ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Amendments to:

State Air Quality Control Plan

Vol. II: III.D.7.9

Attainment Demonstration – 2024

Public Notice Draft

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Note: DEC proposes to repeal and replace this State Air Quality Control Plan section addressing the Fairbanks North Star Borough $PM_{2.5}$ Serious nonattainment area. To aid in the public comment process, the currently adopted section of the air quality plan can be found and referenced at the following internet site: http://dec.alaska.gov/air/anpms/communities/fbks-pm2-5-serious-sip/

7.9 Attainment Demonstration – 2024

Section 189 of the Clean Air Act[1] requires states with a Serious nonattainment area to meet the planning requirements contained in the Moderate Area Plan and, in addition, prepare an implementation plan which satisfies the following requirements:

> *(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*,[2] 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.

The regulation at 40 C.F.R. § 51.1003(b)(iv) states:

> *(b) Nonattainment areas reclassified to Serious. (1) For any nonattainment area reclassified to Serious for a $PM_{2.5}$ NAAQS under § 51.1002(b), in addition to meeting the Moderate area attainment plan submission requirements set forth at § 51.1003(a), the state(s) shall submit a Serious area attainment plan that meets all of the following requirements:*
>
> * * *
>
> *(iv) Attainment demonstration and modeling requirements set forth at § 51.1011 . . . .*

The regulation at 40 C.F.R. § 51.1004(a)(2)(ii) states:

> *(ii) 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*

[1] CAA Part D, subpart 4, Section 189(b)(1)(A)
[2] 81 Fed. Reg. 58,010, 58,150.

> *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). 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.*

The regulation at 40 C.F.R. § 51.1005(b)(1)(i) states, with regard to the attainment demonstration supporting a serious area attainment date extension request:

> *(b) Nonattainment areas reclassified as Serious. (1) A state may apply for one attainment date extension not to exceed 5 years for a Serious nonattainment area if the following conditions are met:*
>
> *(i) 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 . . . .*[3]

The regulation at 40 C.F.R. § 51.1005(b)(2)(iii) states with regard to the attainment demonstration supporting a serious area attainment date extension request

> *(2) At the time of application for an attainment date extension, the state shall submit to the EPA a Serious area attainment plan that meets the following requirements:*
>
> * * *
>
> *(iii) Attainment demonstration and modeling requirements set forth at §51.1011 that justify the state's conclusion under paragraph (b)(1)(i) of this section, and that demonstrate attainment as expeditiously as practicable;*

The regulation at 40 C.F.R. § 51.1011(b) states:

> *(b) Nonattainment areas reclassified as Serious. The attainment demonstration due to the EPA as part of a Serious area attainment plan required under § 51.1003(b) or (c) shall 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.*

[3] 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 .

(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.

(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.

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.

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 applicable 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/m^3. 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 Figure 7.9-1 and

Table 7.9-1 the 2019 three-year design value at the Hurst Road monitor was 64 µg/m^3 and significantly exceeds the 35 µg/m^3 NAAQS.

