Exceptional Event Waiver Request

For $PM_{2.5}$ Events During the 2024 Wildland Fire Season in the Fairbanks North Star Borough, Alaska

August 14, 2025

Air Quality Division

Air Monitoring
& Quality Assurance
Program

555 Cordova St.
Anchorage, AK 99501

Phone: (907) 269-7577
Fax: (907) 269-7508

dec.alaska.gov/air

This page intentionally left blank

Contents

Introduction 1

Conceptual Model 4

The Event Was Natural 14

The Event Was Not Reasonably Controllable or Preventable 15

The Event Affected Air Quality 19

$PM_{2.5}$ Concentrations Exceeded Historical Fluctuations 19

Clear Causal Relationship 23

June 9, 2024 ..... *27*
June 10, 2024 ..... *32*
June 12, 2024 ..... *37*
June 20, 2024 ..... *42*
June 21, 2024 ..... *47*
June 23, 2024 ..... *52*
June 24, 2024 ..... *57*
June 25, 2024 ..... *62*
June 26, 2024 ..... *67*
June 27, 2024 ..... *72*
June 28, 2024 ..... *77*
June 29, 2024 ..... *82*
June 30, 2024 ..... *87*
July 1, 2024 ..... *93*
July 2, 2024 ..... *98*
July 3, 2024 ..... *103*
July 22, 2024 ..... *108*
July 23, 2024 ..... *113*
July 24, 2024 ..... *118*
July 25, 2024 ..... *123*

Summary of the 2024 Event Period.....128

Reasonable Controls.....129

Procedural Requirements.....129

Conclusions.....129

References.....131

Abbreviations.....132

Introduction

The Fairbanks North Star Borough (FNSB) covers an area of 7,361 square miles and has a population of approximately 95,356 residents[1]. Fairbanks is situated on the banks of the Chena River in the upper Tanana Valley in the interior region of Alaska. North of the FNSB are low hills that border the Tanana Valley (Figure 1). Interior Alaska experiences average winter temperatures ranging between -2°F and -19°F and average summer temperatures ranging between 53°F and 72°F. Temperatures have been recorded as low as -78°F in mid-winter, and as high as 93°F in summer. Average annual precipitation is 11.3 inches and ice fog is common during the winter. The extremes in day length in the FNSB range from 21 hours of direct sunlight between May 10 and August 2 to less than four hours of direct sunlight between November 18 and January 24.

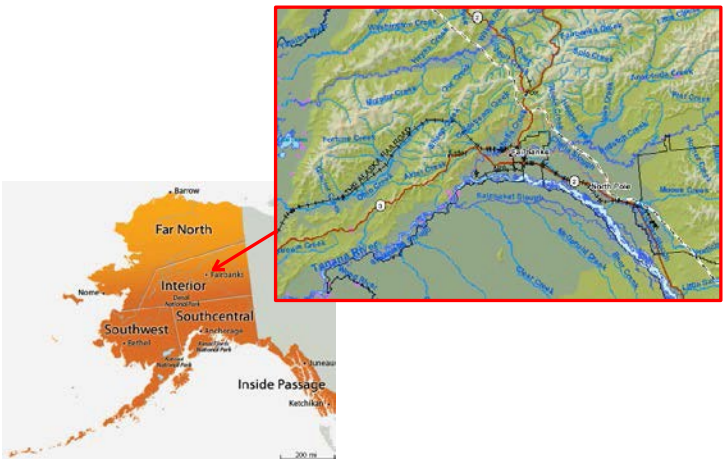

Figure 1. Map of Alaska and inset showing Tanana Valley, Fairbanks, and North Pole.

In December of 2009, the Environmental Protection Agency (EPA) designated 244 square miles (3.3%) of the FNSB as a $PM_{2.5}$ nonattainment area (Figure 2). This area encompasses the cities of Fairbanks and North Pole with an estimated population of over 83,000 residents (83.3% of FNSB). During the summer months (May through September), the main source of elevated $PM_{2.5}$ concentrations is smoke from wildland fires. During the winter months (October through March), local home heating emissions are the dominant $PM_{2.5}$ source[2], to a much greater extent than industrial or mobile source emissions.

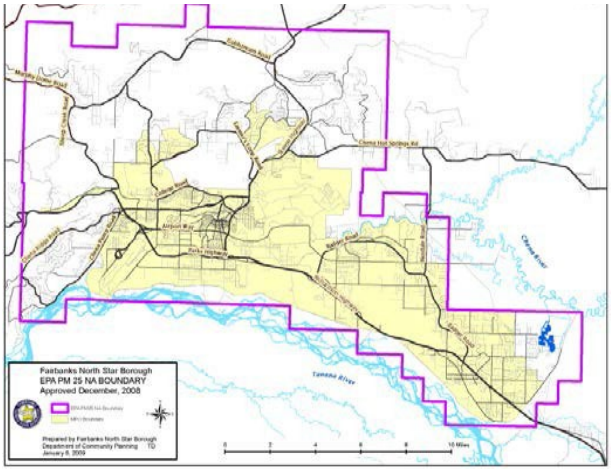

Figure 2. Map of $PM_{2.5}$ non-attainment area in Fairbanks North Star Borough; purple lines indicate boundary.

[1] https://censusreporter.org/profiles/05000US02090-fairbanks-north-star-borough-ak/
[2] http://dec.alaska.gov/air/anpms/communities/fbks-particulate-matter/

In the summer of 2024, the Fairbanks North Star Borough's 24-hour average $PM_{2.5}$ nonattainment area experienced high levels of $PM_{2.5}$ due to wildland fires. As a response, the Alaska Department of Environmental Conservation (DEC) has drafted this document for an Exceptional Event Waiver Request (EEWR). This waiver seeks to omit the elevated $PM_{2.5}$ levels resulting from wildland fire emissions during regulatory assessments, in line with Section 319(b)(3)(B) of the Clean Air Act.

During the 2024 wildland fire season, the Alaska Department of Environmental Conservation (DEC) Air Quality Program operated three official monitoring stations using both Federal Reference Method (FRM) $PM_{2.5}$ monitors and Beta Attenuation Monitors (BAM). The FRM measures daily average $PM_{2.5}$ concentrations, while BAM monitors assess hourly averages, allowing for the display of Air Quality Index (AQI) information on DEC's website.

The continuous BAM analyzer data is primarily utilized by DEC to issue air quality advisories and to initiate burn restrictions during winter for the FNSB nonattainment area. The EEWR incorporates data from BAM monitors from the regulatory sites as supplementary information. In 2023, the A-Street site BAM was switched to a FEM; all other BAMs were operated as non-FEMs.

Monitors included in the EEWR are:

- Fairbanks A-Street Site (AQS Site ID 02-090-0040) with:
    a. FRM 02-090-0040-88101-1 ($PM_{2.5}$ measured every day)
    b. BAM 02-090-0034-88501-3 ($PM_{2.5}$ hourly readings) in 2022
    c. BAM 02-090-0034-88101-3 ($PM_{2.5}$ hourly readings) in 2023

- Fairbanks NCore Site (AQS Site ID 02-090-0034) with:
    a. FRM 02-090-0034-88101-1 ($PM_{2.5}$ measured day)
    b. BAM 02-090-0034-88501-3 ($PM_{2.5}$ hourly readings)
    c. BAM 02-090-0034-81102 (PM_{10} hourly readings)

- Hurst Road Site (AQS Site ID 02-090-0035) with:
    a. FRM 02-090-0035-88101-1 ($PM_{2.5}$ measured every day)
    b. FRM 02-090-0035-88101-2 ($PM_{2.5}$ measured every third day)
    c. BAM 02-090-0035-88501-3 ($PM_{2.5}$ hourly readings)

All monitors recorded several instances where the daily $PM_{2.5}$ concentrations exceeded either the 2006 24-hour average National Ambient Air Quality Standard (NAAQS) of 35 $\mu g/m^3$ or the 2024 annual NAAQS of 9 $\mu g/m^3$ during the wildland fire seasons, between June 9 and July 25, 2024. On July 3, wildland fire smoke reached concentrations above 200 $\mu g/m^3$ in the Fairbanks Air

Quality Zone and the NCore PM_{10} BAM recorded a concentration of 233 µg/m³, which is an exceedance of the 24-hour PM_{10} NAAQS.

The purpose of this document is to clearly demonstrate that the source of the elevated $PM_{2.5}$ concentrations shown in Table 1 were the result of wildland fire emissions from fires located in Interior Alaska. Therefore, DEC requests that the EPA exclude all wildland fire-influenced 24-hour average $PM_{2.5}$ concentrations occurring during this event that exceed either the 2006 24-hour or the 2024 annual NAAQS $PM_{2.5}$ exceedance concentrations of regulatory significance from regulatory decisions.

Table 1. 2024 Wildland Fire Season FNSB $PM_{2.5}$ Exceedance Concentrations (µg/m³)

June 2024								July 2024							
	24-Hour $PM_{2.5}$ Concentrations (µg/m³)								24-Hour $PM_{2.5}$ Concentrations (µg/m³)						
Date	NCore FRM 1	NCore BAM	A-St FRM	A-St BAM	HURST FRM 1	HURST FRM 2	HURST BAM	**Date**	NCore FRM 1	NCore BAM	A-St FRM	A-St BAM	HURST FRM 1	HURST FRM 2	HURST BAM
9	10.3	8.3	9.7	9.5			16.8	1		72.8	57.2	38.8	45.6		44.8
10	9.6	9.3	9.7	10.2			9.9	2	15.2	21.1	15.2		24.1	23.4	26.4
12	14.3	24.8	14.4	19	31.3		34.7	3	15.8	20.4	15.3		24.4		24.1
20	13	14.3	14	17.9		18.6	20.1	22	8.1	12.6	8.0	8.0	10.3		10.5
21	6.4	11.4	9.2	11.6	14.4		15.8	23	9.7	15.2	9.1	9.0	12.7	12.8	14.3
23	7.9	11.5	7.7	7.6	10.4	10.7	11.4	24	17.8	23.5	17.4	18.3	22.5	21.6	23.7
24	48.5	56.8		51.6	52		54.9	25	15.0	21.1	14.4	13.6	20.4		22.0
25	52.6	65.3	60.1	69	123.7		130.5	**Black Bolded Values** indicate an exceedance of the Annual NAAQS (9 µg/m³)							
26	68.8	49.7	64.8	34.6	57.3	36.8	40								
27	29.3	35.2	25.3	28			15.5	**Red Bolded Values** indicate an exceedance of the 24-hour NAAQS (35.5 µg/m³)							
28	68.6	79.6	64.8	73.8	57.3		59.9								
29	94.3	104.5	95.6	106.2	119	118.6	123.4	**7 days over 35.5** **13 Days over 9 < 35.5**							
30	237.3	218.8	113.6	217.3	144.4		145.2	**20 Days Total**							

This includes multiple exceedances due to the nature of the events in 2024. It is impossible to attribute individual exceedances to specific fires; instead, the wildland fire season in 2024 is treated as one wildland fire season event. All events that are combined in this EEWR are due to the upcoming area designations due to the revised annual $PM_{2.5}$ NAAQS. This EEWR follows the steps outlined in the Exceptional Events Rule, finalized in 2016, and includes the elements required in 40 CFR 50.14(c)(3)(iv):

- A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s).
- A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation.
- Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3) (iv)(B) of this section.
- A demonstration that the event was both not reasonably controllable and not reasonably preventable.
- A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event.

Conceptual Model

The 2024 Alaska wildfire season started off slowly in May, with cooler and wetter conditions delaying significant fire activity. By the end of the month, 94 fires had been reported, the majority of which were human-caused, burning a total of 6,699 acres. The Popovich Creek and Sanderson Creek coal seam fires near Healy showed little growth due to damp weather, while fire crews monitored a tundra fire in the Yukon Delta National Wildlife Refuge. However, as June progressed, prolonged warm and dry conditions fueled rapid fire growth across the state. During the second week of June, temperatures began to climb as high pressure moved into Alaska from the east. In the Interior, this shift led to increased fire activity and issuing of red flag warnings. Interior Alaska saw classic “fire weather” conditions this month, characterized by drying fuels, elevated temperatures, and convective storms that produced lightning, igniting numerous wildfires. By the final third of June, widespread smoke significantly reduced air quality in Fairbanks and the North Pole area.

One of the most notable events of the season was the start of the Clear Fire and the expansion of the McDonald Fire on June 21, which threatened structures along the south and west side of the Richardson Highway and prompted evacuation orders for communities to the east of the fires over the next week. Firefighters, including multiple hotshot and smokejumper crews, worked to contain the blaze and protect property. The last week of June saw the highest lightning activity of the fire

season, see Figure 3, below. On June 25, lightning ignited the Globe Fire along the Elliott Highway which also forced evacuations from communities on both sides of the highway. The Bureau of Land Management issued an emergency closure of the western White Mountains National Recreation Area, and the Elliott Highway was temporarily shut down due to the increasing fire threat.

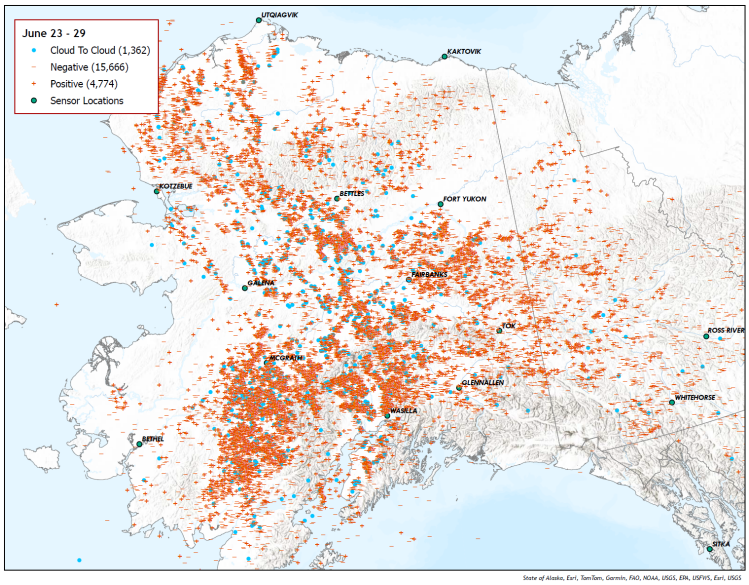

Figure 3. Alaska Lightning Map June 23-29, 2024.

July began with widespread fire activity in Interior and western Alaska, threatening roads and settlements while continuing to degrade air quality. However, cooler and rainier weather helped suppress many of the active fires, bringing a brief reprieve. This changed when a late-July heatwave, from July 21 to 26, heightened fire danger once again, igniting new blazes near Eagle, Tok, and Venetie. The fires near FNSB had received multiple days of wetting rains and widespread smoke in the Tanna flats was at a minimum. Despite these flare-ups, there was minimal growth in total burned acreage after July 5. By early August, warm conditions led to brief increases in fire activity, with noticeable smoke columns rising from the Sinnott and American fires near Eagle and the Steese Highway. As the month progressed, overall fire activity diminished, and by September 1, the Alaska Interagency Coordination Center reported 385 total fires, with 664,092.5 acres burned. Unlike past historic fire seasons, when significant fire growth continued into late summer, 2024 saw an unusually early conclusion. Much of the burned acreage resulted from lightning-caused fires, with human activity responsible for only 0.5% of the total. Weather patterns and fire suppression efforts played a key role in keeping the season from becoming more severe, and by late August, Alaska's wildfire season had effectively ended.

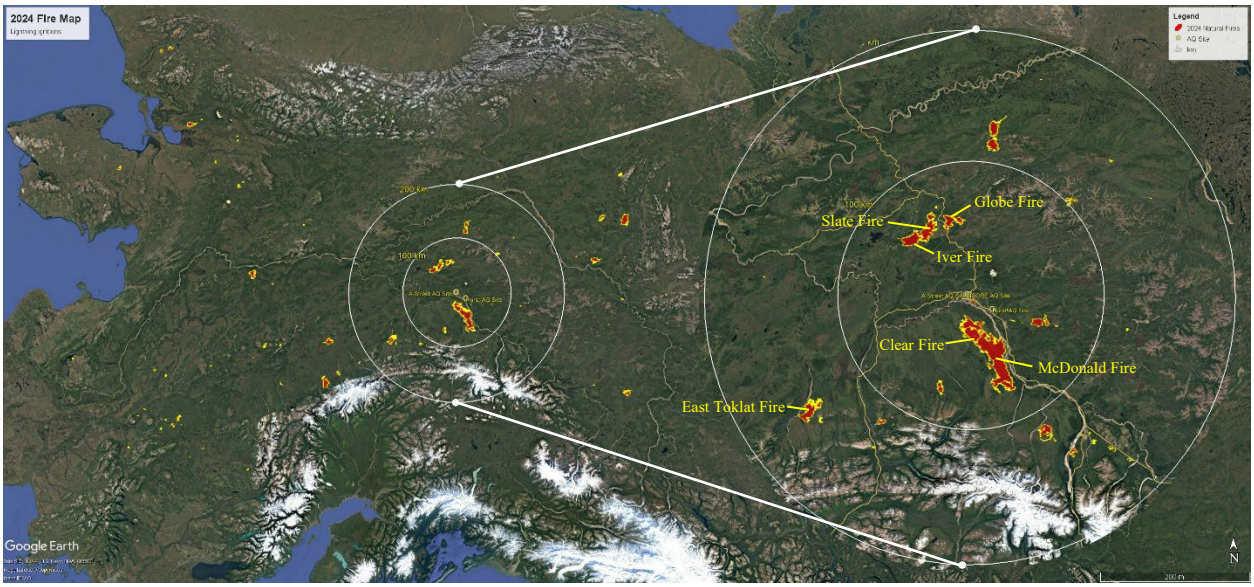

Figure 4. Interior wildland fires during the June-July event are outlined in yellow. The shaded fire plots are estimated from satellite burn scars during the 2024 fire season.

DEC staff collect daily samples from the Federal Reference Method (FRM) monitors at the three monitoring locations within the nonattainment area. These samples document the smoke impact resulting from the wildland fire event. Between June 9 and July 25, 2024, the FRM monitors located at the Fairbanks NCore, Fairbanks A-Street, and North Pole Hurst Road sites reported increased $PM_{2.5}$ concentrations on 20 sample days (Table 2).

Although not every 24-hour concentration exceeded the 2006 24-hour National Ambient Air Quality Standard (NAAQS) of 35 µg/m³, each day recorded at least one site with $PM_{2.5}$ concentrations exceeding the 2024 annual NAAQS of 9 µg/m³, which is higher than usual for summer conditions without wildland fires. In the nonattainment area, during summer months without wildland fires, the peak 24-hour average $PM_{2.5}$ concentrations typically range between 3 and 6 µg/m³.

In the document below, any refence to the 24-hour NAAQS refers to the 2006 24-hour $PM_{2.5}$ NAAQS and any reference to the annual standard refers to the 2024 annual $PM_{2.5}$ NAAQS. The years denoting $PM_{2.5}$ NAAQS revisions have been omitted for brevity.

Table 2. 2024 FRM/BAM $PM_{2.5}$ concentrations in µg/m³ at the NCore, A-Street and Hurst Road sites

June								July							
24-Hour $PM_{2.5}$ Concentrations (µg/m³)								24-Hour $PM_{2.5}$ Concentrations (µg/m³)							
Date	NCore FRM 1	NCore BAM	A-St FRM	A-St BAM	HURST FRM 1	HURST FRM 2	HURST BAM	Date	NCore FRM 1	NCore BAM	A-St FRM	A-St BAM	HURST FRM 1	HURST FRM 2	HURST BAM
1	2.8	1.0	2.5	3.6			3.7	1		72.8	57.2	38.8	45.6		44.8
2	2.1	1.3	2.3	2.1		3	3.5	2	15.2	21.1	15.2		24.1	23.4	26.4
3	3.7	1.2	2.8	2.9			3.1	3	15.8	20.4	15.3		24.4		24.1
4	4.1	3.2	3.7	4.8			4.8	4	4.3	8.4	4.3	5.4	7.9		8.4
5	4.9	6.2	4.1	5.6		3.8	5.6	5	1.1	5.7	1.4	2.7	1.2	1.2	2.4
6	1.7	3.0	1.4	2.8	1.9		2.6	6	1.8	7.6	1.9	2.6	3.8		5.1
7	1.9	0.0	2	2.6	3.1		2.9	7	0.7	5.0	1	1.1	1.4		2.0
8	3.5	1.0	3.3	1.9		4	4.0	8	1.6	7.1	1.8	1.2	2	1.6	1.7
9	10.3	8.3	9.7	9.5			16.8	9	2.1	6.6	1.6	1.9	1.6		2.4
10	9.6	9.3	9.7	10.2			9.9	10	2.7	5.8	1.8	1.1	2		3.4
11	6.3	8.9	6.5	9.7	5.7	5.6	7.5	11	2.4	7.3	2.2	2.9	2.5	2.4	2.7
12	14.3		14.4	19.0	31.3		34.7	12	2.3	5.2	1.9	2.2	3		2.2
13	2.6		2.7	4.0	2.2		2.2	13	1.4	6.0	1.4	1.0	2.9		3.5
14	3.8	5.0	3.6	5.1	4.2	4.6	4.5	14	1.7	6.2	1.8	3.2	2.5	2.5	3.0
15	4.8	5.2	4.7	6.0	5.5		5.3	15	1.4	6.0	1.3	1.4	1.2		1.2
16		5.4	5	5.5	7.2		6.9	16	2.2	5.6	2	3.6	2.5		2.4
17	4.8	4.3	4.7	4.9	6.3	6.3	6.8	17	2	5.3	1.5	1.9	1.6	1.2	2.7
18	4	3.3	4.2	5.8			4.4	18	1.1	6.2	0.8	1.3	1.2		0.6
19	4.7	4.0	4.2	5.5	5.8		7.0	19	2.3	5.4	2.1	3.3	3		4.1
20	13	14.3	14	17.9		18.6	20.1	20	3.5	7.1	3.1	3.7	5.1	5.1	6.2
21	6.4	11.4	9.2	11.6	14.4		15.8	21	7.1	11.4	6.8	6.9	7.9		8.3
22	3.2	6.8	3.8	3.7	3.8		2.8	22	8.1	12.6	8	8.0	10.3		10.5
23	7.9	11.5	7.7	7.6	10.4	10.7	11.4	23	9.7	15.2	9.1	9.0	12.7	12.8	14.3
24	48.5	56.8		51.6	52		54.9	24	17.8	23.5	17.4	18.3	22.5	21.6	23.7
25	52.6	65.3	60.1	69.0	123.7		130.5	25	15	21.1	14.4	13.6	20.4		22.0
26	41.2	49.7	29.5	34.6	37.8	36.8	40.0	26	5.5	12.5	5.3	5.8	6.1	5.9	5.9
27	29.3	35.2	25.3	28.0			15.5	27	0.6	6.0	0.7	1.8	0.7		0.7
28	68.6	79.6	64.8	73.8	57.3		59.9	28	0.8	6.0	1	1.7	1		1.5
29	94.3	104.5	95.6	106.2	119	118.6	123.4	29	1.6	6.7	1.2	1.6	1.5	1.7	2.2
30	237.3	218.8	113.6	217.3	144.4		145.2	30	1	5.9	1	1.6	1.2		0.2
								31	1.2	6.2	1.2	1.7	1.3		1.3

During this timeframe, DEC flagged all daily concentrations that exceeded the updated 2024 annual NAAQS of 9 µg/m³. Some wildland fires affecting Interior Alaska started in early June and persisted throughout the entire event period. As shown in Figure 5, spikes in $PM_{2.5}$ were

correlated with the period when fires in the Interior were most active, strongly indicating the western fire complex from mid-June through mid-July as the source of exceedance. Given that smoke from multiple fires led to the elevated $PM_{2.5}$ concentrations, DEC treated all the days in 2024 mentioned in Table 1 as a single event. Daily $PM_{2.5}$ concentrations varied with fire growth/suppression and meteorological conditions, with wind direction being the most important component. Although the $PM_{2.5}$ concentrations varied, the cause of the elevated $PM_{2.5}$ levels throughout the entire period was wildland fire smoke. See the Clear Causal Relationship section for a detailed breakout of the fire area and smoke ($PM_{2.5}$) activity.

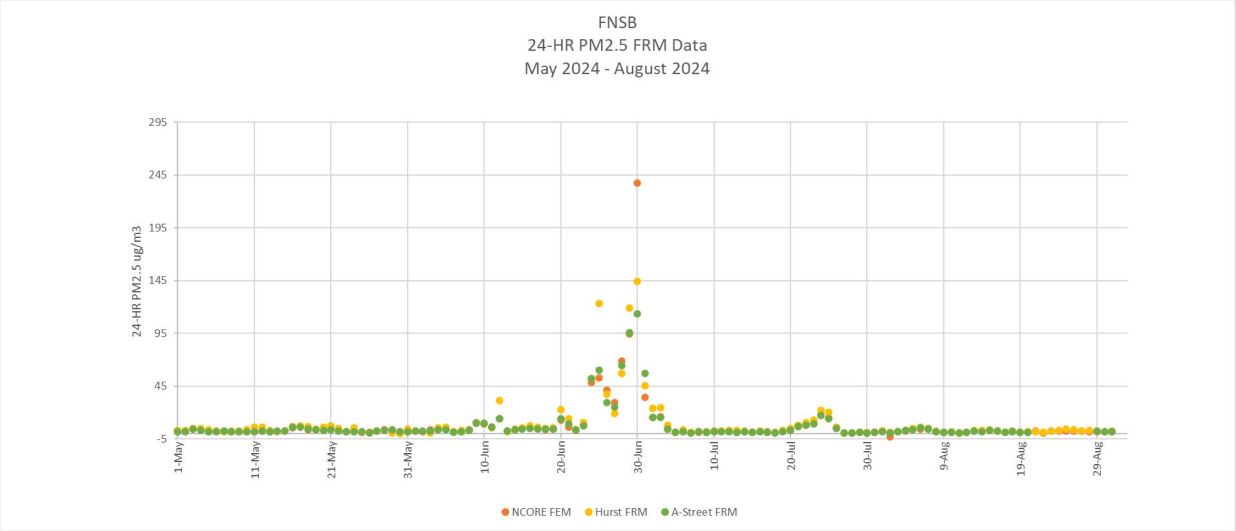

Figure 5. Fairbanks area 24-hr $PM_{2.5}$ concentrations for May through August 2024.

Meteorology

The 2024 fire season in Alaska was marked by dynamic meteorological patterns, with shifting pressure systems and varying temperature trends influencing fire activity and weather impacts across the state. Broadly, the season saw fluctuating conditions, including periods of high pressure leading to warm and dry spells, as well as low-pressure systems bringing cooler, wetter weather. These variations played a crucial role in determining the fire risk and overall climate conditions.

May began with troughing in the southern Bering Sea and over the Arctic coast of Alaska and Canada. The Bering Sea system produced above-average temperatures and unsettled conditions in western Alaska, while cold Arctic air influenced the northeastern parts of the state. Around May 4, the merging of upper-level troughs brought Arctic air south, causing a significant drop in temperature, particularly along the west coast. This cooler pattern persisted through the first week of May.

By mid-month, the upper-level trough weakened and shifted eastward, briefly allowing high pressure in the Bering Sea before another series of storm systems restored the pattern of troughing in the west and ridging in the east. This resulted in near-normal to moderately warmer-than-normal temperatures in the Interior and North Slope, while the southern and southwestern regions experienced cooler, wetter conditions. Seasonal river breakup and snowmelt progressed throughout the month, with flooding affecting communities along the lower Kuskokwim River due to ice jams.

June started with variable weather across the state. An Arctic lopressure system brought snow flurries to the Brooks Range, while low-pressure systems in the southern Bering Sea and Gulf of Alaska caused rainy and windy conditions. Kodiak Island received over three inches of rain in early June, and thunderstorms prompted marine warnings in Southeast Alaska. The Interior also experienced thunderstorms and scattered showers.

By the second week of June, high pressure spread from the east, increasing temperatures and fire activity in the Interior. While the south remained cooler and unsettled, a dissipation of the Aleutian low allowed warm conditions across the state. The northwest stayed cooler due to Arctic air advection.

The general pattern of hot, dry weather with high pressure persisted, intensifying fire conditions in the Interior. By late June, low pressure returned to the Bering Sea, bringing stormy weather to the west coast and warming the previously cool northwest. Despite early precipitation, moderate drought conditions developed in parts of the Interior, particularly around Fort Yukon.

Following a hot and smoky June, the first week of July brought cooler weather and widespread precipitation, reducing fire activity. A low-pressure system over the Aleutians and another over the Arctic influenced conditions, bringing welcome rainfall. However, warm temperatures persisted in Southeast Alaska due to ridging.

Later in the month, low pressure intensified in the Bering Sea resulted in heavy precipitation, setting daily rainfall records in Juneau, Sitka, and Yakutat. As the system moved inland, Arctic air pushed south, causing substantial temperature drops in western, northern, and Interior Alaska. By July 20, high pressure returned, leading to well-above-average temperatures, with McGrath recording 90°F on July 24. However, the month ended with cooler weather as low pressure reintroduced Arctic air, bringing the first snowfalls to higher elevations.

August began with contrasting weather patterns. A ridge over the Interior and the British Columbia coast brought warm, sunny conditions, while low pressure over the Bering Sea caused

strong winds, high surf, and heavy rainfall in western Alaska. On August 6, Deadhorse recorded an all-time high temperature of 89°F, while Seward received over three inches of rain within 24 hours.

A Bering Sea storm near the Pribilof Islands brought more moisture, with strong winds and flood advisories for south-central Alaska. Subsequent storms led to additional coastal flooding along the Kuskokwim Bay and River. Former tropical storm Ampil entered the Bering Sea around August 21, exacerbating storm activity. The month ended with continued unsettled weather, impacting the Gulf of Alaska and southeastern Alaska, while colder air masses brought early snowfalls to the Alaska and Brooks Ranges.

With these meteorological trends in mind, it is important to examine how these patterns specifically influenced Fairbanks and Delta Junction. These two key Interior Alaska regions experienced unique weather conditions shaped by their geographic location and susceptibility to seasonal atmospheric changes.

May 2024:

Fairbanks, Alaska, within the FNSB, exhibited a mean monthly temperature of 50.5°F, exceeding the long-term average by 0.2°F, indicative of a marginally warmer-than-normal period. The maximum temperature recorded was 72.0°F on May 29, while the minimum reached 29.0°F on May 2, reflecting significant diurnal and monthly variability typical of the subarctic climate during spring transition. Total precipitation for the month measured 1.1 inches, 0.5 inches above the climatological norm, suggesting wetter conditions that likely mitigated soil moisture deficits. No snowfall was observed, consistent with the seasonal shift to liquid precipitation. These conditions, slightly elevated temperatures and above-average rainfall, may have influenced local hydrological and ecological dynamics, potentially reducing early-season wildfire risk.

Delta Junction, Alaska, recorded a mean monthly temperature of 47.1°F, which was 1.4°F below the long-term average, indicating a cooler-than-normal period. The maximum temperature reached 68.0°F on May 31, while the minimum was 29.0°F on May 15, reflecting notable temperature variability typical of the spring transition in this subarctic region. Total precipitation measured 1.7 inches, 1.0 inch above the climatological norm, signifying wetter-than-average conditions in Delta Junction. No snowfall was reported, consistent with the seasonal shift to liquid precipitation by late spring.

June 2024:

Fairbanks, Alaska, within FNSB, recorded a mean monthly temperature of 65.1°F, which was 4.0°F above the long-term average, indicating a significantly warmer-than-normal period. The maximum temperature reached 85.0°F on July 3, while the minimum was 45.0°F on June 7, reflecting substantial temperature variation across the month. Total precipitation amounted to 0.5 inches, 1.0 inch below the climatological norm, denoting drier-than-average conditions in Fairbanks. No snowfall was observed, consistent with typical June patterns in the area. The combination of elevated temperatures and reduced precipitation likely increased dryness in the FNSB, potentially heightening the risk of wildfire ignition and spread within the borough during the early stages of the wildfire season.

Delta Junction, Alaska, recorded a mean monthly temperature of 61.1°F, which was 2.6°F above the long-term average, indicating a warmer-than-normal period. The maximum temperature reached 84.0°F on June 26, while the minimum was 39.0°F on June 4, demonstrating significant temperature variation as summer commenced. Total precipitation amounted to 1.5 inches, 0.7 inches below the climatological norm, reflecting drier-than-average conditions in Delta Junction. No snowfall was observed, consistent with typical June patterns in the area. The elevated temperatures and reduced precipitation late in the month coincided with the initiation of several wildfires in the Delta Junction vicinity, suggesting that the warmer and drier conditions may have contributed to an increased fire risk during this period.

July 2024:

Fairbanks, Alaska, within FNSB, recorded a mean monthly temperature of 61.3°F, which was 1.6°F below the long-term average, indicating a cooler-than-normal period. The maximum temperature reached 88.0°F on July 23, while the minimum was 45.0°F on July 19, demonstrating considerable thermal variability throughout the month. Total precipitation measured 4.2 inches, 1.9 inches above the climatological norm, reflecting significantly wetter conditions in Fairbanks. No snowfall was observed, as expected for July in the area. The higher-than-average precipitation likely mitigated soil moisture deficits in the FNSB, potentially reducing the intensity of the wildfire season within the borough despite the presence of elevated temperatures on peak days.

Delta Junction, Alaska, recorded a mean monthly temperature of 60.1°F, which was 0.6°F below the long-term average, indicating a slightly cooler-than-normal period. The maximum temperature reached 86.0°F on July 24, while the minimum was 44.0°F on July 29, reflecting considerable temperature variability throughout the month. Total precipitation amounted to 1.1 inches, 1.2 inches below the climatological norm, signifying drier-than-average conditions overall in Delta Junction. No snowfall was observed, as expected for July. Despite the below-normal monthly precipitation, sufficient rainfall occurred by late July to suppress most wildfires that had started

earlier in the Delta Junction area, suggesting that the timing and distribution of precipitation, rather than the total volume, played a critical role in reducing fire activity.

August 2024:

Fairbanks, Alaska, recorded a mean monthly temperature of 56.2°F, which was 0.9°F below the long-term average, signifying a slightly cooler-than-normal period. The maximum temperature peaked at 86.0°F on August 5, while the minimum dropped to 39.0°F on August 25, illustrating notable temperature fluctuations across the month. Total precipitation amounted to 2.8 inches, 0.7 inches above the climatological norm, indicating wetter-than-average conditions in Fairbanks. No snowfall was observed, consistent with typical August patterns in the area. The above-normal precipitation likely maintained adequate soil moisture levels in FNSB, potentially diminishing the late-season wildfire risk within the borough despite occasional high temperatures early in the month.

Delta Junction, Alaska, recorded a mean monthly temperature of 55.4°F, which was 0.2°F below the long-term average, indicating a marginally cooler-than-normal period. The maximum temperature reached 85.0°F on August 5, while the minimum dropped to 37.0°F on August 31, illustrating significant temperature variation as summer transitioned toward autumn. Total precipitation amounted to 1.5 inches, 0.5 inches below the climatological norm, reflecting drier-than-average conditions in Delta Junction. No snowfall was observed, consistent with typical August patterns in the area.

September 2024:

Fairbanks, Alaska, within FNSB, recorded a mean monthly temperature of 47.5°F, which was 1.7°F above the long-term average, indicating a warmer-than-normal period. The maximum temperature reached 72.0°F on September 5, while the minimum dropped to 26.0°F on September 30, demonstrating considerable temperature variation as the season shifted toward autumn. Total precipitation amounted to 1.3 inches, 0.1 inches below the climatological norm, reflecting slightly drier-than-average conditions in Fairbanks. No snowfall was observed, though the low temperature late in the month suggests the approach of wintry conditions.

