

**ALASKA DEPARTMENT OF
ENVIRONMENTAL CONSERVATION**



**Amendments to:
State Air Quality Control Plan
Vol. II: III.D.7.9
Attainment Demonstration**

Adopted

November 5, 2024

Michael J. Dunleavy, Governor

Emma Pokon, Commissioner

Note: This document provides the adopted language of the 2024 Amendment to the Serious SIP for inclusion in this section of the State Air Quality Control Plan section to address the disapproval of the Serious SIP and the 2020 Amendments. The currently adopted section of the air quality plan can be found and referenced at the following internet site: [Fairbanks PM2.5 Serious SIP](#)

7.9 Attainment Demonstration - 2027

Section 189(b)(1) of the Clean Air Act requires states with a Serious nonattainment area to meet the planning requirements contained in the Moderate Area Plan and, in addition, submit an implementation plan that includes:

(A) A demonstration (including air quality modeling) -

(i) that the plan provides for attainment of the PM-10 national ambient air quality standard by the applicable attainment date, or

(ii) for any area for which the State is seeking, pursuant to section 188(e), an extension of the attainment date beyond the date set forth in section 188(c), that attainment by that date would be impracticable, and that the plan provides for attainment by the most expeditious alternative date practicable.

(B) Provisions to assure that the best available control measures for the control of PM-10 shall be implemented no later than 4 years after the date the area is classified (or reclassified) as a Serious Area.

On August 24, 2016, EPA promulgated the final rule *Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements*,¹ codified at 40 C.F.R. part 51, Subpart Z, to implement the Clean Air Act requirements applicable to PM_{2.5} nonattainment areas, including the requirement for an attainment demonstration. The following regulations outline the attainment demonstration requirements.

Under 40 C.F.R. § 51.1003(b)(1)(iv), for any nonattainment area reclassified to Serious for a PM_{2.5} NAAQS, in addition to meeting the Moderate area attainment plan submission requirements, the state shall submit a Serious area attainment plan that includes the attainment demonstration and modeling requirements set forth at § 51.1011.

Under 40 C.F.R. § 51.1011(b), for nonattainment areas reclassified to Serious, the attainment demonstration due to EPA as part of a serious area plan must meet all of the following criteria:

(1) The attainment demonstration shall show the projected attainment date for the Serious nonattainment area that is as expeditious as practicable.

(2) The attainment demonstration shall meet the requirements of Appendix W of this part and shall include inventory data, modeling results, and emission reduction analyses on which the state has based its projected attainment date.

¹ 81 Fed. Reg. 58,010, 58,150 (Aug. 24, 2016).

(3) The base year for the emissions inventories required for attainment demonstrations under this paragraph shall be one of the 3 years used for designations or another technically appropriate inventory year if justified by the state in the plan submission.

(4) The control strategies modeled as part of a Serious area attainment demonstration shall be consistent with the control strategies required pursuant to § 51.1003 and § 51.1010.

(5) Required timeframe for obtaining emissions reductions. For each Serious nonattainment area, the attainment plan must provide for implementation of all control measures needed for attainment as expeditiously as practicable. All control measures must be implemented no later than the beginning of the year containing the applicable attainment date, notwithstanding BACM implementation deadline requirements in § 51.1010.

Under 40 C.F.R. § 51.1004 (attainment dates), a state that submits an attainment plan that demonstrates that a Serious PM_{2.5} nonattainment area cannot practicably attain the PM_{2.5} NAAQS by the end of the tenth calendar year following the effective date of designation of the area with the implementation of all control measures required under § 51.1010(a) must request an extension of the Serious area attainment date consistent with § 51.1005(b).

40 C.F.R. § 51.1004(a)(2)(ii) specifies that the request must propose a projected attainment date for the nonattainment area that is as expeditious as practicable, but no later than the end of the fifteenth calendar year following the effective date of designation of the area.

Under 40 C.F.R. § 51.1005(b)(1)(i) (attainment date extensions), a state may apply for one attainment date extension not to exceed 5 years for a Serious nonattainment area if the state demonstrates that attainment of the applicable PM_{2.5} NAAQS by the approved attainment date for the area would be impracticable or, in the absence of an approved attainment date, attainment of the applicable PM_{2.5} NAAQS by the applicable statutory attainment date for the area would be impracticable. 40 C.F.R. § 51.1005(b)(1)(i).²

At the time of application for an attainment date extension, the state shall submit to the EPA a Serious area attainment plan that includes the attainment demonstration and modeling requirements set forth at § 51.1011 (listed above) that justify the state's conclusion under § 51.1005(b)(1)(i) (directly above), and that demonstrate attainment as expeditiously as practicable. 40 C.F.R. § 51.1005(b)(2)(iii).

In addition, since Fairbanks failed to attain the 24-hour PM_{2.5} NAAQS by the statutorily required date of December 2019, it is now subject to CAA Section 189(d) requirements. CAA Section 172(a)(2)(A) and 40 C.F.R. § 51.1004(a)(3) require:

The projected attainment date for a Serious PM_{2.5} nonattainment area that failed to attain the PM_{2.5} NAAQS by the applicable Serious area attainment date shall be as expeditious as practicable, but no later than 5 years following the effective date of the EPA's finding

² A discussion of how the state meets the additional conditions for obtaining an extension to the serious area attainment date are included in Sections III.D.7.1.8, III.D.7.2.9, III.D.7.7.3, and III.D.7.11.

that the area failed to attain by the original Serious area attainment date, except that the Administrator may extend the attainment date to the extent the Administrator deems appropriate, for a period no greater than 10 years from the effective date of the EPA's determination that the area failed to attain, considering the severity of nonattainment and the availability and feasibility of pollution control measures.

EPA had to propose and finalize a rule after Fairbanks failed to meet the statutory attainment date of December 2019. The effective date of EPA's final rule that the Fairbanks PM_{2.5} Nonattainment Area failed to attain by the Serious area attainment date is October 2, 2020. Five years following October 2, 2020, is October 2, 2025.

The analysis documented in this section of the 2024 Amendments to the 189(d) Plan for the Fairbanks Areas Serious Plan (subsequently referred to as 2024 Amendments) demonstrates that calendar year 2027 reflects attainment "as expeditiously as practicable" in compliance with 40 C.F.R. § 51.1004(a)(3) as described in greater detail in Section 7.9.3. DEC's proposed attainment date of 2027 is beyond the 5 year deadline of October 2, 2025, and is within the 10 year extension allotment through October 2, 2030. Therefore, DEC is requesting that EPA extend the attainment date to the end of calendar year 2027. An explanation as to the appropriateness of this request is provided in Section 7.9.3.

As required by CAA Section 189(b)(1)(A)(ii), 40 C.F.R. §§ 51.1004(a)(2)(ii) and 51.1005(b), information demonstrating that the area was unable to demonstrate monitored attainment by the statutory 2019 attainment date is shown in Figure 7.9-1 and Table 7.9-1. The 24-hour PM_{2.5} National Ambient Air Quality Standard (NAAQS) is 35 µg/m³. The monitoring design values listed in Table 7.9-1 and plotted in Figure 7.9-1 are three-year running averages of the 98th percentile concentrations, reported in the last year of the average. As seen in Table 7.9-1, the 2023 three-year design value at the Hurst Road (North Pole) monitor was 56 µg/m³, which significantly exceeds the 35 µg/m³ NAAQS.³

³ <https://dec.alaska.gov/air/air-monitoring/alaska-concerns/community-data/fnsb-summary-pm25/>