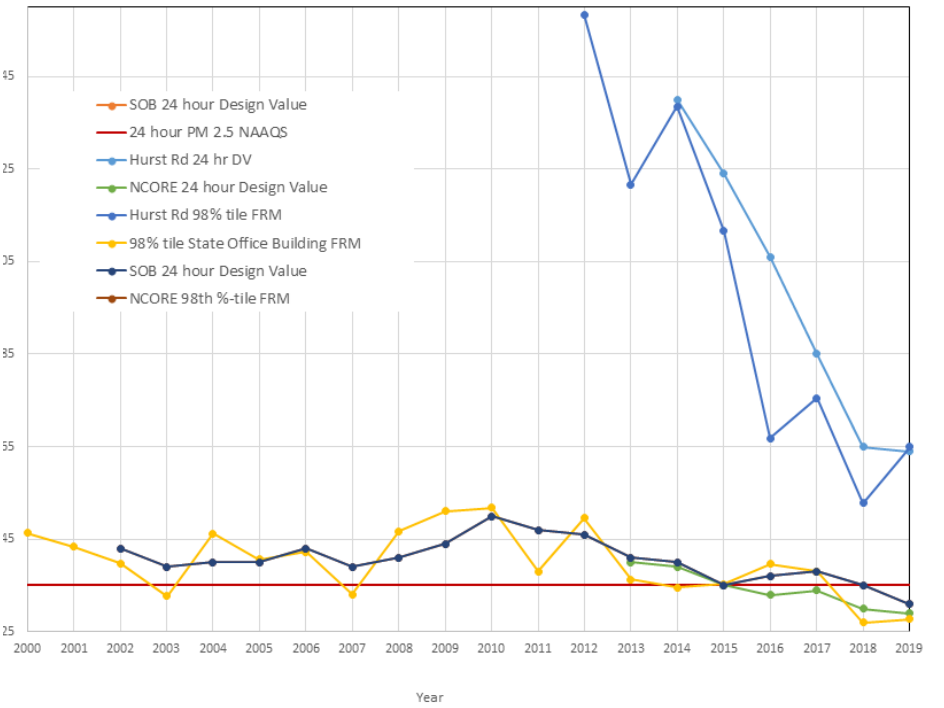

Figure 7.9-1. $PM_{2.5}$ 24-Hour Design Value Trends

Table 7.9-1
$PM_{2.5}$ Monitoring Data Trends 2012-2019

	Measured Concentrations (µg/m^3) by Calendar Year							
Monitoring Site	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
State Office Building 98th Percentile	49.6	36.3	34.5	35.3	39.7	38.0	27.0	27.7
State Office Building Design Value	46	41	40	35	37	38	35	31
NCore 98th Percentile	50.0	36.2	31.6	36.7	30.3	34.4	25.3	27.7
NCore Design Value	45	40	39	35	33	34	30	29
Hurst Road 98th Percentile	158.4	121.6	138.5	111.6	66.8	75.5	52.8	65.0
Hurst Road Design Value	n/a	n/a	139	124	106	85	65	64
A Street 98th Percentile	n/a	n/a	n/a	n/a	n/a	n/a	n/a	34.1
A Street Design Value	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

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 2020 Amendment to the Serious Area SIP (2020 Amendment) contains these plan revisions.

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 µg/m^3. The latest

four-year (2016-2019) design value for the controlling (i.e., highest concentration) Hurst Road monitor

Table 7.9-1 is 64.7 µg/m^3(this 4-year modeling design value is different than the 3-year monitoring design value in Table 7.9-1). This is the base year modeling design value for this 2020 Amendment to the Serious Area SIP (2020 Amendment). Thus, significant improvements in $PM_{2.5}$ 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 2020 Amendment provides DEC's revised attainment demonstration based on this latest 2016-2019 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 annual emission reduction requirement of not less than 5 percent. As explained in the following sub-sections, DEC has determined that 2024 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 – 2024

Methodologies used to perform the emissions inventory and air quality modeling analyses supporting the modeled expeditious attainment demonstration in 2024 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

Building on the 2019 Baseline inventory developed in support of the 2020 Amendment and described in detail in Section III.D.7.6.6, 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 and 5 percent 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 2020 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-2019 Source Activity Growth – Source Activity growth rates used to project 2019 Control inventory emissions in calendar years 2020 through 2029 were generally based on the 2019-2024 and 2024-2035 annualized growth rates by source sector presented in Table 7.6-26 of Section III.D.7.6.7.1 with the following exception for space heating:

Although source activity growth after 2024 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 2024. 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 current (2019) price of heating oil is $2.90/gallon. Based on regional energy price forecasts developed by the Energy Information Administration (EIA) in its 2020 Annual Energy Outlook (AEO) the projected Fairbanks heating oil price in 2024 was $3.06/gallon. This reflects a 5.7% heating oil price increase that translates to an elasticity-based 1.5% increase in wood use between 2019 and 2024. Given the difficulty in reliably forecasting long-term energy prices this effect was capped after 2024. In other words, 2025 and later year space heating emissions reflect this same 1.5% increase in wood use over 2019 levels.

Beyond these activity growth projections, the effects of the federal mobile source and fuel control programs in projecting mobile source emissions to from 2020 through 2029 was accounted for using EPA's MOVES2014b vehicle emissions model.

Control Measure Benefits - Table 7.9-2 lists the state and local control measures for which emission benefits were quantified[4] 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 cross walk to proposed State regulation sections. Point source SO_2 controls determined as BACT by DEC are highlighted in yellow at the bottom of

Table 7.9-2 and were also included in the control inventories developed to analyze expeditious attainment.