Delta Junction, Alaska, recorded a mean monthly temperature of 48.7°F, approximately 1.1°F below the long-term average, reflecting a slightly cooler-than-normal start to autumn. The maximum temperature peaked at 68.3°F on September 4, while the minimum fell to 29.8°F on September 28, signaling the rapid seasonal shift as daylight hours diminished. Total precipitation reached 1.8 inches, just 0.3 inches above the climatological norm, indicating a modestly wetter-

than-average month. Light snowfall returned late in the period, with 0.5 inches recorded on September 29-30, aligning with typical early-autumn patterns in the region.

Table 3. 2024 Daily precipitation, Fairbanks Intl Airport. and Delta Junction, AK

Date	Precip		Date	Precip		Date	Precip	
June	FNSB	DJ	July	FNSB	DJ	Aug	FNSB	DJ
1	**0.07**	0.00	1	0.00	0.00	1	**0.14**	**0.10**
2	0.00	0.00	2	**0.30**	0.00	2	**0.36**	**0.09**
3	**0.01**	0.00	3	0.00	**0.03**	3	**0.62**	**0.31**
4	0.00	0.00	4	0.00	0.00	4	**0.07**	0.00
5	**0.01**	**0.09**	5	**0.64**	**0.16**	5	0.00	0.00
6	**0.02**	**0.03**	6	**0.16**	**0.03**	6	0.00	0.00
7	**0.03**	0.00	7	**0.35**	**0.01**	7	0.00	0.00
8	0.00	0.00	8	**0.04**	**0.12**	8	0.00	0.00
9	0.00	0.00	9	**0.02**	**0.01**	9	**0.07**	**0.02**
10	0.00	0.00	10	**0.21**	0.00	10	**0.34**	**0.44**
11	0.00	**0.17**	11	**0.08**	**0.02**	11	**0.04**	**0.01**
12	**0.31**	**0.56**	12	**0.65**	**0.08**	12	**0.09**	**0.08**
13	0.00	**0.33**	13	0.00	0.00	13	0.00	**0.02**
14	0.00	**0.18**	14	**0.04**	0.00	14	0.00	0.00
15	0.00	**0.02**	15	**0.21**	0.00	15	0.00	0.00
16	0.00	0.00	16	0.00	0.00	16	0.00	0.00
17	0.00	0.00	17	0.00	0.00	17	**0.34**	0.00
18	0.00	0.00	18	**0.03**	**0.02**	18	**0.07**	0.00
19	0.00	**0.04**	19	0.00	**0.07**	19	**0.01**	0.00
20	0.00	0.00	20	0.00	0.00	20	**0.03**	**0.07**
21	0.00	**0.07**	21	0.00	0.00	21	0.00	0.00
22	**0.09**	0.00	22	0.00	0.00	22	**0.30**	**0.10**
23	0.00	0.00	23	0.00	**0.01**	23	**0.38**	**0.11**
24	0.00	0.00	24	0.00	0.00	24	**0.10**	**0.26**
25	**0.04**	0.00	25	0.00	0.00	25	0.00	**0.13**
26	0.00	0.00	26	**0.39**	**0.05**	26	0.00	**0.09**
27	0.00	0.00	27	**0.29**	**0.04**	27	0.00	**0.03**
28	0.00	0.00	28	**0.36**	**0.23**	28	0.00	0.00
29	0.00	0.00	29	**0.03**	**0.12**	29	0.00	**0.03**
30	0.00	0.00	30	**0.17**	0.00	30	0.00	0.00
			31	**0.08**	**0.03**	31	**0.01**	0.00
Total	**0.58**	**1.49**		**4.05**	**1.03**		**2.97**	**1.89**
Precip Norms	**1.37**	**2.31**		**2.16**	**2.62**		**1.88**	**1.92**
Above Below Avg	**-57.66%**	**-35.50%**		**87.50%**	**-60.69%**		**57.98%**	**-1.56%**

The Event Was Natural

Wildland fires in Alaska are a recurring phenomenon under conducive meteorological conditions and abundant dry fuel loads, as observed in 2024. Historical data indicate an annual mean of

932,823 acres burned, with over 90% of this area concentrated in Interior Alaska, characterized by warm, arid summers. Lightning serves as the predominant ignition source, frequently initiating fires in forests dominated by black spruce, paper birch, and balsam poplar.

The 2024 wildfire season in Alaska was predominantly driven by natural processes, with lightning strikes as the primary ignition mechanism. Preceding the active fire period, anomalously dry conditions persisted across Interior Alaska from May through June, resulting in elevated fuel flammability indices. Between June 25 and July 10, widespread cloud-to-ground lightning events—exceeding 5,000 strikes as recorded by the Alaska Lightning Detection Network—initiated 179 fires, accounting for 99.2% of the total 667,064 acres burned by season's end. Notable among these was the McDonald Fire (64.8°N, 147.2°W), which consumed 176,413 acres near Fairbanks by mid-July, driven by fuels and low relative humidity.

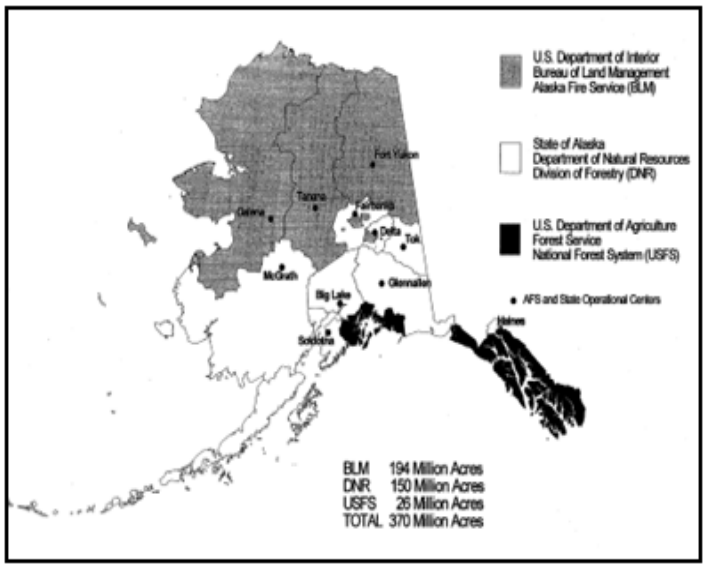

Figure 6. Alaska Wildland Fire Protection Areas.

Fire activity peaked in early July but declined thereafter due to a synoptic shift. Precipitation deficits persisted into August at Delta Junction, yet statewide fire spread was curtailed by mid-July convective rainfall exceeding 1 inch across key burn regions. By September, a transition to cooler temperatures and increased precipitation at Delta Junction, coupled with weather systems advecting moist air from the Gulf of Alaska, reduced fire potential.

The 2024 Alaska wildfire season was a natural event, triggered by lightning ignitions across a receptive fuel bed during an early-summer dry phase. This period of heightened fire activity was consistent with historical patterns in Interior Alaska, where lightning serves as the primary ignition source under desiccated conditions. Subsequent weather improvements—marked by enhanced precipitation and thermal moderation—limited the season's extent, underscoring the dominance of natural climatic drivers over anthropogenic influence. The relatively low total acreage burned (667,064 acres) compared to the long-term mean reflects the efficacy of these late-season moisture inputs, which disrupted the fire weather regime typically sustained by prolonged aridity.

The Event Was Not Reasonably Controllable or Preventable

The events described above were not reasonably controllable or preventable by the State for several reasons. First, authority over fire protection areas is split into three major jurisdictions (Figure 9) so that smoke from fires outside of the state's jurisdiction can impact state lands. Second, the events were caused by meteorological events over which the State has no reasonable control. Tables 6-8 show the breakdown of Landowners and Management Options for 2024.

Alaska Fire Service (AFS) and military units work together on control measures as it is known that live fire training will occasionally ignite fires. Control measures include prescribed burns in the spring to reduce fuel loads and to isolate or "blackline" all the training areas, and, on days with live fire training, coordination with AFS and military responders.

Table 4: Landowner activity for 2024

Landowner Agency	Fires	Acres
State of Alaska	112	219,648
Department of Defence	34	146,098
National Park Service	19	97,478
BLM	32	77,970
US Fish & Wildlife	33	65,200
Alaska Native Claims Settlement Act	40	59,838
Bureau of Indian Affairs	4	707
Private	84	118
County	5	2
US Forest Service	6	1
City	3	<1

Two primary factors contribute to an extensive fire season in Alaska: dry meteorological conditions and ignition sources. The dominant factor—dry meteorological conditions—cannot be effectively controlled or mitigated. The meteorological patterns in 2024 were characterized by a pronounced early-summer dry phase followed by a rapid transition to wetter conditions, influencing a compressed wildfire season. Dry conditions persisted from May through June across Interior Alaska, with precipitation deficits and elevated temperatures desiccating fuels. Between June 25 and July 10, approximately 5,000 cloud-to-ground lightning strikes ignited 179 fires, driving 99.2% of the 667,064 acres burned, predominantly in the central and northern Interior. By mid-July, a shift to above-average rainfall and cooler temperatures curtailed further ignitions, with August recording below-normal precipitation (1.5 inches in Delta Junction) yet limited fire spread.

Table 5. AFS Protection Fires and Acres Burned by Zone and Management Option for 2024

BLM Alaska Fire Service Protection Fires and Acres Burned by Zone and Management Option										
Zone	Critical		Full		Modified		Limited		Totals	
	Fires	Acres	Fires	Acres	Fires	Acres	Fires	Acres	Fires	Acres
Galena	0	0	2	2,926	17	29,098	17	59,167	36	91,191
Military	0	0	16	6861	0	0	18	170,891	34	177,752
Tanana	0	0	5	8,520	5	51,588	19	69,495	29	129,603
Upper Yukon	1	7	5	2,779	4	12,428	28	139,969	38	155,183
Totals	**1**	**7**	**28**	**21,086**	**26**	**93,114**	**82**	**439,522**	**137**	**553,729**

State of Alaska Fires and Acres Burned by Management Option										
Area	Critical		Full		Modified		Limited		Totals	
	Fires	Acres	Fires	Acres	Fires	Acres	Fires	Acres	Fires	Acres
Copper River	4	1	7	227	0	0	0	0	11	228
Delta	7	1	4	7	1	1	1	1	13	9
Fairbanks	20	3	18	2,887	1	1	5	38,702	44	41,593
Tok	9	1	8	183	0	0	4	21,195	21	21,379
Anch/Mat-su	31	166	7	1	1	1	0	0	39	168
Kenai/Kodiak	47	39	4	1	0	0	1	1	52	39
Southwest	0	0	7	7,774	13	13,954	24	28,186	44	49,914
Totals	**118**	**211**	**55**	**11,080**	**16**	**13,957**	**35**	**88,085**	**224**	**113,330**

USDA Forest Service Fires and Acres Burned by Management Option										
Forest	Critical		Full		Modified		Limited		Totals	
	Fires	Acres	Fires	Acres	Fires	Acres	Fires	Acres	Fires	Acres
Chugach N.F.	2	<1	0	0	1	<1	0	0	3	<1
Tongass N.F.	1	<1	3	<1	2	<1	4	1	10	1
Totals	**3**	**<1**	**3**	**<1**	**3**	**<1**	**4**	**1**	**13**	**2**

0 indicates less than .5 acres burned

Control Efforts:

Before the onset of the summer fire season, preventative measures were undertaken in the vicinity of Fairbanks. In alignment with the Alaska Enhanced Smoke Management Plan (ESMP) and DEC 18 AAC 50, Air Quality Control, the AFS executed mitigation efforts by conducting prescribed

burns on the military reservation ranges.

The Stuart Creek 2 and Mississippi regions are designated military training areas where live fire exercises take place throughout the year. Since these exercises can act as potential ignition sources, these regions undergo burning or "black-lining" every spring. Black-lining is a technique where the outer edges of a designated area are deliberately burned. Should a fire spark within the training zone, this charred perimeter ensures the fire remains contained within the black-lined boundary.

The arid conditions, the prevalence of natural ignition sources like lightning, combined with Alaska's vast and remote landscape, make it exceptionally challenging to manage wildfires. Given Alaska's isolation and rugged terrain, firefighting becomes not only costly but also time intensive. In many cases, fires are merely observed rather than actively combated due to these challenges (as noted by NOAA in their 1999 report on U.S. critical weather patterns). Indeed, many such fires aren't subdued by human efforts but are naturally doused by wetter weather conditions.

In response to these unique challenges, Alaska's state authorities, federal land agencies, and indigenous tribes collaboratively formulated the Alaska Interagency Wildland Fire Management Plan (AIWFMP). This comprehensive plan mandates an annual review by land managers and owners, assessing the fire protection requisites for territories under their jurisdiction. Based on this evaluation, lands are classified under Critical, Full, Modified, or Limited management categories. The categorization is influenced by the directives of land managers/owners, the inherent value of the assets to be safeguarded, and broader land and resource management goals.

The fire management tactics employed differ based on the category: from aggressive initial responses and ongoing suppression in Critical and Full management zones to mere monitoring in the Limited zones. This structured approach ensures that:

- People, personal property, and key resources are provided apt protection in line with available firefighting assets.
- Firefighting expenditures align with the intrinsic value of the assets being safeguarded.
- Land overseers can effectively meet their specified management goals.

Furthermore, the AIWFMP acknowledges the ecological significance of fires sparked by lightning in the boreal forest and arctic tundra ecosystems. Total suppression of such fires is not only ecologically misaligned but also financially impractical. While the natural role of fires in these ecosystems is recognized, it is also balanced against the imperative to safeguard human lives, health, personal assets, infrastructure, and select natural and cultural treasures.

During intensified fire seasons, firefighting resources might become scarce due to engagement in multiple initial responses or in combating expansive fires. Prioritizing territories before the fire season, as per the AIWFMP, helps dictate the allocation of firefighting forces, thereby enhancing the financial and operational efficiency of wildfire management.

A significant part of the state has been categorized under Modified or Limited management. The Modified management approach offers maximum flexibility to land managers and owners. Its primary goal is to amplify protection during times of high fire danger, when there's a significant likelihood of fire spreading, and the chances of containment are minimal. However, as fire threats reduce, this approach offers less protection. The Modified option aims to strike a balance between suppressing fire and managing costs, rather than merely minimizing fire damage. It's a middle ground between Full and Limited management.

The Limited management approach, on the other hand, suggests minimal fire intervention. It is employed in areas where the expense of fire suppression might surpass the resource's value, where fire suppression could harm the environment more than the fire itself, or where excluding fire could harm ecosystems that rely on it. This strategy aims to reduce both immediate and long-term suppression costs and risks. It acknowledges that in certain conditions, fires might surpass the designated boundaries despite suppression efforts. Some areas within the Limited management might need higher protection, and suitable suppression measures will be applied accordingly without undermining the broader strategy.

DEC has initiated various fire prevention and public health protection strategies. Before the fire season kicks in, measures are taken as per the Alaska Enhanced Smoke Management Plan (ESMP) and DEC 18 AAC 50 for air quality. DEC oversees smoke management in Alaska with the help of ESMP, ensures controlled burns aligned with state air quality norms, and approves land clearing requests. The ESMP emphasizes that evaluating smoke emission dispersion is crucial for effective management. Projects involving controlled burns on land over 40 acres annually require an approved permit. Moreover, the Responsible Authority must inform DEC a day before the burning by phone, get a favorable forecast from the National Weather Service, and gain approval from a DEC meteorologist. While these burns help in reducing fire fuel, they don't eradicate the threat entirely.

DEC also issues Air Quality Advisories as per DEC 18 AAC 50 to safeguard public health during low air quality periods. Between June 6 and July 15, 2022, 28 advisories were released due to wildfire smoke. Between June 9 and July 25, 2024, 13 advisories were issued for regions including Fairbanks. More advisories were sent out for other regions including the Western Interior and North Slope. For a detailed breakdown of Central and Eastern Interior Alaska advisories, refer to Appendix B.

The Event Affected Air Quality

The $PM_{2.5}$ 24-hour concentrations measured at the Fairbanks NCore, A-Street, and North Pole Hurst Road primary monitors reflect the unusual fire conditions during the events. Table 6 lists the 24-hour $PM_{2.5}$ concentrations of samples collected by the FRM and BAM monitors from June through July 2024. Summer 2024 $PM_{2.5}$ concentrations were significantly higher than the annual summer average (June 1-August 31) of 4.5 $\mu g/m^3$ for 1999-2019, without wildland fire smoke. In 2024, the smoke and $PM_{2.5}$ levels varied due to changes in fire spread, suppression efforts, and shallow, surface-based inversions. This prolonged exposure resulted in seven 24-hour $PM_{2.5}$ exceedances, and FNSB also recorded thirteen days over the 9 $\mu g/m^3$ annual $PM_{2.5}$.

Table 6. 2024 NCore, A-Street, and Hurst Road 24-hour $PM_{2.5}$ concentrations

June 2024							
24-Hour $PM_{2.5}$ Concentrations ($\mu g/m^3$)							
Date	NCore FRM 1	NCore BAM	A-St FRM	A-St BAM	HURST FRM 1	HURST FRM 2	HURST BAM
9	**10.3**	8.3	**9.7**	**9.5**			**16.8**
10	**9.6**	**9.3**	**9.7**	**10.2**			**9.9**
12	**14.3**	**24.8**	**14.4**	**19**	**31.3**		**34.7**
20	**13**	**14.3**	**14**	**17.9**		**18.6**	**20.1**
21	6.4	**11.4**	**9.2**	**11.6**	**14.4**		**15.8**
23	7.9	11.5	7.7	7.6	**10.4**	**10.7**	**11.4**
24	**48.5**	**56.8**		**51.6**	**52**		**54.9**
25	**52.6**	**65.3**	**60.1**	**69**	**123.7**		**130.5**
26	**68.8**	**49.7**	**64.8**	**34.6**	**57.3**	**36.8**	**40**
27	**29.3**	**35.2**	**25.3**	**28**			**15.5**
28	**68.6**	**79.6**	**64.8**	**73.8**	**57.3**		**59.9**
29	**94.3**	**104.5**	**95.6**	**106.2**	**119**	**118.6**	**123.4**
30	**237.3**	**218.8**	**113.6**	**217.3**	**144.4**		**145.2**

July 2024							
24-Hour $PM_{2.5}$ Concentrations ($\mu g/m^3$)							
Date	NCore FRM 1	NCore BAM	A-St FRM	A-St BAM	HURST FRM 1	HURST FRM 2	HURST BAM
1		**72.8**	**57.2**	**38.8**	**45.6**		**44.8**
2	**15.2**	**21.1**	**15.2**		**24.1**	**23.4**	**26.4**
3	**15.8**	**20.4**	**15.3**		**24.4**		**24.1**
22	8.1	**12.6**	8.0	8.0	**10.3**		**10.5**
23	**9.7**	**15.2**	**9.1**	**9.0**	**12.7**	**12.8**	**14.3**
24	**17.8**	**23.5**	**17.4**	**18.3**	**22.5**	**21.6**	**23.7**
25	**15.0**	**21.1**	**14.4**	**13.6**	**20.4**		**22.0**

Black Bolded Values indicate an exceedance of the Annual NAAQS (9 $\mu g/m^3$)

Red Bolded Values indicate an exceedance of the 24-hour NAAQS (35.5 $\mu g/m^3$)

7 days over 35.5 **13 Days over 9 < 35.5**

20 Days Total

$PM_{2.5}$ Concentrations Exceeded Historical Fluctuations

Summertime $PM_{2.5}$ concentrations in the interior of Alaska are directly related to wildfires. In recent years the frequency and extent of wildland fires are increasing and summers without any wildland fire smoke impacts on the Fairbanks North Star Borough are becoming uncommon. To evaluate $PM_{2.5}$ concentrations in the absence of fire is becoming progressively difficult.

Analysis of the FRM filter data from Fairbanks State Office Building (SOB), NCore, and the North Pole Hurst Road sites showed an average summertime 24-hour $PM_{2.5}$ concentration of 3.6 $\mu g/m^3$ when wildfires were excluded. This value was computed by averaging all data for June through August 2000 through 2021 after removing any data impacted by wildland fire smoke, which gets flagged in AQS as an exceptional event or unreliable data. Data were only flagged above the value of the former annual $PM_{2.5}$ standard of 12 $\mu g/m^3$ regardless of smoke impact on days with lower concentrations. When comparing mean concentrations for June through August of the four years with low wildland fire activity (2008, 2024, 2026, and 2020), average $PM_{2.5}$ concentrations range from 2.8 $\mu g/m^3$ to 3.5 $\mu g/m^3$ depending on the monitoring site. Mean concentrations are at 3.0 $\mu g/m^3$ and below if data from 2020 is excluded, see Table 7.

Table 7. Low Fire Years Summer Mean Concentrations

Site	%	2008	2014	2016	2020	Avg	Average without 2020
	98% percentile	8.1	4.8	6.8	N/A	**6.6**	**6.6**
SOB	mean	2.9	2.9	2.7	N/A	**2.8**	**2.8**
	98% percentile	N/A	5.7	7	9.8	**7.5**	**6.4**
NCore	mean	N/A	2.9	2.8	3.2	**3.0**	**2.8**
	98% percentile	N/A	N/A	7.7	8.8	**8.3**	**7.7**
Hurst Road	mean	N/A	N/A	3.0	4.0	**3.5**	**3.0**
	98% percentile	N/A	N/A	N/A	7.9	**7.9**	N/A
A-Street	mean	N/A	N/A	N/A	3.2	**3.2**	N/A

Another conservative measure of concentrations to be expected for summers without appreciable wildland fire smoke impacts is using the 98th percentile of low fire summer concentrations. Table 7 shows the 98th percentile for four years identified as low fire years. While 2020 was a low fire year in Alaska, wildland fire smoke from Siberia drifted into the state numerous times and elevated the air quality into the moderate range, so calculations were done with and without including the data from 2020. The average $PM_{2.5}$ 98th percentile concentration for these three to four years range between 6.6 µg/m^3 at the SOB site and 7.7 µg/m^3 (8.8 µg/m^3 when 2020 is included) at Hurst Road. For A-Street, data was only available for 2020 for a 98th percentile of 7.7 µg/m^3. The data clearly show that in the absence of wildland fire smoke, concentrations are well below the new annual standard. On the other hand, as wildland fire is part of the Alaskan ecosystem, any fire in the state or neighboring countries could impact the air quality and raise concentrations into the moderate AQI range. Table 7 calculations can be viewed in Appendix A.

Table 8. Fire Years

Year	Acres burned	# Fires
2000	756,296	369
2001	218,113	351
2002	2,186,682	544
2003	602,146	465
2004	6,523,816	696
2005	4,649,597	624
2006	270,539	305
2007	649,411	506
2008	103,299	368
2009	2,951,592	527
2010	1,125,419	688
2011	293,018	515
2012	286,888	418
2013	1,320,752	612
2014	293,202	377
2015	5,150,673	766
2016	500,949	572
2017	652,904	353
2018	411,176	362
2019	2,589,893	719
2020	181,253	340
2021	254,500	389
2022	3,182,976	590
2023	295,764	343
2024	667,060	374
Avg.	1,444,717	487

Wildfires occur in Alaska every year, primarily between June and September. In the last 25 years, the average annual acreage burned by wildfire in Alaska is 1,444,717 acres. However, the annual acreage burnt can vary greatly, from as low as 103,299 acres in 2008, to 6,523,816 acres in 2004 (Table 8). The number of wildfires and the area burned each year vary with meteorological conditions and locations of fires. Wildfires are at a minimum during years of wet meteorological conditions and can be quite extensive in years with dry to exceptionally dry conditions. The 2024 Alaska wildfire season began quietly in May but turned severe in June as hot, dry weather fueled lightning-sparked fires across the Interior. The McDonald Fire, ignited by lightning on June 21, rapidly expanded along the Richardson Highway, threatening homes and triggering evacuations in nearby communities. Thick smoke from the blaze significantly degraded air quality in Fairbanks and North Pole from late June into early July.

Figure 7. shows a comparison of the $PM_{2.5}$ concentrations for each fire season for the years 2000 to 2024. DEC defined the fire season as the period from June 1 through August 31 for each year since these dates included all $PM_{2.5}$ exceedances and the major fire periods. "Fire years" are those years where many fires occur on more than one occasion during the year. These fires impact the $PM_{2.5}$ concentrations in FNSB. The summer of 2004 was the worst fire year since record keeping began in Alaska. If the 2004 data were displayed completely in Figure 7, the upper (green) box would be over 300 and the whisker would be well over 700. This would make all other years of

data virtually unreadable due to their disproportionately small size when displayed.

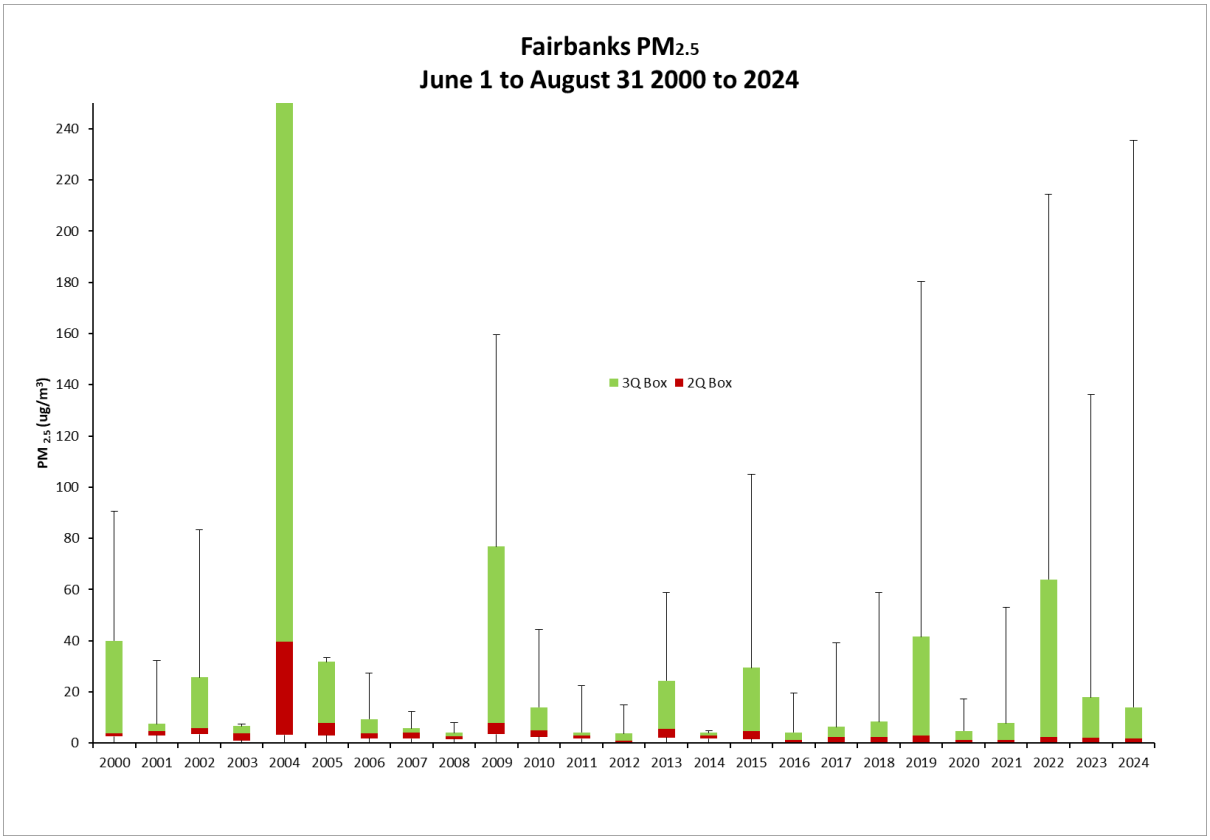

Figure 7. Fairbanks $PM_{2.5}$ for the fire seasons year 2000-2024. The upper box (green) represents data from the median to the 90th percentile. The lower (red) boxes represent data from the median down to the 10th percentile. The "whiskers" indicate the values between the top (bottom) of the box, 90th (10th) percentile to the highest (lowest) values.

Despite 2024 being a notably low-fire year in Alaska, with 385 fires burning 664,092.5 acres, $PM_{2.5}$ concentrations in Fairbanks North Star Borough (FNSB) were significantly elevated. This spike was driven by the proximity of large lightning-ignited fires, including the McDonald Fire, which ignited on June 21 and ranged within 100 km of FNSB air quality monitors. The resulting smoke heavily impacted air quality in Fairbanks during June and July, contributing to 99% of $PM_{2.5}$ levels from lightning-caused fires. The chart illustrates this with a 3Q box reaching around 60 µg/m³, indicating poor air quality despite the season's relatively low fire activity compared to historical peaks like 2004, which saw far greater $PM_{2.5}$ levels due to more extensive burning.

Clear Causal Relationship

This section establishes the clear causal relationship between the smoke from the wildland fires in the Interior of Alaska during the summer of 2024 and the $PM_{2.5}$ concentrations in FNSB measured between June 9, 2024, and July 24, 2024. The following section describes the major fires impacting air quality in FNSB during these periods. This includes a daily description of fire locations, measured $PM_{2.5}$ concentrations, Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) backward trajectory forecasts, meteorological observations, and other pertinent data for each day as needed to show the origin and extent of fire smoke. These products are arranged in chronological order on a day-to-day basis and shown for each day of the event. Along with these products, a narrative details the daily changes.

The dry and hot conditions discussed in the meteorology section above set the stage for the fires around FNSB. On June 29, 2024, the Alaska Fire Service, Predictive Services Branch issued the first of three "Fuels and Fire Behavior Advisories". Part of this advisory is quoted below (Complete advisory is available in Appendix E):

Fuels and Fire Behavior Advisories

Central to Northeast Interior Alaska
Valid: June 29 – July 12, 2024

Subject: Exceptional landscape flammability and widespread ongoing large fire growth.

Discussion: The Buildup Index (BUI) is the best indicator of seasonal severity and overall flammability of fuels in Alaska. It represents deeper drying in the duff layers and greater fuel availability. Large fire growth generally occurs from mid-June to mid-July surrounding the summer solstice when long days and rapid drying can produce elevated BUIs. Southwest Alaska normally experiences shorter periods of high flammability due to marine influences but has had numerous fires burning since the middle of June across a wide swath of the state. The area of most significant fire growth is occurring from the southern central Interior, through the northeast Interior to the Canadian border. Hot weather and a dry air mass has put BUIs at near-record levels.

Description of Major Fires:

In 2024, there were 374 wildland fires in Alaska with a total of 667,060 acres burned. The total acreage is well below the average acreage burned annually in Alaska for the last 25 years (Table 8). The elevated $PM_{2.5}$ levels measured in Fairbanks in the summer of 2024 were related to the location of the fires in relation to FNSB.

Figure 8 illustrates the proximity of fires to Fairbanks. Significant fire activity in southwest Alaska, shown in Figure 11B, was triggered by lightning strikes in the first week of June. Despite their considerable distance, smoke from these fires enveloped the Alaska Range to the east and drifted over the Tanana Flats, resulting in notably high $PM_{2.5}$ levels in FNSB early in the fire season. Figure 8 highlights fires within 200 km and 100 km of FNSB. Due to the location of the fires, shifts in wind direction consistently resulted in elevated $PM_{2.5}$ levels affecting FNSB. Figure 9 provides a summary of fires that exceeded 1,000 acres within 200 km of FNSB and the total acreage burned by each at the end of the fire season.

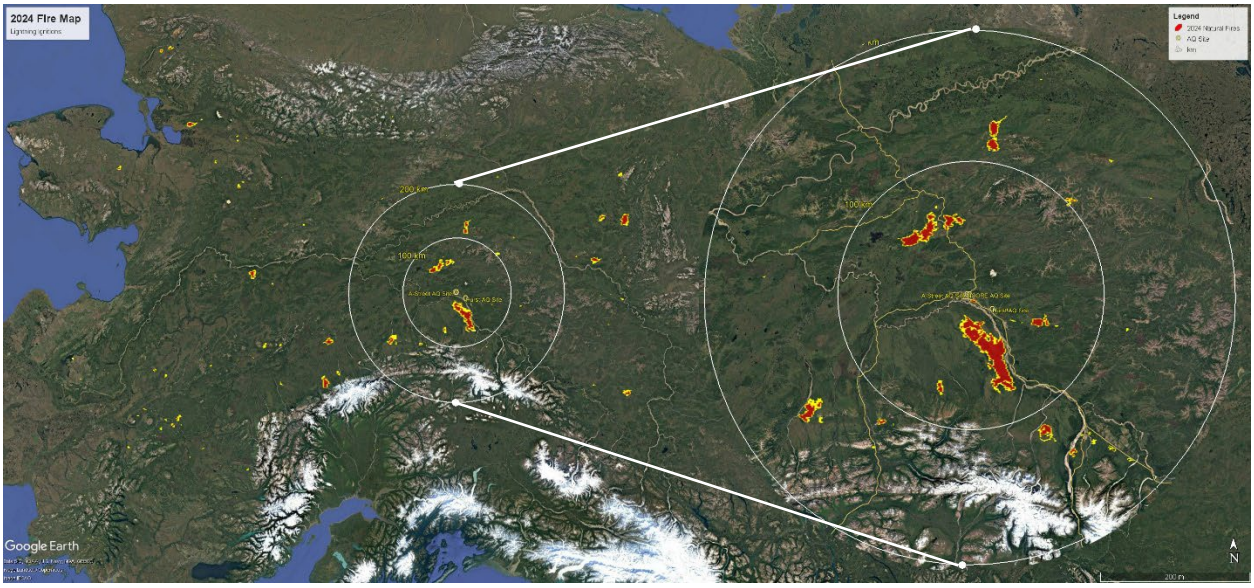

Figure 8. Interior wildland fires during the June-July event are outlined in yellow.

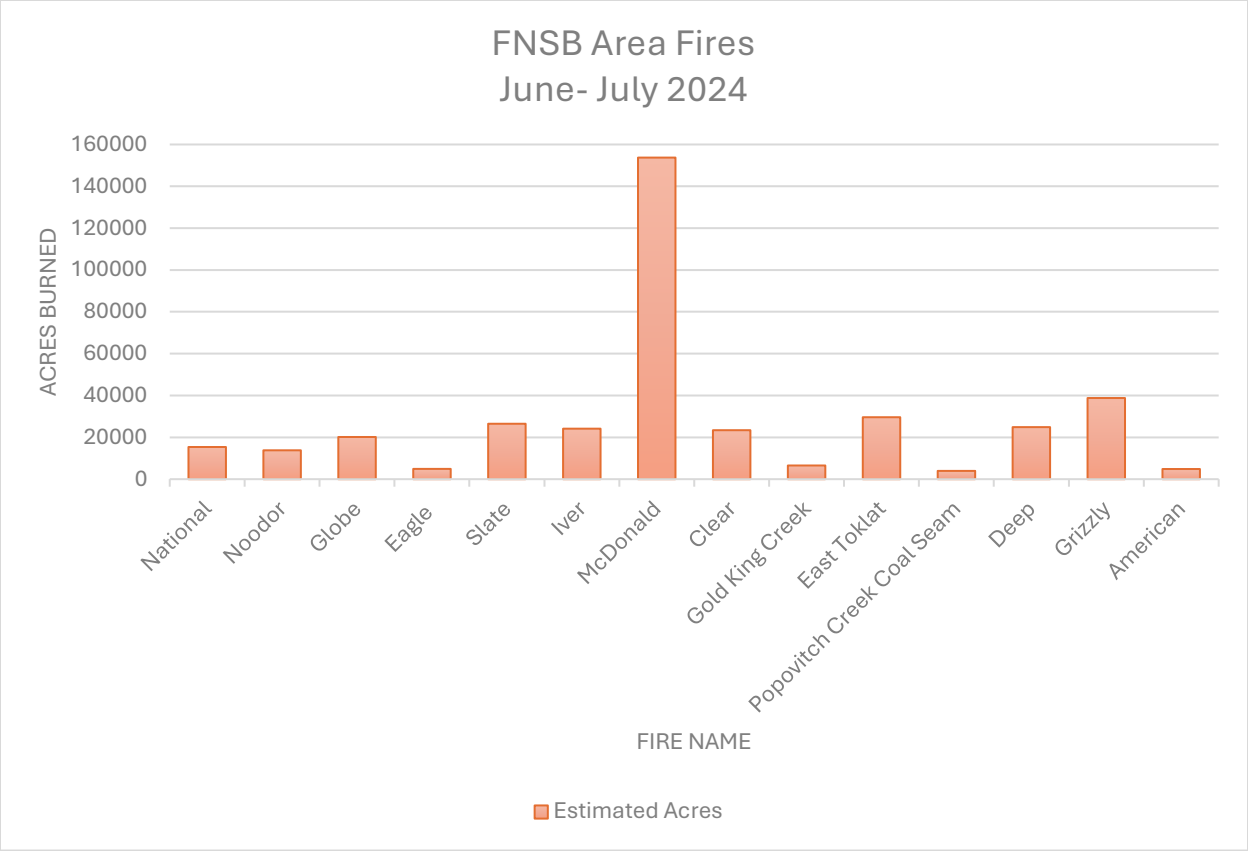

Figure 9. 2024 Fire Season, Fires over 1,000 acres, within 200 km of FNSB.