Figure 7.9-1. PM_{2.5} 24-hr Design Values

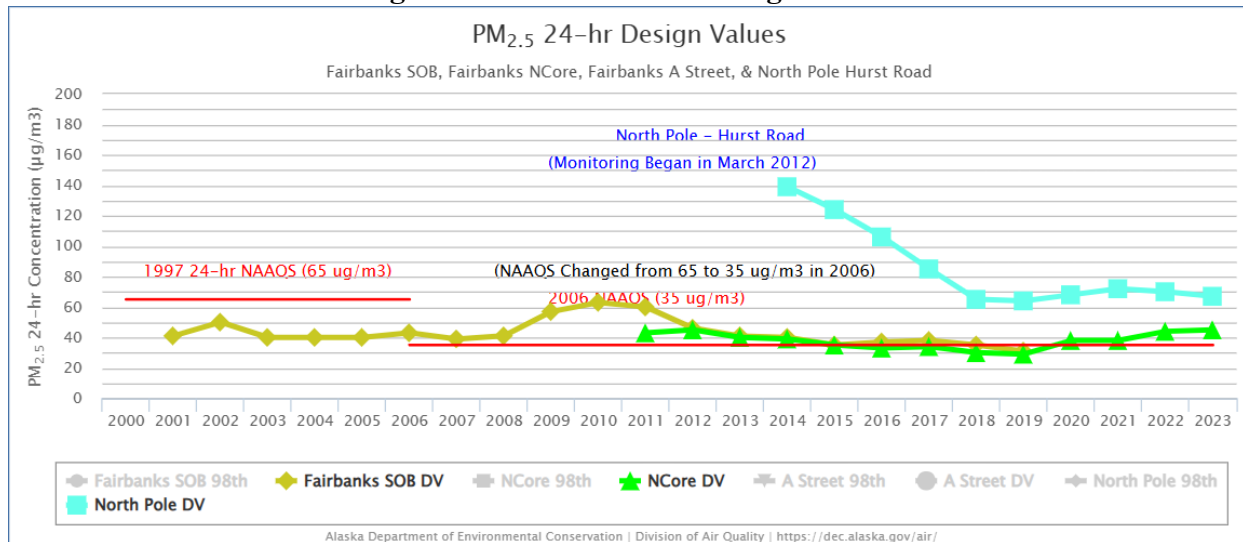


Table 7.9-1 PM_{2.5} 24-Hour Design Values 2020-2023

PM _{2.5} 24-Hour Design Values 2020-2023				
	2020	2021	2022	2023
NCORE 98 TH PERCENTILE	26.6	27.5	76.3 (29.1 ¹)	30.7 (20 ¹)
NCORE 24-HR DESIGN VALUE	37 (27 ¹)	38 (27.3 ¹)	44 (28 ¹)	45 (26 ¹)
A STREET 98 TH PERCENTILE	36.1	N/A ²	N/A ²	34.4 (27.8 ¹)
A STREET 24-HR DESIGN VALUE	--	N/A ³	N/A ³	N/A ³
NORTH POLE 98 TH PERCENTILE	71.4	65.5	72.5 (51.2 ¹)	62.5 (51.9 ¹)
NORTH POLE 24-HR DESIGN VALUE	68 (63 ¹)	72 (67.3 ¹)	70 (63 ¹)	67 (56 ¹)

Source: <https://dec.alaska.gov/air/air-monitoring/alaska-concerns/community-data/fnsb-summary-pm25/>

1. The number in parentheses indicates the value when exceedance days caused by wildland fire smoke are excluded from calculation.
2. The site did not meet required data capture; therefore, a 98th percentile cannot be calculated.
3. A design value cannot be calculated due to a lack of sufficient data.

With the inability to demonstrate attainment in 2019, CAA 189(d) requires areas that fail to attain to submit, within 12 months after the applicable attainment date, plan revisions which provide for attainment and show annual reduction of emissions within the area of not less than 5 percent. This 2024 Amendment contains these plan revisions, which include updates to the 2020 Amendment.

For attainment modeling, four or five-year design values are generally required. For the earlier Serious Area Plan, the base year modeling design value was 131.6 $\mu\text{g}/\text{m}^3$. The latest five-year (2017-2021) design value for the controlling (i.e., highest concentration) Hurst Road monitor is 64.9 $\mu\text{g}/\text{m}^3$ (this five-year modeling design value is different than the 3-year monitoring design value in Table 7.9-1). This is the base year 2020 modeling design value for this Amendment. Improvements in $\text{PM}_{2.5}$ air quality have been measured at Hurst Road monitor over the last few years and as discussed in detail in Section III.D.7.4.4, are not the result of milder weather in these years.

This section of the 2024 Amendment provides DEC's revised attainment demonstration based on this latest 2017-2021 design value that, given its decrease from the Serious SIP design value, helps to significantly advance model-forecasted attainment. It also includes a demonstration that the revised plan fulfills the CAA 189(d) annual emission reduction requirement of not less than 5 percent. DEC has determined that 2027 is the most expeditious attainment date based on this latest design value coupled with modeling of air quality impacts from quantified emission reductions associated with control measures evaluated in Section III.D.7.7.

7.9.1 Modeled Attainment Demonstration - 2027

Methodologies used to perform the emissions inventory and air quality modeling analyses supporting the modeled expeditious attainment demonstration in 2027 are summarized in Section III.D.7.9.1.1 and Section III.D.7.9.1.2, respectively. The inventory methods and sources are described in further detail in Section III.D.7.6, including procedures used to calculate emission benefits from adopted control measures. (Section III.D.7.7 contains detailed discussions of the evaluation and development of the control measures.) Similarly, the detailed air quality modeling methods are also further described in Section III.D.7.8. The summarized analyses presented in the following two sub-sections are fully consistent with data sources and methods discussed in these preceding sections (III.D.7.6, III.D.7.7 and III.D.7.8).

7.9.1.1 Inventory Analysis to Support Expeditious Attainment

As noted earlier in Section 7.9, 40 C.F.R. § 51.1011(b)(3) requires selection of the base year of the emissions inventories use for the attainment demonstration to be *“one of the 3 years used for designations or another technically appropriate inventory year if justified by the state in the plan submission”*.

A key revision to the attainment modeling under the 2024 Amendment consisted of the use of a new modeling platform using the latest gridded regional meteorological and photochemical models as well as a more current modeling episode covering a 74-day period from December 1, 2019 through February 12, 2020 during which DEC collected and validated speciated ambient $\text{PM}_{2.5}$ monitoring data at sites located in both the Fairbanks and North Pole portions of the nonattainment area. Although the three years used for the area designation were 2017 through 2019, 2020 was selected as the Base Year to align with this new winter 2019-2020 historical modeling episode. (A calendar year inventory refers to emissions as of January 1 of that year representing source activity and controls as of start of the calendar year.) Therefore, selection of

2020 as the inventory Base Year for the 2024 Amendment represents the most technically appropriate inventory year in accordance with 40 C.F.R. § 51.1011(b)(3).

It also complies with provisions in 40 C.F.R. § 51.1010(c) that require, in addition to an attainment demonstration, that nonattainment area emissions will be reduced by at least 5 percent for each year over the entire attainment horizon “*based on the most recent emissions inventory for the area*”. As explained above, 2020 was selected as the Base Year to align with the winter 2019-2020 modeling episode that provides the ambient measurement-based foundation for calibrating the air quality model to a starting point in time for modeling future year attainment. “Current” source activity data were then collected for calendar year 2020 (e.g., Point sources), or backcasted to 2020 from more recently collected activity data (e.g., 2023 Home Heating survey data to support Residential Space Heating sources). Thus, the 2020 Base Year inventory also meets these requirements in 40 C.F.R. § 51.1010(c) and provides a consistent starting point for both the attainment demonstration and the 5 percent per year reduction requirements.

Building on the 2020 Base Year inventory developed in support of the 2024 Amendment and described in detail in Section III.D.7.6.9, a series of future year emission inventories were developed for each calendar year from 2020 through 2029. Since the development of the future year inventories preceded the air quality modeling analysis used to evaluate modeled attainment, inventories were developed for each of these calendar years: (1) to ensure the attainment year was sufficiently bounded; and (2) to develop emission estimates within the nonattainment area for intervening years required to satisfy Reasonable Further Progress requirements discussed in Section III.D.7.10, as well as 5 percent annual reduction requirements for Serious areas that fail to attain the NAAQS by the required attainment date discussed in Section III.D.7.9.2.2.

Each of these future year inventories accounted for growth in source activity over time (e.g., increases in residential heating emissions resulting from forecasted housing growth). They also accounted for emission reductions associated with both on-going state/local control programs (such as the Wood Stove Change Out and Solid Fuel-Burning Appliance Curtailment programs) and control measures adopted under the Serious SIP or these 2024 Amendments. Thus, these future year inventories are referred to as Control inventories since they account for both source activity growth and control measure benefits applicable to each year.

Post-2020 Source Activity Growth – Source activity growth rates used to project 2020 Control inventory emissions in calendar years 2021 through 2029 were generally based on the 2020-2024 and 2024-2035 annualized growth rates by source sector presented in Table 7.6-10 of Section III.D.7.6.10.1 with the following exception for space heating:

Although source activity growth after 2027 used the same domain average annual growth rate of 1.7%, the effect of oil price shifts in wood vs. oil use was capped after 2027. As explained earlier in the Emission Inventory chapter (Section III.D.7.6) and the Emission Inventory appendix, an oil price-based approach was used to project wood vs. oil use based on a local, historically developed elasticity between wood and oil use driven by the price of heating oil. The base year (2020) price of heating oil was \$2.42/gallon and as of the end of 2022 the price had risen to \$4.73/gallon. Based on regional energy price forecasts developed by the Energy Information Administration (EIA) in its 2023 Annual Energy Outlook (AEO), the projected

Fairbanks heating oil price in 2027 was \$4.76/gallon after peaking at \$5.10/gallon in 2024. Given the difficulty in reliably forecasting long-term energy prices this effect was capped after 2024. In other words, 2028 and later year space heating emissions reflect no changes in oil price from that forecasted in 2027.

Beyond these activity growth projections, the effects of the federal mobile source and fuel control programs in projecting mobile source emissions from 2021 through 2029 were accounted for using EPA's MOVES3 vehicle emissions model.

