

**Alaska Air Quality Control Plan Volume II. Section III.D.5
Fairbanks North Star Borough (FNSB)
Fine Particulate Matter (PM_{2.5}) Moderate Area Attainment Plan**

5.1 Executive Summary

5.1.1 Overview

This executive summary is meant to provide the public an overview of the air quality plan or State Implementation Plan (SIP) for the Fairbanks North Star Borough (FNSB) fine particulate matter (PM_{2.5}) nonattainment area. The plan has been developed to address federal SIP requirements. The following sections and their associated appendices provide detailed information on the local PM_{2.5} pollution problem area, air monitoring data and network, emission sources and levels, control strategies and contingency measures, technical modeling to project future emission trends, and emergency episode plan. The plan also identifies the statutes, regulations, and ordinances that support the efforts to reduce air pollution in the community. Finally the plan addresses motor vehicle emissions and their link to transportation planning efforts in the community. While many of these sections build and rely upon each other, readers will find that the plan contains some redundancies that are meant to assist in reviewing sections without having to refer back too frequently to other sections.

This plan contains thirteen total sections and associated appendices as follows:

5.1	Executive Summary
5.2	Background and Overview of PM _{2.5} Rule
5.3	Nonattainment Boundary and Design Day Episode Selection
5.4	Ambient Air Quality and Trends
5.5	PM _{2.5} Network and Monitoring Program
5.6	Emission Inventory Data
5.7	Control Strategies
5.8	Modeling
5.9	Attainment Demonstration
5.10	Contingency Plan
5.11	Emergency Episode Plan
5.12	Assurance of Adequacy
5.13	Conformity and Motor Vehicle Emission Budget

5.1.2 Background on PM_{2.5}

The Clean Air Act (CAA) requires EPA to set air quality standards (40 CFR Part 50) to protect the health and the welfare of the public and the environment. The law requires EPA to periodically review and update the standards to ensure that health and environmental protection are adequate based on the scientific justifications. EPA has set National Ambient Air Quality Standards (NAAQS) for six principal criteria pollutants and particulate matter (PM) is one of these.

Particulate pollution includes a complex mixture of both solid particles and liquid droplets found in the air. These particles come in different sizes and shapes; particulates less than 10 micrometer (PM₁₀) pose health concerns because they can be inhaled and cause respiratory problems and particles less than 2.5 micrometer (PM_{2.5}) in size, also known as “fine particles” can lodge deeply into lungs and enter the bloodstream causing numerous health problems.

