitoring and research would not leave EPA or the states without options for regulation of coarse PM during the period of deferral. Coarse PM, as a component of total particulate matter, would continue to be subject to a comprehensive set of regulations as an “air pollutant” under other provisions of the Clean Air Act, as well as under state law. Coarse PM emissions from stationary sources have been stringently regulated as total particulate matter since the Clean Air Amendments of 1970 and as PM₁₀ particulate matter since the promulgation of the PM₁₀ NAAQS in 1987.

2. Exemption of Crustal Particulate Matter of Geologic Origin

NSSGA believes that the coarse PM NAAQS should be deferred. When the NAAQS are eventually adopted, NSSGA believes that crustal material of geologic origin should be exempted from regulation. This conclusion is based, in part, on the data and information in the CD that supports the following summary statement included in the CD.

“Certain classes of ambient particles appear to be distinctly less toxic than others and are unlikely to exert human health effects at typical ambient exposure concentrations (or perhaps only under special circumstances). For example, particles of crustal origin, which are predominately in the coarse fraction, are relatively non-toxic under most circumstances, compared to combustion-related particles (such as from coal and oil

combustion, wood burning, etc.). However, under some conditions crustal particles may become sufficiently toxic to cause human health effects. For example, resuspended crustal particles may be contaminated with toxic trace elements and other components from previously deposited fine PM, e.g. metals from smelters (Phoenix) or steel mills (Steubenville, Utah Valley), PAHs from automobile exhaust, or pesticides from agricultural lands.” (EPA, PM Criteria Document, Page 8-344)

NSSGA agrees with EPA’s that the data and information in the CD demonstrates that crustal particles of geologic origin from a wide variety of natural non-anthropogenic sources, unpaved public roads, mining activities, and agricultural activities are not toxic. The “special circumstances” and “conditions” discussed on page 8-344 of the PM Criteria Document seem to refer to the speculated role of coarse particles to serve as “carriers” of contaminants of non-crustal material. For reasons discussed earlier in these comments, NSSGA is not convinced future research will demonstrate that coarse particles are effective “carriers” of contaminants relative to fine particles. For these reasons, an exemption of crustal material of geologic origin is technically appropriate.

The exemption of crustal material of geologic origin is easily accomplished by quantifying the concentrations of geologic crustal material and excluding ambient concentration data that indicate that nonattainment is due primarily to the presence of these materials. The speciation methods necessary to support the exemption of crustal material are readily available and have been used in studies referenced in the CD.

Thank you for the opportunity to submit these comments.

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