Daily Breakdown of the Event:

The daily fluctuations in $PM_{2.5}$ concentrations in Fairbanks from June 9 to July 25 are analyzed using terrain maps, satellite imagery, and modeling. For each day, the analysis incorporates AICC Situation Reports (Appendix F), Moderate Resolution Imaging Spectroradiometer (MODIS) satellite images, HYSPLIT model forecasts presented on terrain maps and MODIS imagery, along with hourly $PM_{2.5}$ readings. These assessments are supported by observational data, meteorological insights, and information on firefighting efforts.

$PM_{2.5}$ concentration data primarily comes from the Fairbanks NCore, A-Street and Hurst Road FRMs. All primary FRM samplers operate on a daily sample schedule collecting 24-hour sample filter particulate data. Secondary data are gathered from a co-located FRM samplers operating on a 1-in-3 day sampling schedule at the NCore and Hurst Road sites. Additionally, continuous $PM_{2.5}$ measurements are obtained from a beta attenuation monitor (BAM) co-located at all sites.

All weather observation data were downloaded from the National Climate Data Center (NCDC) and were subject to their quality control (http://www7.ncdc.noaa.gov/CDO/dataproduct). The MODIS imagery was downloaded from either http://www.arl.noaa.gov/HYSPLIT_info.php or

https://worldview.earthdata.nasa.gov/. The HYSPLIT model information and model runs are available online from http://www.arl.noaa.gov/HYSPLIT_info.php.

$PM_{2.5}$ data underwent quality assurance and control by DEC staff to ensure they meet the requirements as defined in the State Quality Assurance Plan. DEC provides oversight of FNSB data collection, processing, and quality assurance and certifies all Fairbanks data entered in AQS, EPA's national ambient air monitoring database.

All days with $PM_{2.5}$ concentrations above 9 $\mu g/m^3$ from June 9-10, 12 and 20-30, and July 1-3 and 22-25, 2024, are being submitted as one exceptional event. The cause of increased $PM_{2.5}$ concentrations throughout the entire period was wildfire smoke. Daily $PM_{2.5}$ concentrations varied with meteorological conditions and fire development or suppression. Wind direction (WD) and fire location were the most important components with which to predict high $PM_{2.5}$ concentrations. The following 2024 daily data can be referenced in Appendix C, 2024 Daily Data.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 9, 2024

AICC Fire Report Summary:

- **New Fires:** 5 new fires reported.
- **Total Fires Statewide:** 23 fires burning.
- **Acres Burned:** 7,775 acres, with a 24-hour increase of 1,015 acres.

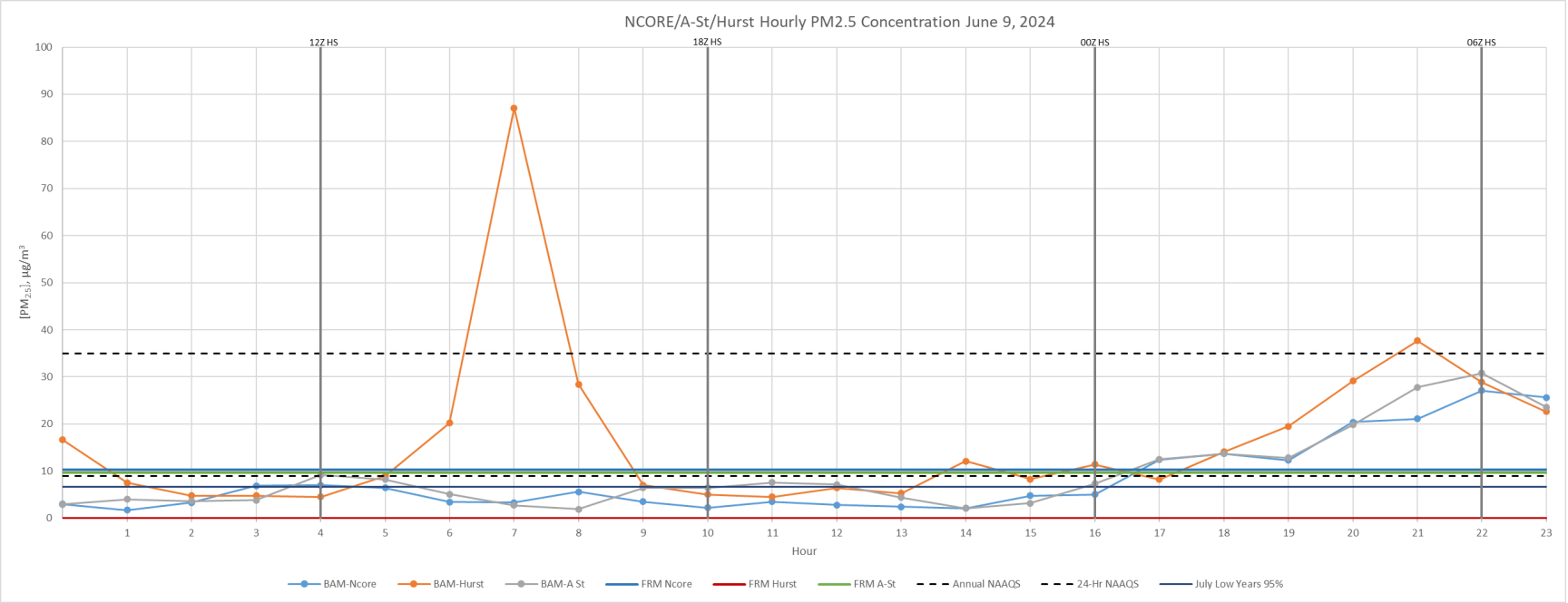

Figure 10: FNSB $PM_{2.5}$ concentrations for June 9, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 9, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: $PM_{2.5}$ levels started low, with all sites measuring below 10 µg/m³ in the early morning hours. A sharp spike occurred at the BAM-Hurst site, reaching approximately 90 µg/m³ around 7:00 AM, indicating a brief period of poor air quality.
Midday Levels: Following the morning peak, concentrations dropped significantly, remaining low (around or below 10 µg/m³) through late morning and into the afternoon across all sites.
Afternoon to Evening Levels: Starting in the late afternoon, $PM_{2.5}$ levels began to rise steadily. By mid-evening, around 9:00 PM, the BAM-Hurst site recorded a peak of approximately 38 µg/m³, while other sites also saw increases, with several readings approaching or exceeding 35 µg/m³.

Overall Trend: On June 9, 2024, $PM_{2.5}$ concentrations fluctuated significantly. After starting low with a notable early morning spike at Hurst, levels remained stable and low during midday before rising again in the late afternoon and evening. By evening, all sites exceeded the 24-hour National Ambient Air Quality Standard (NAAQS) of 35 µg/m³ (upper dashed black line), and the annual NAAQS limit of 9 µg/m³ (lower dashed line) was surpassed for most of the day, particularly during the morning spike and evening increase. These trends highlight periods of degraded air quality, influenced by nearby wildfire smoke.

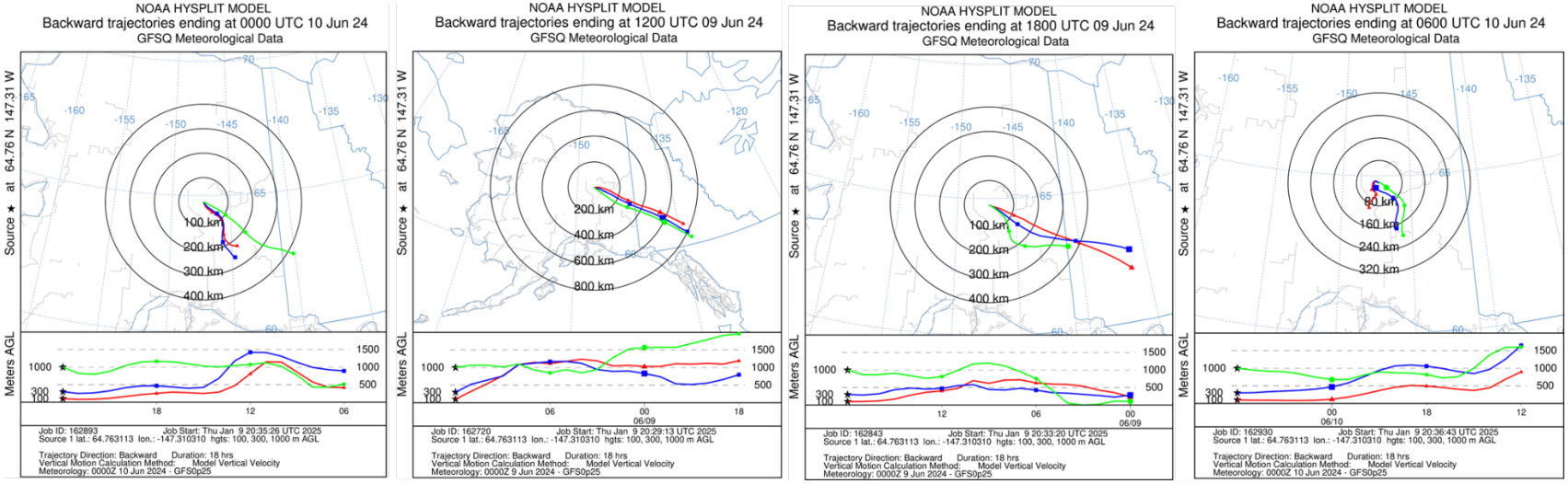

Figure 11: NOAA HYSPLIT model backward trajectories for June 9, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 9 to June 10, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below the map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (00:00 UTC, June 9, 2024): This image shows the backward trajectory ending at midnight UTC on June 9. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originated from the west and southwest, converging towards the target location. The vertical profile below the map shows that air parcels at all altitudes remained below 1000m AGL, suggesting that pollutants, such as smoke from the McDonald Fire, were likely transported at lower levels, potentially impacting surface air quality.

Image 2 (12:00 UTC, June 9, 2024): The second image captures the backward trajectory ending at midday UTC on June 9. The air parcels' pathways highlight movement from the southwest at 100m (red) and 300m (blue), while the 1000m (green) trajectory shows influence from the west. The vertical profile indicates that air parcels at 100m and 300m remained below 500m AGL, while the 1000m trajectory briefly ascended to around 1500m AGL before descending, providing clues about potential pollutant sources upwind, likely related to the McDonald Fire's smoke plume.

Image 3 (18:00 UTC, June 9, 2024): The third image displays the backward trajectory ending in the late afternoon UTC on June 9. It shows a consistent pattern with the earlier images, with air parcels at 100m (red) and 300m (blue) tracing back to sources located southwest, while the 1000m (green) trajectory originates from the west. The vertical profile shows air parcels at 100m and 300m staying below 500m AGL, and the 1000m trajectory descending from around 1000m AGL, indicating continued influence from these directions and potential transport of smoke at lower altitudes.

Image 4 (06:00 UTC, June 10, 2024): The final image in this series illustrates the backward trajectory ending early in the morning UTC on June 10. The convergence of air parcels at 100m (red) and 300m (blue) from the southwest, and at 1000m (green) from the west, aligns with the previous observations, reinforcing the pattern of pollutant transport from these regions. The vertical profile shows air parcels at 100m and 300m remaining below 500m AGL, while the 1000m trajectory descends from around 1000m AGL, suggesting that smoke from the McDonald Fire likely continued to impact the area at lower levels.

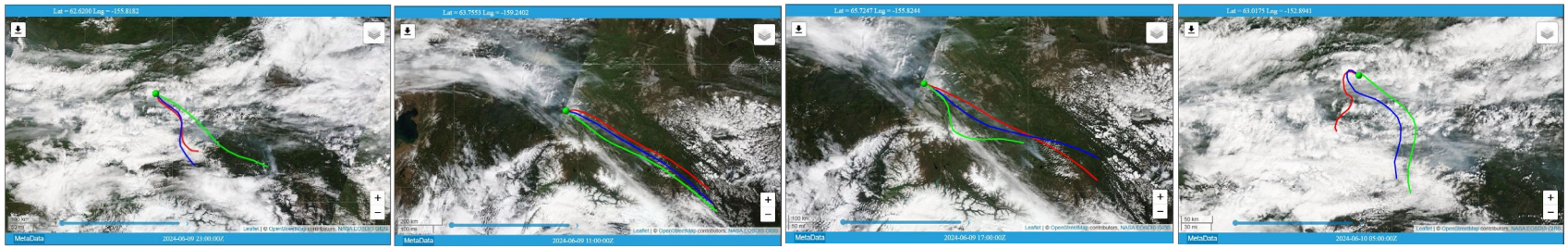

Figure 12: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 9, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 4 (06:00 UTC, June 9, 2024): This image shows the backward trajectory ending in the late evening at a point in the FNSB. The air parcels' pathways highlight movement originating in the southeast but wrapping in from the northwest during the last few hours of the trajectory.

Smoke Transport: The imagery shows smoke plumes moving from fires located north of Fairbanks. The northwest wind direction has likely facilitated the transport of smoke from these fires into the FNSB, contributing to elevated $PM_{2.5}$ levels.

Table 9. Hourly surface observation for Fairbanks International Airport, June 9, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	06/09/2024 00:53 AKDT	7	50			10	64	35
PAFA	06/09/2024 01:53 AKDT	7	60			10	64	34
PAFA	06/09/2024 02:53 AKDT	3	50			10	62	37
PAFA	06/09/2024 03:53 AKDT	7	10			10	61	37
PAFA	06/09/2024 04:53 AKDT	7	30			10	62	38
PAFA	06/09/2024 05:53 AKDT	6	40			10	61	45
PAFA	06/09/2024 06:53 AKDT	6	190			10	65	46
PAFA	06/09/2024 07:53 AKDT	5	330			10	65	44
PAFA	06/09/2024 08:53 AKDT	6	30			10	67	46
PAFA	06/09/2024 09:53 AKDT	3	90			10	70	42
PAFA	06/09/2024 10:53 AKDT	6	90			10	71	40
PAFA	06/09/2024 11:53 AKDT	6	70			10	73	39
PAFA	06/09/2024 12:53 AKDT	10	100			10	75	35
PAFA	06/09/2024 13:53 AKDT	5	90			10	77	38
PAFA	06/09/2024 14:53 AKDT	0	0			10	78	39
PAFA	06/09/2024 15:53 AKDT	3	210			10	78	40
PAFA	06/09/2024 16:53 AKDT	3				10	80	35
PAFA	06/09/2024 17:53 AKDT	7	230			10	81	35
PAFA	06/09/2024 18:53 AKDT	5	250			10	81	36
PAFA	06/09/2024 19:53 AKDT	6	240			10	80	40
PAFA	06/09/2024 20:53 AKDT	5	250			10	76	44
PAFA	06/09/2024 21:53 AKDT	3	300			10	76	39
PAFA	06/09/2024 22:53 AKDT	0	0			9	70	45
PAFA	06/09/2024 23:53 AKDT	0	0		13	10	67	51

Surface observations: The surface observations from June 9, 2024, reduced visibility due to smoke, in the late evening. Visibility at the PAFA station in Fairbanks dropped to 9 statute miles by 22:53 UTC, coinciding with a shift in wind direction to 300° (northwest). These observations align with the $PM_{2.5}$ concentration data and HYSPLIT trajectories, indicating smoke transport into the Fairbanks area from fires to the north at different times of the day.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 10, 2024

AICC Fire Report Summary:

- **New Fires:** 1 new fire reported.
- **Total Fires Statewide:** 11 fires burning.
- **Acres Burned:** 13,455 acres, with a 24-hour increase of 5,680 acres.

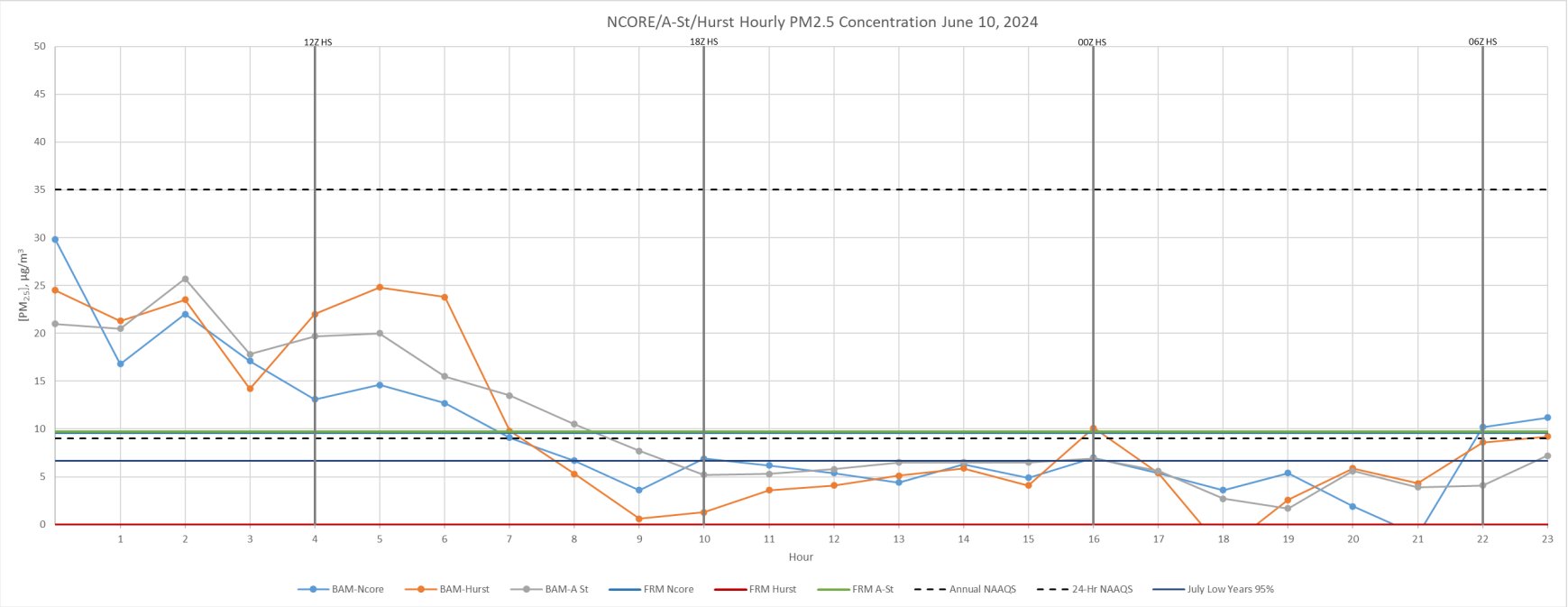

Figure 13: FNSB $PM_{2.5}$ concentrations for June 10, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 10, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: $PM_{2.5}$ levels were elevated early, with all sites measuring above 20 µg/m³ in the early morning hours. A gradual decline occurred for all sites.
Midday Levels: Concentrations stabilized and dropped through the late morning and early afternoon, settling around 5-10 µg/m³ at all sites. This period reflected a temporary improvement in air quality, with levels meeting the annual NAAQS limit.
Afternoon to Evening Levels: $PM_{2.5}$ levels remained relatively consistent in the afternoon, hovering near 10 µg/m³, before a gradual decrease began around 6:00 PM.

Overall Trend: On June 10, 2024, $PM_{2.5}$ concentrations started with moderate variability in the early morning, peaked modestly at Hurst, and then leveled off during midday. All values stayed below the 24-hour NAAQS threshold of 35 µg/m³ (upper dashed black line). The annual NAAQS standard of 9 µg/m³ (lower dashed line) was exceeded intermittently, particularly in the morning, suggesting mild air quality concerns possibly due to early regional wildfire activity.

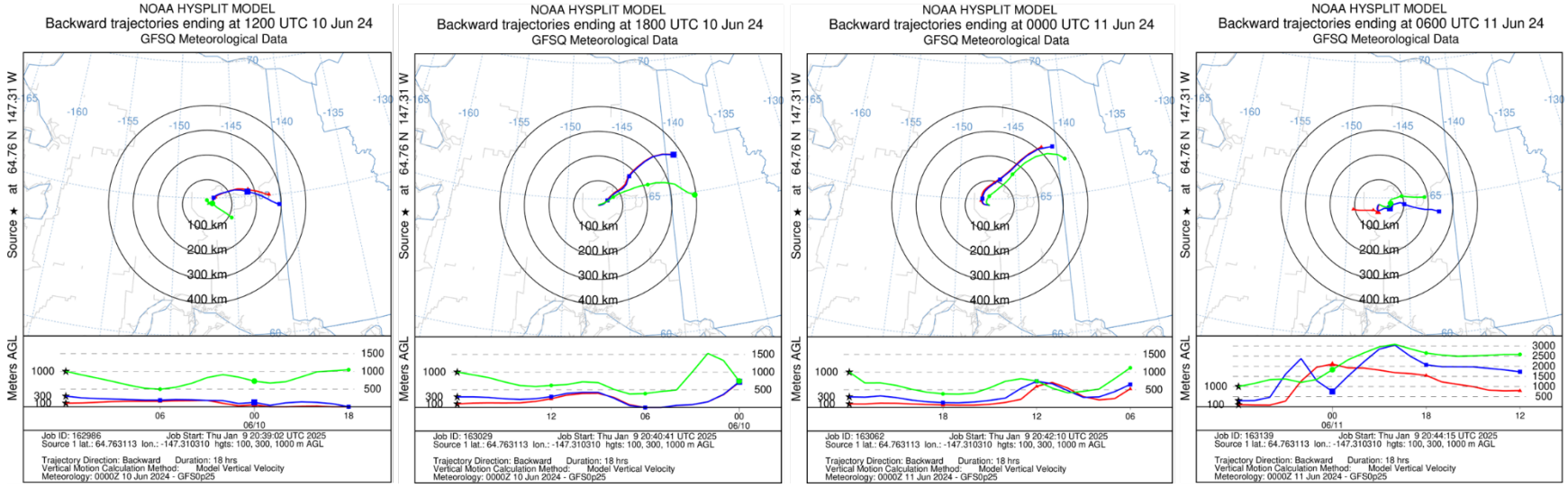

Figure 14: NOAA HYSPLIT model backward trajectories for June 10, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).
The above images provide NOAA HYSPLIT model backward trajectories for June 10 to June 11, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each

map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 10, 2024): This image shows the backward trajectory ending at midday UTC on June 10. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originated from the southwest and west, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m remained below 500m AGL, while the 1000m trajectory ascended to around 1500m AGL before descending, suggesting that pollutants, possibly from regional sources, were transported at lower levels with some mixing at higher altitudes.

Image 2 (18:00 UTC, June 10, 2024): The second image captures the backward trajectory ending in the late afternoon UTC on June 10. The air parcels' pathways highlight movement from the southwest at 100m (red) and 300m (blue), while the 1000m (green) trajectory shows influence from the west. The vertical profile indicates that air parcels at 100m and 300m stayed below 500m AGL, with the 1000m trajectory peaking at around 1000m AGL, providing clues about potential pollutant sources upwind, likely related to regional emissions or earlier fire activity.

Image 3 (00:00 UTC, June 11, 2024): The third image displays the backward trajectory ending at midnight UTC on June 11. It shows a consistent pattern with the earlier images, with air parcels at 100m (red) and 300m (blue) tracing back to sources located southwest, while the 1000m (green) trajectory originates from the west. The vertical profile shows air parcels at 100m and 300m remaining below 500m AGL, and the 1000m trajectory descending from around 1000m AGL, indicating continued influence from these directions and potential transport of pollutants at lower altitudes.

Image 4 (06:00 UTC, June 11, 2024): The final image in this series illustrates the backward trajectory ending early in the morning UTC on June 11. The convergence of air parcels at 100m (red) and 300m (blue) from the southwest, and at 1000m (green) from the west, aligns with the previous observations, reinforcing the pattern of pollutant transport from these regions. The vertical profile shows air parcels at 100m and 300m remaining below 500m AGL, while the 1000m trajectory descends from around 1500m AGL, suggesting that pollutants, possibly from regional sources, continued to impact the area at lower levels.

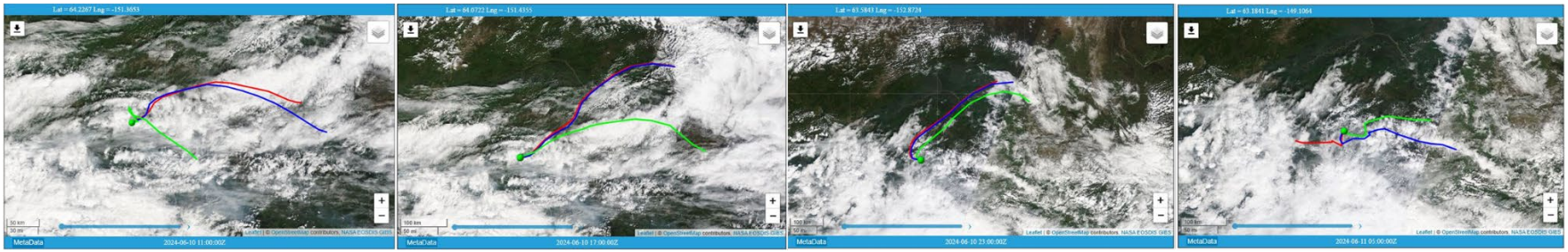

Figure 15: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 10, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 1 (11:00 UTC, June 10, 2024): This image shows the backward trajectory ending in the late morning at a point in the FNSB. The air parcels' pathways highlight movement originating in the southeast, traveling in a relatively straight path before slightly curving and arriving from the southeast.

Smoke Transport The imagery shows smoke plumes in the flats to the south, being transported from the southeast. Given the morning timing, the compressed atmosphere has likely allowed the smoke to reach the surface in the FNSB, contributing to elevated $PM_{2.5}$ levels.

Table 10. Hourly surface observation for Fort Wainwright AAF, June 10, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFB	06/10/2024 00:55 AKDT	3	360		7	5	71	42
PAFB	06/10/2024 01:55 AKDT	6	190		7	6	68	44
PAFB	06/10/2024 02:55 AKDT	0	0		7	6	65	45
PAFB	06/10/2024 03:55 AKDT	0	0		7	6	64	45
PAFB	06/10/2024 04:55 AKDT	0	0		7	6	60	46
PAFB	06/10/2024 05:55 AKDT	3	170		7	6	60	49
PAFB	06/10/2024 06:55 AKDT	3	50		7	6	60	49
PAFB	06/10/2024 07:55 AKDT	3	160		7	6	62	51
PAFB	06/10/2024 08:55 AKDT	0	0			9	65	49
PAFB	06/10/2024 09:55 AKDT	6	210			10	66	44
PAFB	06/10/2024 10:55 AKDT	0	0			10	68	46
PAFB	06/10/2024 11:55 AKDT	7	210			10	69	47
PAFB	06/10/2024 12:55 AKDT	3	160		17	10	69	47
PAFB	06/10/2024 13:55 AKDT	3	210			10	70	49
PAFB	06/10/2024 14:55 AKDT	0	0			10	71	49
PAFB	06/10/2024 15:55 AKDT	9	200			10	72	50
PAFB	06/10/2024 16:55 AKDT	8	230			9	72	50
PAFB	06/10/2024 17:55 AKDT	9	230		13	9	70	52
PAFB	06/10/2024 18:55 AKDT	12	260			10	69	47
PAFB	06/10/2024 19:55 AKDT	7	240			10	68	48
PAFB	06/10/2024 20:55 AKDT	8	240			9	66	47
PAFB	06/10/2024 21:55 AKDT	5	240			10	65	48
PAFB	06/10/2024 22:55 AKDT	0	0			10	64	49
PAFB	06/10/2024 23:55 AKDT	6	20			10	62	49

Surface observations: The surface observations from June 10, 2024, show reduced visibility due to smoke, primarily in the early morning hours. Visibility at the PAFB station in Fort Wainwright AAF dropped to 6 statute miles by 09:55 UTC (01:55 AKDT), coinciding with a southeast wind direction of 130°. These observations align with the $PM_{2.5}$ concentration data and HYSPLIT trajectories, indicating smoke transport into the Fairbanks area from the flats to the south at different times of the day.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 12, 2024

AICC Fire Report Summary:

- **New Fires:** 3 new fires reported.
- **Total Fires Statewide:** 22 fires burning.
- **Acres Burned:** 35,897 acres, with a 24-hour increase of 5,097 acres.

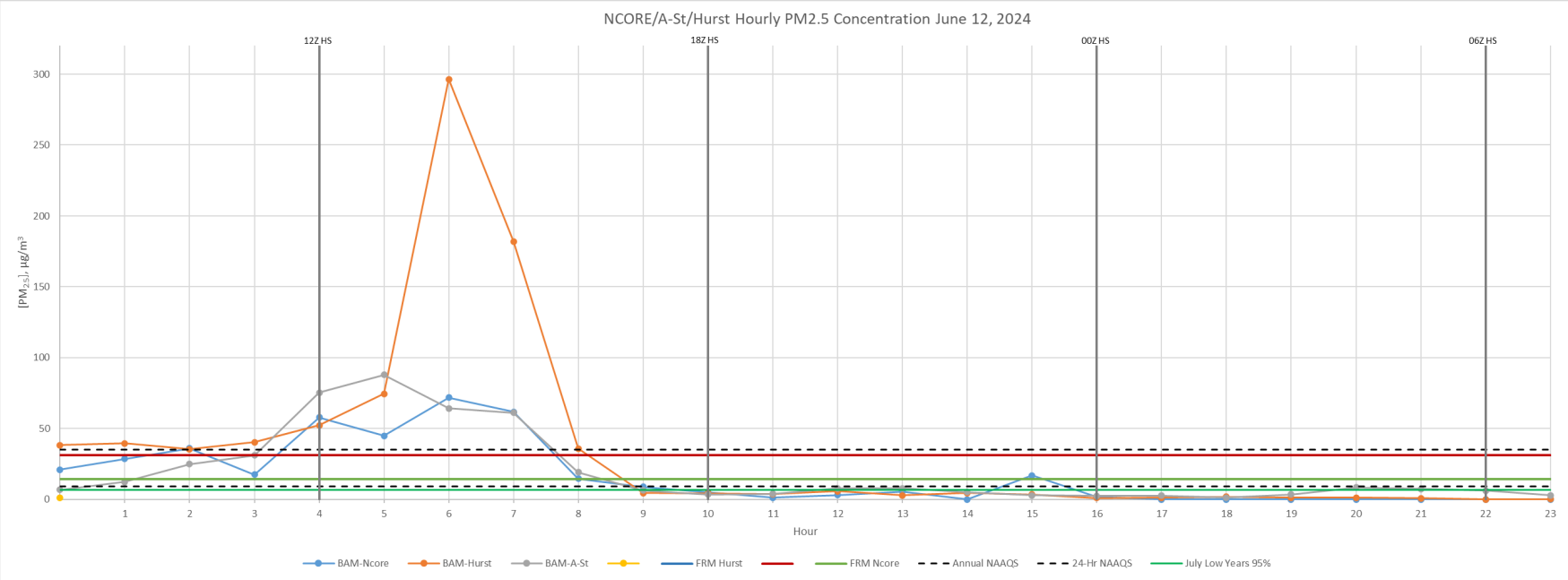

Figure 16: FNSB $PM_{2.5}$ concentrations for June 12, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 12, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day started with elevated PM 2.5 levels, particularly at the BAM-Hurst site, which spiked dramatically to around 300 µg/m³ between 5:00 AM and 7:00 AM. Other sites, such as BAM-NCore and BAM-A-Street, also showed increases, peaking above 50 µg/m³ during this period, indicating a significant air quality decline.
Midday Levels: Following the early morning peak, concentrations dropped sharply by 8:00 AM, with BAM-Hurst falling below 50 µg/m³ and other sites stabilizing around 10–20 µg/m³. This downward trend continued through late morning and early afternoon, with levels remaining relatively low, near the annual NAAQS limit of 9 µg/m³.
Afternoon to Evening Levels: $PM_{2.5}$ levels stayed consistently low throughout the afternoon and evening, fluctuating between 5 and 15 µg/m³ across all sites. No significant increases were observed, suggesting sustained air quality improvement after the morning spike.

Overall Trend: On June 12, 2024, $PM_{2.5}$ concentrations exhibited a dramatic early morning surge, with BAM-Hurst reaching an extreme peak of 300 µg/m³, likely due to early regional wildfire activity. This spike caused all sites to exceed both the 24-hour NAAQS threshold of 35 µg/m³ (upper dashed black line) and the annual NAAQS standard of 9 µg/m³ (lower dashed line) during the early hours. However, levels quickly subsided, remaining below the 24-hour NAAQS for the rest of the day, fluctuating above and below the annual limit.

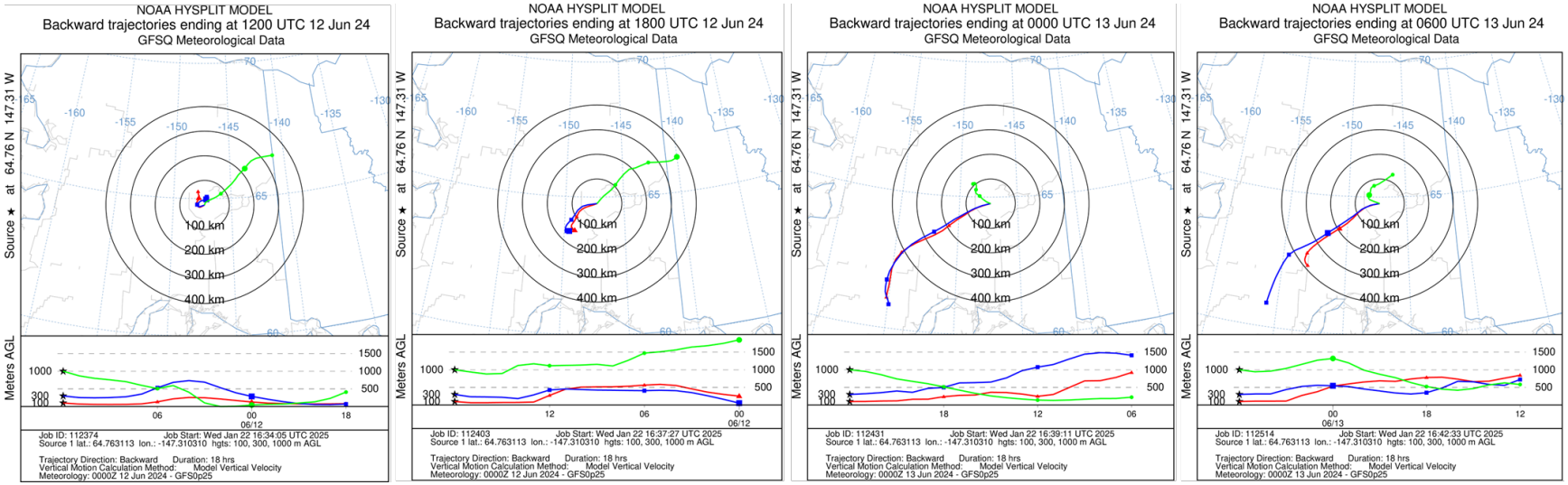

Figure 17: NOAA HYSPLIT model backward trajectories for June 12, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m

AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 12 to June 13, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 12, 2024): This image shows the backward trajectory ending at midday UTC on June 12. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from the southwest, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m remained below 500m AGL, while the 1000m trajectory descended from around 1000m AGL to 500m AGL, suggesting that pollutants, possibly from regional sources, were transported at lower levels with some mixing from higher altitudes.