[4] The package of measures planned for adoption by Alaska include additional measures beyond those listed in Table 7.9-5 for which data were not fully available to quantify emission benefits.

Table 7.9-2
List of Control Measures for Which Emission Benefits Were Quantified

Source Sector	Measure ID	Measure Summary	Start Year
Area, Space Heat	WSCO	Borough Wood Stove Change Out Program, reflecting future change outs using currently available funding[a]	On-going, thru 2025
	Curtailment	Solid Fuel Burning Appliance (SFBA) Episodic Curtailment 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
Point	n/a	BACT SO_2 controls	2021

[a] Reflects WSCO program funding through 2016, 2017 and 2018 EPA -awarded Targeted Airshed Grants (TAGs).

As explained earlier in Section III.D.7.6.8.1, DEC also evaluated effects of the expansion of natural gas availability being implemented by the Interior Gas Utility (IGU) but chose not to quantify near-term reductions (through 2026) from this expansion due to the degree of uncertainty associated with the forecasted expansion and customer 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 2024. Except where footnoted, this phase-in percentage reflects a combined compliance and penetration rate for each measure.

As shown in Table 7.9-3, the increases in phase-in percentages shown by inventory year generally reflect improvements in compliance and/or accumulative of benefits over time Beyond these 2020-2024 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 2026. And Table 7.6-33 of Section III.D.7.6.8.1 provides a detailed breakout of the point source facility and emission unit specific BACT control factors.

Table 7.9-3
Control Measure Phase-In Forecast for Inventory Years 2020-2024

Source Sector	Measure Summary and ID	Phase-In Percentages (%) by Year					Benefit Type
		2020	2021	2022	2023	2024	

Area, Space Heat	Borough Wood Stove Change Out Program (WSCO)	2,791[a]	3,111[a]	3,428[a]	3,645[a]	3,754[a]	Accumulative as funded
	SFBA Episodic Curtailment Program (Curtailment)[b]	30%	30%	40%	45%	45%	Recurrent
	(Shift space heating from #2 to #1 oil (STF-12)	n/a	n/a	n/a	100%	100%	One-Time
	Requires commercially sold wood to be dry before sale (STF-13)	n/a	n/a	50%	75%	75%	One-Time
	Removal of all uncertified devices & cordwood OHHs (STF-17)	n/a	n/a	n/a	n/a	15%	One-Time
	2.0 g/hr and 0.10 lb/mmBTU certified emission rates for new or re-conveyed wood devices (BACM-R8)	100%	100%	100%	100%	100%	Accumulative
	Removal of coal heaters (BACM-48)	n/a	n/a	n/a	n/a	25%	One-Time
	Wood-fired devices may not be primary or only heating source (STF-22)	80%, 100%[c]	80%, 100%[c]	80%, 100%[c]	80%, 100%[c]	80%, 100%[c]	Partially Accumulative
	NOASH/Exemption requirements (STF-23)	0%	10%	30%	50%	70%	One-Time
Point	BACT SO_2 controls	n/a	20%[d]	20%[d]	22%[d]	53%[d]	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 $\mu g/m^3$ to 20 and 30 $\mu g/m^3$ 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.

[d] Metric for BACT SO_2 control phase-in is the point source sector-wide control reduction in each year from BACT controls required for specific facilities/fuels in that year.

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 SO_2 emission reductions 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.7.6.8.1. 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. Based on a rough scaling analysis, 2024 was selected as the initial year to evaluate attainment under this 2020 Amendment. As explained in Section III.D.7.8.14, attainment modeling was conducted under the 2020 Amendment that utilized the updated 2019 Baseline inventory.

First, the 2024 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 2024 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 30.9 $\mu g/m^3$, comfortably below the 35 $\mu g/m^3$ NAAQS for 24-hour $PM_{2.5}$ and thus demonstrating modeled attainment by 2024.

To evaluate whether attainment could be advanced any sooner than 2024, DEC considered two approaches. The first consisted of using "rollback" or scaling calculations of the 2024 modeled CMAQ results to estimate 2023 design values based on inventory changes between 2024 and 2023, the preceding year. The second approach considered, and the one used by DEC, was more robust and consisted of running the CMAQ air quality model again, this time using the 2023 Control inventory.

The 2023 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 2023. The resulting 2023 modeled design value at the Hurst Road monitor was found to be 37.0 $\mu g/m^3$, which exceeds the 35 $\mu g/m^3$ NAAQS.