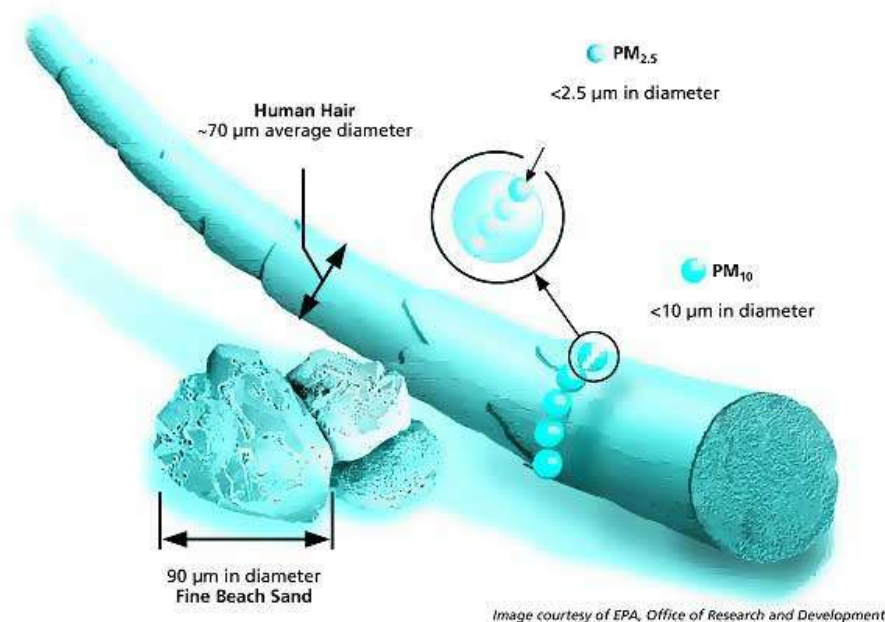


Figure 5.1-1. Particle Size Comparison

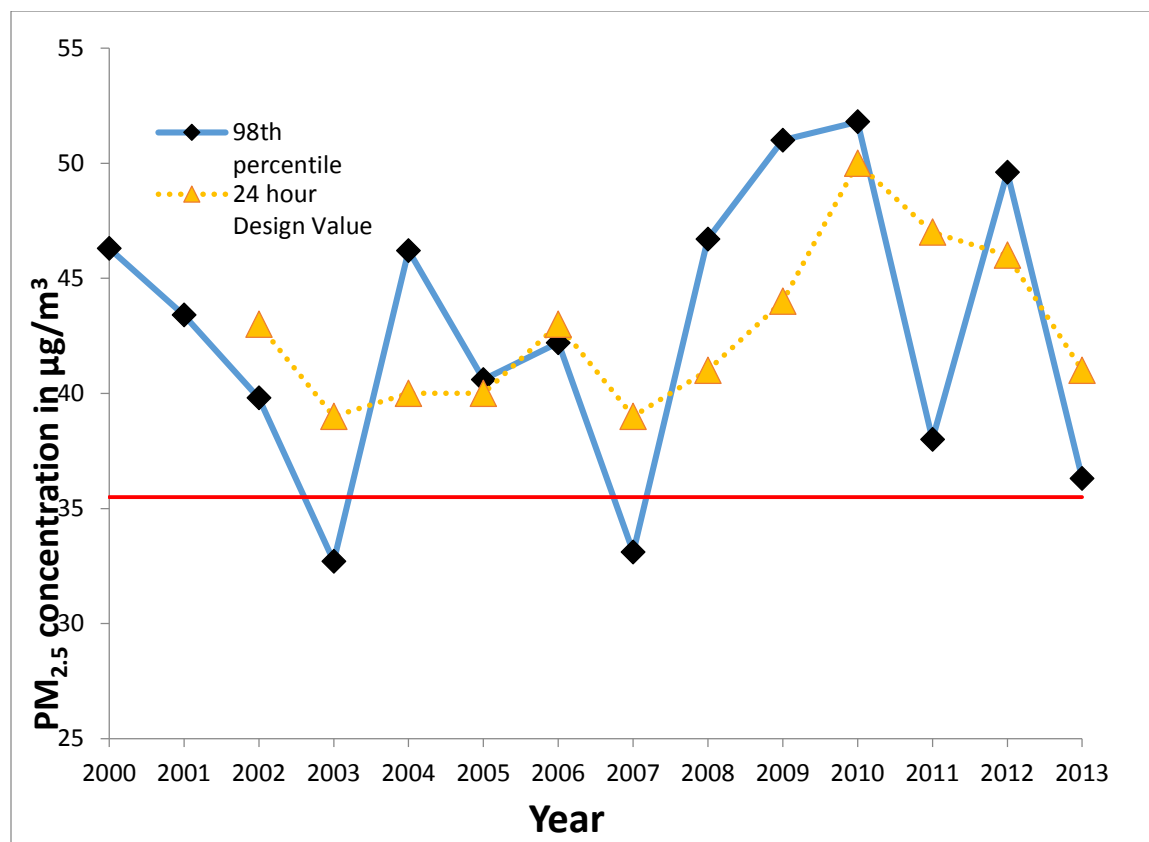
Health studies have shown a significant association between exposure to fine particles and premature mortality. Other important effects include aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions, emergency room visits, absences from school or work, and restricted activity days), lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia. Individuals particularly sensitive to fine particle exposure include older adults, people with heart and lung disease, and children.

Sources of fine particles include all types of combustion activities (motor vehicles, power plants, wood burning, etc.) and certain industrial processes. Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse." Sources of coarse particles include crushing or grinding operations, and dust from paved or unpaved roads.

5.1.3 Designating the FNSB PM_{2.5} Nonattainment Area

In 1997, EPA established the first annual and 24-hour NAAQS for PM_{2.5}. In 2006, EPA strengthened the 24-hour ambient PM_{2.5} standard from 65 micrograms per cubic meter (µg/m³) to 35 µg/m³. States were required to examine monitoring data collected within their communities and make designation recommendations based on the new standard by December 2007. Compliance with ambient air quality standards is based on the calculation of a “design value” for individual monitors consistent with the calculation of the applicable standard. For the 24-hour ambient PM_{2.5} standard, the design value is calculated from the 3-year average of annual 98th percentile values.