Image 2 (18:00 UTC, June 12, 2024): The second image captures the backward trajectory ending in the late afternoon UTC on June 12. The air parcels' pathways highlight movement from the southwest at 100m (red), 300m (blue), and 1000m (green). The vertical profile indicates that air parcels at 100m and 300m stayed below 500m AGL, with the 1000m trajectory descending from around 1000m AGL to 500m AGL, providing clues about potential pollutant sources upwind, likely related to regional emissions or fire activity.

Image 3 (00:00 UTC, June 13, 2024): The third image displays the backward trajectory ending at midnight UTC on June 13. It shows a consistent pattern with the earlier images, with air parcels at 100m (red) and 300m (blue) tracing back to sources located southwest, while the 1000m (green) trajectory also originates from the southwest with a slight westward curve. The vertical profile shows air parcels at 100m and 300m remaining below 500m AGL, and the 1000m trajectory descending from around 1000m AGL to 500m AGL, indicating continued influence from these directions and potential transport of pollutants at lower altitudes.

Image 4 (06:00 UTC, June 13, 2024): The final image in this series illustrates the backward trajectory ending early in the morning UTC on June 13. The convergence of air parcels at 100m (red), 300m (blue), and 1000m (green) from the southwest aligns with the previous observations, reinforcing the pattern of pollutant transport from this region. The vertical profile shows air parcels at 100m and 300m remaining below 500m AGL, while the 1000m trajectory descends from around 1000m AGL to 500m AGL, suggesting that pollutants, possibly from regional sources, continued to impact the area at lower levels.

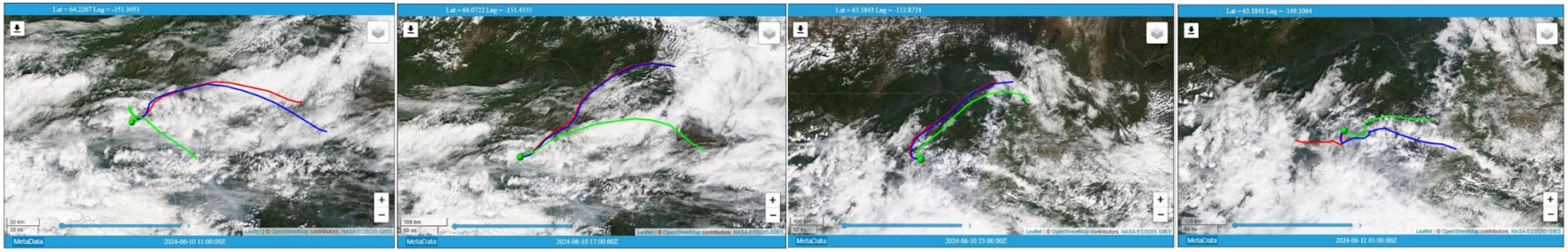

Figure 18: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 12, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 1 (11:00 UTC, June 12, 2024): This image shows the backward trajectory ending in the late morning at a point in the FNSB. The air parcels' pathways highlight movement originating in the southwest, traveling in a relatively straight path before arriving from the southwest.

Smoke Transport: The imagery shows smoke trapped under the clouds over Fairbanks (FBX). The southwest wind direction has likely contributed to the accumulation of smoke in the FNSB, with the cloud cover preventing dispersion and keeping $PM_{2.5}$ levels elevated at the surface.

Table 11. Hourly surface observation for Fairbanks International Airport, June 12,2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	06/12/2024 00:53 AKDT	6	40			10	58	55
PAFA	06/12/2024 01:53 AKDT	3	40			10	57	55
PAFA	06/12/2024 02:53 AKDT	0	0		7	4	57	53
PAFA	06/12/2024 03:53 AKDT	3	100		7	2	57	54
PAFA	06/12/2024 04:53 AKDT	3	180		7	2	56	54
PAFA	06/12/2024 05:53 AKDT	3	220		7	2	56	53
PAFA	06/12/2024 06:53 AKDT	5	180		7	2	56	54
PAFA	06/12/2024 07:53 AKDT	5	220		7	2	56	54
PAFA	06/12/2024 08:53 AKDT	10	230		7	3	59	53
PAFA	06/12/2024 09:53 AKDT	5.75	240			9	60.08	51.98
PAFA	06/12/2024 10:53 AKDT	13	230			10	58	51
PAFA	06/12/2024 11:53 AKDT	14	220	23.02		10	59	51
PAFA	06/12/2024 12:53 AKDT	13	230			10	60	52
PAFA	06/12/2024 13:53 AKDT	13	220			10	59	52
PAFA	06/12/2024 14:53 AKDT	14	230		13	10	57	51
PAFA	06/12/2024 15:53 AKDT	15	230			10	58	51
PAFA	06/12/2024 16:53 AKDT	14	230			10	59	51
PAFA	06/12/2024 17:53 AKDT	10	210			10	59	51
PAFA	06/12/2024 18:53 AKDT	9	210			10	60	51
PAFA	06/12/2024 19:53 AKDT	8	210	19.56		10	60	50
PAFA	06/12/2024 20:53 AKDT	7	220			10	59	50
PAFA	06/12/2024 21:53 AKDT	10	230			10	58	50
PAFA	06/12/2024 22:53 AKDT	12	230			10	57	49
PAFA	06/12/2024 23:53 AKDT	9	240			10	55	49

Surface Observations: The surface observations from June 12, 2024, show reduced visibility due to smoke, primarily in the early morning hours. Visibility at the PAFA station in Fairbanks dropped to 2 statute miles by 11:53 UTC (03:53 AKDT), coinciding with a southwest wind direction of 220°. These observations align with the $PM_{2.5}$ concentration data and HYSPLIT trajectories, indicating smoke trapped under the clouds over FBX and transported into the Fairbanks area from the southwest during the morning hours.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 20, 2024

AICC Fire Report Summary:

- **New Fires:** 6 new fires reported.
- **Total Fires Statewide:** 64 fires burning.
- **Acres Burned:** 71,577 acres, with a 24-hour increase of 6,826 acres.

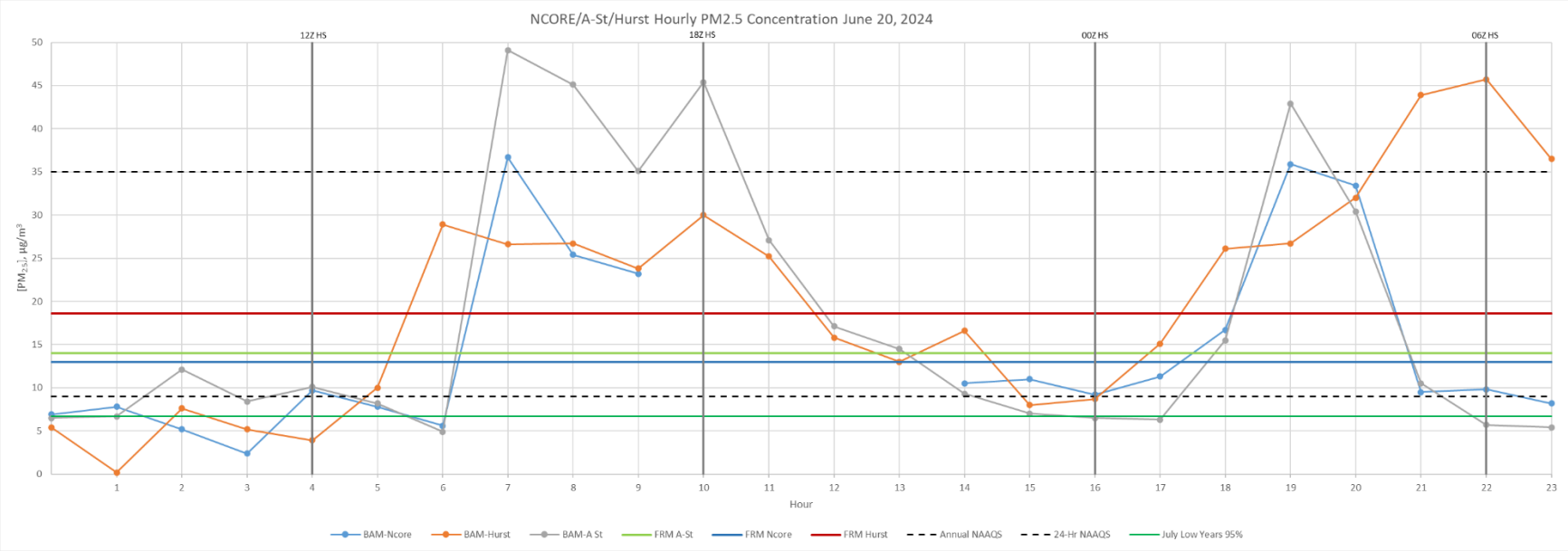

Figure 19: FNSB $PM_{2.5}$ concentrations for June 20, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 20, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day began with moderate $PM_{2.5}$ levels, ranging between 10 and 20 µg/m³ across most sites. A noticeable increase occurred around 6:00 AM, with BAM-A-Street peaking near 50 µg/m³, while other sites climbed to around 30-35 µg/m³.
Midday Levels: Concentrations fluctuated through late morning and early afternoon, with a decline from morning highs, where BAM-A-Street reached approximately 50 µg/m³. Then all declined, stabilizing around 10–20 µg/m³ by early afternoon.
Afternoon to Evening Levels: $PM_{2.5}$ levels saw another increase starting around 5:00 PM, with BAM-Hurst climbing steadily to a peak of about 45 µg/m³ by 10:00 PM. BAM-NCore and BAM-A-Street also rose, reaching around 35-40 µg/m³ during this period.

Overall Trend: On June 20, 2024, $PM_{2.5}$ concentrations displayed multiple peaks throughout the day, with notable spikes in the early morning (BAM-A-Street at 50 µg/m³). All sites consistently exceeded the annual NAAQS standard of 9 µg/m³ (lower dashed line) throughout the day, and during the afternoon lull, several sites surpassed the 24-hour NAAQS threshold of 35 µg/m³ (upper dashed line). These elevated levels suggest periods of poor air quality, likely influenced by early regional wildfire activity.

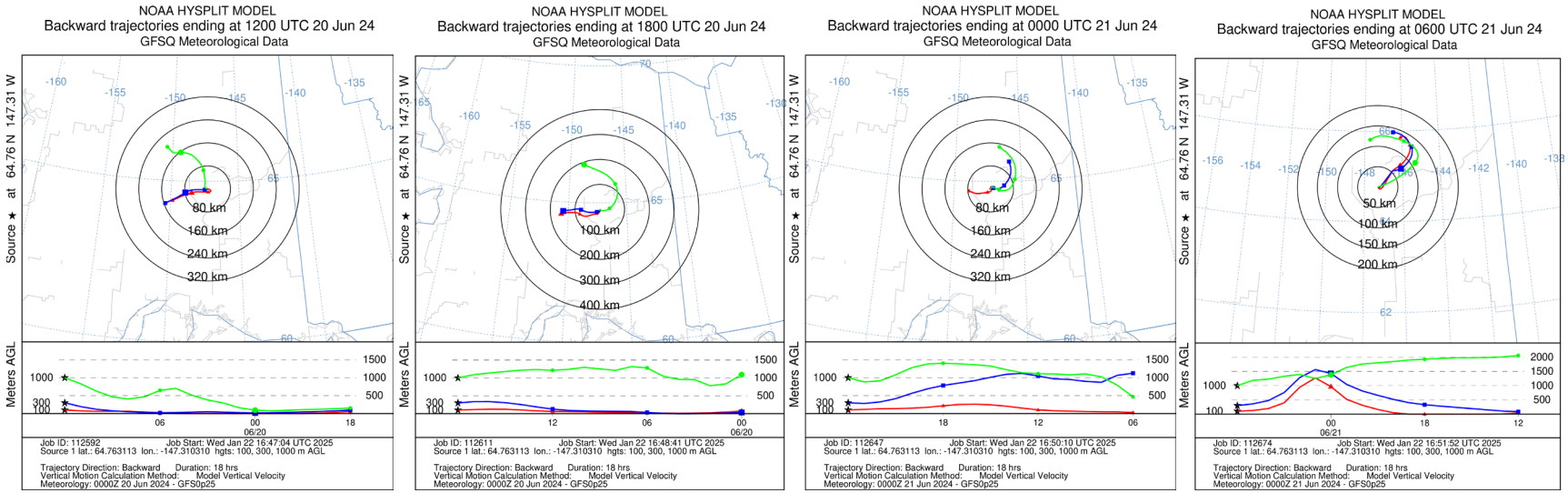

Figure 20: NOAA HYSPLIT model backward trajectories for June 20, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 20 to June 21, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 20, 2024): This image shows the backward trajectory ending at midday UTC on June 20. The trajectories at 100m (red), 300m (blue), indicate the air masses originating from the southwest, while the 1000m (green) originating from the northwest, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m remained below 500m AGL, while the 1000m trajectory ascending near surface to the 1000m AGL over FNSB, suggesting that pollutants, possibly from regional sources, were transported at lower levels.

Image 2 (18:00 UTC, June 20, 2024): The second image captures the backward trajectory ending in the late afternoon UTC on June 20. The air parcels' pathways highlight movement from the west at 100m (red), 300m (blue), and the 1000m (green) originating from the north. The vertical profile indicates that air parcels at 100m and 300m and stayed below 500m AGL, with the 1000m trajectory staying elevated throughout the trajectory, providing clues about potential pollutant sources upwind.

Image 3 (00:00 UTC, June 21, 2024): The third image displays the backward trajectory ending at midnight UTC on June 21. It shows a consistent pattern with the earlier images, with air parcel at 100m (red) tracing back to sources located west, while the 300m (blue) and 1000m (green) trajectory originates from the northeast. The vertical profile shows air parcels at 100m remaining below 100m AGL, and the 300m trajectory descending from around 1000m AGL to 250m AGL. The 1000m trajectory stayed elevated throughout the timeline.

Image 4 (06:00 UTC, June 21, 2024): The final image in this series illustrates the backward trajectory ending early in the morning UTC on June 21. The convergence of air parcels at 100m (red), 300m (blue), and 1000m (green) from the northeast aligns with the previous observations, reinforcing the pattern of pollutant transport from this region. The vertical profile shows air parcels at 100m and 300m remaining ascending during the timeline before descending back to the surface, while the 1000m trajectory descends from around 2000m AGL to 1000m AGL

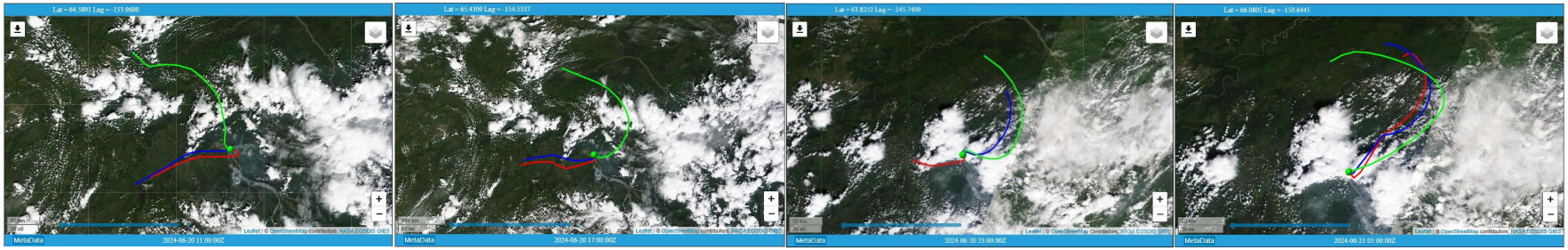

Figure 21: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 20, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 3 (23:00 UTC, June 20, 2024): This image shows the backward trajectory ending in the late morning at a point in the FNSB. The air parcels' pathways highlight movement originating in the east and northeast.

Smoke Transport: The imagery shows smoke over FNSB and to the east through south. The wind direction changed during the day as the weak surface low moved through the region, allowing the smoke to stay concentrated to the southeast of FNSB.

Table 12. Hourly surface observation for Fort Wainwright AAF, June 20,2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFB	06/20/2024 00:55 AKDT	3	80			8	58	49
PAFB	06/20/2024 01:55 AKDT	6	260			8	56	48
PAFB	06/20/2024 02:55 AKDT	3	160			9	53	47
PAFB	06/20/2024 03:55 AKDT	3	120			8	53	46
PAFB	06/20/2024 04:55 AKDT	3	70			9	51	47
PAFB	06/20/2024 05:55 AKDT	0	0			9	53	46
PAFB	06/20/2024 06:55 AKDT							
PAFB	06/20/2024 07:55 AKDT	6	80			9	57	47
PAFB	06/20/2024 08:55 AKDT	7	100			8	61	47
PAFB	06/20/2024 09:55 AKDT	0	0			7	64	48
PAFB	06/20/2024 10:55 AKDT	0	0		7	6	67	49
PAFB	06/20/2024 11:55 AKDT	0	0		7	8	69	48
PAFB	06/20/2024 12:55 AKDT	3	140		7	8	73	47
PAFB	06/20/2024 13:55 AKDT	3	120		7	9	76	47
PAFB	06/20/2024 14:55 AKDT	0	0			9	77	42
PAFB	06/20/2024 15:55 AKDT	0	0			10	78	42
PAFB	06/20/2024 16:55 AKDT	13	40			10	77	44
PAFB	06/20/2024 17:55 AKDT	13	120			10	75	46
PAFB	06/20/2024 18:55 AKDT	12	120			10	76	45
PAFB	06/20/2024 19:55 AKDT	9	170		7	6	74	45
PAFB	06/20/2024 20:55 AKDT	0	0			8	73	43
PAFB	06/20/2024 21:55 AKDT	8	320		7	8	74	44
PAFB	06/20/2024 22:55 AKDT	7	360			9	71	45
PAFB	06/20/2024 23:55 AKDT	5	50			8	68	46

Surface Observations: The surface observations from June 20, 2024, show reduced visibility due to smoke, primarily throughout the day. Visibility at the PAFB station in North Pole dropped to 6 statute miles by 02:55 UTC (10:55 AKDT), coinciding with a calm wind. As the wind increased the smoke cleared out, but as soon as the wind decreased the smoke migrated back into the area. These observations align with the $PM_{2.5}$ concentration data and HYSPLIT trajectories, indicating smoke trapped under the clouds over FBX and transported into the Fairbanks area from the southwest during the morning hours.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 21, 2024

AICC Fire Report Summary:

- **New Fires:** 6 new fires reported.
- **Total Fires Statewide:** 68 fires burning.
- **Acres Burned:** 81,977 acres, with a 24-hour increase of 10,400 acres.

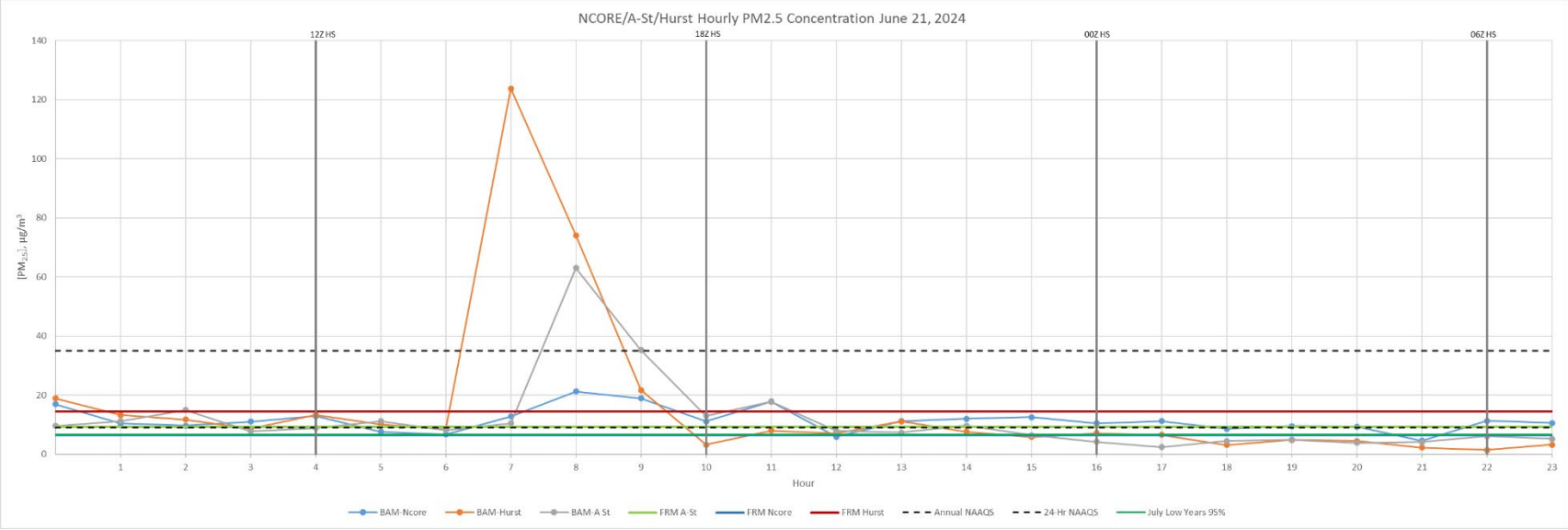

Figure 22: FNSB $PM_{2.5}$ concentrations for June 21, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 21, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day started with low $PM_{2.5}$ levels, generally below 20 µg/m³ across all sites. A sharp increase occurred after 6:00 AM, with BAM-Hurst rising to approximately 120 µg/m³ and the BAM-A-Street spiking just over 60 µg/m³.
Midday Levels: After the morning peak, levels dropped sharply, stabilizing below 15 µg/m³ across all sites by late morning and continuing into the early afternoon.
Afternoon to Evening Levels: $PM_{2.5}$ levels stayed consistently low throughout the afternoon and evening, fluctuating between 5 and 15 µg/m³. No significant increases were observed, indicating a sustained period of improved air quality following the morning spike.

Overall Trend: On June 21, 2024, $PM_{2.5}$ concentrations exhibited a significant early morning surge, with BAM-Hurst reaching an extreme peak of 120 µg/m³. All sites to exceed the annual NAAQS standard of 9 µg/m³ (lower dashed line) for the day.

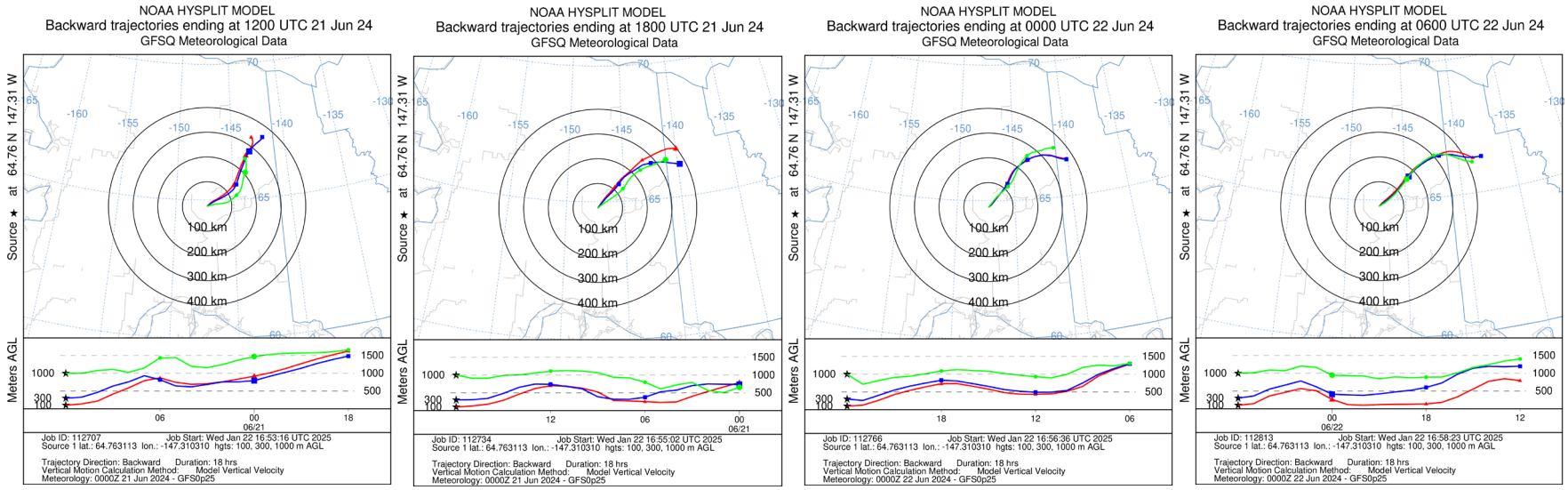

Figure 23: NOAA HYSPLIT model backward trajectories for June 21, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 21 to June 22, 2024. These backward trajectories trace

the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 21, 2024): This image shows the backward trajectory ending at midday UTC on June 21. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from the northeast, converging towards the target location. The vertical profile below the map shows that air parcels at 100m, 300m and 1000m all descended from above 1500m during the period. The 100m and 300m decreased to below 250m, while the 1000m trajectory ended around 1000m AGL.

Image 2 (18:00 UTC, June 21, 2024): The second image captures the backward trajectory ending in the late afternoon UTC on June 21. The air parcels' pathways highlight movement from the northeast at 100m (red), 300m (blue), and 1000m (green). The parcel profile is similar to the previous image.

Image 3 (00:00 UTC, June 22, 2024): The third image displays the backward trajectory ending at midnight UTC on June 22. It shows a pattern consistent with the earlier images, with air parcels at 100m (red), 300m (blue), and 1000m (green) tracing back to sources located northeast. The vertical profile shows air parcels at 100m and 300m remaining below 500m AGL, and the 1000m trajectory descending from around 1500m AGL to 1000m AGL.

Image 4 (06:00 UTC, June 22, 2024): The final image in this series illustrates the backward trajectory ending early in the morning UTC on June 22. The convergence of air parcels at 100m (red), 300m (blue), and 1000m (green) from the northeast aligns with the previous observations, reinforcing the pattern of pollutant transport from this region. The vertical profile shows air parcels at 100m and 300m remaining below 300m AGL, while the 1000m trajectory descends slightly to around 1000m AGL at target.

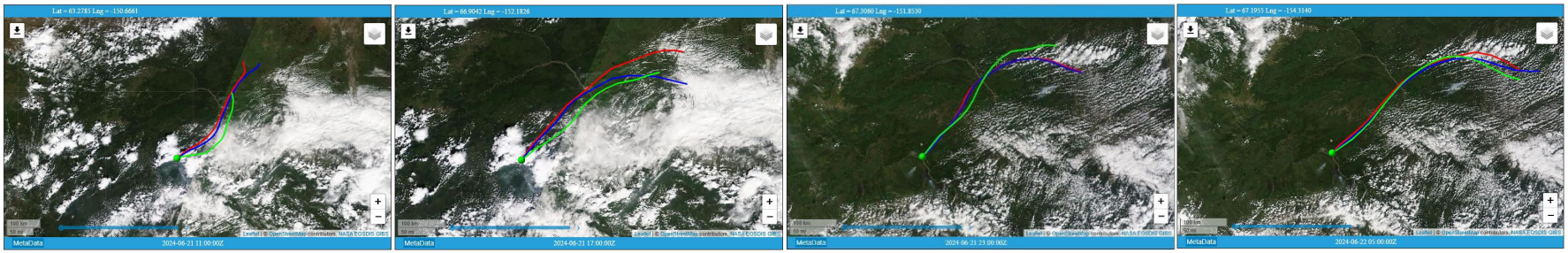

Figure 24: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 21, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 1 (11:00 UTC, June 21, 2024): This image shows the backward trajectory ending in the late morning at a point in the FNSB. The air parcels' pathways highlight movement originating in the east and northeast.

Smoke Transport: The imagery shows smoke over FNSB and to the south. FNSB experienced smoke in the area during the early morning hours due to the calm winds. Once the inversion broke and the winds mixed down to the surface, the smoke dissipated, as seen in the observations for the day.

Table 13. Hourly surface observation for Fort Wainwright AAF, June 21,2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFB	06/21/2024 00:55 AKDT	6	80			8	62	47
PAFB	06/21/2024 01:55 AKDT	0	0			8	59	48
PAFB	06/21/2024 02:55 AKDT	0	0			8	60	47
PAFB	06/21/2024 03:55 AKDT	0	0			9	53	47
PAFB	06/21/2024 04:55 AKDT	5	40			9	56	47
PAFB	06/21/2024 05:55 AKDT	0	0			8	56	47
PAFB	06/21/2024 06:55 AKDT	0	0			9	58	47
PAFB	06/21/2024 07:55 AKDT	0	0			10	61	48
PAFB	06/21/2024 08:55 AKDT	0	0			9	63	48
PAFB	06/21/2024 09:55 AKDT	0	0		6	6	65	49
PAFB	06/21/2024 10:55 AKDT	0	0			7	69	50
PAFB	06/21/2024 11:55 AKDT	3	220			8	73	50
PAFB	06/21/2024 12:55 AKDT	0	0			9	75	49
PAFB	06/21/2024 13:55 AKDT	13	350		13	8	68	47
PAFB	06/21/2024 14:55 AKDT	7	120		1045	7	64	55
PAFB	06/21/2024 15:55 AKDT	3	350		13	7	61	57
PAFB	06/21/2024 16:55 AKDT	0	0			10	64	55
PAFB	06/21/2024 17:55 AKDT	3	320			10	68	56
PAFB	06/21/2024 18:55 AKDT	5	10			10	72	52
PAFB	06/21/2024 19:55 AKDT	0	0			10	73	49
PAFB	06/21/2024 20:55 AKDT	5	300			10	73	53
PAFB	06/21/2024 21:55 AKDT	5	10			10	73	47
PAFB	06/21/2024 22:55 AKDT	10	160			10	68	54
PAFB	06/21/2024 23:55 AKDT	3	60			10	63	53

Surface Observations: The surface observations from June 21, 2024, show reduced visibility due to smoke, primarily in the early morning hours. Visibility at the PAFB station in Fort Wainwright AAF dropped to a low of 6 statute miles by 01:55 UTC (09:55 AKDT. These observations align with the $PM_{2.5}$ concentration data and the red HYSPLIT trajectory at 100 meters AGL, indicating smoke transport into the Fairbanks area from the flats to the south during the late morning hours.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 23, 2024

AICC Fire Report Summary:

- **New Fires:** 16 new fires reported.
- **Total Fires Statewide:** 96 fires burning.
- **Acres Burned:** 108,552 acres, with a 24-hour increase of 8,047 acres.

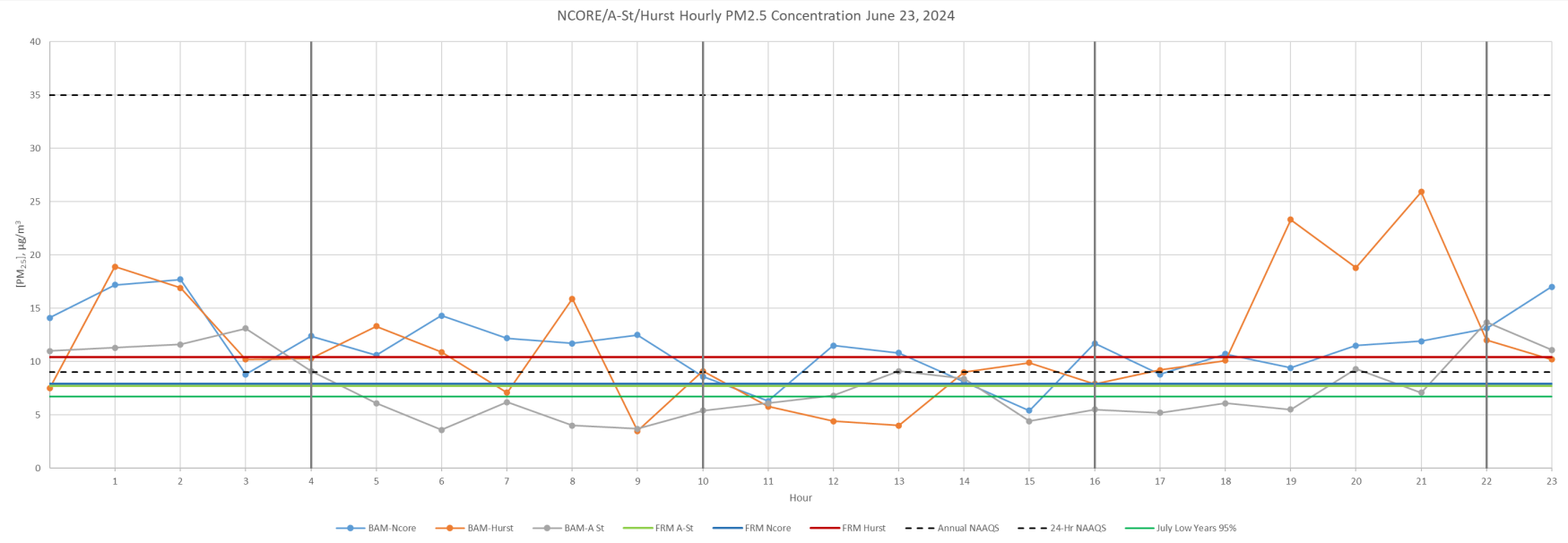

Figure 25: FNSB $PM_{2.5}$ concentrations for June 23, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 23, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day began with moderate $PM_{2.5}$ levels, fluctuating between 5 and 20 µg/m³ across all sites.
Midday Levels: Concentrations remained relatively stable through late morning and early afternoon, hovering between 5 and 15 µg/m³.
Afternoon to Evening Levels: $PM_{2.5}$ levels began to increase modestly around 6:00 PM, with BAM-Hurst climbing to a peak of about 25 µg/m³ by 9:00 PM. Other sites, including BAM-NCore and BAM-A-Street, followed with rises to around 15 µg/m³, indicating a slight deterioration in air quality during the evening hours.

Overall Trend: On June 23, 2024, $PM_{2.5}$ concentrations started with moderate variability in the early morning, maintained a stable mid-day range, and experienced a small evening surge, with BAM-Hurst reaching 25 µg/m³. All sites exceeded the annual NAAQS standard of 9 µg/m³ (lower dashed line) for the day.