Control Measure Benefits

Information demonstrating that the area meets CAA Section 189(b)(1)(B) regarding BACT implementation requirements is found in Section III.D.7.7, the Control Measure section.

Table 7.9-2 lists the state and local control measures for which emission benefits were quantified⁴ and included in the alternative attainment date analysis. The Borough's Wood Stove Change Out (WSCO) Program is shown at the top of Table 7.9-2. It will continue to provide benefits from change outs projected through 2025 based on currently available funding. The column labeled "Start Year" in Table 7.9-2 identifies the initial year scheduled for implementation. This is defined as the first full year for which a measure is in place. (For example, a measure implemented in October 2021 has a start year of 2022.)

Measures in Table 7.9-2 below the WSCO Program reflect State measures for which benefits were quantified and included in the expeditious attainment analysis. Table 7.7-7 of the SIP Control Strategies section (Section III.D.7.7) provides a more detailed description of each measure along with a crosswalk to proposed State regulation sections.

⁴ The package of measures planned for adoption by Alaska include additional measures beyond those listed in Table 7.9-6 for which data were not fully available to quantify emission benefits.

Table 7.9-1
List of Control Measures for Which Emission Benefits Were Quantified

Measure ID	Measure Summary	Start Year^b
WSCO	Borough Wood Stove Change Out Program, reflecting future change outs using currently secured funding ^a	On-going, thru 2029
Curtailement	Solid Fuel Burning Appliance (SFBA) Episodic Curtailement Program, reflects enhanced compliance by future attainment date	On-going
STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	2023
STF-13, Modified BACM 31, 32	Requires commercially sold wood to be dry before sale	2022
STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified devices and cordwood outdoor hydronic heaters (OHHs)	2024
BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU (hydronic heaters) certified PM emission rates for new or re-conveyed wood devices	2020
BACM 48, 49	Removal of coal heaters	2024
STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	2020
STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	2020

^a Reflects WSCO program funding through 2016, 2017, 2018, 2019-2020, 2021, and 2022 EPA-awarded Targeted Airshed Grants (TAGs).

^b Start year refers to the first full calendar year of measure implementation. For example, a measure implemented in September 2022 has a start year of 2023. In SIP inventory development and attainment modeling, a measure must be fully implemented over an entire calendar year for its control benefits to be counted in that year.

As explained earlier in Section III.D.7.6.9.3, DEC also evaluated effects of the expansion of natural gas availability being implemented by the Interior Gas Utility (IGU) but chose not to quantify reductions (through 2029) from this expansion due to the degree of uncertainty associated with the forecasted expansion and customer conversions. Instead, DEC plans to estimate emission reductions from natural gas expansion in Reasonable Further Progress reporting based on historical, rather than forecasted residential and commercial natural gas conversions. Thus, natural gas expansion (NGE) was not listed in Table 7.9-2.

Table 7.9-3 provides further details on the phase-in percentage estimated for each control measure for calendar years 2020 through 2027. Except where footnoted, this phase-in percentage reflects a combined compliance and penetration rate for each measure.

Table 7.9-2
Control Measure Phase-In Forecast for Inventory Years 2020-2027

Measure Summary and ID	Phase-In Percentages (%) by Year								Benefit Type
	2020	2021	2022	2023	2024	2025	2026	2027	
Borough Wood Stove Change Out Program (WSCO)	2,791 ^a	3,055 ^a	3,267 ^a	3,576 ^a	3,974 ^a	4,524 ^a	5,078 ^a	5,628 ^a	Accumulative as funded
SFBA Episodic Curtailment Program (Curtailment) ^b	30%	33%	38%	38%	38%	38%	38%	38%	Recurrent
(Shift space heating from #2 to #1 oil (STF-12))	n/a	n/a	n/a	72%	95%	95%	95%	95%	One-Time
Requires commercially sold wood to be dry before sale (STF-13)	n/a	n/a	40%	40%	45%	45%	45%	50%	One-Time
Removal of all uncertified devices & cordwood OHHs (STF-17)	0%	5%	15%	30%	30%	30%	30%	30%	One-Time
2.0 g/hr and 0.10 lb/mmBTU certified emission rates for new or re-conveyed wood devices (BACM-R8)	22%	25%	30%	35%	35%	35%	35%	35%	Accumulative
Removal of coal heaters (BACM-48)	n/a	n/a	n/a	n/a	25%	25%	25%	25%	One-Time
Wood-fired devices may not be primary or only heating source (STF-22)	0%, 0% ^c	0%, 0% ^c	0%, 0% ^c	0%, 0% ^c	20%, 40% ^c	20%, 40% ^c	20%, 40% ^c	20%, 40% ^c	Partially Accumulative
NOASH/Exemption requirements (STF-23)	0%	10%	10%	30%	30%	30%	50%	50%	One-Time

n/a – Not applicable in years preceding start year.

^a WSCO program phase-in metric is cumulative change outs since program inception (July 2010) and reflects projected device change-outs/conversions developed by the Borough based on currently secured funding.

^b Metric shown for Curtailment Program is the compliance rate. Although not shown in the table, the emission benefits analysis also includes State revisions to Curtailment program strengthening alert stage thresholds from 25 and 35 µg/m³ to 20 and 30 µg/m³ for Stages 1 and 2, respectively, effective January 2020.

^c Paired percentages for Measure STF-22 reflect compliance/penetration rates for existing and new home components of the measure, respectively.

As shown in Table 7.9-3, the increases in phase-in percentages shown by inventory year generally reflect improvements in compliance and/or accumulation of benefits over time, where supported. The rationale for these improvements/changes over time is provided separately by measure as follows:

- *Wood Stove Change Out Program* – The projected change outs listed in Table 7.9-3 are based on funding from the 2016, 2017, 2018, 2019-2020, 2021, and 2022 Targeted Airshed Grants (TAGs). In addition, the TAG funding-based change outs will also incentivize compliance/penetration for other measures as noted below.
- *Curtailment Program Enforcement* – DEC typically uses a basic 3-strike enforcement response method. During an air quality alert, DEC technicians drive around affected areas

using randomized, pre-determined routes and document violations from public vantage points. Upon first observance of a violation, DEC issues an Advisory Letter that assumes the recipient was previously unaware of the curtailment requirements. Upon second observance of a violation, DEC issues a Compliance Letter that presses the recipient to reach out for options of compliance assistance. Upon third observance of a violation, DEC issues a Notice of Violation and an offer of expedited settlement with a penalty. Repeated violations beyond a third observance can be subject to increased penalties or other civil remedies under the State’s discretion to return the violator to compliance. The department tracks violations across winters; the count for each owner/resident does not restart each winter. Each communication gives the recipient a chance to object if they believe DEC’s observations were in error.

As shown in Table 7.9-4 below, DEC has generally issued increasing Notices of Violation each winter since 2020/2021, reflecting an escalation in third observance responses. As time proceeds into future years, DEC expects to see a further increasing pattern of progressive enforcement responses. DEC reserves full enforcement discretion and the right to revisit its enforcement response process.

Table 7.9-4. Curtailment Statistics for Heating Seasons 2018 to 2024

Heating Seasons	Potential	Advisory Letters Issued	Compliance Letters Issued	Stage 1 Letters Issued	Stage 2 Letters Issued	Notice of Violation (NOV)**
(November – March)	Observed Violations					
2018/2019	232	197	15	30	161	0
2019/2020	86	84	14	36	43	0
2020/2021	80	49	16	24	44	3
2021/2022	142	106	30	N/A*	N/A*	6
2022/2023	298	230	47	N/A*	N/A*	14
2023/2024	276	198	51	N/A*	N/A*	12

*Stage 1 and Stage 2 Letters are no longer distinguished. However, DEC Advisory Letters, Compliance Letters, and NOV's all follow the same procedures. DEC responds to as many alerts as possible, regardless of Stage.

**NOV's are issued with expedited settlement agreements, which contain a penalty.

In the earlier Serious SIP and 2020 Amendments, DEC projected the compliance rate would increase from 30% in 2020 to 45% in 2023. That projected compliance rate increase was estimated based on TAG funding that would be used to: (1) deploy roadway dynamic message sign (DMS) systems within the nonattainment area to increase public awareness of curtailment alerts; (2) purchase and use an infrared camera for dark/low-light winter conditions; (3) increase compliance staffing; and (4) perform additional in-field curtailment compliance assessment and enforcement surveys. In winter 2022-2023, DEC conducted an observational field study from which Curtailment Program compliance was estimated to be 38.1%; described in Appendix III.D.7.09 Attainment Demonstration. A similar study was conducted during winter 2023-2024. Until DEC has an opportunity to analyze those results, the Curtailment Program compliance rate is conservatively being held at 38% over the attainment analysis horizon.