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 then presents emission reductions developed in support of the 2020 Amendments plan.

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 7.9-4 presents the projected calendar year 2029 $PM_{2.5}$ and SO_2 emission benefits associated with each of the measures/programs as modeled under the Serious SIP. (This was listed as Table 7.9-7 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 7.9-4 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 7.9-4
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/m^3) and Stage 2 (30 µg/m^3) alert conditions.
n/a – Not Applicable.

7.9.2.2 Emission Reductions – 2020 Amendments Plan

Emissions Reductions to Support Attainment Analysis - As noted earlier in Section III.D.7.9.1.1 and Section III.D.7.9.1.2, emission inventories for calendar years 2023 and 2024 were used to support the revised attainment modeling under the 2020 Amendments. Table 7.9-5 presents the $PM_{2.5}$ and SO_2 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 7.9-4. Again, reductions were quantified only for $PM_{2.5}$ and SO_2 and overlapping effects of individual measures were accounted for to avoid double-counting of emission benefits.

Table 7.9-5
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/m^3) and Stage 2 (30 µg/m^3) alert conditions.
n/a – Not Applicable.

The reductions shown in Table 7.9-5 for the 2020 Amendment are consistent with, but do not match those presented earlier in Table 7.9-4 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 7.9-5 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 Rule[5] (PM Rule) include the additional requirement that the control strategy demonstrates 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 (SO_2 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 7.9-6 demonstrates that the control strategy reductions under this 2020 Amendment fulfill these 5% annual reduction requirements. The upper half of Table 7.9-6 shows nonattainment area emissions and reduction requirement calculations for directly emitted $PM_{2.5}$; similar emissions and reductions for SO_2 (the applicable precursor pollutant in Fairbanks) are presented in the lower half of Table 7.9-6.

Within each half of Table 7.9-6 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 year 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 ($3.173 \times 5\% = 0.159$). 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 7.9-6 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).

[5] Federal Register, Vol. 81, No. 164, August 24, 2016 (81 FR 58010).

As shown in Table 7.9-6, minimum 5% per year reductions are achieved in each year from 2020-2024 for either direct $PM_{2.5}$ or applicable precursor SO_2, fulfilling the requirements of Section VII.D.3 of the PM Rule.

Table 7.9-6
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**
Source Sector	**SO_2 Emissions (tons/episode day)**					
	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**
SO_2 Target Met?	**n/a**	**No**	**No**	**No**	**No**	**Yes**

n/a – Not Appliable

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 2024 and then 2023 and input to the CMAQ gridded air quality model to: 1) demonstrate modeled attainment in 2024, 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 7.9-7 summarizes modeling (entire modeling domain) and planning (nonattainment area) emissions (in tons/day, averaged over the historical attainment modeling episodes for the 2024 Control inventory. It incorporates the control measure specific $PM_{2.5}$ and SO_2 emission

reductions for appropriate source sectors shown earlier in Table 7.9-5. Within the inventory and modeling workflows, these emission reductions are applied at the detailed Source Classification Code (SCC) level.

Table 7.9-7
2024 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)*				
	$PM_{2.5}$	**NOx**	**SO_2**	**VOC**	**NH_3**	**$PM_{2.5}$**	**NOx**	**SO_2**	**VOC**	**NH_3**
Point Sources	0.64	11.21	3.01	0.04	0.079	0.62	11.16	2.81	0.03	0.079
Area, Space Heating	1.09	2.87	2.58	10.52	0.156	0.74	2.43	2.27	8.60	0.132
Area, Space Heat, Wood	1.00	0.49	0.17	10.26	0.106	0.67	0.39	0.16	8.39	0.088
Area, Space Heat, Oil	0.03	2.15	2.32	0.12	0.004	0.03	1.83	2.04	0.10	0.004
Area, Space Heat, Coal	0.04	0.06	0.07	0.13	0.017	0.03	0.05	0.05	0.11	0.014
Area, Space Heat, Other	0.01	0.17	0.02	0.01	0.029	0.01	0.15	0.02	0.01	0.027
Area, Other	0.26	0.41	0.03	2.42	0.053	0.24	0.38	0.03	2.24	0.050
On-Road Mobile	0.20	1.67	0.01	4.45	0.058	0.16	1.25	0.01	3.55	0.043
Non-Road Mobile	0.36	1.79	8.88	4.60	0.003	0.24	1.02	5.59	3.64	0.002
TOTALS	**2.54**	**17.95**	**14.51**	**22.02**	**0.350**	**1.99**	**16.24**	**10.71**	**18.06**	**0.306**