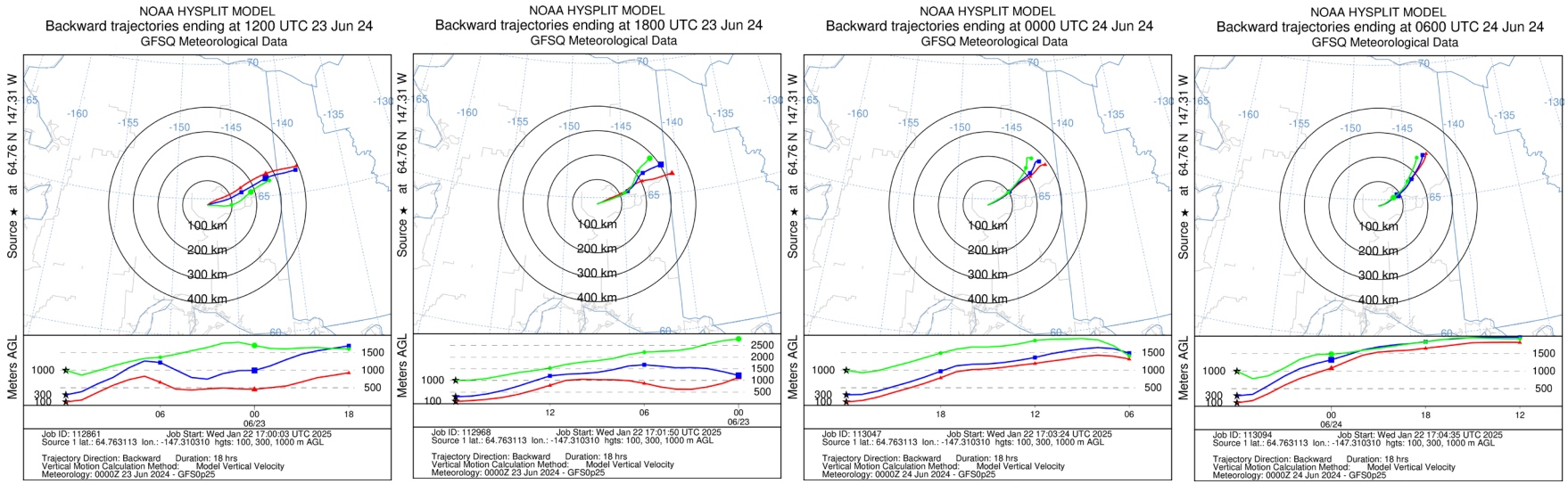

Figure 26: NOAA HYSPLIT model backward trajectories for June 23, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 23 to June 24, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 23, 2024): This image shows the backward trajectory ending early morning on June 23. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from the northeast, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m remained below 500m AGL, while the 1000m trajectory descended slightly from 1500m AGL.

Image 2 (18:00 UTC, June 23, 2024): The second image captures the backward trajectory ending in the late morning on June 23. The air parcels' pathways highlight movement from the northeast at 100m (red), 300m (blue), and 1000m (green). The vertical profile indicates that air parcels at 100m, 300m and 1000m descended slightly during the trajectory timeline.

Image 3 (00:00 UTC, June 24, 2024): The third image displays the backward trajectory ending late afternoon on June 23. The air parcels' pathways highlight movement from the northeast at 100m (red), 300m (blue), and 1000m (green). The vertical profile indicates that air parcels at 100m, 300m and 1000m descended slightly during the trajectory timeline.

Image 4 (06:00 UTC, June 24, 2024): The final image in this series illustrates the backward trajectory ending late evening on June 23. The air parcels' pathways highlight movement from the northeast at 100m (red), 300m (blue), and 1000m (green). The vertical profile indicates that air parcels at 100m, 300m and 1000m descended slightly during the trajectory timeline.

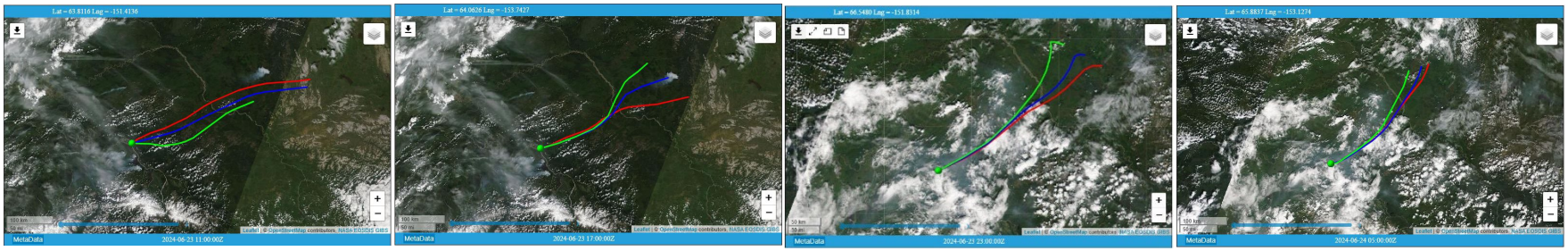

Figure 27: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 23, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 2 (17:00 UTC, June 23, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The air parcels' pathways indicate movement originating from the northeast. Active fires are located to the northeast and southeast of FNSB.

Smoke Transport: The imagery shows heavy smoke extending from the southeast to the west of FNSB. Although air parcels originated from the northeast, where a fire is located, the smoke impacting FNSB was primarily from fires to the southeast. Light winds during early morning and late evening hours allowed smoke to settle in the flats, as observed in FNSB monitors and surface observations.

Table 14. Hourly surface observation for Fort Wainwright AAF, June 23,2024

	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFB	06/23/2024 00:55 AKDT	6	50		6	4	62	43
PAFB	06/23/2024 01:55 AKDT	6	70			8	59	42
PAFB	06/23/2024 02:55 AKDT	5	100			9	55	42
PAFB	06/23/2024 03:55 AKDT	5	80			10	55	42
PAFB	06/23/2024 04:55 AKDT	0	0			10	56	42
PAFB	06/23/2024 05:55 AKDT	0	0			10	59	42
PAFB	06/23/2024 06:55 AKDT	0	0			10	61	44
PAFB	06/23/2024 07:55 AKDT	3	70			10	65	44
PAFB	06/23/2024 08:55 AKDT	0	0			10	68	46
PAFB	06/23/2024 09:55 AKDT	5	100			10	73	44
PAFB	06/23/2024 10:55 AKDT	8	70			10	76	40
PAFB	06/23/2024 11:55 AKDT	8	160			10	77	37
PAFB	06/23/2024 12:55 AKDT	6	120			10	79	38
PAFB	06/23/2024 13:55 AKDT	5	160			10	80	37
PAFB	06/23/2024 14:55 AKDT	5	130			10	81	37
PAFB	06/23/2024 15:55 AKDT	3	360			10	81	36
PAFB	06/23/2024 16:55 AKDT	3	50			8	81	36
PAFB	06/23/2024 17:55 AKDT	5	60			10	82	34
PAFB	06/23/2024 18:55 AKDT	3	220			10	82	36
PAFB	06/23/2024 19:55 AKDT	6	200			10	82	35
PAFB	06/23/2024 20:55 AKDT	6	240			10	81	36
PAFB	06/23/2024 21:55 AKDT	3	290			9	79	38
PAFB	06/23/2024 22:55 AKDT	0	0			8	71	49
PAFB	06/23/2024 23:55 AKDT	6	80			8	64	48

Surface Observations: The surface observations from June 23, 2024, indicate reduced visibility due to smoke, primarily during early morning and late evening hours. At the PAFB station in Fort Wainwright AAF, visibility dropped to a low of 4 statute miles by 08:55 UTC (00:55 AKDT). Evening wind patterns supported the transport of smoke from fires to the southeast, contributing to the reduced visibility. Visibility decreased further as smoke moved into the area later in the day.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 24, 2024

AICC Fire Report Summary:

- **New Fires:** 12 new fires reported.
- **Total Fires Statewide:** 106 fires burning.
- **Acres Burned:** 116,764 acres, with a 24-hour increase of 8,212 acres.

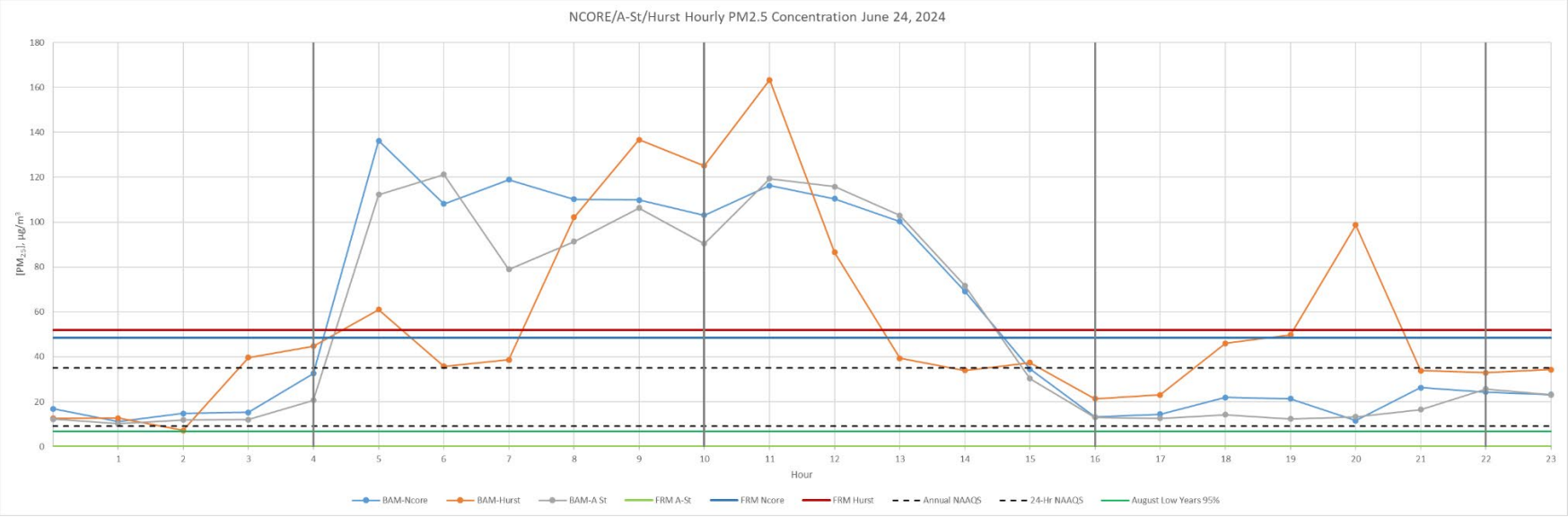

Figure 28: FNSB $PM_{2.5}$ concentrations for June 24, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 24, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day started with low $PM_{2.5}$ levels, generally below 15 µg/m³ across all sites. A sharp increase occurred around 4:00 AM, with BAM-NCore peaking at approximately 140 µg/m³, while BAM-Hurst rose to around 60 µg/m³, indicating a significant early morning air quality decline.
Midday Levels: BAM-Hurst spiked at 11:00 AM to just above 160 µg/m³ then the $PM_{2.5}$ levels at all sites declined steadily, stabilizing around 20–40 µg/m³ by late afternoon.
Afternoon to Evening Levels: $PM_{2.5}$ levels remained relatively stable through the afternoon, hovering around 10–20 µg/m³. A notable spike occurred around 7:00 PM, with BAM-Hurst surging to approximately 100 µg/m³, while other sites stayed around 20 µg/m³.

Overall Trend: On June 24, 2024, $PM_{2.5}$ concentrations displayed multiple significant peaks, with BAM-NCore reaching 140 µg/m³ in the early morning and BAM-Hurst hitting 160 µg/m³ late morning and 100 µg/m³ in the evening. These spikes caused all sites to exceed both the 24-hour NAAQS threshold of 35 µg/m³ (upper dashed line) and the annual NAAQS standard of 9 µg/m³ (lower dashed line) during peak hours. The elevated levels, particularly at Hurst, reflect the impact of the McDonald Fire, which ignited on June 21, 2024, and continued to affect air quality in the region.

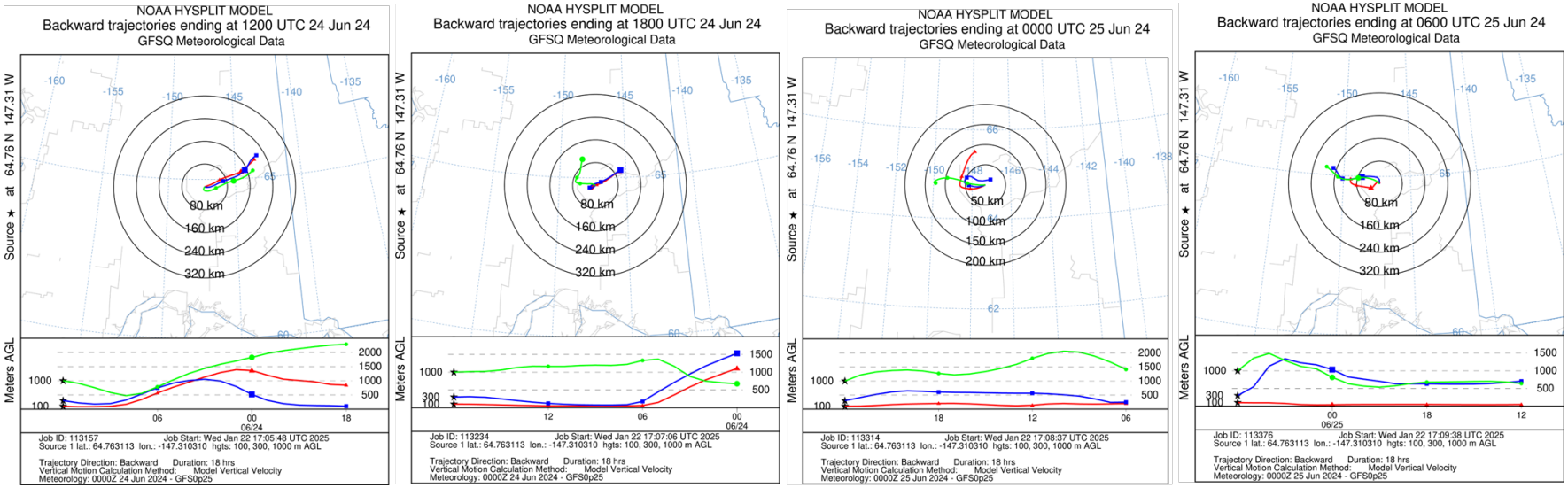

Figure 29: NOAA HYSPLIT model backward trajectories for June 24, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 24 to June 25, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 24, 2024): This image shows the backward trajectory early morning June 24. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from the northeast, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m remained below 500m AGL, while the 1000m trajectory descended from over 2000m AGL before its final elevation of 1000m AGL.

Image 2 (18:00 UTC, June 24, 2024): The second image captures the backward trajectory ending in the late morning on June 24. The air parcels' pathways highlight movement from the southwest at 100m (red), 300m (blue), and 1000m (green). The vertical profile indicates that air parcels at 100m and 300m originated above 1000m and ended below 250m AGL, with the 1000m trajectory ascending from around 600m AGL to 1000m AGL.

Image 3 (00:00 UTC, June 25, 2024): The third image displays the backward trajectory ending late afternoon on June 25. It shows a pattern consistent with the earlier images, with air parcels at 100m (red), 300m (blue), and 1000m (green) tracing back to sources located to the west. The vertical profile shows air parcels at 100m and 300m remaining below 500m AGL, and the 1000m trajectory ascending to around 1500m AGL before descending back to 1000m AGL, indicating continued influence from these directions and potential transport of pollutants at lower altitudes.

Image 4 (06:00 UTC, June 25, 2024): The final image in this series illustrates the backward trajectory ending late evening June 25. The convergence of air parcels at 100m (red), 300m (blue), and 1000m (green) from the west aligns with the previous observations, reinforcing the pattern of pollutant transport from this region. The vertical profile shows air parcels at 100m and 300m remaining below 500m AGL, while the 1000m trajectory ascends to around 1000m AGL after beginning at 750m AGL.

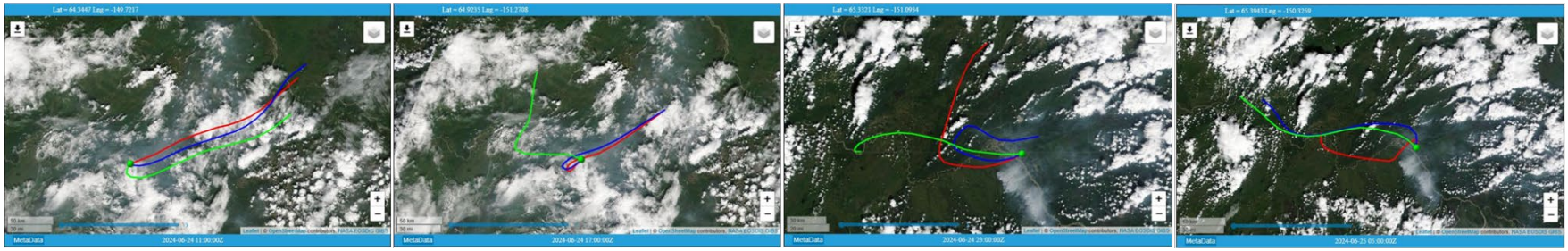

Figure 30: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 24, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 2 (17:00 UTC, June 24, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The air parcels' pathways indicate movement originating from the northeast wrapping around FNSB in the final hours and bringing in smoke from the flats to the southwest. Active fires are located to the northeast and southeast of FNSB.

Smoke Transport: The imagery shows heavy smoke filling the Tanana Flats and surrounding FNSB. Although air parcels originated from the northeast, the parcels migrated to the southwest within the smoke field. The smoke originated from fires to the southeast. Light winds during early morning and late evening hours allowed smoke to settle in the flats, as observed in FNSB monitors and surface observations.

Table 15. Hourly surface observation for Fairbanks International Airport, June 24, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	06/24/2024 00:53 AKDT	3	10			10	64	46
PAFA	06/24/2024 01:53 AKDT	3	10			10	63	46
PAFA	06/24/2024 02:53 AKDT	3	150			10	60	49
PAFA	06/24/2024 03:53 AKDT	6	350			10	58	46
PAFA	06/24/2024 04:53 AKDT	8	60			10	58	45
PAFA	06/24/2024 05:53 AKDT	0	0			10	57	47
PAFA	06/24/2024 06:53 AKDT	8	40		7	2	58	45
PAFA	06/24/2024 07:53 AKDT	0	0		7	1	58	45
PAFA	06/24/2024 08:53 AKDT	6	130		7	2	59	48
PAFA	06/24/2024 09:53 AKDT	0	0		7	2	62	47
PAFA	06/24/2024 10:53 AKDT	5	30		7	2	64	46
PAFA	06/24/2024 11:53 AKDT	0	0		7	2	67	45
PAFA	06/24/2024 12:53 AKDT	0	0		7	2	71	48
PAFA	06/24/2024 13:53 AKDT	5	170		7	2	72	50
PAFA	06/24/2024 14:53 AKDT	5	170		7	5	75	53
PAFA	06/24/2024 15:53 AKDT	5			7	6	77	50
PAFA	06/24/2024 16:53 AKDT	5	180			8	80	50
PAFA	06/24/2024 17:53 AKDT	9	230			8	79	49
PAFA	06/24/2024 18:53 AKDT	12	250			10	77	47
PAFA	06/24/2024 19:53 AKDT	10	220			10	73	50
PAFA	06/24/2024 20:53 AKDT	9	240			10	71	50
PAFA	06/24/2024 21:53 AKDT	0	0			10	71	50
PAFA	06/24/2024 22:53 AKDT	9	50		6	7	65	52
PAFA	06/24/2024 23:53 AKDT	0	0			10	63	54

Surface Observations: The surface observations from June 24, 2024, indicate reduced visibility due to smoke, primarily during late morning and early afternoon hours. At the PAFA station at the Fairbanks International Airport, visibility dropped to a low of 1 statute mile by 15:53 UTC (07:53 AKDT). Light and variable winds support the smoke from the McDonald Fire settling in the flats and migrating into FNSB.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 25, 2024

AICC Fire Report Summary:

- **New Fires:** 9 new fires reported.
- **Total Fires Statewide:** 112 fires burning.
- **Acres Burned:** 129,998 acres, with a 24-hour increase of 13,234 acres.

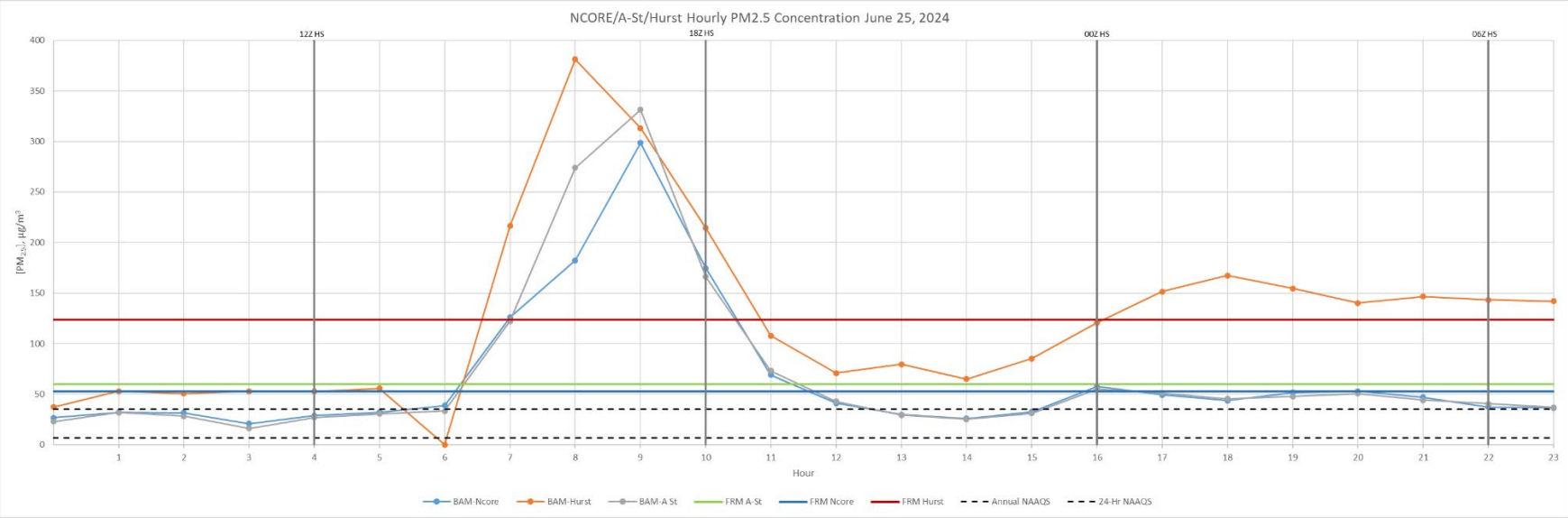

Figure 31: FNSB $PM_{2.5}$ concentrations for June 25, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 25, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day began with elevated $PM_{2.5}$ levels, typically below 50 µg/m³ across most sites. A dramatic spike occurred around 6:00 AM, with all sites soring to concentrations between 300 µg/m³ and 400 µg/m³, signaling a severe air quality deterioration.

Midday Levels: After the early morning peak, concentrations lowered in early afternoon to 25-70 µg/m³.
Afternoon to Evening Levels: $PM_{2.5}$ levels remained relatively steady through the afternoon, hovering around 50 µg/m³ at the BAM-A-Street and BAM-NCore sites. BAM-Hurst rose from afternoon lulls to hover around 150 µg/m³ the remainder of the late afternoon and evening.

Overall Trend: On June 25, 2024, $PM_{2.5}$ concentrations featured two prominent peaks, with BAM-Hurst hitting almost 400 µg/m³ in the early morning and 150 µg/m³ in the afternoon, likely driven by the McDonald Fire, which ignited on June 21, 2024. These spikes caused all sites to far exceed both the 24-hour NAAQS (upper dashed line) threshold of 35 µg/m³ and the annual NAAQS (lower dashed line) standard of 9 µg/m³.

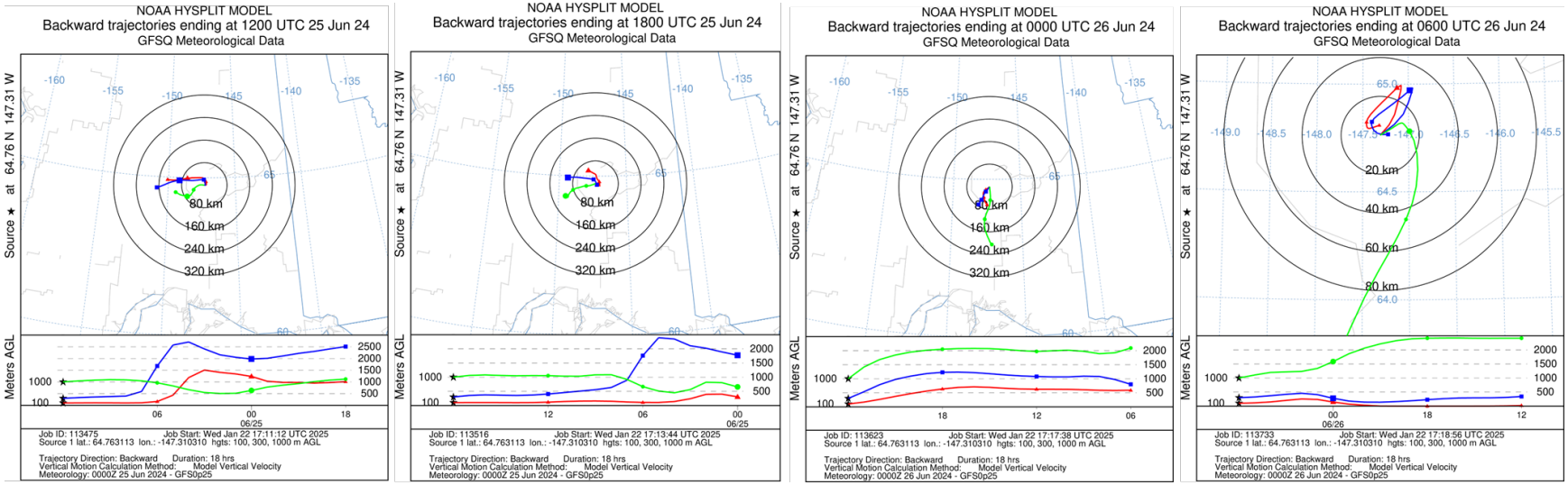

Figure 32: NOAA HYSPLIT model backward trajectories for June 25, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 25 to June 26, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential

sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 25, 2024): This image shows the backward trajectory ending early morning on June 25. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from the west, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m began above 1000m AGL but ended below 300m, while the 1000m trajectory stayed around 1000m during the period.

Image 2 (18:00 UTC, June 25, 2024): The second image captures the backward trajectory ending in the late morning on June 25. The air parcels' pathways highlight movement from the northwest at 100m (red) and 300m (blue) while the 1000m (green) continued from the west. The vertical profile indicates that air parcels at 100m stayed below 300m AGL. The 300m parcel began above 1500m AGL and descended to 300m during the trajectory timeframe. The 1000m trajectory began below 1000m AGL and ascended to just above 1000m at target.

Image 3 (00:00 UTC, June 26, 2024): The third image displays the backward trajectory ending late afternoon on June 25. The air parcels' pathways highlight movement from the northwest at 100m (red) and 300m (blue) while the 1000m (green) switched during the past 6 hours to originate from the south. The vertical profile indicates that air parcels at 100m and 300m ended below 300m AGL, with the 1000m trajectory beginning above 2000m AGL and descending to 1000m at target.

Image 4 (06:00 UTC, June 26, 2024): The final image in this series illustrates the backward trajectory ending late evening June 25. The convergence of air parcels at 100m (red), 300m (blue), and 1000m (green) changed significantly during the evening hours. The vertical profile shows air parcels at 100m and 300m circling the hills to the north of FNSB and returning to the target below 300m AGL, while the 1000m trajectory originates well above 2000m AGL and gradually descends to around 1000m AGL above the target.

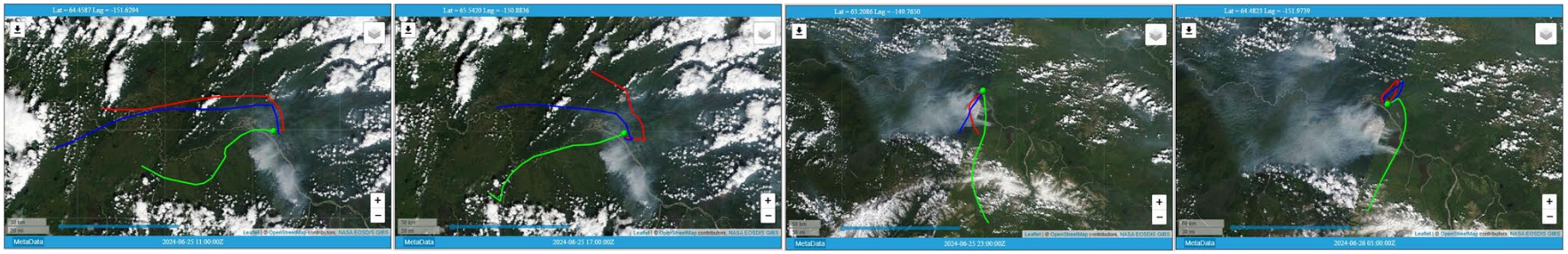

Figure 33: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 25, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 2 (17:00 UTC, June 25, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The air parcels' pathways indicate movement originating from the west wrapping around and coming in from the south of FNSB in the final hours and bringing in smoke from the flats to the southwest. Active fires are located to the northeast and southeast of FNSB.

Smoke Transport: The imagery shows heavy smoke filling the Tanana Flats and surrounding FNSB and Smoke from the McDonald and Clear fires to the south. Although air parcels originated from the west and north, the parcels migrated to the southwest within the smoke field. The smoke originated from fires to the southeast. Light winds during early morning and late evening hours allowed smoke to settle in the flats, as observed in FNSB monitors and surface observations.

Table 16. Hourly surface observation for Fairbanks International Airport, June 25, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	06/25/2024 00:53 AKDT	0	0			10	61	56
PAFA	06/25/2024 01:53 AKDT	0	0			10	58	55
PAFA	06/25/2024 02:53 AKDT	0	0			10	56	54
PAFA	06/25/2024 03:53 AKDT	0	0			10	56	53
PAFA	06/25/2024 04:53 AKDT	6	50			10	57	54
PAFA	06/25/2024 05:53 AKDT	0	0			10	57	52
PAFA	06/25/2024 06:53 AKDT	3	250			10	57	54
PAFA	06/25/2024 07:53 AKDT	0	0			10	61	53
PAFA	06/25/2024 08:53 AKDT	3	50		7	3	64	54
PAFA	06/25/2024 09:53 AKDT	3			7	2	66	55
PAFA	06/25/2024 10:53 AKDT	0	0		7	2	70	54
PAFA	06/25/2024 11:53 AKDT	0	0		7	3	71	53
PAFA	06/25/2024 12:53 AKDT	0	0		7	6	74	52
PAFA	06/25/2024 13:53 AKDT	0	0			10	76	50
PAFA	06/25/2024 14:53 AKDT	3	160			10	77	50
PAFA	06/25/2024 15:53 AKDT	5	70			10	79	49
PAFA	06/25/2024 16:53 AKDT	6	170			10	78	49
PAFA	06/25/2024 17:53 AKDT	6				10	78	49
PAFA	06/25/2024 18:53 AKDT	3	120			10	77	51
PAFA	06/25/2024 19:53 AKDT	3	50			7	78	50
PAFA	06/25/2024 20:53 AKDT	0	0		7	6	77	50
PAFA	06/25/2024 21:53 AKDT	0	0		7	6	74	55
PAFA	06/25/2024 22:53 AKDT	0	0		7	6	70	56
PAFA	06/25/2024 23:53 AKDT	0	0			7	66	56

Surface Observations: The surface observations from June 25, 2024, indicate reduced visibility due to smoke, primarily during late morning and late evening hours. At the PAFA station at Fairbanks International Airport, visibility dropped to a low of 2 statute miles by 17:53 UTC (09:53 AKDT). Light and variable winds support the smoke from the McDonald Fire and Clear Fire settling in the flats and migrating into FNSB.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 26, 2024

AICC Fire Report Summary:

- **New Fires:** 15 new fires reported.
- **Total Fires Statewide:** 120 fires burning.
- **Acres Burned:** 146,947 acres, with a 24-hour increase of 16,949 acres.

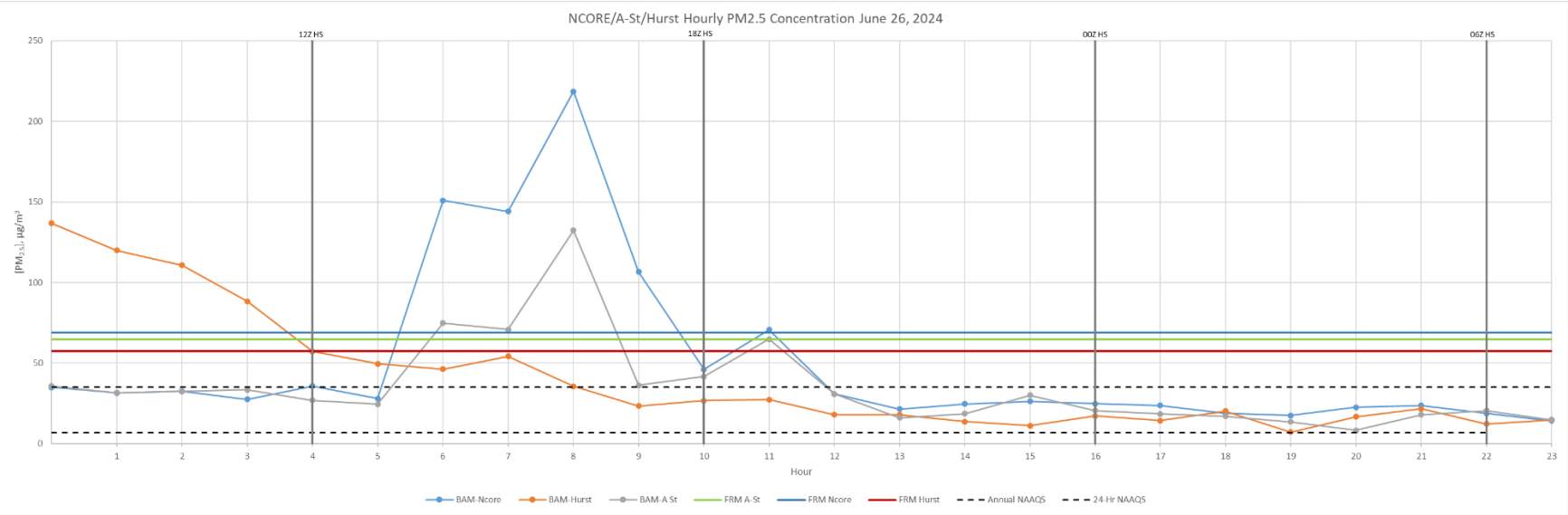

Figure 34: FNSB $PM_{2.5}$ concentrations for June 26, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 26, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day began with elevated $PM_{2.5}$ levels, between 50 µg/m³ and 150 µg/m³ all sites. While BAM- Hurst site saw a gradual decline from 150 µg/m during the morning hours, BAM-A-Street and BAM-NCore saw a spike at 5:00 AM. Maximum concentrations occurred at 8:00 AM with BAM-A-Street reaching 135 µg/m³ and BAM-NCore maxing out at 230 µg/m³.

Midday Levels: After the early morning peaks, concentrations lowered in early afternoon to 25µg/m³ at all sites.
Afternoon to Evening Levels: $PM_{2.5}$ levels remained relatively steady through the afternoon and evening hours, hovering between 10-30 µg/m³ at all sites.

Overall Trend: On June 26, 2025, $PM_{2.5}$ concentrations displayed a prominent early morning peak, with BAM-A-Street reaching 135 µg/m³ and BAM-NCore hitting 230 µg/m³ at 8:00 AM, driven by elevated levels across all sites (50–150 µg/m³). These spikes caused all sites to exceed the 24-hour NAAQS threshold of 35 µg/m³ and the annual NAAQS standard of 9 µg/m³. By early afternoon, concentrations dropped to around 25 µg/m³ across all sites, remaining steady through the evening between 10–30 µg/m³, yet still above the annual NAAQS, reflecting ongoing air quality challenges.