- *Shift to #1 Oil (STF-12)* – This measure required a one-time shift from the current mix of #2 and #1 heating oil refined and sold in the nonattainment area by September 2022. The 72% penetration rate in 2023 reflects an adjustment to account for the residential oil tank volumes fill frequencies based on the 2023 Home Heating survey. It accounts for the fact that tanks were mostly filled with #1 oil as of the start of 2023. In 2024 and later years the penetration rate has been estimated at 95% (rather than 100%) to reflect anecdotal evidence that a small number of residents may be importing #2 oil from sellers outside the nonattainment area.
- *Commercially-Sold Dry Wood (STF-13)* – Regulations adopted under the Serious SIP (18 AAC 50.076) require commercially sold wood after October 1, 2021 to be dry, or if sold as 8-ft length rounds, to require proof of proper/adequate storage for drying by the buyer. Under the Serious SIP, DEC has estimated initial compliance in 2022 (first full year) to be 50% based on moisture data collected at that time from commercial wood sellers. An updated analysis was conducted with more recent wood seller data and also accounted for operation of Aurora Energy’s wood drying kiln, which began operation in 2020 and ramped up throughput in subsequent years. Despite inclusion of data from the Aurora kiln, it was found that fewer sellers were drying and measuring wood moisture content and selling more wood in 8-ft rounds for which moisture measurements are problematic. As a result, the updated compliance rate was calculated to be 40% in 2022 and is projected to nominally increase over the attainment analysis horizon to reflect local demand for dry wood.
- *Solid-Fuel Device Removal Measures (STF-17, BACM-48)* – Compliance rates in the first full year of implementation (2024) of these uncertified wood and coal heating device measures were estimated at 30% and 25% respectively based on existing/on-going public education/outreach efforts. As shown in Table 7.9-3, compliance with STF-17 was estimated to begin ramping up prior to the first full year of implementation based on these education/outreach efforts. (Due to the small number of coal devices found in the 2023 Home Heating survey, compliance for BACM-48 was not assumed to begin until the initial 2024 implementation year.) For 2025 and later years, DEC has conservatively held compliance/penetration rates for these measures constant as shown in Table 7.9-3. The rationale here is that a key forcing mechanism for solid fuel device removal will be increased compliance with and stringency of the Curtailment Program. As DEC continues to gather information on solid fuel device in the nonattainment area through NOASH applications, the Wood Stove Change Out Program and on-going Curtailment Program compliance field study measurements, the future compliance/penetration rates for these measures will be further examined.
- *Wood Device Emission Rates (BACM-R8)* – The compliance/penetration rates estimated for this measure reflect the volume of home sales (projected from historical data) coupled with DEC’s adoption of 18 AAC 50.077(h), which requires registration of wood-fired heating devices upon sale or conveyance of a property. Compliance/penetration is conservatively held constant after 2023 due to uncertainty around Alaska’s current list of approved solid-fuel appliances for sale within the nonattainment area.
- *Prohibit Wood Devices as Primary Heat Source (STF-22)* – Similar to the measure above, the compliance/penetration rates of 80%/100% for new sales and reconveyance

transactions are based on enforcement through the registration requirements under 18 AAC 50.077(h). However, since the Serious SIP DEC has re-examined the enforcement mechanisms supporting this measure. In short, mechanisms anticipated in conjunction with the real estate industry have not been achieved at the levels expected under the Serious SIP. As a result, compliance/penetration of this measure has been delayed until 2024 as shown in Table 7.9-3, and with rates of 20% for new sales compliance and 40% for resales. As estimated under the Serious SIP, the new sales compliance rate is discounted from 40% to 20% to account for the estimated portion of large lot (greater than 2 acre) cabins which are exempted from this requirement.

- *NOASH/Exemption Requirements (STF-23)* – The rates given in Table 7.9-3 for this measure reflect projected penetration rate increases associated with annual renewal and device registration requirements, proper installation and maintenance determinations from third-party verifiers, and requirements for catalyst replacement when manufacturer-recommended catalyst useful life is reached (estimated at six years averaged across manufacturers). These elements are also coupled with projected impacts from the NOASH reduction program funded under currently secured TAGs.

Beyond these 2020-2027 phase-in percentages focal to the expeditious attainment analysis, Section III.D.7.10 provides further projections of measure penetration at three-year Reasonable Further Progress (RFP) intervals through 2029.

Table 7.9-3 also identifies the nature of the calculated emission benefits in the “Benefit Type” column. Accumulative benefits represent those that grow over time beyond the initial implementation year. For example, emission benefits from Measure BACM-R8 requiring new or re-conveyed devices to meet more stringent (2.0 g/hr, 0.10 lb/mmBTU) certification standards will accumulate over time as cleaner devices are installed in new construction or re-conveyed rental units. One-Time benefits indicate reductions that are applied as a single reduction that remains constant going forward, subject only to increased measure penetration/compliance. The Episodic Curtailment Program is classified as Recurrent to reflect on-going operational requirements to execute the program each winter.

Based on these measure phase-in forecasts a detailed spreadsheet was developed to calculate PM_{2.5} and SO₂ emission reductions within the space heating sector for each measure in each inventory year. The source activity data, device/fuel splits, emission factors, and methods used to calculate control measure emission benefits to support the control inventories developed for the expeditious attainment analysis are discussed in detail in Section III.7.6.11.1. As explained there, the control measure emission benefits calculations also accounted for the effects of overlap between measures that impact the same source category, properly eliminating double counting. That spreadsheet is also included in the electronic appendix to this section (Section III.7.9).

The emission reductions from these controls and their impacts on the overall emissions inventory are presented later in Section III.D.7.9.4.

7.9.1.2 Modeling Analysis to Support Expeditious Attainment

As noted earlier, control inventories for each year from 2020 through 2029 were prepared to support the analysis of expeditious attainment. Full modeling runs were completed for 2029, 2027 and 2026 in that order. From the 2029 modeling results, 2027 was selected as the next year to evaluate expeditious attainment. As explained in Section III.D.7.8.16, the attainment modeling utilized the updated 2020 Base year inventory.

First, the 2027 episodic modeling inventory (based on control measure phase-in/penetration in calendar year 2024 presented earlier in Table 7.9-3) was input to the CMAQ air quality model as described in Section III.D.7.8.14. Modeled concentration outputs for this 2027 Control inventory run were post-processed for each grid cell corresponding to ambient monitors for which design values could be computed and processed through DEC's Speciated Modeled Attainment Test (SMAT) tool (which is described in detail in Section III.D.7.8.9). The resultant 2024 modeled design value at the controlling Hurst Road monitor was found to be $31.9 \mu\text{g}/\text{m}^3$, comfortably below the $35 \mu\text{g}/\text{m}^3$ NAAQS for 24-hour $\text{PM}_{2.5}$ and thus demonstrating modeled attainment by 2027.

To evaluate whether attainment could be advanced any sooner than 2027, DEC compiled another emissions inventory based on the Table 7.9-3 for 2026.

The 2026 CMAQ gridded outputs were then post-processed for the key monitor-based grid cells through the SMAT tool to develop modeled design values that reflected penetration of the State's control strategy package in 2026.

The resulting 2026 modeled design value at the Hurst Road monitor was found to be $38.1 \mu\text{g}/\text{m}^3$, which exceeds the $35 \mu\text{g}/\text{m}^3$ NAAQS.

In addition, DEC also examined the question of whether attainment could be achieved sooner than 2027 if emission controls for pollutants/source sectors that were not required based on precursor pollutant significance modeling discussed in Section III.D.7.8 were instead applied. This consists primarily of SO_2 controls within the stationary point source sector (since SO_2 controls are already being applied in the stationary area source space heating sector). As explained in the SO_2 Precursor Demonstration (Section III.D.7.8.18), full control of stationary point source SO_2 emissions (i.e., full elimination of all point source SO_2) would result in a modeled reduction in secondary sulfate $\text{PM}_{2.5}$ of at most $0.6 \mu\text{g}/\text{m}^3$, which would still not be sufficient to advance attainment earlier than 2027 ($38.1 \mu\text{g}/\text{m}^3 - 0.6 \mu\text{g}/\text{m}^3 = 37.5 \mu\text{g}/\text{m}^3$).

7.9.2 Emission Reductions

Emission reductions from on-going or adopted local and state control measures under DEC's control strategy package are presented in this sub-section. As noted earlier, DEC has adopted several additional controls beyond those for which sufficient data were available and for which benefits were formally quantified to support attainment analysis.

For historical reference, attainment year control measure emission reductions developed under the Serious Area SIP are provided in Section III.D.7.9.2.1 below. Section III.D.7.9.2.2 presents emission reductions developed in support of the 2020 Amendments plan. Finally, Section III.D.7.9.2.3 provides emission reductions developed under this current 2024 Amendments Plan.

It is noted that the emission reductions in each of these sections are reported as initially estimated. As additional data have been collected through the SIP development process (e.g., the 2023 Home Heating Survey) the assumptions underlying these estimates are not the same, but the methodologies used to estimate the reductions were generally consistent across each version.