In 2009, EPA designated Fairbanks as nonattainment for the 24-hour PM_{2.5} standard using measurements collected at the State Office Building over the previous 3-year period, 2006 – 2008. The 98th percentile value for each of those years was 42.2 µg/m³, 33.1 µg/m³ and 46.7 µg/m³; collectively they produced a PM_{2.5} design value of 41 µg/m³ for the 3-year period ending in 2008. Design values are updated each year, based on the previous 3-years of data. Figure 5.1-2 shows the 98th percentile values and design values for the State Office Building monitor from 2000-2013. The EPA designated boundary of the Fairbanks North Star Borough (FNSB) PM_{2.5} nonattainment area is depicted in Figure 5.1-3.



States are required to develop and implement SIPs in accordance with the CAA, which is enforced through the EPA. The SIP contains narrative overviews, background information, control strategies, technical data, data analyses and implementation plans for complying with CAA requirements. Alaska's State Air Quality Control Plan contains all the required SIPs for Alaska and is incorporated by reference into state regulations at 18 AAC 50.030.

For Fairbanks, the FNSB is delegated air quality planning authority for PM_{2.5}. The Borough develops and submits their local air quality plans to the DEC for adoption and inclusion in the SIP. This PM_{2.5} plan describes how the State of Alaska and FNSB in collaboration with other agencies will meet the federal requirements to control and reduce PM_{2.5} pollution in the FNSB non-attainment area. It also describes how the State of Alaska and FNSB will identify and implement air pollution control measures to achieve lower emissions of fine particulate matter (PM_{2.5}) as well as nitrogen oxides (NO_x), sulfur oxides (SO_x), volatile organic compounds (VOCs) and ammonia which also can contribute to the PM_{2.5} pollution. The plan also describes how the State and FNSB will work to educate the community on using cleaner burning and more efficient home heating units.

Developing an air quality plan to address fine particulate matter is a multi-step process. The goal is to develop a plan that addresses the problem, reflects the local situation, and has controls that are reasonable and cost effective. Planning steps include:

- Characterizing the air pollution problem using technical tools and analyzing data. This step includes:
 - Monitoring Studies
 - Assessing Emissions
 - Modeling Impacts
- Evaluating options to reduce air pollution and develop the plan. The Clean Air Act requires emission reductions that are permanent and enforceable.
 - Identify and evaluate programs that can reduce pollutant emissions.
 - Develop regulations and ordinances to ensure permanent reductions.
 - Consider voluntary measures that can assist in mitigating pollution.
 - Draft the local air quality plan and have it reviewed by the public and Borough Assembly.
- Adopting the local plan into state regulations and transmitting it to EPA for approval.
 - The state incorporates the local plan into the SIP through regulation providing additional opportunities for public notice, comment, and hearing.
 - Once the state regulatory process is complete, DEC transmits the plan to EPA for approval
- EPA taking action on the plan to make it federally enforceable.
 - EPA reviews the plan to insure it is complete and meets all requirements of the Clean Air Act.
 - EPA issues a federal register notice of their action, takes public comment, and finalizes their decision.

DEC, FNSB, and EPA Region 10 engaged cooperatively in discussions throughout the development of this SIP for the nonattainment area. The objective of this early and ongoing

dialogue was to help ensure the SIP meets federal requirements and can be processed efficiently by EPA.

5.1.5 Analysis Framework for the Plan

Extensive effort was devoted to the development of a technical analysis framework for the SIP. This included selection of representative conditions causing elevated PM_{2.5} concentrations, the definition of a modeling domain that accounts for the meteorological and emission contributions impacting monitors located within the nonattainment area, the collection of activity data and emission factors that support the development of a representative emission inventory. Key components of the analysis framework include:

- Two multi-day episodes in 2008 were selected to represent days leading up to high concentrations, design day conditions, and days that exceed design day conditions. These episodes (January 23 – February 10 and November 2 -17) provide a reasonable baseline for analyzing controls to see what impact they have on reducing emissions to levels below the standard.
- Estimates of hourly meteorological conditions and emissions were developed for 201 x 201, 1.33 km grid cells that encompassed a modeling domain substantially larger than the nonattainment area for each of the multi-day episodes. The meteorological estimates were held constant for each analysis year. Emission estimates for individual source categories were developed to account for changes in activity (e.g., miles traveled, fuel mix and use, distribution of combustion devices, etc.) in 2008, 2015, 2017 and 2019. Emission estimates in 2008, 2015, 2017 and 2019 were prepared for baseline conditions (which accounts for the effects of natural turnover in vehicles, fuel burning devices, etc., growth and the effects of controls in place). Emission estimates were also prepared to account for the effects of controls implemented after 2008. The primary future year analyzed in this plan is 2015. The 2017 and 2019 analysis years are included to help demonstrate future progress toward compliance with the ambient air quality standard.
- The EPA approved Community Multiscale Air Quality (CMAQ) Modeling System was used to assess the impact of changes in baseline and controlled emissions on progress towards attainment.
- Emission estimates for each of the analysis years were based on controls that were fully implemented by the beginning of that year. For example, emission estimates for 2015 are based on the control measures and activity changes that were in place at the end of 2014. This is a conservative approach that only counts the benefits achieved by the start of the analysis year; it provides no benefit for control measures implemented or extended in the analysis year (2015).