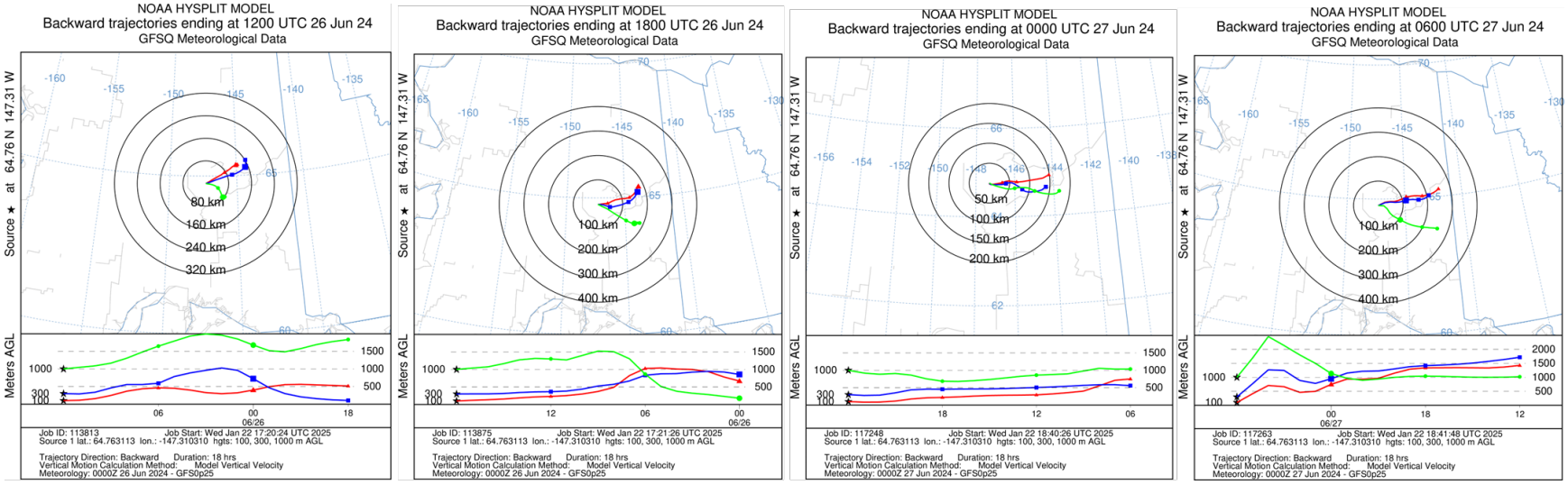

Figure 35: NOAA HYSPLIT model backward trajectories for June 26, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 26 to June 27, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential

sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 26, 2024): This image shows the backward trajectory ending early morning on June 26. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from an easterly component, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m began below 500m AGL and ended below 500m, while the 1000m trajectory began above 1700 AGL and ended at 1000m above the target location.

Image 2 (18:00 UTC, June 26, 2024): The second image captures the backward trajectory ending in the late morning on June 26. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from an easterly component, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m began above 500m AGL and ended below 500m, while the 1000m trajectory began near surface and ended at 1000m above the target location.

Image 3 (00:00 UTC, June 27, 2024): The third image displays the backward trajectory ending late afternoon on June 26. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from an easterly component, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m began above 500m AGL and ended below 500m, while the 1000m trajectory maintained its 1000m height above the target.

Image 4 (06:00 UTC, June 27, 2024): The final image in this series illustrates the backward trajectory ending late evening June 26. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from an easterly component, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m began above 1500m AGL and ended below 500m, while the 1000m trajectory began around 1000m, spiked during parcel movement, and returned to 1000m above the target.

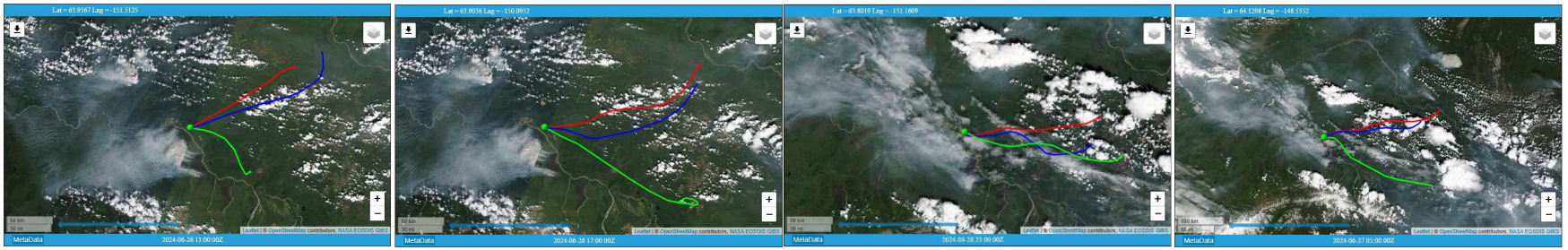

Figure 36: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 26, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 1 (11:00 UTC, June 26, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The air parcels' pathways indicate movement originating from an easterly component. Active fires are located to the northeast and southeast of FNSB. Durning the early morning hours, smoke filled the Tanana Flats and impacted FNSB until winds increased, providing cleaner air from the east.

Smoke Transport: The imagery shows heavy smoke filling the Tanana Flats and surrounding FNSB from the McDonald and Clear fires to the south. Although air parcels originated from the east, the parcels migrated to the southwest outside the smoke field. The smoke originated from fires to the southeast. Light and variable winds during early morning hours allowed for smoke to impact all monitors and as winds increased the smoke thinned and concentrations decreased, as observed in FNSB monitors and surface observations.

Table 17. Hourly surface observation for Fairbanks International Airport, June 26, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	06/26/2024 00:53 AKDT	3	150		7	5	63	55
PAFA	06/26/2024 01:53 AKDT	3	50		7	4	61	55
PAFA	06/26/2024 02:53 AKDT	5	360			7	59	52
PAFA	06/26/2024 03:53 AKDT	0	0			7	58	54
PAFA	06/26/2024 04:53 AKDT	5	90			7	56	52
PAFA	06/26/2024 05:53 AKDT	0	0			7	57	51
PAFA	06/26/2024 06:53 AKDT	5	20		7	6	61	53
PAFA	06/26/2024 07:53 AKDT	6	50		7	2	62	53
PAFA	06/26/2024 08:53 AKDT	0	0		7	1	64	51
PAFA	06/26/2024 09:53 AKDT	0	0		7	1	69	51
PAFA	06/26/2024 10:53 AKDT	3	30		7	1	73	52
PAFA	06/26/2024 11:53 AKDT	5	60		7	6	76	52
PAFA	06/26/2024 12:53 AKDT	3			7	3	79	49
PAFA	06/26/2024 13:53 AKDT	5				10	81	50
PAFA	06/26/2024 14:53 AKDT	5	300			10	80	51
PAFA	06/26/2024 15:53 AKDT	5	300			10	79	49
PAFA	06/26/2024 16:53 AKDT	6	300			9	79	50
PAFA	06/26/2024 17:53 AKDT	3	310			8	79	53
PAFA	06/26/2024 18:53 AKDT	3	300			9	79	55
PAFA	06/26/2024 19:53 AKDT	6	310			10	80	51
PAFA	06/26/2024 20:53 AKDT	13	70			10	79	46
PAFA	06/26/2024 21:53 AKDT	14	60			10	76	49
PAFA	06/26/2024 22:53 AKDT	7	50			10	72	50
PAFA	06/26/2024 23:53 AKDT	5	20			10	69	50

Surface Observations: The surface observations from June 26, 2024, indicate reduced visibility due to smoke, primarily during early morning/afternoon hours. At the PAFA station at Fairbanks International Airport, visibility dropped to a low of 1 statute mile by 16:53 UTC (08:53 AKDT). Light and variable winds support the smoke from the McDonald Fire and Clear Fire settling in the flats and migrating into FNSB.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 27, 2024

AICC Fire Report Summary:

- **New Fires:** 15 new fires reported.
- **Total Fires Statewide:** 128 fires burning.
- **Acres Burned:** 195,592 acres, with a 24-hour increase of 48,645 acres.

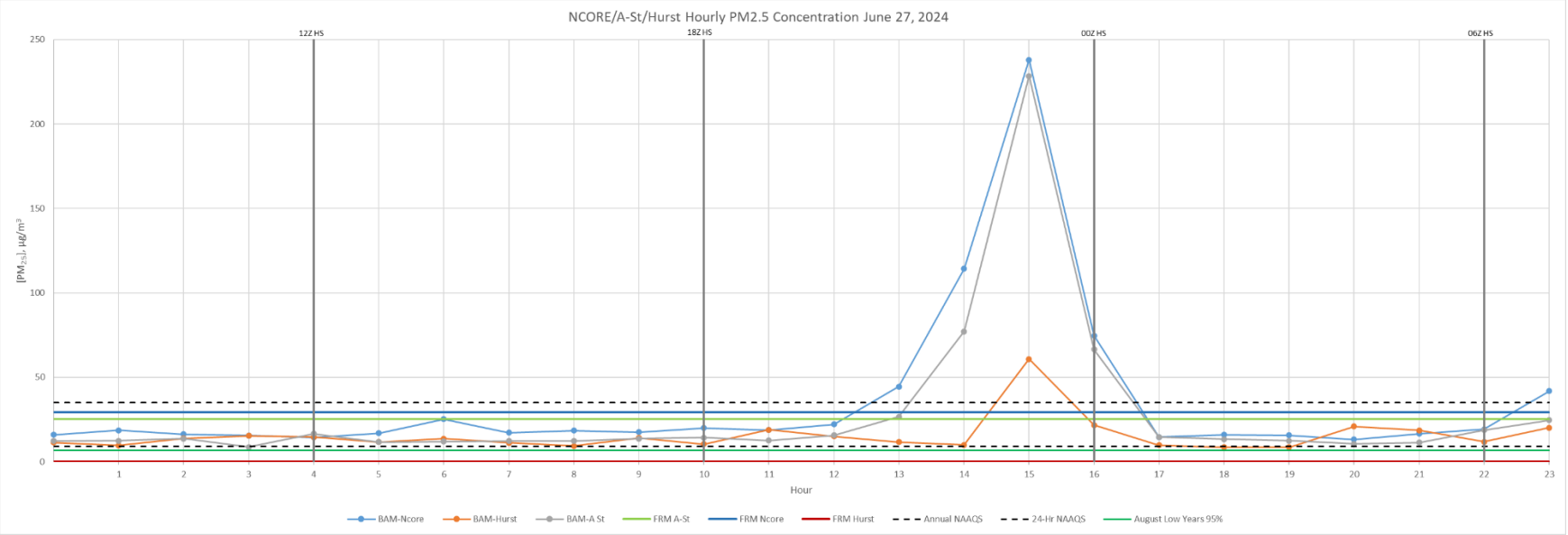

Figure 37: FNSB $PM_{2.5}$ concentrations for June 27, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 27, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day began with low $PM_{2.5}$ levels, generally between 10-20 µg/m³ across all sites.

Midday Levels: Concentrations remained stable through late morning, fluctuating between 10 and 20 µg/m³. A significant surge began around 12:00 PM and continued into the afternoon.

Afternoon to Evening Levels: $PM_{2.5}$ levels spiked early afternoon with BAM-NCore and BAM-A-Street to around 230 µg/m³ by 3:00 PM. The BAM-Hurst only spike to around 50 µg/m³. All sites drastically reduced after the afternoon spike, with all sites returning to the 10-20 µg/m³ range.

Overall Trend: On June 27, 2025, $PM_{2.5}$ concentrations displayed a prominent early afternoon peak, with BAM-A-Street and BAM-NCore both reaching 230 µg/m³ at 3:00 PM. These spikes caused all sites to exceed the annual NAAQS standard (lower dashed line) of 9 µg/m³ and the 24-hr NAAQS standard (upper dashed line) of 35 µg/m³.. By late afternoon, concentrations dropped to around 20 µg/m³ across all sites, remaining steady through the evening between 10–20 µg/m³, yet still above the annual NAAQS, reflecting ongoing air quality challenges.

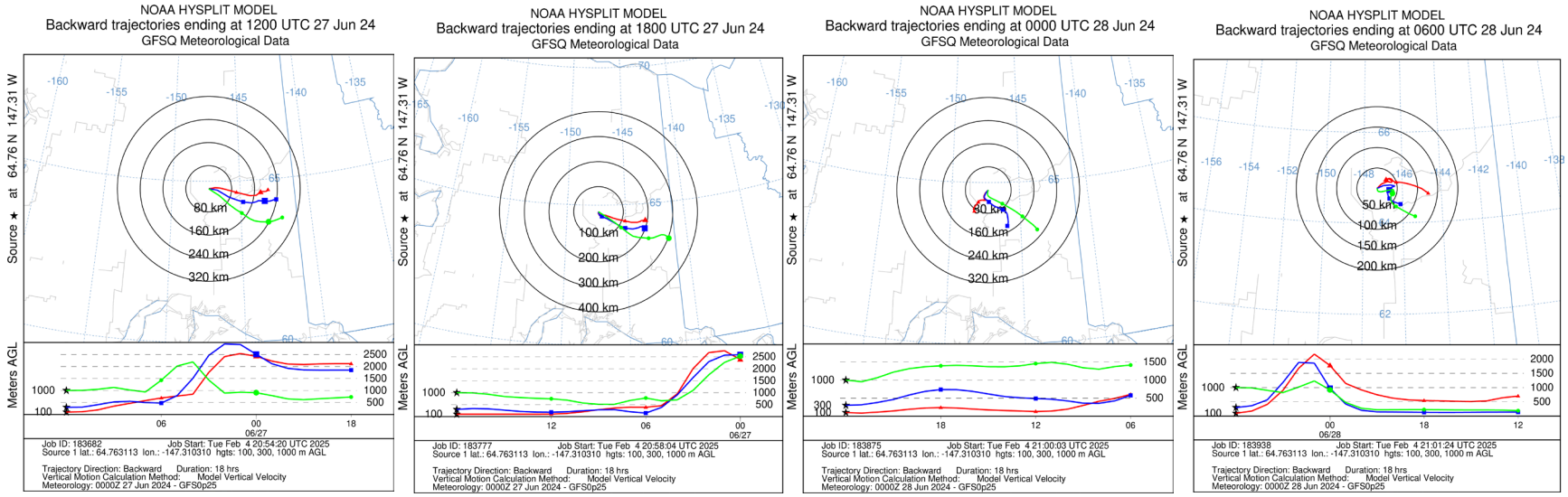

Figure 38: NOAA HYSPLIT model backward trajectories for June 27, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 27 to June 28, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile

below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 27, 2024): This image shows the backward trajectory ending early morning on June 27. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from the southeast, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m began around 2000m AGL and ended below 500m, while the 1000m trajectory began below 1000m AGL and ended at 1000m above the target location.

Image 2 (18:00 UTC, June 27, 2024): The second image captures the backward trajectory ending in the late morning on June 27. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses continuing from the southeast, converging towards the target location. The vertical profile below the map shows all air parcels at 100m, 300m, and 1000m began above 2000m AGL and ended below 1000m.

Image 3 (00:00 UTC, June 28, 2024): The third image displays the backward trajectory ending late afternoon on June 27. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses migrated to a more southerly component, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m began above 500m AGL and ended below 500m, while the 1000m trajectory originated just below 1500m AGL and lowered to 1000m above the target.

Image 4 (06:00 UTC, June 28, 2024): The final image in this series illustrates the backward trajectory ending late evening June 27. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from an easterly component, converging towards the target location. The vertical profile below the map shows that air parcels at 300m and 1000m began near surface and rose during parcel movement. The trajectories at 300m ended at 500m and the 1000m ended at 1000m above target, while the 100m trajectory began above 500m and ended near surface over target.

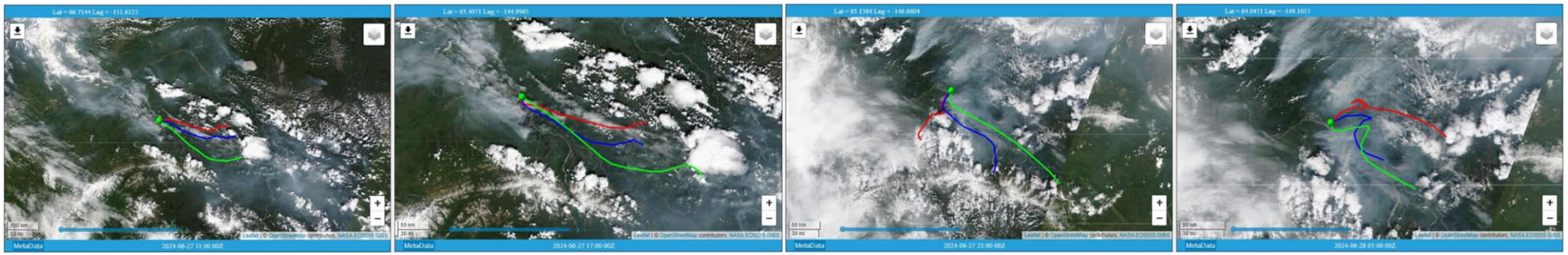

Figure 39: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 27, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 3 (23:00 UTC, June 27, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The air parcels' pathways indicate movement originating from a southerly component. Active fires are located to the northeast and southeast of FNSB. With the direction change for the wind; you can see the smoke from the Clear and McDonald fires moving through FNSB.

Smoke Transport: The imagery shows heavy smoke filling the region and surrounding FNSB and Smoke from the McDonald and Clear fires to the south. Although air parcels originated from the southeast early, the parcels migrated to the south inside the smoke field. The smoke originated from fires to the southeast. Easterly winds during early morning hours allowed for smoke to fill the Tanana Flats, and as winds shifted, smoke moved into FNSB and impacted all monitors.

Table 18. Hourly surface observation for Fairbanks International Airport, June 27, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	06/27/2024 00:53 AKDT	10	40			10	67	49
PAFA	06/27/2024 01:53 AKDT	0	0			10	66	48
PAFA	06/27/2024 02:53 AKDT	5	30			10	59	51
PAFA	06/27/2024 03:53 AKDT	0	0			10	58	50
PAFA	06/27/2024 04:53 AKDT	0	0			10	58	50
PAFA	06/27/2024 05:53 AKDT	3	40			10	59	49
PAFA	06/27/2024 06:53 AKDT	0	0			10	62	51
PAFA	06/27/2024 07:53 AKDT	5	20			10	66	51
PAFA	06/27/2024 08:53 AKDT	0	0			10	71	50
PAFA	06/27/2024 09:53 AKDT	3	40			10	72	52
PAFA	06/27/2024 10:53 AKDT	0	0			10	75	50
PAFA	06/27/2024 11:53 AKDT	3				10	78	50
PAFA	06/27/2024 12:53 AKDT	6	110			10	79	48
PAFA	06/27/2024 13:53 AKDT	5	230			10	79	50
PAFA	06/27/2024 14:53 AKDT	3	230			7	79	50
PAFA	06/27/2024 15:53 AKDT	0	0		7	2	81	46
PAFA	06/27/2024 16:53 AKDT	0	0		7	2	83	46
PAFA	06/27/2024 17:53 AKDT	20	70	29.92	7	5	79	47
PAFA	06/27/2024 18:53 AKDT	12	70	26.47		10	74	48
PAFA	06/27/2024 19:53 AKDT	15	30			10	73	49
PAFA	06/27/2024 20:53 AKDT	6	60			10	73	49
PAFA	06/27/2024 21:53 AKDT	0	0			10	71	50
PAFA	06/27/2024 22:53 AKDT	5	40			10	66	51
PAFA	06/27/2024 23:53 AKDT	5	10		7	6	65	50

Surface Observations: The surface observations from June 27, 2024, indicate reduced visibility due to smoke for a few hours in late afternoon. At the PAFA station at Fairbanks International Airport, visibility dropped to a low of 2 statute miles by 23:53 UTC (15:53 AKDT). Southeast winds in the preceding hours support the smoke from the McDonald Fire and Clear Fire moving into FNSB.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 28, 2024

AICC Fire Report Summary:

- **New Fires:** 15 new fires reported.
- **Total Fires Statewide:** 138 fires burning.
- **Acres Burned:** 234,152 acres, with a 24-hour increase of 38,560 acres.

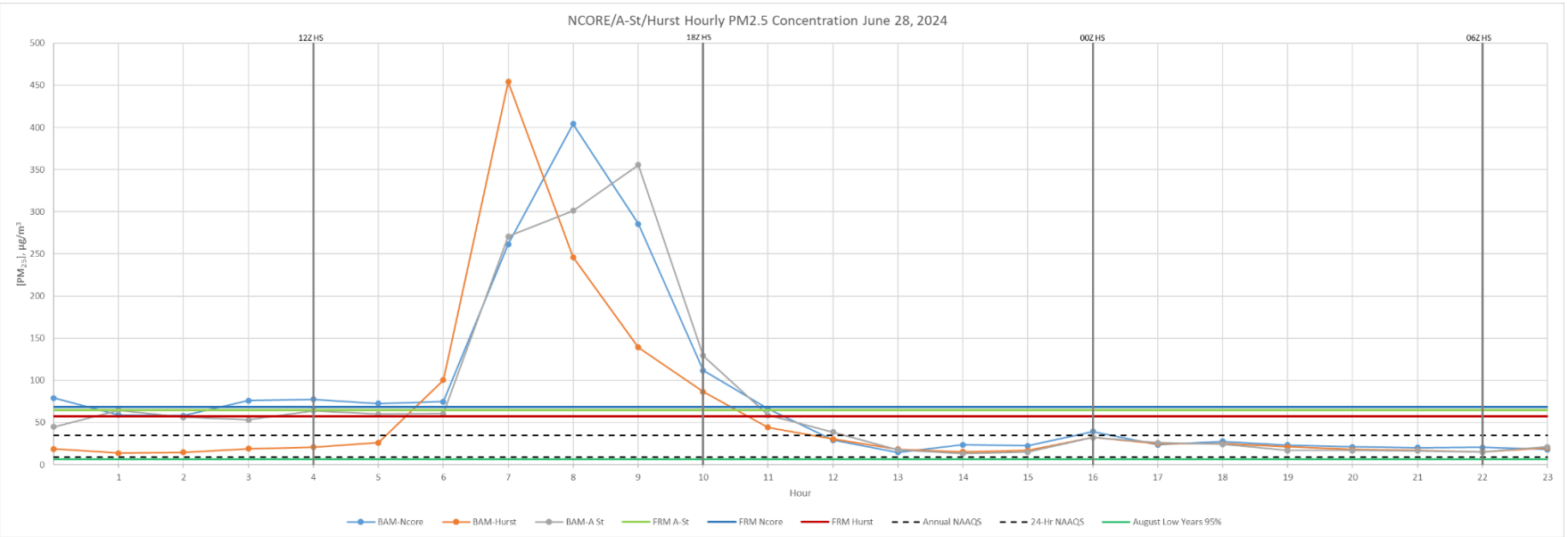

Figure 40: FNSB $PM_{2.5}$ concentrations for June 28, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 28, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day began with elevated $PM_{2.5}$ levels of 50 µg/m³ and 75 µg/m³ at the BAM-A-Street and BAM-NCore sites, with the BAM- Hurst site at 20 µg/m³ in the early morning hours. A sharp spike occurred around 6:00 AM, with BAM-Hurst reaching just over 450 µg/m³, BAM-NCore peaking at just over 400 µg/m³, and BAM-A-St rising to just over 350 µg/m³.

Midday Levels: Following the morning peak, concentrations dropped significantly between 10:00 AM and 12:00 PM, falling to around 25-50 µg/m³ across all sites. Levels remained relatively stable through late morning and into the afternoon, hovering below 35µg/m³.
Afternoon to Evening Levels: From 4:00 PM through the evening, $PM_{2.5}$ levels remained relatively stable, continuing to hover below 20 µg/m³ across all sites, with no spikes.

Overall Trend: On June 27, 2025, $PM_{2.5}$ concentrations displayed a prominent early morning peak, with BAM-Hurst reaching 450 µg/m³, BAM-NCore hitting 400 µg/m³, and BAM-A-Street rising to 350 µg/m³ at 6:00 AM, driven by elevated levels across all sites (20–450 µg/m³). These spikes caused all sites to exceed the 24-hour NAAQS threshold of 35 µg/m³ and the annual NAAQS standard of 9 µg/m. By late morning, concentrations dropped to around 25–50 µg/m³ across all sites, remaining steady through the evening below 20 µg/m³, yet still above the annual NAAQS, reflecting ongoing air quality challenges.

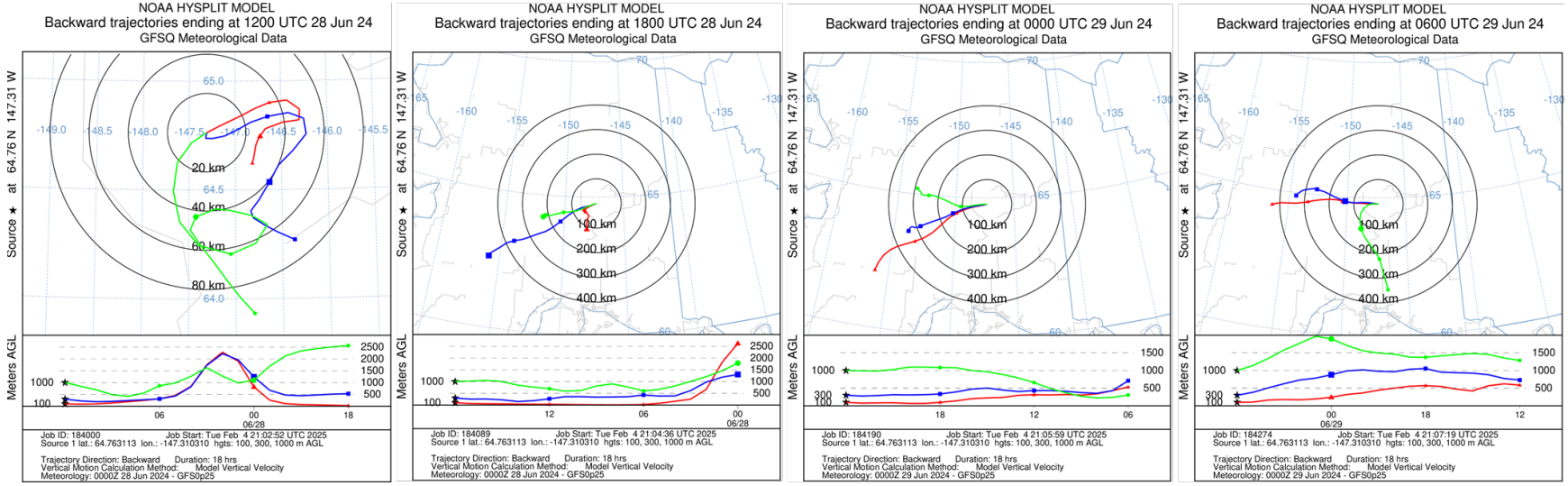

Figure 41: NOAA HYSPLIT model backward trajectories for June 28, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 28 to June 29, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile

below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 28, 2024): This image shows the backward trajectory ending early morning on June 28. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses experiencing a great deal of directional change during their path but all trajectories originated from a southerly component, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m began around 500m AGL and ended below 400m, while the 1000m trajectory began around 2500m AGL and ended at 1000m above the target location.

Image 2 (18:00 UTC, June 28, 2024): The second image captures the backward trajectory ending in the late morning on June 28. The trajectories at 100m (red), 300m (blue), and 1000m (green) stabilized after the frontal passage with the air masses now from the southwest, converging towards the target location. The vertical profile below the map shows all air parcels at 100m, 300m, and 1000m began above 1300m AGL and ended at 1000m and below.

Image 3 (00:00 UTC, June 29, 2024): The third image displays the backward trajectory ending late afternoon on June 28. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses continued southwesterly component, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m began above 500m AGL and ended below 500m, while the 1000m trajectory originated just below 500m AGL and raised to 1000m height above the target.

Image 4 (06:00 UTC, June 29, 2024): The final image in this series illustrates the backward trajectory ending late evening June 28. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses originating from a west and southerly component, converging towards the target location. The vertical profile below the map shows that air parcels at 300m and 1000m began above 500m AGL and sank during parcel movement, ending up near surface over target. The 1000m remained elevated during the trajectory's path.

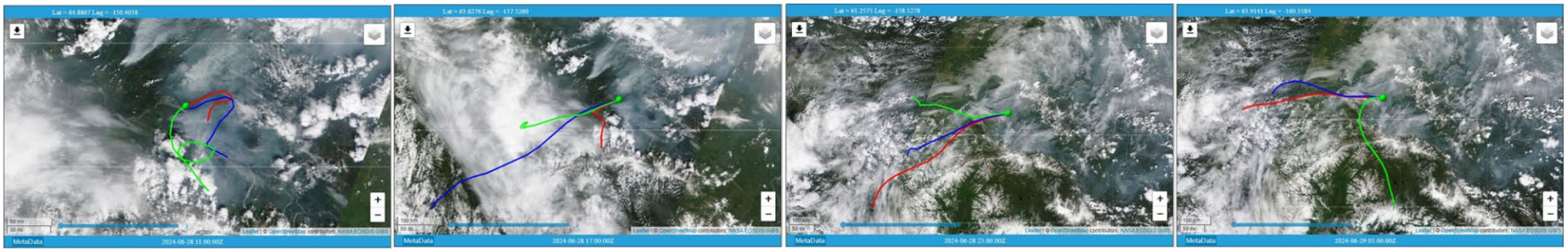

Figure 42: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 28, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 1 (11:00 UTC, June 28, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses experiencing a great deal of directional change during their path but all trajectories originated from a southerly component, converging towards the target location. Active fires are located to the northeast and southeast of FNSB. With the direction change for the wind; you can see the smoke from the Clear and McDonald fires moving through FNSB.

Smoke Transport: The imagery shows heavy smoke filling the region and surrounding FNSB and smoke from the McDonald and Clear fires to the south. The smoke originated from fires to the southeast. Easterly winds during early morning hours allowed for smoke to fill the Tanana Flats, and as winds shifted, smoke moved into FNSB and impacted all monitors. As the winds shifted, smoke from all the fires blew to the northeast, cleaning out FNSB for the rest of the day.

Table 19. Hourly surface observation for Fairbanks International Airport, June 28, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	06/28/2024 00:53 AKDT	5	320		7	3	64	50
PAFA	06/28/2024 01:53 AKDT	0	0		7	3	63	53
PAFA	06/28/2024 02:53 AKDT	0	0		7	4	61	54
PAFA	06/28/2024 03:53 AKDT	0	0		7	4	61	54
PAFA	06/28/2024 04:53 AKDT	0	0		7	3	61	54
PAFA	06/28/2024 05:53 AKDT	3	40		7	4	60	52
PAFA	06/28/2024 06:53 AKDT	3	310		7	5	60	52
PAFA	06/28/2024 07:53 AKDT	0	0		7	4	62	52
PAFA	06/28/2024 08:53 AKDT	5	160		7	5	64	53
PAFA	06/28/2024 09:53 AKDT	3			7	2	68	53
PAFA	06/28/2024 10:53 AKDT	6	180		7	5	71	52
PAFA	06/28/2024 11:53 AKDT	8	160		7	5	73	53
PAFA	06/28/2024 12:53 AKDT	6	210			7	75	53
PAFA	06/28/2024 13:53 AKDT	6				10	78	53
PAFA	06/28/2024 14:53 AKDT	8	190			10	78	54
PAFA	06/28/2024 15:53 AKDT	7	220			10	79	52
PAFA	06/28/2024 16:53 AKDT	15	270	19.56		10	78	53
PAFA	06/28/2024 17:53 AKDT	12	280			8	75	53
PAFA	06/28/2024 18:53 AKDT	13	260	16.11		8	75	53
PAFA	06/28/2024 19:53 AKDT	10	250			8	73	52
PAFA	06/28/2024 20:53 AKDT	5	260			8	73	51
PAFA	06/28/2024 21:53 AKDT	7	270			10	73	49
PAFA	06/28/2024 22:53 AKDT	3	250			10	72	48
PAFA	06/28/2024 23:53 AKDT	6	270			10	69	48

Surface Observations: The surface observations from June 28, 2024, indicate reduced visibility due to smoke during the morning hours at the PAFA station at Fairbanks International Airport, with visibility dropping as low as 2 statute miles by 17:53 UTC (09:53 AKDT). Calm and variable winds earlier in the day transitioned to westerly winds by afternoon and cleared out the smoke from the McDonald and Clear fires.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 29, 2024

AICC Fire Report Summary:

- **New Fires:** 4 new fires reported.
- **Total Fires Statewide:** 140 fires burning.
- **Acres Burned:** 297,237 acres, with a 24-hour increase of 63,085 acres.

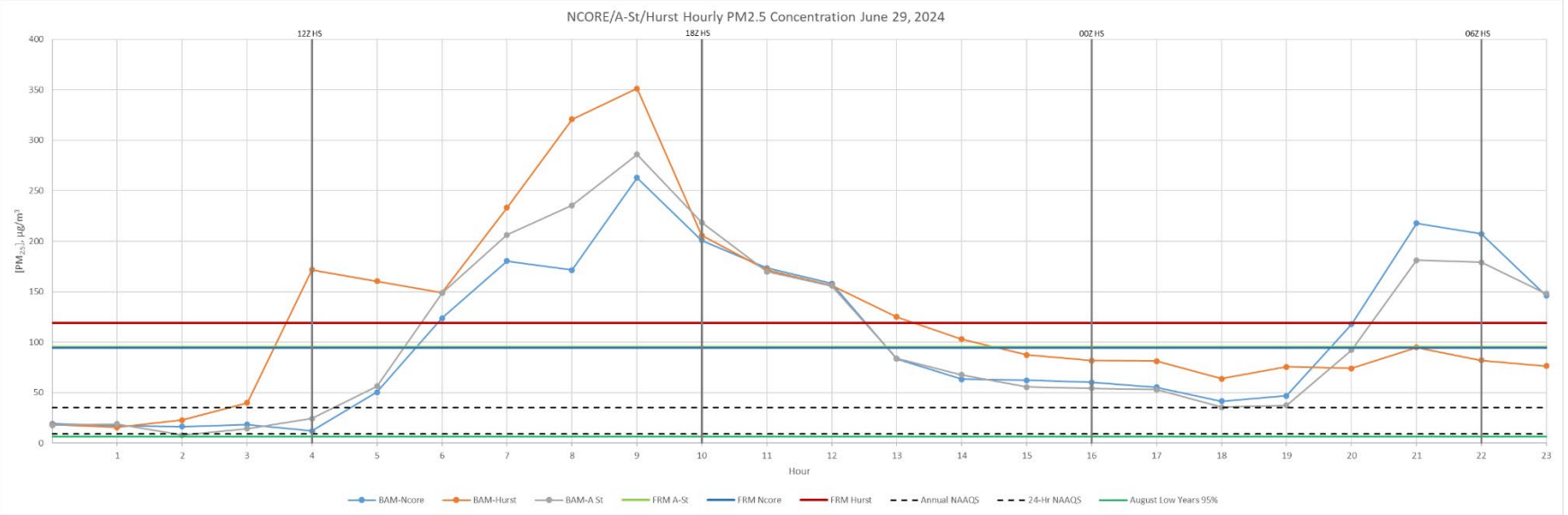

Figure 43: FNSB $PM_{2.5}$ concentrations for June 29, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 29, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day began with $PM_{2.5}$ levels relatively low, with all sites measuring below 35 µg/m³ in the early morning hours (approximately 1:00 AM to 4:00 AM), ranging between 10-30 µg/m³. A sharp spike began around 5:00 AM, with BAM-Hurst reaching approximately 350 µg/m³, BAM-NCore peaking at around 260 µg/m³, and BAM-A-St rising to about 290 µg/m³ by 9:00 AM.