For context, Table 7.9-8 provides a comparison of sector-specific and total emission changes between these 2024 Control inventory and the 2019 Baseline inventories that was presented earlier in Section III.D.7.6.6.8 and Section III.D.7.6.8.2, respectively. As seen in Table 7.9-8, $PM_{2.5}$ from space heating and SO_2 from point source area reduced by roughly 50% in 2024 relative to 2019. Overall, 2024 $PM_{2.5}$ and SO_2 emission reductions within the nonattainment area are 37% and 29% of 2019 levels, respectively.

Table 7.9-8
Relative Change (%) in Episode Average Daily Emissions (tons/day) by Source Sector, 2024 Control vs. 2019 Baseline Inventory

Source Sector	*Modeling Inventory Change in Grid 3 Domain Emissions (%)*					*Planning Inventory Change in NA Area Emissions (%)*				
	$PM_{2.5}$	**NOx**	**SO_2**	**VOC**	**NH_3**	**$PM_{2.5}$**	**NOx**	**SO_2**	**VOC**	**NH_3**
Point Sources	+8%	+8%	-49%	+8%	+8%	+8%	+8%	-50%	+8%	+8%
Area, Space Heating	-51%	+10%	-38%	+10%	+8%	-61%	+0%	-42%	+0%	+0%
Area, Space Heat, Wood	-51%	+10%	+0%	+10%	+10%	-62%	+0%	-0%	+0%	+2%
Area, Space Heat, Oil	-50%	+11%	-40%	+10%	+11%	-56%	+1%	-44%	-0%	+1%
Area, Space Heat, Coal	-48%	+8%	-33%	+8%	+9%	-59%	-2%	-39%	-2%	+1%
Area, Space Heat, Other	+0%	+0%	+0%	+0%	+0%	-2%	-9%	+0%	-9%	-7%
Area, Other	+7%	+7%	+7%	+7%	+7%	+7%	+7%	+7%	+7%	+7%
On-Road Mobile	-25%	-27%	-2%	-9%	+6%	-24%	-26%	-0%	-7%	+8%
Non-Road Mobile	-1%	+2%	+14%	-13%	+3%	-8%	+8%	+3%	-13%	+4%
TOTALS	**-31%**	**+3%**	**-19%**	**+0%**	**+8%**	**-37%**	**+3%**	**-29%**	**-3%**	**+4%**

Table 7.9-9**Error! Reference source not found.** and Table 7.9-10 present similar emission summaries for the 2023 Control inventory and its emission changes relative to the 2019 Baseline

inventory, respectively. Comparing these tables to Table 7.9-8 and Table 7.9-9, it is seen that forecasted emission reductions in 2023 (32% and 16% for $PM_{2.5}$ and SO_2, respectively within the nonattainment area) track toward, but are below those projected in 2024 as the measures in the State's control strategy have another year to phase in.

Table 7.9-9
2023 Control Episode Average Daily Emissions (tons/day) by Source Sector

	Modeling Inventory Grid 3 Domain Emissions (tons/day)					*Planning Inventory NA Area Emissions (tons/day)*				
Source Sector	**$PM_{2.5}$**	**NOx**	**SO_2**	**VOC**	**NH_3**	**$PM_{2.5}$**	**NOx**	**SO_2**	**VOC**	**NH_3**
Point Sources	0.63	11.14	4.92	0.04	0.079	0.61	11.08	4.73	0.03	0.079
Area, Space Heating	1.24	2.84	2.58	10.36	0.154	0.89	2.43	2.28	8.60	0.132
Area, Space Heat, Wood	1.13	0.49	0.18	10.10	0.104	0.81	0.39	0.17	8.38	0.087
Area, Space Heat, Oil	0.03	2.13	2.29	0.12	0.004	0.03	1.84	2.01	0.10	0.004
Area, Space Heat, Coal	0.06	0.06	0.10	0.13	0.017	0.04	0.05	0.08	0.11	0.014
Area, Space Heat, Other	0.01	0.17	0.02	0.01	0.029	0.01	0.15	0.02	0.01	0.027
Area, Other	0.25	0.41	0.03	2.38	0.053	0.24	0.38	0.03	2.21	0.049
On-Road Mobile	0.22	1.76	0.01	4.51	0.058	0.17	1.32	0.01	3.58	0.042
Non-Road Mobile	0.36	1.81	8.85	4.71	0.003	0.24	1.01	5.55	3.72	0.002
TOTALS	**2.70**	**17.96**	**16.39**	**22.00**	**0.346**	**2.15**	**16.22**	**12.59**	**18.16**	**0.304**