7.9.2.1 Emission Reductions – Serious Plan

Under the Serious Plan, the most expeditious modeled attainment date was 2029. This was largely because the modeling base year design value or “starting point” upon which the control measure reductions are applied was much higher than that under the 2020 Amendments.

Table 7.9-5 presents the projected calendar year 2029 PM_{2.5} and SO₂ emission benefits associated with each of the measures/programs as modeled under the Serious SIP. (This was listed as Table 7.9-8 in the earlier Serious Area plan.)

No reductions were calculated for the other precursor pollutants. The benefits shown for each individual measure are discounted to account for the overlap of measures controlling the same sources within the combined control package.

Combined measure benefits shown at the bottom of Table 7.9-5 also properly account for measure overlap within the combined control package (eliminating double-counting).

A detailed spreadsheet containing all the data, assumptions, and calculations of these 2029 emission benefits by individual measure, and accounting for overlap, was included in the electronic appendix to this section in the Serious SIP.

**Table 7.9-5
Projected 2029 Emission Reductions for Post-2019 Control Measures under
Serious SIP Attainment Analysis**

Measure ID	Measure Summary	Emission Reductions ^a (tons/episodic day)	
		PM _{2.5}	SO ₂
WSCO	Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding	0.29	<0.01
Curtailment	Solid Fuel Burning Application Episodic Curtailment Program, reflects enhanced compliance by future attainment date	S1 ^b : 0.14 S2 ^b : 0.22	S1 ^b : -0.09 S2 ^b : -0.13
STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	<0.01	1.77

STF-13, Modified BACM 31, 32	Required commercially sold wood to be dry before sale	0.10	0.01
STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified device and cordwood outdoor hydronic heaters	0.82	0.01
BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU certified emission rates for new of re-conveyed wood devices	0.62	0.02
BACM 48, 49	Removal of coal heaters	0.04	0.07
STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	0.39	-0.04
STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	<0.01	<0.01
n/a	IGU-projected natural gas expansion through 2029	0.24	0.59
Combined Total, Area Space Heating (accounting for measure overlap)		S1^b: 2.65 S2^b: 2.73	S1^b: 2.33 S2^b: 2.29
n/a	Point Source fuel-based sulfur controls by 2029	n/a	4.46
Combined Total, Point Sources		n/a	4.46

^a Emission reductions shown for each measure account for effects of overlap within the combined control package.

^b S1 and S2 refer to benefits under Curtailment program Stage 1 (20 µg/m³) and Stage 2 (30 µg/m³) alert conditions.
n/a – Not Applicable.

7.9.2.2 Emission Reductions – 2020 Amendments Plan

Emissions Reductions to Support Attainment Analysis – Under the 2020 Amendments, emission inventories for calendar years 2023 and 2024 were used to support the attainment modeling contained in that revised plan. Table 7.9-6 presents the PM_{2.5} and SO₂ emission reductions for each measure in the State’s control strategy package for which benefits were quantified. Individual measure reductions and combined reductions are shown in a manner similar to those presented earlier in Table 7.9-5. Again, reductions were quantified only for PM_{2.5} and SO₂ and overlapping effects of individual measures were accounted for to avoid double-counting of emission benefits.

**Table 7.9-6
Projected 2023 and 2024 Emission Reductions for Post-2019 Control Measures under
2020 Amendments Expeditious Attainment Analysis**

Measure ID	Measure Summary	Emission Reductions ^a (tons/episodic day)			
		2023		2024	
		PM _{2.5}	SO ₂	PM _{2.5}	SO ₂
WSCO	Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding	0.66	0.01	0.68	0.01
Curtailment	Solid Fuel Burning Application Episodic Curtailment Program, reflects enhanced compliance by future attainment date	S1 ^b : 0.31 S2 ^b : 0.51	S1 ^b : -0.09 S2 ^b : -0.13	S1 ^b : 0.26 S2 ^b : 0.42	S1 ^b : -0.10 S2 ^b : -0.13
STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	0.01	1.93	0.01	1.95
STF-13, Modified BACM 31, 32	Required commercially sold wood to be dry before sale	0.10	<0.01	0.10	<0.01

STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified device and cordwood outdoor hydronic heaters	0.00	0.00	0.16	<0.01
BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU certified emission rates for new of re-conveyed wood devices	0.33	0.01	0.39	0.01
BACM 48, 49	Removal of coal heaters	0.00	0.00	0.02	0.02
STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	0.34	-0.01	0.35	-0.01
STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	<0.01	<0.01	<0.01	<0.01
n/a	IGU-projected natural gas expansion through 2029	0.00	0.00	0.00	0.00
Combined Total, Area Space Heating (accounting for measure overlap)		S1^b: 1.76 S2^b: 1.96	S1^b: 1.85 S2^b: 1.81	S1^b: 1.95 S2^b: 2.11	S1^b: 1.88 S2^b: 1.84
n/a	Point Source fuel-based sulfur controls by 2029	n/a	1.39	n/a	3.34
Combined Total, Point Sources		n/a	1.39	n/a	3.34

^a Emission reductions shown for each measure account for effects of overlap within the combined control package.

^b S1 and S2 refer to benefits under Curtailment program Stage 1 (20 µg/m³) and Stage 2 (30 µg/m³) alert conditions.
n/a – Not Applicable.

The reductions shown in Table 7.9-6 for the 2020 Amendment are consistent with, but do not match those presented earlier in Table 7.9-5 for the Serious Plan for two reasons. First, the attainment analysis years are different: 2029 for the Serious Plan vs. 2023 and 2024 for the 2020 Amendment. Second, the baseline or “starting point” 2019 inventory was also revised under the 2020 Amendment as explained earlier in Section III.D.7.6.6.

The reductions in Table 7.9-6 for 2023 and 2024 reflect DEC’s projected most expeditious schedule for implementing and phasing in measure penetration and compliance and, integrated into the 2023 and 2024 attainment modeling inventories, provide the basis for evaluation of expeditious attainment, which is presented in the following sub-section.

Emission Reductions to Support 5% Annual Reduction Requirements – For Serious areas that fail to attain by the statutorily required attainment date (2019 for Fairbanks), EPA’s PM_{2.5} Implementation Rule⁵ (PM Rule) includes the additional requirement that the control strategy demonstrate that each year the area will achieve at least a 5 percent reduction in emissions of direct PM_{2.5} or a 5 percent reduction in emissions of a PM_{2.5} plan precursor based on the most recent emissions inventory for the area; and that the area will attain the standard as expeditiously as practicable. The requirements are contained in 40 C.F.R. §§ 51.1003(c) and 51.1010(c).

These reductions apply to directly emitted PM_{2.5} and precursors of significance (SO₂ in Fairbanks) and are applied in an “either or” manner for applicable pollutants in each given year.

⁵ 81 Fed. Reg. 58010 (Aug. 24, 2016).

The 5% emission reduction targets for each pollutant are calculated from total base year emissions within the nonattainment area (covering all inventories sources).

Table 7.9-7 demonstrates that the control strategy reductions under this 2020 Amendment fulfill these 5% annual reduction requirements. The upper half of Table 7.9-7 shows nonattainment area emissions and reduction requirement calculations for directly emitted PM_{2.5}; similar emissions and reductions for SO₂ (the applicable precursor pollutant in Fairbanks) are presented in the lower half of Table 7.9-7.

Within each half of Table 7.9-7, nonattainment area emissions by source sector and totaled (tons/episode day) are presented for the 2019 Baseline and 2020-2024 Control inventories. Reductions from each prior year (in tons/episode day) are then presented below the inventory totals. As implied, the “Relative Reduction to 2019 (%)” row lists percentage reductions in total emissions relative to the 2019 Baseline inventory.

Below these are the rows that contain the calculations that demonstrate whether emission reductions for each pollutant are sufficient to achieve minimum 5% reductions for each subsequent year beyond the baseline year (2019) until the year attainment is demonstrated (2024). The “5% Annual Reduction Target” row is the minimum required emission reduction in each year. For example, the annual reductions required for PM_{2.5} of 0.159 tons/episode day were calculated by taking 5% of total 2019 base year emissions (3.173 × 5% = 0.159). Below this, the “Reductions Required ...” row show the emission reductions needed in each year until the demonstrated attainment year based on this 5% per year from Baseline reduction requirement. The next row, “Reductions Achieved ...” lists the calculated emissions reductions in each year based on the State’s adopted control strategy and implementation schedule. Finally, the last row in each half of Table 7.9-7 indicates whether the reductions achieved equal or exceed the reductions required in each year from 2020 (the first year after the base year) to 2024 (the demonstrated attainment year).

As shown in Table 7.9-7, minimum 5% per year reductions are achieved in each year from 2020-2024 for either direct PM_{2.5} or applicable precursor SO₂, fulfilling the requirements of Section VII.D.3 of the PM Rule.