Midday Levels: Following the morning peak, concentrations gradually declined, falling to around 50-125 µg/m³ across all sites. Levels remained high, but stable through the afternoon.
Afternoon to Evening Levels: From 4:00 PM through the evening, $PM_{2.5}$ levels began to rise again, with a notable increase starting around 7:00 PM. By 9:00 PM, BAM-NCore peaked just over 200 µg/m³, while BAM-A-St reached around 175 µg/m³.

Overall Trend: On June 29, 2024, $PM_{2.5}$ concentrations exhibited a significant early morning spike—peaking at approximately 350 µg/m³ at BAM-Hurst, 260 µg/m³ at BAM-NCore, and 300 µg/m³ at BAM-A-St—due to the McDonald Fire's smoke plume. After this peak, levels declined to 50-100 µg/m³ and remained stable through the midday, followed by a secondary spike in the evening, reaching up to 270 µg/m³ at BAM-NCore. These concentrations exceed the 24-hour National Ambient Air Quality Standard (NAAQS) of 35 µg/m³ (upper dashed black line) and the annual NAAQS limit of 9 µg/m³ (lower dashed line) throughout the 24-hour period, indicating poor to hazardous air quality conditions. The elevated concentrations are attributed to smoke from the McDonald and Clear fires.

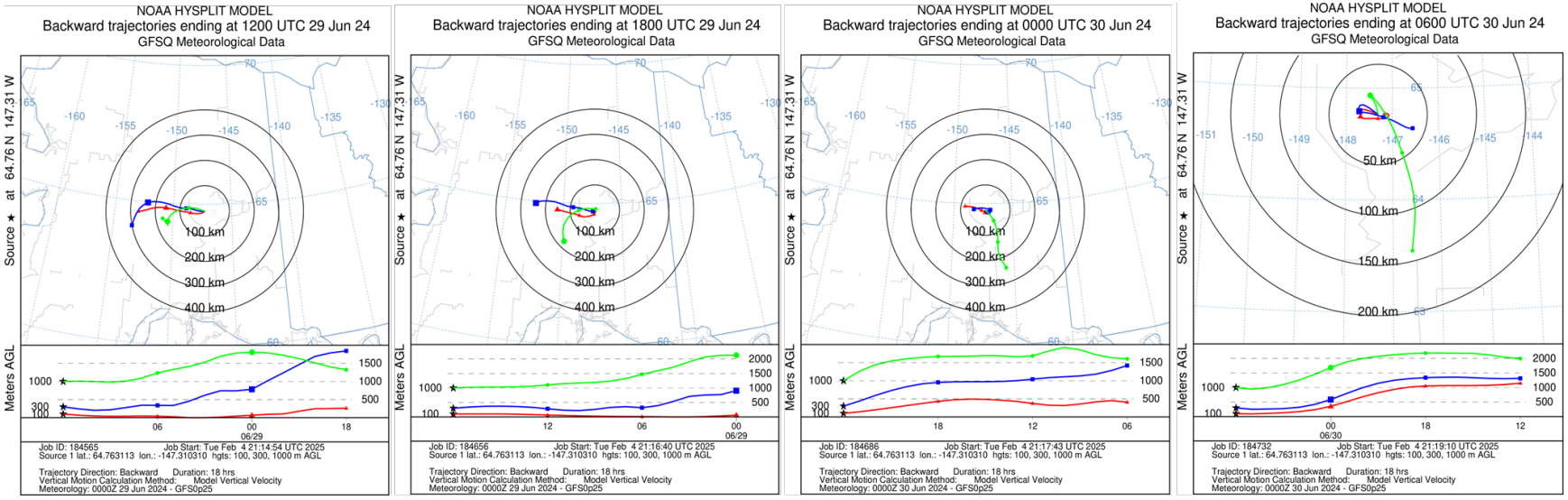

Figure 44: NOAA HYSPLIT model backward trajectories for June 29, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 29 to June 30, 2024. These backward trajectories trace

the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 29, 2024): This image shows the backward trajectory ending early morning on June 29. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate all trajectories originated from the west, converging towards the target location. The vertical profile below the map shows that air parcels at 100m began and ended its path near surface while the 300m began above 1500m AGL and ended below 300m, and the 1000m trajectory began around 1400m AGL and ended at 1000m above the target location.

Image 2 (18:00 UTC, June 29, 2024): The second image captures the backward trajectory ending in the late morning on June 29. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the air masses continued from a westerly component, converging towards the target location. The vertical profile below the map shows that air parcels at 100m began and ended their path near surface while the 300m began at 1000m AGL and ended below 400m, and the 1000m trajectory began around 2000m AGL and ended at 1000m above the target location.

Image 3 (00:00 UTC, July 3, 2024): The third image displays the backward trajectory ending late afternoon on June 30. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the lower trajectories continued from a westerly component, while the 1000m trajectory shifted to a southern component, converging towards the target location. The vertical profile below the map shows that air parcels at 100m began just below 500m AGL and ended its path near surface while the 300m began at 1500m AGL and ended below 400m, and the 1000m trajectory began above 1500m AGL and ended at 1000m above the target location.

Image 4 (06:00 UTC, July 3, 2024): The final image in this series illustrates the backward trajectory ending late evening June 30. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate meandering air masses in the lower levels with air parcels originating from southerly components in the upper levels, converging towards the target location. The vertical profile below the map shows that air parcels at 100m and 300m began above 1000m AGL and sank during parcel movement, ending up near surface over target. The 1000m began over 2000m AGL and lowered to 1000m over target.

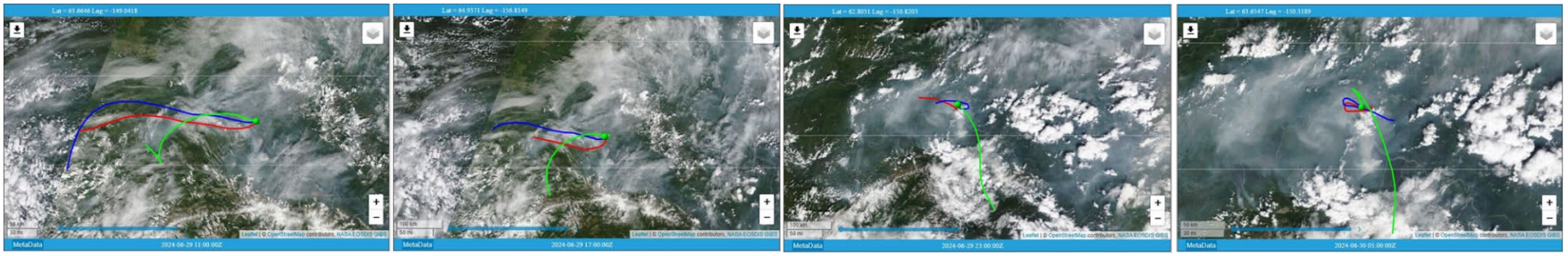

Figure 45: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 29, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 3 (23:00 UTC, June 29, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the lower trajectories continued from a westerly component, while the 1000m trajectory shifted to a southern component, converging towards the target location. All trajectories moved within the smoke field seen on the imagery. Active fires are located to the northeast and southeast of FNSB.

Smoke Transport: The imagery shows heavy smoke within the region surrounding FNSB. Any directional change in trajectories would support movement of smoke over the target location.

Table 20. Hourly surface observation for Fairbanks International Airport, June 29, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	06/29/2024 00:53 AKDT	3	190			10	63	50
PAFA	06/29/2024 01:53 AKDT	0	0			10	60	50
PAFA	06/29/2024 02:53 AKDT	3	20			10	58	52
PAFA	06/29/2024 03:53 AKDT	0	0			10	59	49
PAFA	06/29/2024 04:53 AKDT	0	0			10	59	52
PAFA	06/29/2024 05:53 AKDT	0	0			10	60	49
PAFA	06/29/2024 06:53 AKDT	7	60		7	7	60	52
PAFA	06/29/2024 07:53 AKDT	5	60		7	4	62	52
PAFA	06/29/2024 08:53 AKDT	5	30		7	3	63	53
PAFA	06/29/2024 09:53 AKDT	3	30		7	1	65	53
PAFA	06/29/2024 10:53 AKDT	5	110		7	1	68	53
PAFA	06/29/2024 11:53 AKDT	3	190		7	1	70	53
PAFA	06/29/2024 12:53 AKDT	3	150		7	2	72	53
PAFA	06/29/2024 13:53 AKDT	0	0		7	2	76	52
PAFA	06/29/2024 14:53 AKDT	3			7	3	80	50
PAFA	06/29/2024 15:53 AKDT	5			7	5	81	49
PAFA	06/29/2024 16:53 AKDT	0	0		7	5	82	50
PAFA	06/29/2024 17:53 AKDT	0	0		7	5	82	50
PAFA	06/29/2024 18:53 AKDT	5	320		7	5	81	48
PAFA	06/29/2024 19:53 AKDT	3	340		7	6	82	48
PAFA	06/29/2024 20:53 AKDT	7	330		7	6	80	48
PAFA	06/29/2024 21:53 AKDT	7	340		7	1	76	49
PAFA	06/29/2024 22:53 AKDT	6	360		7	1	72	49
PAFA	06/29/2024 23:53 AKDT	8	340		7	1	71	48

Surface Observations: The surface observations from June 29, 2024, indicate reduced visibility due to smoke beginning during the morning hours at the PAFA station at Fairbanks International Airport, with visibility dropping as low as 1 statute miles by 17:53 UTC (09:53 AKDT). Smoke from the McDonald and Clear fires filled the area and surrounded FNSB, as winds shifted throughout the day and did not clear out the airport.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough - June 30, 2024

AICC Fire Report Summary:

- **New Fires:** No Report for Sunday, June 30th.
- **Total Fires Statewide:** No Report for Sunday, June 30th.
- **Acres Burned:** No Report for Sunday, June 30th.

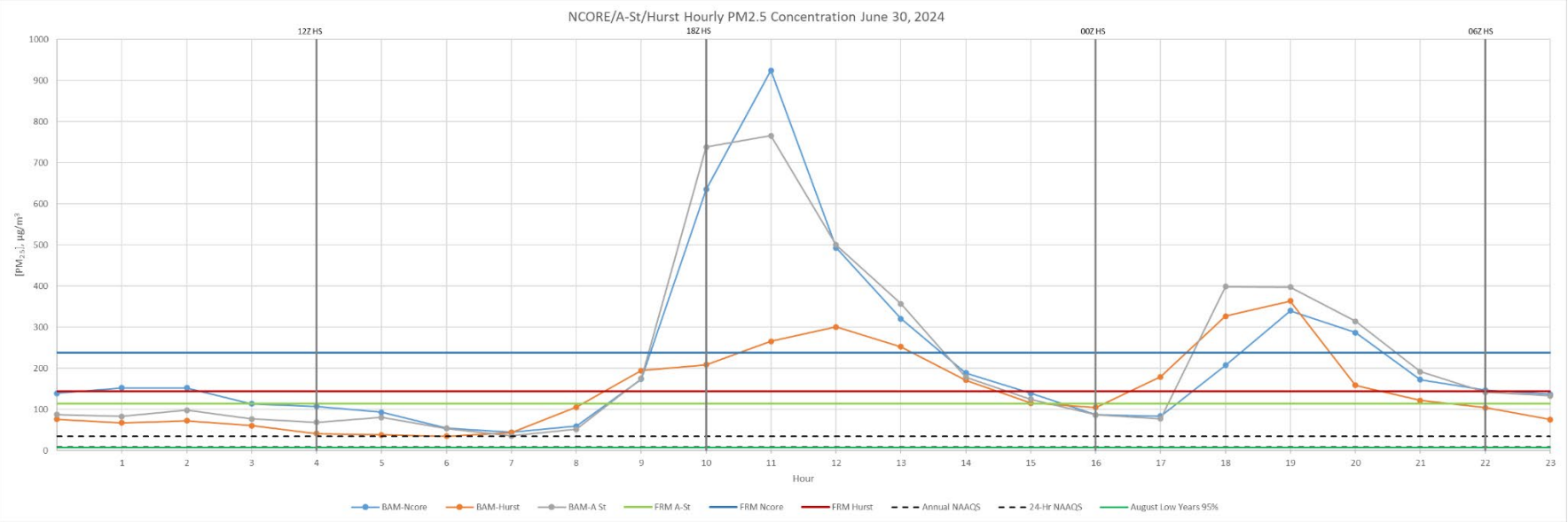

Figure 46: FNSB $PM_{2.5}$ concentrations for June 30, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on June 30, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day began with elevated $PM_{2.5}$ levels, with all sites measuring between 75-150 µg/m³ in the early morning hours. A sharp spike occurred around 8:00 AM, with BAM-NCore reaching approximately 900 µg/m³, BAM-A-St rising to about 775 µg/m³, and BAM-Hurst peaking at around 300 µg/m³ by 11:00 AM.

Midday Levels: Following the morning peak, concentrations dropped significantly, falling to around 70-150 µg/m³ across all sites. Levels remained high through late morning and into the afternoon.

Afternoon to Evening Levels: From 4:00 PM through the evening, $PM_{2.5}$ levels began to spike again, with a notable increase starting around 5:00 PM. By 6:00 PM, BAM-Hurst peaked at approximately 375 µg/m³, BAM-NCore reached around 350 µg/m³, and BAM A-St hit about 400 µg/m³. Levels then gradually declined but remained elevated, hovering between 50-150 µg/m³ through midnight.

Overall Trend: On June 30, 2024, $PM_{2.5}$ concentrations exhibited a significant early morning spike—peaking at approximately 900 µg/m³ at BAM-NCore, 775 µg/m³ at BAM-A-St, and 300 µg/m³ at BAM-Hurst— due to the McDonald Fire's smoke plume. After this peak, levels declined to 50-150 µg/m³ and remained stable through the midday, followed by a secondary spike in the early evening. These concentrations exceeded the 24-hour National Ambient Air Quality Standard (NAAQS) of 35 µg/m³ (upper dashed black line) and the annual NAAQS limit of 9 µg/m³ (lower dashed line) throughout the 24-hour period, indicating poor to hazardous air quality conditions. The high concentrations are a result of smoke from the Clear and McDonald fires.

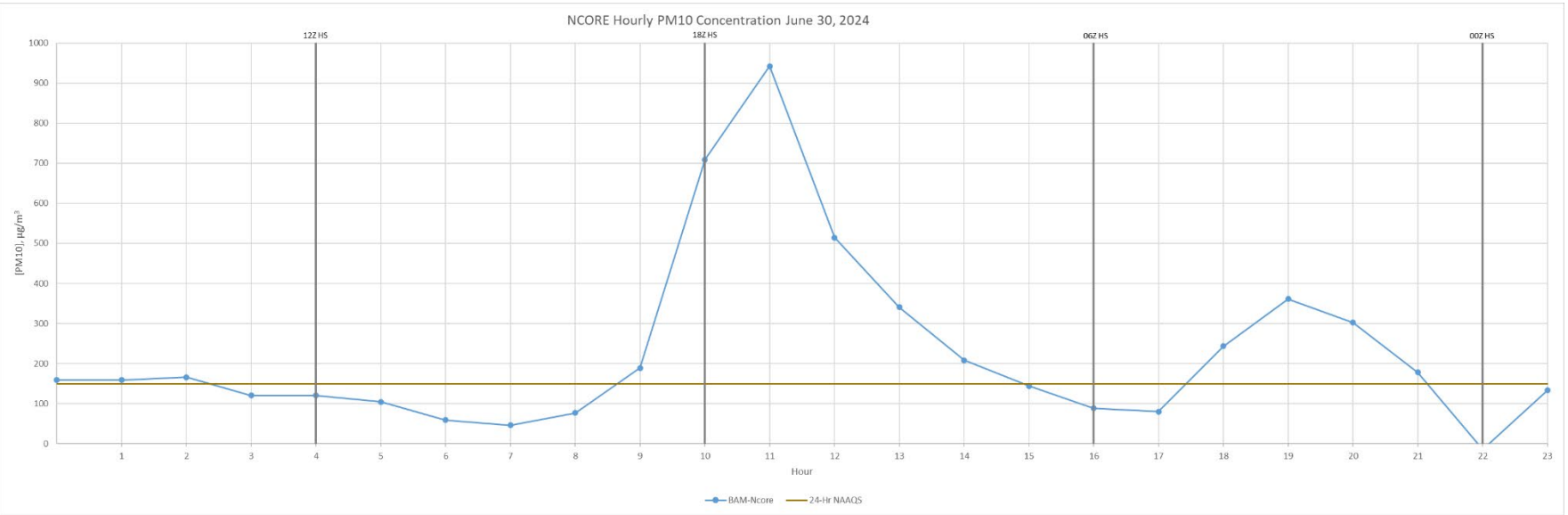

Figure 47: FNSB PM_{10} concentrations for June 30, 2024.

The chart above illustrates the hourly PM_{10} concentrations measured at the NCore site on June 30, 2024.

Early Morning Levels: The day began with elevated PM_{10} levels, with the NCore site measuring above 150 µg/m³ in the early morning hours. There was a gradual decline in concentrations from 2:00 AM to 7:00 AM.
Midday Levels: Following the morning decline, concentrations significantly spiked after 8:00 AM, climbing to 950 µg/m³. After, concentration levels began to decline into the afternoon hours.
Afternoon to Evening Levels: From 4:00 PM through the evening, PM_{10} levels began to rise again, with a notable increase starting around 6:00 PM. By 7:00 PM, BAM-NCore peaked just over 350 µg/m³ then saw a rapid decline to below the 150 µg/m³.

Overall Trend: On June 30, 2024, PM_{10} concentrations at the NCore site showed significant fluctuations. Early morning hours (2:00 AM–7:00 AM) began with levels above the EPA's 24-hour PM_{10} standard of 150 µg/m³, followed by a gradual decline. A dramatic spike occurred after 8:00 AM, reaching 950 µg/m³, well above the 24-hour standard. Concentration then declined into the afternoon. At 4:00 PM, levels rose again, peaking just over 350 µg/m³ at BAM-NCore by 7:00 PM, before rapidly dropping below 150 µg/m³.

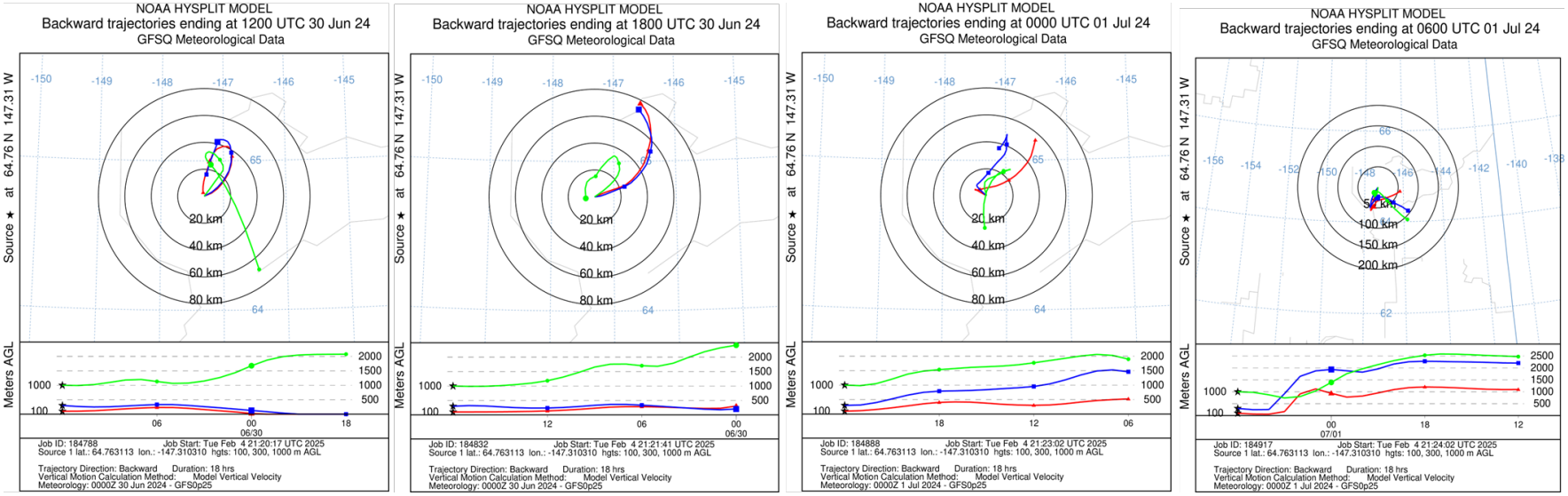

Figure 48: NOAA HYSPLIT model backward trajectories for June 30, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for June 30 to July 1, 2024. These backward trajectories trace

the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, June 30, 2024): This image shows the backward trajectory ending early morning on June 30. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the north, circling the area, and converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels started over the northern hills below 500m AGL and descended to below 500m above the target. The 1000m trajectory began above 2000m AGL and descended to 1000m above the target.

Image 2 (18:00 UTC, June 30, 2024): The second image captures the backward trajectory ending in the late morning on June 30. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the northeast and converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels started over the northern hills and descended to below 500m above the target. The 1000m trajectory began above 2000m AGL and descended to 1000m above the target.

Image 3 (00:00 UTC, July 1, 2024): The third image displays the backward trajectory ending late afternoon on July 1. Trajectories at 100m (red), 300m (blue), and 1000m (green) originate from the northeast, curving around the target location, and converging over target. The vertical profile below the map indicates that the 100m and 300m parcels start below 1500m AGL and descend below 500m above the target, while the 1000m trajectory begins above 2000m AGL and descends to approximately 1000m above the target.

Image 4 (06:00 UTC, July 1, 2024): The final image in this series illustrates the backward trajectory ending late evening July 1. Trajectories at 100m (red), 300m (green), and 1000m (blue) originate from the southeast, curving around the target location, and converging over target. The vertical profile below the map indicates that the 100m parcel started near 1000m AGL and descended to surface while the 300m and 1000m began above 2000m AGL and descended to below 1000m over the target.

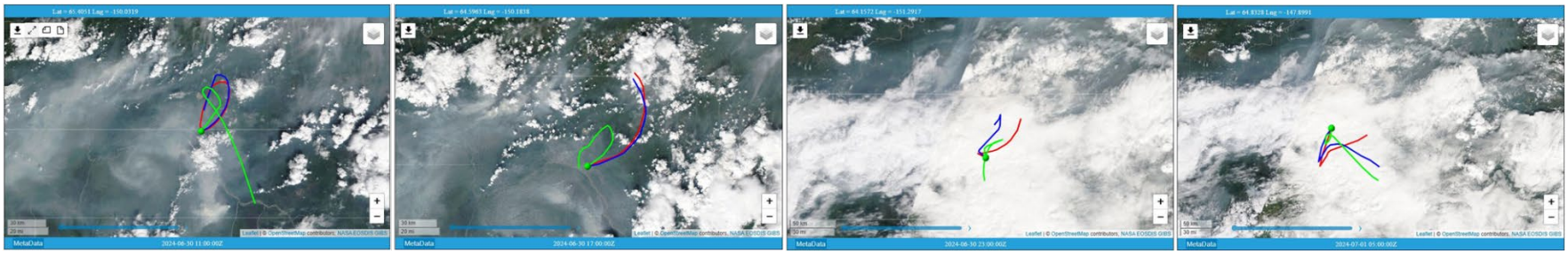

Figure 49: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for June 30, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 2 (17:00 UTC, June 30, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate a northeasterly component, converging towards the target location. All trajectories move within the smoke field throughout the timeframe.

Smoke Transport: The imagery shows cloud cover and smoke within the region surrounding the target area. The northeasterly trajectories support the movement of smoke over the target location, with a gradual rise to 1000m AGL over 12 hours, suggesting a steady transport influenced by regional weather patterns.

Table 21. Hourly surface observation for Fairbanks International Airport, June 30, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	06/30/2024 00:53 AKDT	5	70		7	1	67	50
PAFA	06/30/2024 01:53 AKDT	0	0		7	1	68	48
PAFA	06/30/2024 02:53 AKDT	0	0		7	1	64	51
PAFA	06/30/2024 03:53 AKDT	3	20		7	1	58	50
PAFA	06/30/2024 04:53 AKDT	7	60		7	1	62	50
PAFA	06/30/2024 05:53 AKDT	6	20		7	2	62	52
PAFA	06/30/2024 06:53 AKDT	0	0		7	3	63	54
PAFA	06/30/2024 07:53 AKDT	6	30		7	3	63	54
PAFA	06/30/2024 08:53 AKDT	6	40		7	4	68	53
PAFA	06/30/2024 09:53 AKDT	6	140		7	4	69	54
PAFA	06/30/2024 10:53 AKDT	3	90		7	1	72	55
PAFA	06/30/2024 11:53 AKDT	0	0		7	1	74	54
PAFA	06/30/2024 12:53 AKDT	0	0		7	0	76	53
PAFA	06/30/2024 13:53 AKDT	0	0		7	0	80	53
PAFA	06/30/2024 14:53 AKDT	3	200		7	1	81	52
PAFA	06/30/2024 15:53 AKDT	5	180		7	1	83	48
PAFA	06/30/2024 16:53 AKDT	3	140		7	1	84	51
PAFA	06/30/2024 17:53 AKDT	5	270		7	3	83	50
PAFA	06/30/2024 18:53 AKDT	17	270	24.17	7	1	78	50
PAFA	06/30/2024 19:53 AKDT	10	190	20.71	565	3	74	51
PAFA	06/30/2024 20:53 AKDT	13	110		7	2	71	52
PAFA	06/30/2024 21:53 AKDT	3	270		7	1	69	53
PAFA	06/30/2024 22:53 AKDT	5	80		7	1	67	55
PAFA	06/30/2024 23:53 AKDT	6	40		7	1	65	54

Surface Observations: The surface observations from June 30, 2024, indicate reduced visibility throughout the day at the PAFA station at Fairbanks International Airport. The two hours of 0 visibility coincide with the spikes in $PM_{2.5}$ and PM_{10}. Smoke from the McDonald and Clear fires filled the area and surrounded FNSB.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough – July 1, 2024

AICC Fire Report Summary:

- **New Fires:** 17 new fires reported.
- **Total Fires Statewide:** 161 fires burning.
- **Acres Burned:** 428,911 acres, with a 48-hour increase of 131,674 acres.

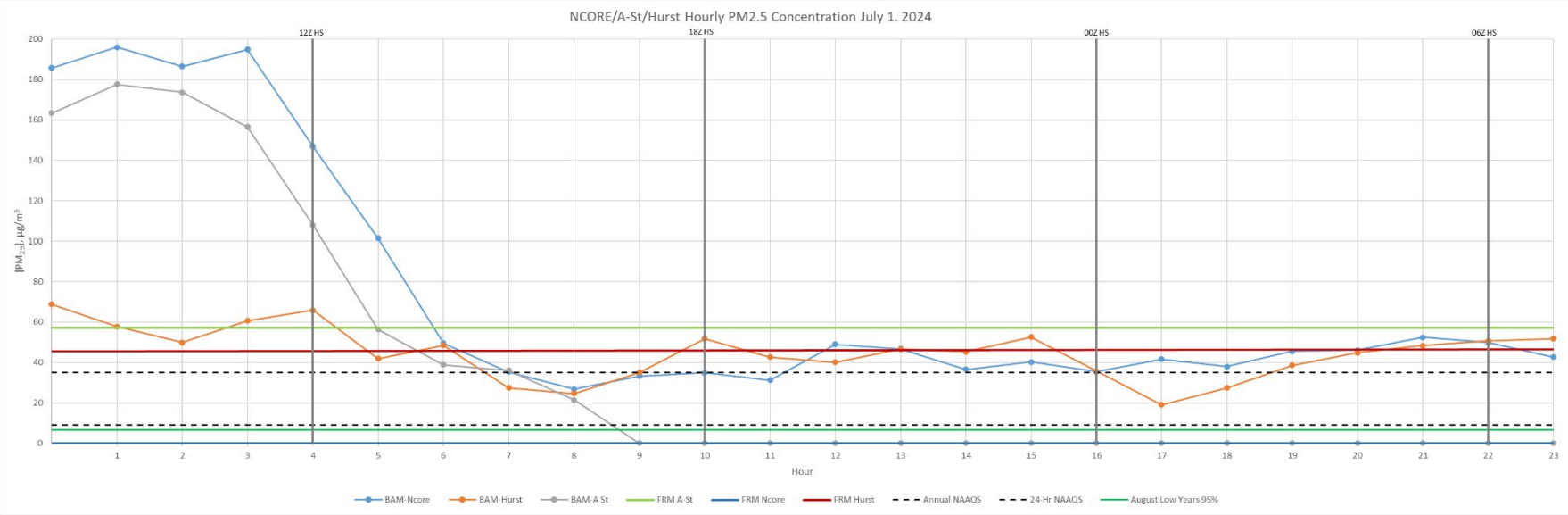

Figure 50: FNSB $PM_{2.5}$ concentrations for July 1, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on July 1, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: The day began with $PM_{2.5}$ levels extremely high, with all sites measuring between 70-200 µg/m³ in the early morning hours. A steady decline began around 3:00 AM, with all sites lowering to 30µg/m³ by 8:00 AM.
Midday Levels: Following the morning decline, concentrations leveled off to around 40-50 µg/m³ across all sites. Levels remained steady through late morning and into the afternoon.

Afternoon to Evening Levels: From 4:00 PM through the evening, $PM_{2.5}$ levels maintained the midday levels, with a minor dip for BAM-Hurst to 20 µg/m³ at 5:00 PM.

Overall Trend: On July 1, 2024, $PM_{2.5}$ concentrations began with a spike of 70-200 µg/m³ across all sites in the early morning, with BAM-NCore starting at 190 µg/m³, BAM-Hurst at 60 µg/m³, and BAM-A-St at 180 µg/m³, due to the Clear and McDonald fire's smoke plumes. Levels gradually declined to 40-50 µg/m³ by late morning and remained stable through the midday, afternoon, and evening, with no notable spikes. These concentrations exceed the 24-hour National Ambient Air Quality Standard (NAAQS) of 35 µg/m³ (upper dashed black line) and the annual NAAQS limit of 9 µg/m³ (lower dashed line) throughout the 24-hour period, indicating poor to hazardous air quality conditions.

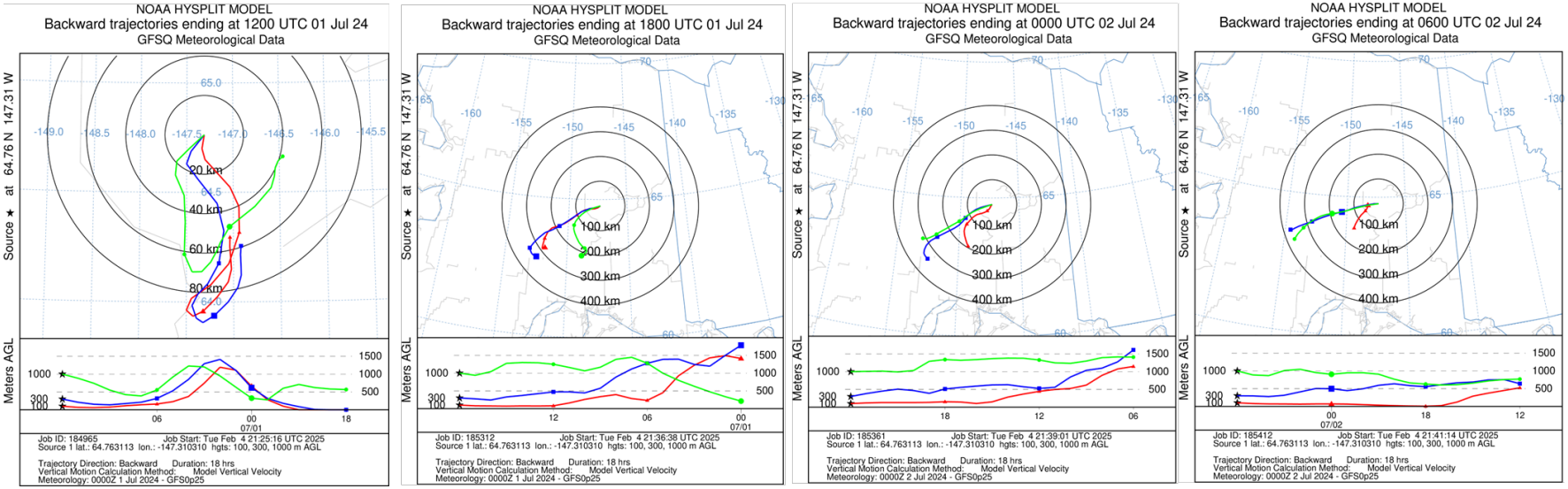

Figure 51: NOAA HYSPLIT model backward trajectories for July 1, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for July 1 to July 2, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of

pollutants and smoke impacting the area.

Image 1 (12:00 UTC, July 1, 2024): This image shows the backward trajectory ending early in the morning on July 1. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the south, converging toward the target location. The vertical profile below the map indicates that the 100m, 300m and 1000m parcels originated to the south along the Alaska Range. All trajectories migrated through the smoke that filled the Tanana Flats.

Image 2 (18:00 UTC, July 1, 2024): The second image shows the backward trajectory ending late morning on July 1. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m, 300m and 1000m parcels originated to the southwest indicating all trajectories migrated through the smoke that filled the Tanana Flats.

Image 3 (00:00 UTC, July 2, 2024): The third image displays the backward trajectory ending late afternoon on July 1. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m, 300m and 1000m parcels originated to the southwest indicating all trajectories migrated through the smoke that filled the Tanana Flats.

Image 4 (06:00 UTC, July 2, 2024): The final image in this series illustrates the backward trajectory ending late evening July 1. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m, 300m and 1000m parcels originated to the southwest indicating all trajectories migrated through the smoke that filled the Tanana Flats.

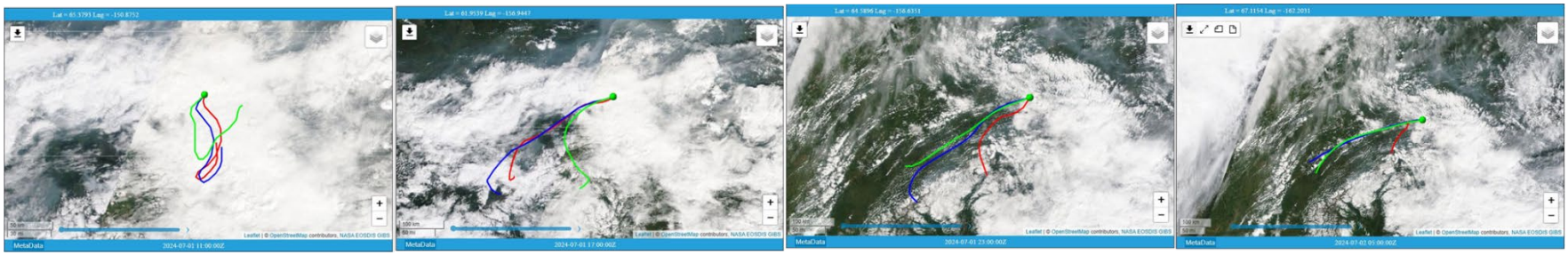

Figure 52: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for July 1, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 1 (11:00 UTC, July 1, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate a southerly component, converging towards the target location. All trajectories migrate within the smoke field trapped under the clouds.

Smoke Transport: The imagery shows cloud cover and smoke within the region surrounding the target area. The southerly trajectories support the movement of smoke over the target location, suggesting steady transport from the Clear and McDonald fires influenced by regional weather patterns.