5.1.6 Reducing PM_{2.5} Air Pollution

The FNSB PM_{2.5} nonattainment area plan relies on several primary control strategies coupled with additional voluntary measures to mitigate PM_{2.5} air pollution. During the period 2008-2013, a number of programs were implemented at the local and state levels to encourage changes in behavior that produce emission reductions. The plan discusses these efforts and their emission

reduction benefits by 2015 as well as additional emission reduction measures that are planned for or continuing during the period from 2015 to 2019. Measures included are:

- Solid fuel-fired heating device upgrades through change out and retrofit incentive programs
- Solid fuel-fired heating device emission standards to ensure new heaters are clean burning
- Improving solid fuel-fired heating device operations through public education, fuel and visible emission requirements
- Encouraging reduced use of solid fuel-fired heaters during air pollution episodes through public education and a voluntary cessation program
- Alaska Housing Finance Corporation energy efficiency and weatherization programs to reduce space heating demands
- Expanded availability and use of natural gas for space heating after 2016
- Expanded availability of motor vehicle plug-in infrastructure to reduce vehicle cold-start emissions
- Mass transit to reduce the emissions from the use of single occupant vehicles
- Diesel anti-idling and emission reductions for heavy vehicles and equipment
- Federal vehicle emission controls that provide for cleaner burning cars over time
- Winter season prohibition on outdoor open burning to avoid additional smoke emissions in the nonattainment area
- Stationary source air permitting to control power plants and industrial facilities

These programs are discussed in greater detail in Sections 5.7 and 5.10. Section 5.7 discusses all the control measures identified, implemented, planned, and underway within the non-attainment area. Section 5.10 is focused on the contingency measures that are planned for the period between 2015 and 2019 that show additional progress to reach attainment by 2019.

5.1.7 Findings and Demonstrating Attainment

The analysis framework described in Section 5.1.5 was used to quantify the impact of changing trends in activity and controls on emissions and concentrations in future years. The key findings of that analysis were that it was not possible to demonstrate attainment by the December 31, 2015 federal attainment deadline, but that it is possible to demonstrate attainment by 2019.

The plan makes an “impracticability” demonstration because the combined benefits of the Borough’s wood stove change out program projected through 2015, the Alaska Resource Agency project to retrofit outdoor wood boilers with catalytic converters, the natural turnover of both vehicles and wood burning heaters, and other voluntary measures are insufficient to reduce emissions to levels needed to demonstrate attainment by the December 31, 2015 deadline. The combined benefit of the non-voluntary measures produced a predicted 2015 concentration of $40.1 \mu\text{g}/\text{m}^3$, which was adjusted to $39.6 \mu\text{g}/\text{m}^3$ to reflect a $0.5 \mu\text{g}/\text{m}^3$ benefit of the voluntary control measures. While this value represents a substantial reduction from the $44.7 \mu\text{g}/\text{m}^3$ baseline design value, it falls far short of the $35\mu\text{g}/\text{m}^3$ standard.

The plan further details an analysis of the benefits of implementing additional control measures that are planned for, and measures that will continue, after 2015. These measures include the new state emission standards for wood burning appliances, a dry wood program and natural gas expansion. Together with the continuing measures already underway, these measures produced a predicted 2019 concentration of $34.0 \mu\text{g}/\text{m}^3$, which was adjusted to $33.5 \mu\text{g}/\text{m}^3$ to account for the $0.5 \mu\text{g}/\text{m}^3$ benefit of voluntary measures. The plan further discusses the potential benefits of adding a program that uses compressed wood “energy logs” to further reduce emissions and the predicted 2019 design value. Thus, this plan shows that it is possible to demonstrate attainment by 2019.

5.1.8. The Public Review Process

Addressing air pollution problems can be challenging for communities. For any air quality plan to be successful, it must be accepted and implemented by the community as a whole. For this reason, it is critically important that the Borough, State, and EPA receive feedback and input from the public on this air quality plan. Additional information on open houses, oral hearings, and ways to provide comments are available through the Alaska Department of Environmental Conservation’s Division of Air Quality website at: <http://dec.alaska.gov/air/index.htm>.