**Table 7.9-7
Nonattainment Area Emissions (2019-2024) and
Achievement of 5% Annual Reduction Requirements**

Source Sector	PM _{2.5} Emissions (tons/episode day)					
	2019	2020	2021	2022	2023	2024
Point	0.568	0.583	0.600	0.607	0.611	0.615
Area, Space Heating	1.909	1.556	1.377	1.086	0.889	0.740
Area, Other	0.224	0.227	0.230	0.233	0.237	0.240
Mobile, On-Road	0.216	0.203	0.191	0.181	0.173	0.163
Mobile, Non-Road	0.256	0.247	0.244	0.241	0.238	0.236
TOTALS	3.173	2.815	2.641	2.348	2.147	1.993
Reduction from Prior Year:	n/a	0.358	0.175	0.293	0.200	0.154
Relative Reduction to 2019 (%):	n/a	11.3%	16.8%	26.0%	32.3%	37.2%
5% Annual Reduction Target, PM_{2.5}:	0.159					

Reductions Required, PM _{2.5} :	n/a	0.159	0.317	0.476	0.635	0.793
Reductions Achieved, PM _{2.5} :	n/a	0.358	0.533	0.826	1.026	1.180
PM_{2.5} Target Met?	n/a	Yes	Yes	Yes	Yes	Yes
	SO₂ Emissions (tons/episode day)					
Source Sector	2019	2020	2021	2022	2023	2024
Point	5.684	5.827	4.765	4.825	4.728	2.814
Area, Space Heating	3.881	3.977	4.109	4.172	2.278	2.269
Area, Other	0.028	0.028	0.029	0.029	0.030	0.030
Mobile, On-Road	0.007	0.007	0.007	0.007	0.007	0.007
Mobile, Non-Road	5.409	5.443	5.478	5.514	5.550	5.586
TOTALS	15.009	15.283	14.389	14.546	12.592	10.706
Reduction from Prior Year:	n/a	-0.273	0.894	-0.158	1.954	1.886
Relative Reduction to 2019 (%):	n/a	-1.8%	4.1%	3.1%	16.1%	28.7%
5% Annual Reduction Target, SO ₂ :	0.750					
Reductions Required, SO ₂ :	n/a	0.750	1.501	2.251	3.002	3.752
Reductions Achieved, SO ₂ :	n/a	-0.273	0.621	0.463	2.417	4.303
SO₂ Target Met?	n/a	No	No	No	No	Yes

n/a – Not Applicable

7.9.2.3 Emission Reductions – 2024 Amendments Plan

Emissions Reductions to Support Attainment Analysis – Under the 2024 Amendments, emission inventories for calendar years 2026 and 2027 were used to support the attainment modeling contained in this revised plan. Table 7.9-8 presents the PM_{2.5} and SO₂ emission reductions for each measure in the State’s control strategy package for which benefits were quantified. Individual measure reductions and combined reductions are shown in a manner similar to those presented earlier in Table 7.9-5 and Table 7.9-6. Again, reductions were quantified only for PM_{2.5} and SO₂ and overlapping effects of individual measures were accounted for to avoid double-counting of emission benefits.

**Table 7.9-8
Projected 2026 and 2027 Emission Reductions for Post-2020 Control Measures under
2024 Amendments Expeditious Attainment Analysis**

Measure ID	Measure Summary	Emission Reductions ^a (tons/episodic day)			
		2026		2027	
		PM _{2.5}	SO ₂	PM _{2.5}	SO ₂
WSCO	<i>Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding</i>	0.91	0.09	1.09	0.11
Curtailement	Solid Fuel Burning Application Episodic Curtailement Program, reflects enhanced compliance by future attainment date	S1 ^b : 0.02 S2 ^b : 0.12	S1 ^b : -0.00 S2 ^b : -0.02	S1 ^b : 0.02 S2 ^b : 0.12	S1 ^b : -0.00 S2 ^b : -0.02
STF-12, BACM 51	Shift residential and commercial space heating from #2 to #1 oil	0.02	1.73	0.02	1.73
STF-13, Modified BACM 31, 32	Required commercially sold wood to be dry before sale	0.06	<0.01	0.06	<0.01
STF-17b, 18 BACM 16, 17, R6, R10	Removal of all uncertified device and cordwood outdoor hydronic heaters	0.26	-0.01	0.25	-0.01
BACM R8, R9, R16, R17 Modified, R5 Modified	Requires 2.0 g/hr (stoves/inserts) and 0.10 lb/mmBTU certified emission rates for new of re-conveyed wood devices	0.08	<0.01	0.09	<0.01
BACM 48, 49	Removal of coal heaters	<0.01	<0.01	<0.01	<0.01
STF-22, 31 BACM 3, 24	Wood-fired devices may not be primary or only heating source	0.03	<-0.01	0.03	<-0.01
STF-23, 24, 26, 27 BACM 25, 27	NOASH/Exemption requirements	<0.01	<0.01	<0.01	<0.01
Combined Total, Area Space Heating (accounting for measure overlap)		S1^b: 1.05 S2^b: 1.18	S1^b: 1.78 S2^b: 1.77	S1^b: 1.24 S2^b: 1.37	S1^b: 1.81 S2^b: 1.80

^a Emission reductions shown for each measure account for effects of overlap within the combined control package.

^b S1 and S2 refer to benefits under Curtailement program Stage 1 (20 µg/m³) and Stage 2 (30 µg/m³) alert conditions.
n/a – Not Applicable.

As explained in Section III.D.7.9.9.2, the reductions shown in Table 7.9-8 for the 2024 Amendment are consistent with, but do not match those presented earlier in Table 7.9-5 for the Serious Plan in Section III.D.7.9.1.1 and in Table 7.9-6 Section III.D.7.9.1.2 for the 2020 Amendments for two reasons. First, the attainment analysis years are different: 2029 for the Serious Plan and 2023 and 2024 for the 2020 Amendment vs. 2026 and 2027 for the 2024 Amendment. Second, the baseline or “starting point” 2020 inventory was also revised under the 2024 Amendment relative to the earlier plan baseline inventories as explained earlier in Section III.D.7.6.9.

In addition, comparison of the emission reductions from each table from the Serious SIP through the 2024 Amendment (Table 7.9-5, Table 7.9-6, and Table 7.9-8) indicate increased reliance on reductions from the Wood Stove Change Out Program (WSCOP) to achieve attainment under the 2024 Amendment. This is based on on-going tracking of penetration and compliance by Alaska of control measures implemented since the Serious SIP. From these efforts, Alaska has

determined that unlike the other control measures that involve behavioral changes to increase compliance, the WSCOP is a financially based incentive program that has historically demonstrated participation and use of the program to tangibly reduce emissions through device change outs. Moreover, based on secured funding through and beyond the 2027 expeditious attainment date, the WSCOP reductions are tracked on a quarterly basis and the Borough regularly reviews and optimizes the structure and device-specific incentives to optimize these reductions.

The reductions in Table 7.9-8 for 2026 and 2027 reflect DEC's projected most expeditious schedule for implementing and phasing in measure penetration and compliance and, integrated into the 2026 and 2027 attainment modeling inventories, provide the basis for evaluation of expeditious attainment, which is presented in the following sub-section.

Emission Reductions to Support 5% Annual Reduction Requirements – For Serious areas that fail to attain by the statutorily required attainment date (2019 for Fairbanks), EPA's PM_{2.5} Implementation Rule⁶ (PM Rule) includes the additional requirement that the control strategy demonstrate that each year the area will achieve at least a 5 percent reduction in emissions of direct PM_{2.5} or a 5 percent reduction in emissions of a PM_{2.5} plan precursor based on the most recent emissions inventory for the area; and that the area will attain the standard as expeditiously as practicable. The requirements are contained in 40 C.F.R. §§ 51.1003(c) and 51.1010(c).

These reductions apply to directly emitted PM_{2.5} and precursors of significance (SO₂ in Fairbanks) and are applied in an "either or" manner for applicable pollutants in each given year. The 5% emission reduction targets for each pollutant are calculated from total base year emissions within the nonattainment area (covering all inventories sources).

Table 7.9-9 demonstrates that the control strategy reductions under this 2024 Amendment fulfill these 5% annual reduction requirements. The upper half of Table 7.9-9 shows nonattainment area emissions and reduction requirement calculations for directly emitted PM_{2.5}; similar emissions and reductions for SO₂ (the applicable precursor pollutant in Fairbanks) are presented in the lower half of Table 7.9-9.

Within each half of Table 7.9-9, nonattainment area emissions by source sector and totaled (tons/episode day) are presented for the 2020 Baseline and 2021-2027 Control inventories. Reductions from each prior year (in tons/episode day) are then presented below the inventory totals. As implied, the "Relative Reduction to 2020 (%)" row lists percentage reductions in total emissions relative to the 2020 Baseline inventory.