Table 7.9-10
Relative Change (%) in Episode Average Daily Emissions (tons/day) by Source Sector, 2023 Control vs. 2019 Baseline Inventory

	Modeling Inventory Change in Grid 3 Domain Emissions (%)					*Planning Inventory Change in NA Area Emissions (%)*				
Source Sector	**$PM_{2.5}$**	**NOx**	**SO_2**	**VOC**	**NH_3**	**$PM_{2.5}$**	**NOx**	**SO_2**	**VOC**	**NH_3**
Point Sources	+8%	+8%	-16%	+8%	+8%	+8%	+8%	-17%	+8%	+8%
Area, Space Heating	-44%	+9%	-38%	+8%	+7%	-53%	+0%	-41%	+0%	+0%
Area, Space Heat, Wood	-45%	+8%	+5%	+9%	+8%	-54%	-1%	+5%	+0%	+2%
Area, Space Heat, Oil	-50%	+10%	-41%	+9%	+8%	-55%	+1%	-44%	+1%	+2%
Area, Space Heat, Coal	-26%	+8%	-4%	+8%	+8%	-34%	-1%	-6%	-1%	+1%
Area, Space Heat, Other	+0%	+0%	+0%	+0%	+0%	-2%	-8%	+0%	-8%	-6%
Area, Other	+6%	+6%	+6%	+6%	+6%	+6%	+6%	+6%	+6%	+6%
On-Road Mobile	-21%	-23%	-2%	-8%	+5%	-20%	-22%	+0%	-6%	+7%
Non-Road Mobile	+0%	+3%	+14%	-10%	+3%	-7%	+8%	+3%	-10%	+4%
TOTALS	**-26%**	**+3%**	**-8%**	**+0%**	**+6%**	**-32%**	**+3%**	**-16%**	**-3%**	**+4%**

Beyond these emission inventory comparisons, Table 7.9-11 summarizes the resulting attainment modeling conducted for the 2019 Baseline and 2023 and 2024 Control inventories that were used to evaluate and determined the most expeditious modeled attainment date. Modeled design values for each year/scenario are shown for the gird cells corresponding to the key monitors in each portion of the nonattainment area for which a sufficient historical ambient measure record exists: 1) the Hurst Road monitor in North Pole; and 2) the NCORE monitor just north of downtown Fairbanks.

Table 7.9-11
Modeled Expeditious Attainment Summary

Modeling Scenario	Base and Future Design Values (µg/m^3) by Monitoring Site	
	Hurst Road	NCORE
2019 Base Year	64.7	29.6
2023 Control	37.0	23.2
2024 Control	30.9	21.0
24-Hour $PM_{2.5}$ NAAQS	35	

As shown using the red and green shading Table 7.9-11, although the NCORE monitor is modeled as attaining the 35 µg/m^3 $PM_{2.5}$ NAAQS under all modeled years, the controlling monitor for the nonattainment area at Hurst Road is modeled to comfortably attain the NAAQS by 2024, but not in 2023.

Therefore, this air quality modeling-based evaluation demonstrates that 2024 is the most expeditious attainment date forecasted for the Fairbanks $PM_{2.5}$ nonattainment area based on currently available data.

7.9.4 Future Efforts

As detailed in Section III.D.7.8 Modeling, the 2008 episodes used in this attainment demonstration are based on the State Office Building monitor, and while model performance meets requirements for that monitor, there is poor performance at the Hurst Road site in North Pole. It is hoped that an updated model will result in better model performance in the future and lend additional accuracy to the attainment forecasts.

During the winter of 2019-2020, DEC collected data with the goal of updating the monitored speciation data and meteorological data with new WRF episodes for the area. This effort will take a number of years to collect the data; updated meteorological episodes using the WRF model are currently under development. The next steps are updated speciation, emission inventories, configure, and conduct QA/QC on, the updated air quality model. In the future, this plan may need to be updated to reflect findings based on this new modeling platform.