Below these are the rows that contain the calculations that demonstrate whether emission reductions for each pollutant are sufficient to achieve minimum 5% reductions for each subsequent year beyond the baseline year (2020) until the year attainment is demonstrated (2027). The "5% Annual Reduction Target" row is the minimum required emission reduction in each year. For example, the annual reductions required for PM_{2.5} of 0.147 tons/episode day were calculated by taking 5% of total 2020 base year emissions ($2.950 \times 5\% = 0.147$). Below this, the

⁶ 81 Fed Reg. 58010 (Aug. 24, 2016).

“Reductions Required ...” row shows the emission reductions needed in each year until the demonstrated attainment year based on this 5% per year from Baseline reduction requirement. The next row, “Reductions Achieved ...” lists the calculated emissions reductions in each year based on the State’s adopted control strategy and implementation schedule. Finally, the last row in each half of Table 7.9-9 indicates whether the reductions achieved equal or exceed the reductions required in each year from 2020 (the first year after the base year) to 2027 (the demonstrated attainment year).

As shown in Table 7.9-9, minimum 5% per year reductions are achieved in each year from 2021-2027 for either direct PM_{2.5} or applicable precursor SO₂, fulfilling the requirements of Section VII.D.3 of the PM Rule.

**Table 7.9-9
Nonattainment Area Emissions (2020-2027) and
Achievement of 5% Annual Reduction Requirements**

Source Sector	PM _{2.5} Emissions (tons/episode day)							
	2020	2021	2022	2023	2024	2025	2026	2027
Point	0.579	0.596	0.603	0.607	0.612	0.616	0.620	0.624
Area, Space Heating	1.974	1.743	1.578	1.480	1.333	1.144	0.939	0.739
Area, Other	0.114	0.116	0.118	0.119	0.121	0.123	0.124	0.126
Mobile, On-Road	0.074	0.066	0.066	0.062	0.059	0.056	0.054	0.052
Mobile, Aircraft	0.119	0.119	0.120	0.121	0.121	0.123	0.124	0.125
Mobile, Non-Road (less aircraft)	0.090	0.088	0.086	0.083	0.081	0.077	0.077	0.077
TOTALS	2.950	2.728	2.570	2.473	2.326	2.139	1.938	1.742
Reduction from Prior Year:	n/a	0.221	0.158	0.097	0.147	0.188	0.201	0.196
Relative Reduction to 2020 (%):	n/a	7.5%	12.9%	16.2%	21.1%	27.5%	34.3%	40.9%
5%/Yr Reduction Target, PM _{2.5} :	0.147							
Reductions Required, PM _{2.5} :	n/a	0.147	0.295	0.442	0.590	0.737	0.885	1.032
Reductions Achieved, PM _{2.5} :	n/a	0.220	0.377	0.474	0.618	0.806	1.007	1.203
PM_{2.5} Target Met?	n/a	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Source Sector	SO ₂ Emissions (tons/episode day)							
	2020	2021	2022	2023	2024	2025	2026	2027
Point	6.627	6.820	6.905	6.952	7.000	7.050	7.098	7.145
Area, Space Heating	3.606	3.714	3.729	2.375	1.967	1.970	1.976	1.980
Area, Other	0.028	0.029	0.029	0.030	0.030	0.031	0.031	0.031
Mobile, On-Road	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Mobile, Aircraft	5.441	5.476	5.511	5.547	5.547	5.620	5.658	5.695
Mobile, Non-Road (less aircraft)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
TOTALS	15.707	16.044	16.181	14.909	14.550	14.676	14.766	14.857
Reduction from Prior Year:	n/a	-0.337	-0.136	1.272	0.359	-0.127	-0.090	-0.090
Relative Reduction to 2020 (%):	n/a	-2.1%	-3.0%	5.1%	7.4%	6.6%	6.0%	5.4%
5%/Yr Redectonn Target, SO ₂ :	0.785							
Reductions Required, SO ₂ :	n/a	0.785	1.571	2.356	3.141	3.927	4.712	5.497
Reductions Achieved, SO ₂ :	n/a	-0.337	-0.474	0.798	1.158	1.031	0.941	0.850
SO ₂ Target Met?	n/a	No	No	No	No	No	No	No
Overall Target Met?	n/a	Yes	Yes	Yes	Yes	Yes	Yes	Yes

n/a – Not Applicable

7.9.3 Expeditious Attainment Evaluation and Demonstration

As described earlier in Section III.D.7.9.1, episodic modeling inventories were developed for calendar years 2027 and then 2026 and input to the CMAQ gridded air quality model to: (1) demonstrate modeled attainment in 2027, and (2) evaluate whether modeled attainment could be advanced any earlier based on the State's control strategy and most expeditious measure implementation schedule.

Table 7.9-10 summarizes modeling (entire modeling domain) and planning (nonattainment area) emissions (in tons/day, averaged over the historical attainment modeling episodes for the 2027 Control inventory. It incorporates the control measure specific PM_{2.5} and SO₂ emission reductions for appropriate source sectors shown earlier in Table 7.9-8. Within the inventory and modeling workflows, these emission reductions are applied at the detailed Source Classification Code (SCC) level.

Table 7.9-10
2027 Control Episode Average Daily Emissions (tons/day) by Source Sector

Source Sector	<i>Modeling Inventory Grid 3 Domain Emissions (tons/day)</i>					<i>Planning Inventory NA Area Emissions (tons/day)</i>				
	PM _{2.5}	NO _x	SO ₂	VOC	NH ₃	PM _{2.5}	NO _x	SO ₂	VOC	NH ₃
Point Sources	0.62	14.60	7.15	0.04	0.095	0.62	14.60	7.15	0.04	0.095
Area, Space Heating	0.99	2.50	2.28	8.56	0.133	0.74	2.34	1.98	8.01	0.124
Area, Space Heat, Wood	0.94	0.34	0.06	8.43	0.090	0.70	0.28	0.04	7.90	0.081
Area, Space Heat, Oil	0.03	1.95	2.20	0.11	0.004	0.02	1.83	1.91	0.10	0.004
Area, Space Heat, Coal	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.000
Area, Space Heat, Other	0.02	0.22	0.02	0.01	0.039	0.02	0.22	0.02	0.01	0.039
Area, Other	0.20	1.36	0.74	2.53	0.056	0.13	0.40	0.03	2.33	0.051
Mobile, On-Road	0.07	0.95	0.00	1.39	0.060	0.05	0.65	0.00	1.08	0.038
Mobile, Aircraft	0.21	0.70	8.99	0.33	0.000	0.12	0.45	5.70	0.17	0.000
Mobile, Non-Road less aircraft	0.10	0.88	0.00	2.75	0.002	0.08	0.32	0.00	2.22	0.002
TOTALS	2.20	20.99	19.16	15.59	0.346	1.74	18.75	14.86	13.85	0.310

For context, Table 7.9-11 provides a comparison of sector-specific and total emission changes between these 2027 Control and 2020 Baseline inventories that was presented earlier in Section III.D.7.6.9.8 and Section III.D.7.6.10.2, respectively. As seen in Table 7.9-11, PM_{2.5} and SO₂ emissions from space heating in the nonattainment area are reduced by 63% and 45%, respectively in 2027 relative to 2020. Overall, across all source sectors 2027 PM_{2.5} emission reductions within the nonattainment area are 41%, while SO₂ reductions are 5% relative to the 2020 Baseline.

Table 7.9-11
Relative Change (%) in Episode Average Daily Emissions (tons/day) by Source Sector,
2027 Control vs. 2020 Baseline Inventory

Source Sector	Modeling Inventory Change in Grid 3 Domain Emissions (%)					Planning Inventory Change in NA Area Emissions (%)				
	PM _{2.5}	NO _x	SO ₂	VOC	NH ₃	PM _{2.5}	NO _x	SO ₂	VOC	NH ₃
Point Sources	+8%	+8%	+8%	+8%	+8%	+8%	+8%	+8%	+8%	+8%
Area, Space Heating	-54%	+8%	-42%	+20%	+14%	-63%	+8%	-45%	+20%	+13%
Area, Space Heat, Wood	-54%	+23%	+13%	+20%	+22%	-63%	+23%	+13%	+21%	+22%
Area, Space Heat, Oil	-60%	+6%	-43%	+6%	+6%	-65%	+7%	-46%	+6%	+3%
Area, Space Heat, Coal	-60%	+0%	-36%	+4%	+0%	-61%	+0%	-40%	+9%	+0%
Area, Space Heat, Other	-1%	-0%	-1%	+0%	+0%	-2%	+0%	+1%	+0%	+0%
Area, Other	+10%	+10%	+10%	+10%	+10%	+10%	+10%	+10%	+10%	+10%
Mobile, On-Road	-31%	-47%	-9%	-25%	-5%	-30%	-45%	-9%	-24%	-4%
Mobile, Aircraft	+10%	+8%	+9%	+8%	+0%	+5%	+3%	+5%	+7%	+0%
Mobile, Non-Road less aircraft	-14%	+5%	+0%	-17%	+1%	-14%	+12%	+0%	-16%	+3%
TOTALS	-34%	+3%	-2%	+4%	+8%	-41%	+4%	-5%	+6%	+9%

Table 7.9-12 and Table 7.9-13 present similar emission summaries for the 2026 Control inventory and its emission changes relative to the 2020 Baseline inventory, respectively. Comparing these tables to Table 7.9-10 and Table 7.9-11 shows that forecasted nonattainment area PM_{2.5} emission reductions in 2026 (across all source sectors) are 34% and track toward, but are below, those projected in 2027 as the measures in the State’s control strategy have another year to phase in. (SO₂ reductions in 2026 and 2027 are similar relative to 2020.)

Table 7.9-12
2026 Control Episode Average Daily Emissions (tons/day) by Source Sector

Source Sector	Modeling Inventory Grid 3 Domain Emissions (tons/day)					Planning Inventory NA Area Emissions (tons/day)				
	PM _{2.5}	NO _x	SO ₂	VOC	NH ₃	PM _{2.5}	NO _x	SO ₂	VOC	NH ₃
Point Sources	0.62	14.50	7.10	0.04	0.095	0.62	14.50	7.10	0.04	0.095
Area, Space Heating	1.19	2.49	2.27	8.60	0.133	0.94	2.32	1.98	8.05	0.124
Area, Space Heat, Wood	1.15	0.34	0.06	8.48	0.090	0.90	0.29	0.05	7.94	0.082
Area, Space Heat, Oil	0.03	1.93	2.19	0.11	0.004	0.03	1.82	1.91	0.10	0.004
Area, Space Heat, Coal	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.000
Area, Space Heat, Other	0.02	0.22	0.02	0.01	0.039	0.02	0.22	0.02	0.01	0.039
Area, Other	0.20	1.34	0.73	2.50	0.055	0.12	0.39	0.03	2.30	0.051
Mobile, On-Road	0.07	1.00	0.00	1.44	0.060	0.05	0.69	0.00	1.12	0.038
Mobile, Aircraft	0.21	0.70	8.95	0.33	0.000	0.12	0.45	5.66	0.16	0.000
Mobile, Non-Road less aircraft	0.10	0.88	0.00	2.76	0.002	0.08	0.32	0.00	2.22	0.002
TOTALS	2.40	20.92	19.05	15.66	0.345	1.94	18.66	14.77	13.91	0.309

Table 7.9-13
Relative Change (%) in Episode Average Daily Emissions (tons/day) by Source Sector,
2026 Control vs. 2020 Baseline Inventory

Source Sector	Modeling Inventory Change in Grid 3 Domain Emissions (%)					Planning Inventory Change in NA Area Emissions (%)				
	PM _{2.5}	NO _x	SO ₂	VOC	NH ₃	PM _{2.5}	NO _x	SO ₂	VOC	NH ₃
Point Sources	+7%	+7%	+7%	+7%	+7%	+7%	+7%	+7%	+7%	+7%
Area, Space Heating	-45%	+7%	-43%	+20%	+14%	-52%	+7%	-45%	+21%	+14%
Area, Space Heat, Wood	-45%	+24%	+15%	+21%	+22%	-53%	+24%	+15%	+21%	+22%
Area, Space Heat, Oil	-55%	+6%	-44%	+5%	+3%	-60%	+6%	-46%	+5%	+3%
Area, Space Heat, Coal	-55%	+0%	-36%	+4%	+0%	-56%	+0%	-40%	+9%	+0%
Area, Space Heat, Other	-1%	-0%	-1%	+0%	+0%	-2%	+0%	+1%	+0%	+0%
Area, Other	+9%	+9%	+9%	+9%	+9%	+9%	+9%	+9%	+9%	+9%
Mobile, On-Road	-28%	-43%	-8%	-23%	-4%	-27%	-42%	-7%	-21%	-4%
Mobile, Aircraft	+10%	+7%	+8%	+8%	+0%	+4%	+3%	+4%	+6%	+0%
Mobile, Non-Road less aircraft	-14%	+4%	+0%	-17%	+0%	-14%	+11%	+0%	-16%	+2%

Beyond these emission inventory comparisons, Table 7.9-14 summarizes the resulting attainment modeling conducted for the 2020 Baseline and 2026 and 2027 Control inventories that were used to evaluate and determine the most expeditious modeled attainment date. Modeled design values for each year/scenario are shown for the grid cells corresponding to the currently operating monitors in the nonattainment area: (1) the Hurst Road monitor in North Pole; (2) the NCORE monitor just across the Chena River from downtown Fairbanks; and (3) the A Street monitor located just northeast of downtown Fairbanks.

Table 7.9-14
Modeled Expeditious Attainment Summary

Fairbanks NAA Monitor	Base Year 2020 5 year modeling DV(2017-2021) (ug/m ³)	Future 5 year modeling DV 2027 PM 2.5 (ug/m ³)	Expeditious Attainment not possible 2026 PM 2.5 (ug/m ³)
Hurst Road		31.9	38.1
NCORE	27.7	18.4	19.8
A Street	34.8	22.7	24.5

As shown in Table 7.9-14, modeled design values at all three monitors are below the 35 µg/m³ 24-hour PM_{2.5} NAAQS in 2027. The modeled design value at the controlling Hurst Road

monitor is $31.9 \mu\text{g}/\text{m}^3$, over $3 \mu\text{g}/\text{m}^3$ below the NAAQS (which provides a “buffer” to account for concentrations in unmonitored grid cells across the nonattainment area). Modeled 2027 design values at the other two monitors near downtown Fairbanks are well below the NAAQS as shown in Table 7.9-14. In the rightmost column of Table 7.9-14, modeled design values for 2026 are presented. The modeled 2026 design value for the Hurst Road monitor is $38.1 \mu\text{g}/\text{m}^3$, which exceeds the $35 \mu\text{g}/\text{m}^3$ NAAQS by over $3 \mu\text{g}/\text{m}^3$.

And as explained earlier in Section 7.9.1.2, even if emission controls were applied for precursor pollutants within applicable source sectors for which precursor significance determinations have been made, the reduction in secondary $\text{PM}_{2.5}$ from such controls would not be sufficient to advance attainment sooner than 2027.

Therefore, this air quality modeling-based evaluation demonstrates that 2027 is the most expeditious attainment date forecasted for the Fairbanks $\text{PM}_{2.5}$ nonattainment area based on currently available data and complies with 40 C.F.R. § 51.1004(a)(3) requirements to demonstrate attainment “as expeditiously as practicable.”

As stated in Section 7.9, the outermost attainment date set under CAA Section 172(a)(2)(A) and 40 C.F.R. § 51.1004(a)(3) is October 2, 2025, except that the Administrator may extend the attainment date up to October 2, 2030, considering (a) the severity of nonattainment and (b) the availability and feasibility of pollution control measures. DEC is requesting an extension to the end of the 2027 calendar year based largely on the preceding analysis that demonstrates 2027 is the most expeditious attainment date for the area.

Regarding the severity of nonattainment, refer to Figure 7.9-1 and Table 7.9-1. The area had a 3-year design value of $139 \mu\text{g}/\text{m}^3$ in 2014, which is nearly 4 times the 2006 24-hr standard of $35 \mu\text{g}/\text{m}^3$. Significant progress has been made in the 10 years since 2014, and the 2023 design value is down to $56 \mu\text{g}/\text{m}^3$; less than half of the 2014 design value. However, pollution levels remain at 160% of the health-based standard, which demonstrates a high severity of nonattainment.

Regarding the availability and feasibility of control measures, for context, residential wood smoke emissions are the largest contributing source sector to $\text{PM}_{2.5}$ pollution in the nonattainment area. Attainment cannot be modeled without significant emission reductions from residential wood smoke. After exhaustive reviews and implementing all feasible control measures and technologies required by the moderate, serious, and 189(d) plan revisions, there are not any remaining feasible control measures that would result in meaningful emission reductions from residential wood smoke. While the control measures for residential wood smoke are permanent and enforceable regulations, the emission reductions are dependent on device turnover (aided by the WSCOP) and/or large-scale behavioral changes within the community. Projections of device turnover and behavioral changes are represented by the phase-in schedule for space heating controls presented in Table 7.9-3. Acknowledging that large-scale behavioral changes are difficult to achieve, DEC projected an aggressive but realistic phase-in schedule for the residential wood smoke controls that cannot feasibly be accelerated.

Adopted

November 5, 2024

Therefore, DEC has demonstrated that the severity of nonattainment coupled with the availability and feasibility of pollution control measures warrants an attainment date extension to the end of calendar year 2027 under CAA Section 172(a)(2)(A) and 40 C.F.R. § 51.1004(a)(3).