Table 22. Hourly surface observation for Fairbanks International Airport, July 1, 2024

PAFA	07/01/2024 00:53 AKDT	3	10		7	2	64	54
PAFA	07/01/2024 01:53 AKDT	0	0		7	1	64	55
PAFA	07/01/2024 02:53 AKDT	0	0		7	2	63	57
PAFA	07/01/2024 03:53 AKDT	0	0		7	2	61	55
PAFA	07/01/2024 04:53 AKDT	10	240	21.86	7	2	66	51
PAFA	07/01/2024 05:53 AKDT	9	250		7	5	65	51
PAFA	07/01/2024 06:53 AKDT	8	240		7	6	65	49
PAFA	07/01/2024 07:53 AKDT	6	190		13	7	59	54
PAFA	07/01/2024 08:53 AKDT							
PAFA	07/01/2024 09:53 AKDT	3	130		13	7	58	55
PAFA	07/01/2024 10:53 AKDT	0	0		13	7	58	55
PAFA	07/01/2024 11:53 AKDT	3	170		47293	3	58	56
PAFA	07/01/2024 12:53 AKDT	0	0		2493	3	59	56
PAFA	07/01/2024 13:53 AKDT	0	0		31	3	60	57
PAFA	07/01/2024 14:53 AKDT	0	0		31	2	61	57
PAFA	07/01/2024 15:53 AKDT	5	80		591	2	62	58
PAFA	07/01/2024 16:53 AKDT	5	100		591	3	62	57
PAFA	07/01/2024 17:53 AKDT	0	0		7	5	65	57
PAFA	07/01/2024 18:53 AKDT	3	140		7	6	66	58
PAFA	07/01/2024 19:53 AKDT	0	0		7	5	67	58
PAFA	07/01/2024 20:53 AKDT	0	0		7	5	66	59
PAFA	07/01/2024 21:53 AKDT	0	0		7	6	64	59
PAFA	07/01/2024 22:53 AKDT	0	0		7	4	63	60
PAFA	07/01/2024 23:53 AKDT	0	0		7	4	62	58

Surface Observations: The surface observations from July 1, 2024 indicate reduced visibility throughout the day at the PAFA station at Fairbanks International Airport. Smoke from the McDonald and Clear fires filled the area and surrounded FNSB.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough – July 2, 2024

AICC Fire Report Summary:

- **New Fires:** 6 new fires reported.
- **Total Fires Statewide:** 166 fires burning.
- **Acres Burned:** 460,137 acres, with a 48-hour increase of 31,226 acres.

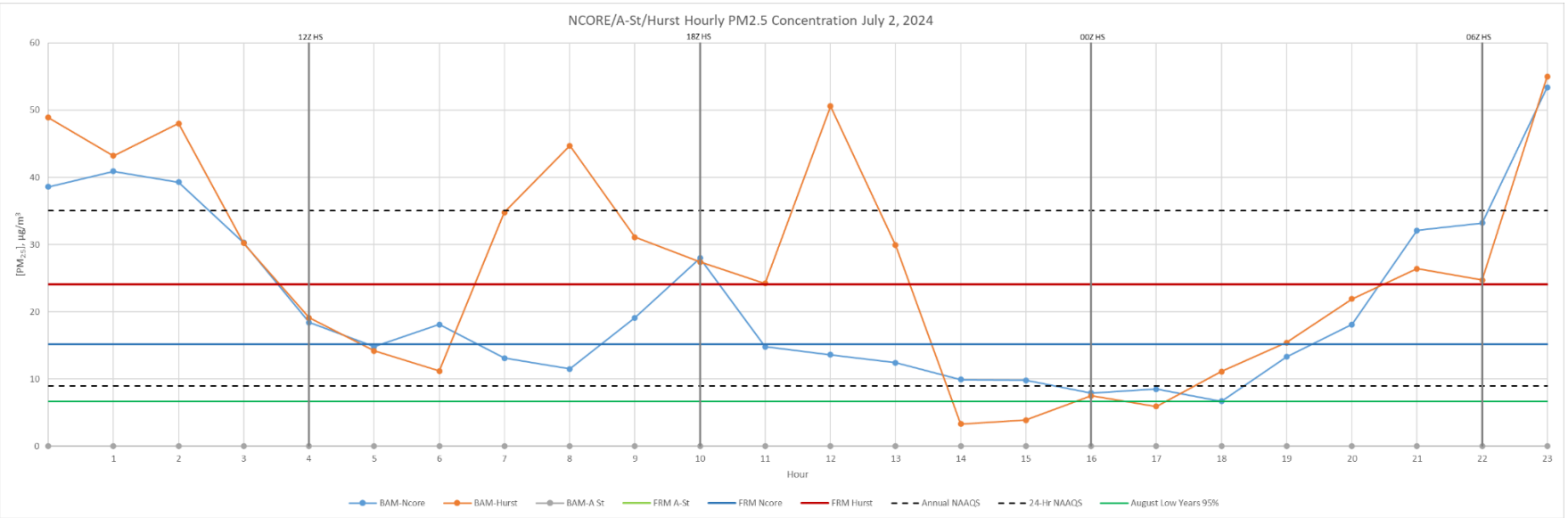

Figure 53: FNSB $PM_{2.5}$ concentrations for July 2, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore and Hurst Road) on July 2, 2024. The data includes readings from both BAM and FRM instruments at the A-Street site, it is down due to maintenance.

Early Morning Levels: The day began with elevated $PM_{2.5}$ levels, with all sites measuring between 38-50 µg/m³ before decreasing to 12-50 µg/m³ in the early morning hours.
Midday Levels: Fluctuating $PM_{2.5}$ levels continued during midday then leveled off around 2:00 PM at 10 µg/m³.
Afternoon to Evening Levels: From 4:00 PM through the evening, $PM_{2.5}$ levels began to rise again, with a significant increase starting

around 6:00 PM. By 11:00 PM, BAM-NCore and BAM-Hurst reached around 55 µg/m³.

Overall Trend: On July 2, 2024, $PM_{2.5}$ concentrations began with a spike of 38-50 µg/m³ across all sites in the early morning, with BAM-NCore starting at 38 µg/m³, BAM-Hurst at 50 µg/m³, and BAM-A-St not reporting. Concentrations did not exceed the 24-hour NAAQS of 35 µg/m³ (upper dashed line) for the day, but the reporting sites exceeded the annual NAAQS limit of 9 µg/m³ (lower dashed line) throughout the 24-hour period, reflecting poor conditions. The early morning and evening peaks were driven by the Clear and McDonald fires.

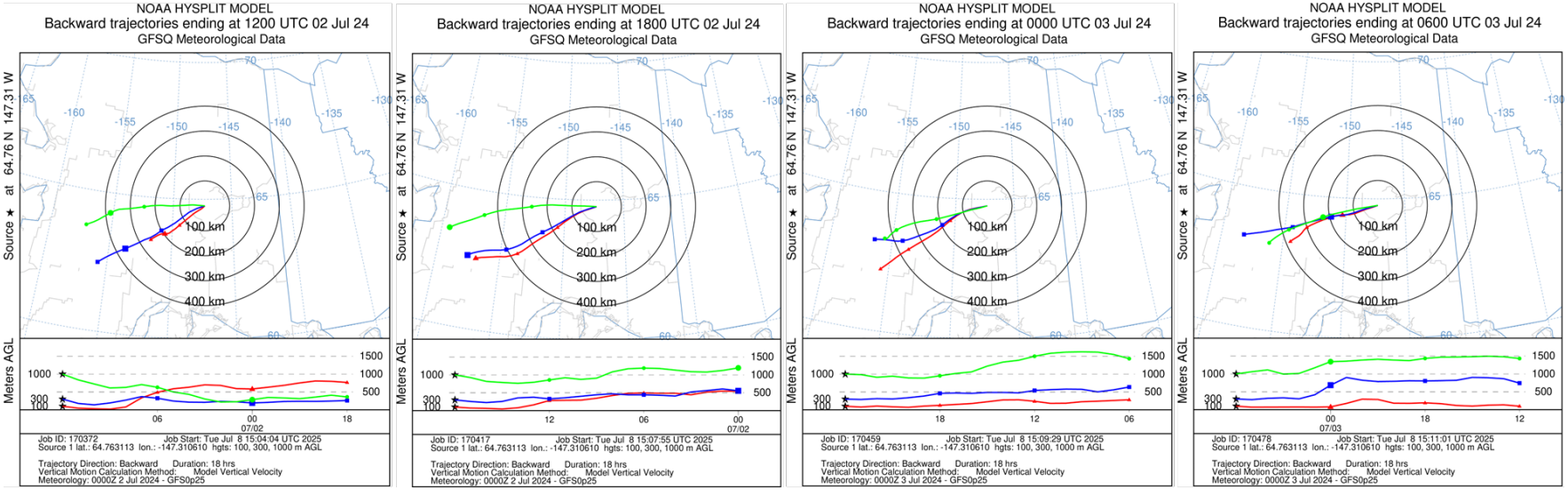

Figure 54: NOAA HYSPLIT model backward trajectories for July 2, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories for July 2 to July 3, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, July 2, 2024): This image shows the backward trajectory ending early in the morning on July 2. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in southwestern interior just below 800m AGL and descended to below 300m above the target. The 1000m trajectory began below 500m AGL and ascended to 1000m above the target.

Image 2 (18:00 UTC, July 2, 2024): The second image shows the backward trajectory ending late morning on July 2. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the southwestern interior just above 500m AGL and descended to below 400m above the target. The 1000m trajectory began above 1200m AGL and descended to 1000m above the target.

Image 3 (00:00 UTC, July 3, 2024): The third image displays the backward trajectory ending late afternoon on July 2. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the southwestern interior around 600m and 100m AGL and descended to below 300m above the target. The 1000m trajectory began around 1500m AGL and descended to 1000m above the target.

Image 4 (06:00 UTC, July 3, 2024): The final image in this series illustrates the backward trajectory ending late evening July 2. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the southwestern interior around 700m and 200m AGL and descended to below 300m above the target. The 1000m trajectory began around 1500m AGL and descended to 1000m above the target.

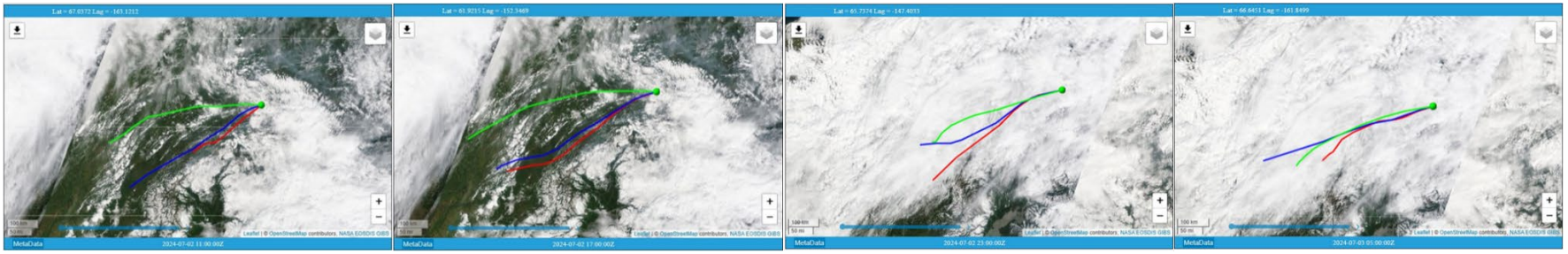

Figure 55: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for July 2, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 2 (17:00 UTC, July 2, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate a southwestern component, converging towards the target location. Light smoke is seen in the image to the south and north of the target location. The current wind pattern is cleaning out the higher $PM_{2.5}$ concentrations in the area.

Smoke Transport: The imagery shows cloud cover and light smoke within the region surrounding the target area. The westerly trajectories support the movement of cleaner air over the target location. There is smoke from the Clear and McDonald fires trapped under the low-level clouds.

Table 23. Hourly surface observation for Fairbanks International Airport, July 2, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	07/02/2024 00:53 AKDT	0	0		7	3	62	59
PAFA	07/02/2024 01:53 AKDT	0	0		7	3	61	58
PAFA	07/02/2024 02:53 AKDT	5	190		7	4	60	58
PAFA	07/02/2024 03:53 AKDT	7	190			10	61	55
PAFA	07/02/2024 04:53 AKDT	6	190			10	61	53
PAFA	07/02/2024 05:53 AKDT	6	200			10	62	53
PAFA	07/02/2024 06:53 AKDT	6	200			10	63	53
PAFA	07/02/2024 07:53 AKDT	6.91	220			10	62.96	53.96
PAFA	07/02/2024 08:53 AKDT	9	220			10	64	53
PAFA	07/02/2024 09:53 AKDT	7	200			10	63	52
PAFA	07/02/2024 10:53 AKDT	5	200		13	10	64	53
PAFA	07/02/2024 11:53 AKDT	5	220			10	65	53
PAFA	07/02/2024 12:53 AKDT	7	230			10	71	54
PAFA	07/02/2024 13:53 AKDT	9	250			10	73	54
PAFA	07/02/2024 14:53 AKDT	14	250	21.86		10	73	53
PAFA	07/02/2024 15:53 AKDT	13	240			10	75	52
PAFA	07/02/2024 16:53 AKDT	20	250	25.32		10	75	51
PAFA	07/02/2024 17:53 AKDT	12	240	21.86		10	76	51
PAFA	07/02/2024 18:53 AKDT	12	250			10	74	52
PAFA	07/02/2024 19:53 AKDT	12	260			10	75	50
PAFA	07/02/2024 20:53 AKDT	12	240			10	74	49
PAFA	07/02/2024 21:53 AKDT	12	250			10	73	48
PAFA	07/02/2024 22:53 AKDT	6.91	220			10	69.98	48.02
PAFA	07/02/2024 23:53 AKDT	9	200			9	66	48

Surface Observations: The surface observations from July 2, 2024 indicate reduced visibility only in the early morning hours at PAFA station at Fairbanks International Airport. Stronger winds and from the approaching weather system helped transport the smoke from the Clear and McDonald fires to the northeast.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough – July 3, 2024

AICC Fire Report Summary:

- **New Fires:** No Report for Wednesday, July 3rd.
- **Total Fires Statewide:** No Report for Wednesday, July 3rd.
- **Acres Burned:** No Report for Wednesday, July 3rd.

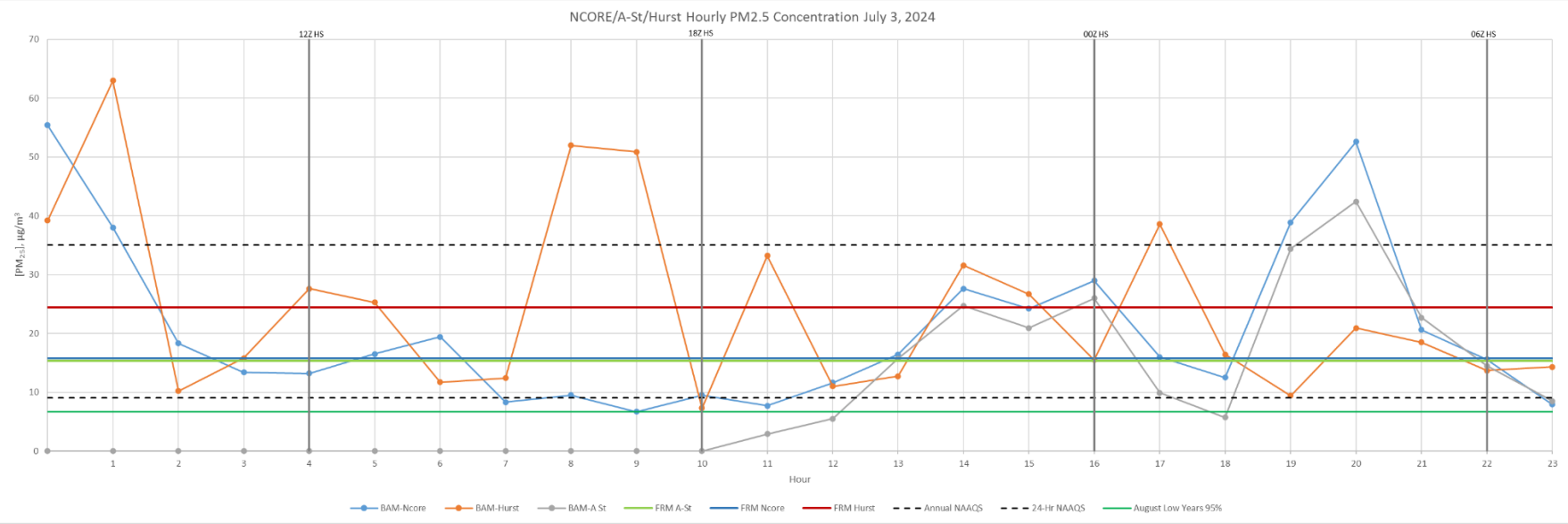

Figure 56: FNSB $PM_{2.5}$ concentrations for July 3, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on July 3, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: $PM_{2.5}$ levels started relatively high, with all sites measuring between 40-60 µg/m³ in the early morning hours (approximately 1:00 AM to 5:00 AM). At 1:00 AM, BAM-NCore recorded around 50 µg/m³ and the BAM-Hurst was at approximately 60 µg/m³.

Midday Levels: Concentrations fluctuated between 6:00 AM and 12:00 PM, with a noticeable peak around 7:00 AM. At this peak, BAM-

Hurst reached approximately 55 µg/m. Levels then declined and remained relatively stable through late morning and into the afternoon, hovering between 20-35 µg/m³, with BAM-NCore at about 25 µg/m³, BAM-Hurst at 30 µg/m³, and BAM-A-St at 20 µg/m³ by 12:00 PM. **Afternoon to Evening Levels:** From 4:00 PM through the evening, $PM_{2.5}$ levels began to rise again, with a significant increase starting around 6:00 PM. By 8:00 PM, BAM-NCore peaked at approximately 55 µg/m³, BAM-Hurst decreased to 20 µg/m³, and BAM-A-St hit a little over 40 µg/m³.

Overall Trend: On July 3, 2024, $PM_{2.5}$ concentrations began with a baseline of 40-60 µg/m³ across all sites in the early morning, with BAM-NCore starting at 50 µg/m³ and the BAM-Hurst at 60 µg/m³. A midmorning peak occurred around 7:00 AM, reaching up to 55 µg/m³ at BAM-Hurst, followed by a decline to 20-35 µg/m³. A secondary peak in the evening reached up to 60 µg/m³ at BAM-NCore by 8:00 PM. Concentrations did not exceed the 24-hour NAAQS of 35 µg/m³ (upper dashed line) for the day, but the sites exceeded the annual NAAQS limit of 9 µg/m³ (lower dashed line) throughout the 24-hour period, reflecting poor conditions.

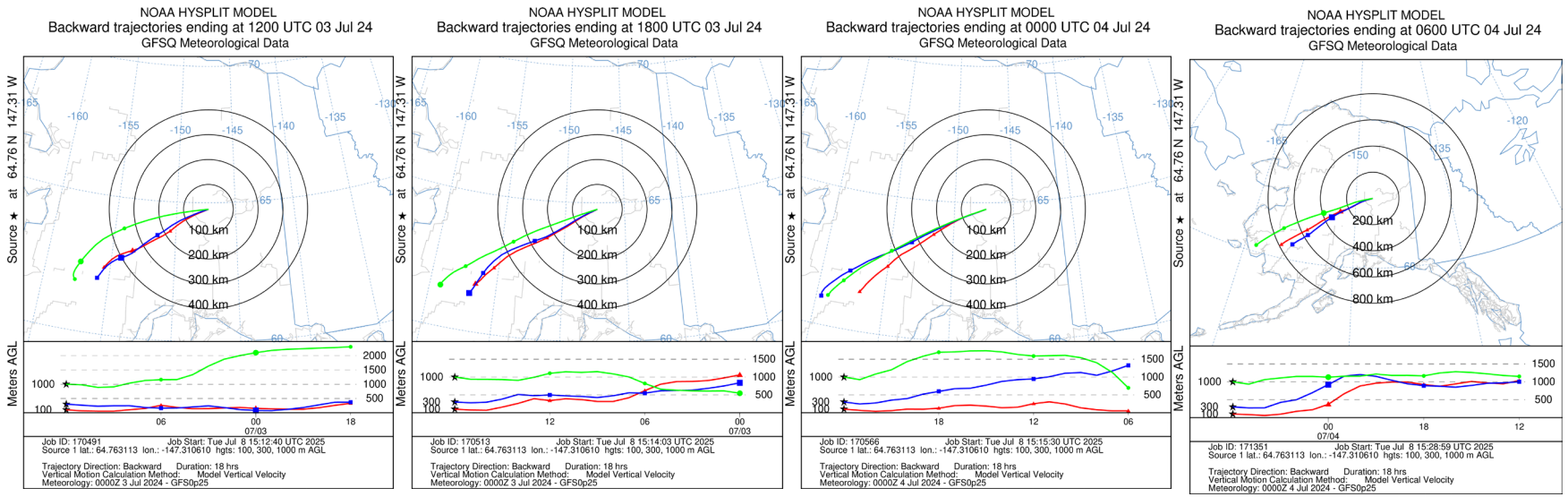

Figure 57: NOAA HYSPLIT model backward trajectories for July 3, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories from July 3 to July 4, 2024. These backward trajectories trace

the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, July 3, 2024): This image shows the backward trajectory ending early in the morning on July 3. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in southwestern interior just below 500m AGL and descended to below 300m above the target. The 1000m trajectory began below 500m AGL and ascended to 1000m above the target.

Image 2 (18:00 UTC, July 3, 2024): The second image shows the backward trajectory ending late morning on July 3. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the southwestern interior at 1000m AGL and descended to below 300m above the target. The 1000m trajectory began above 700m AGL and ascended to 1000m above the target.

Image 3 (00:00 UTC, July 4, 2024): The third image displays the backward trajectory ending late afternoon on July 3. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m parcel began its path at surface while the 300m parcel began just below 1500m AGL. The 1000m trajectory began around 1100m AGL and descended to 1000m above the target.

Image 4 (06:00 UTC, July 4, 2024): The final image in this series illustrates the backward trajectory ending late evening July 3. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m, 300m and 1000m parcels originated in the southwestern interior just above 1000m AGL and descended to their respective heights (100m, 300m and 1000m) above the target.

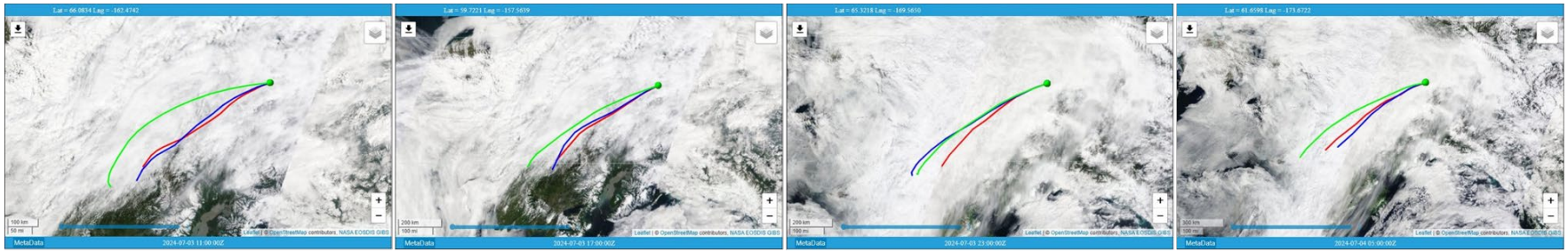

Figure 58: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for July 3, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 3 (23:00 UTC, July 3, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the parcels originating from a southwesterly component converging towards the target location. Active fires are located to the northeast and southeast of FNSB are not visible under the cloud shield. Increased winds and precipitation greatly hindered smoke production.

Smoke Transport: During periods of light wind, smoldering from the Clear and McDonald fires was able to sporadically impact the monitors in FNSB.

Table 24. Hourly surface observation for Fairbanks International Airport, July 3, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFA	07/03/2024 00:53 AKDT	8	200		7	6	64	48
PAFA	07/03/2024 01:53 AKDT	7	200		7	6	62	47
PAFA	07/03/2024 02:53 AKDT	8	200			10	61	46
PAFA	07/03/2024 03:53 AKDT	8	200			10	62	46
PAFA	07/03/2024 04:53 AKDT	8	190			10	60	47
PAFA	07/03/2024 05:53 AKDT	8	190			10	61	47
PAFA	07/03/2024 06:53 AKDT	7	200			10	62	48
PAFA	07/03/2024 07:53 AKDT	12	220			10	64	48
PAFA	07/03/2024 08:53 AKDT	13	220			10	65	48
PAFA	07/03/2024 09:53 AKDT	14	220	26.47		10	66	48
PAFA	07/03/2024 10:53 AKDT	15	220	26.47		10	66	47
PAFA	07/03/2024 11:53 AKDT	17	230	28.77		10	67	47
PAFA	07/03/2024 12:53 AKDT	22	240	42.58		10	67	45
PAFA	07/03/2024 13:53 AKDT	18	240	32.22		10	67	45
PAFA	07/03/2024 14:53 AKDT	25	240	39.13		10	67	45
PAFA	07/03/2024 15:53 AKDT	25	240	39.13		9	67	43
PAFA	07/03/2024 16:53 AKDT	26	250	39.13		8	67	44
PAFA	07/03/2024 17:53 AKDT				13	10	65	44
PAFA	07/03/2024 18:53 AKDT				13	10	63	46
PAFA	07/03/2024 19:53 AKDT	16	230	21.86	13	9	61	48
PAFA	07/03/2024 20:53 AKDT	7	230		47293	6	58	50
PAFA	07/03/2024 21:53 AKDT	5	210		13	8	58	50
PAFA	07/03/2024 22:53 AKDT	14	240	23.02		10	61	47
PAFA	07/03/2024 23:53 AKDT				13	10	60	48

Surface Observations: The surface observations from July, 2024 indicate reduced visibility in the early morning hours at PAFA station at Fairbanks International Airport. Stronger winds and from the approaching weather system helped transport the smoke from the Clear and McDonald fires. Visibility dropped again in the late evening due to a mix of rain and smoke.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough – July 22, 2024

AICC Fire Report Summary:

- **New Fires:** 2 new fires reported.
- **Total Fires Statewide:** 144 fires burning.
- **Acres Burned:** 607,570 acres, with a 24-hour increase of 2,047 acres.

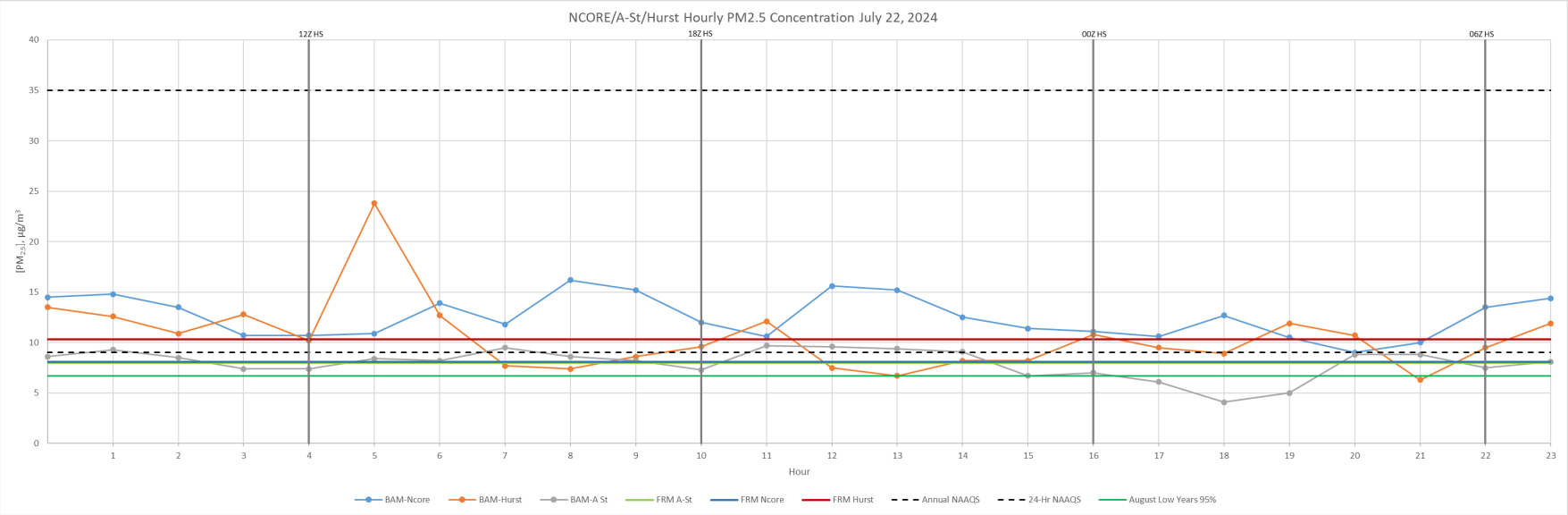

Figure 59: FNSB $PM_{2.5}$ concentrations for July 22, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on July 22, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: $PM_{2.5}$ levels started relatively low, with all sites measuring between 10-15 µg/m³ in the early morning hours (approximately 1:00 AM to 5:00 AM), indicating good air quality as concentrations were below the 24-hour NAAQS of 35 µg/m³. A sharp but brief spike occurred around 5:00 AM, with BAM-Hurst reaching approximately 25 µg/m³.

Midday Levels: Levels remained relatively stable through late morning and into the afternoon (9:00 AM to 3:00 PM), hovering between

10-15 µg/m³, with BAM-NCore at about 15 µg/m³, BAM-Hurst at 08 µg/m³, and BAM-A-St at 10 µg/m³ by 12:00 PM
Afternoon to Evening Levels: From 4:00 PM through the evening, $PM_{2.5}$ remained relatively stable, continuing to hover between 10-15 µg/m³ across all sites, with no significant spikes. At 6:00 PM, BAM-NCore recorded around 12 µg/m³, BAM-Hurst was at approximately 08 µg/m³, and BAM-A-St was about 4 µg/m³.

Overall Trend: On July 22, 2024, $PM_{2.5}$ concentrations began with a baseline of 10-15 µg/m³ across all sites in the early morning, with BAM-NCore starting at 15 µg/m³, BAM-Hurst at 08 µg/m³, and BAM-A-St at 10 µg/m³. A brief spike occurred around 5:00 AM, reaching up to 25 µg/m³ at BAM-Hurst, followed by a decline to 10-15 µg/m³, remaining stable through the midday, afternoon, and evening, with no notable secondary spikes. Concentrations exceeded the annual NAAQS limit of 9 µg/m³ throughout the 24-hour period, reflecting sustained poor conditions.

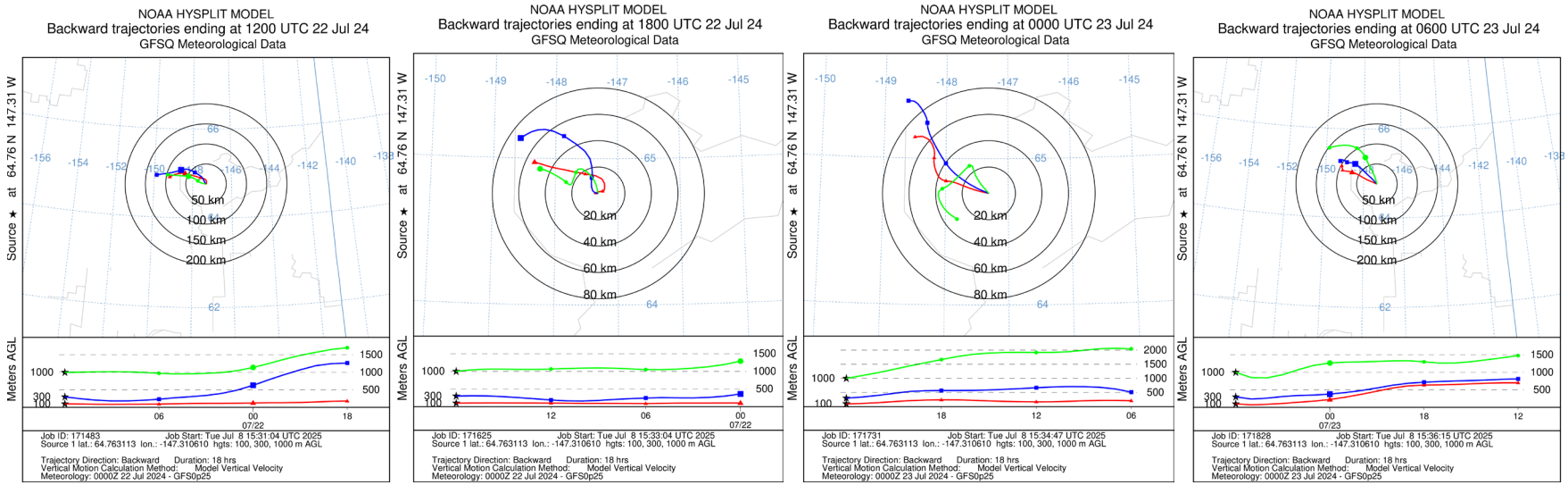

Figure 60: NOAA HYSPLIT model backward trajectory for July 22, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories from July 22 to July 23, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below

each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, July 22, 2024): This image shows the backward trajectory ending early in the morning on July 22. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the northwest, converging toward the target location. The vertical profile below the map indicates that the 100m parcel originated in the northwest interior near surface, continued along the surface to target location. The 300m and 1000m trajectories began above 1200m AGL and descended their respective heights above the target.

Image 2 (18:00 UTC, July 22, 2024): The second image shows the backward trajectory ending late morning on July 22. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the northwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the northwest interior at their respective height and continued along that path to the target. The 1000m trajectory began above 1300m AGL and descended to 1000m above the target.

Image 3 (00:00 UTC, July 23, 2024): The third image displays the backward trajectory ending late afternoon on July 22. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the northwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the northwest interior at their respective height and continued along that path to the target. The 1000m trajectory began above 2000m AGL and descended to 1000m above the target.

Image 4 (06:00 UTC, July 23, 2024): The final image in this series illustrates the backward trajectory ending late evening July 22. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the northwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the northwest interior above 500m AGL and descended to 100m and 300m above the target. The 1000m trajectory began above 1500m AGL and descended to 1000m above the target.

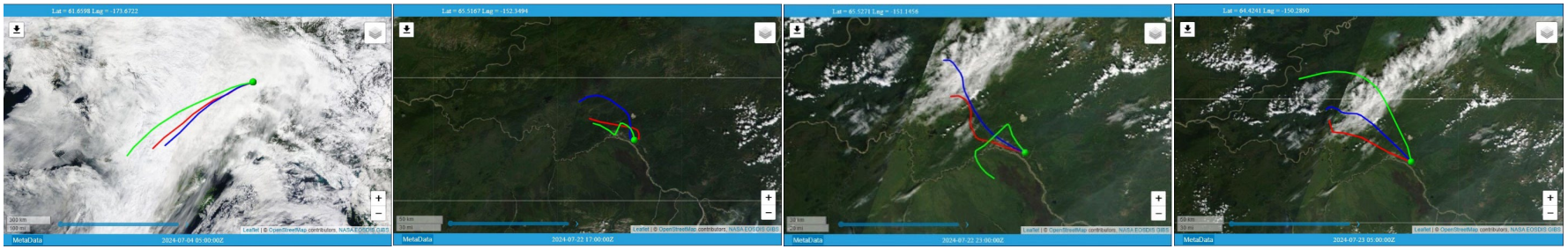

Figure 61: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for July 22, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 3 (23:00 UTC, July 22, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the parcels originated from a northwesterly component converging towards the target location. Fire activity is almost nonexistent, lingering smoke is so thin it is not visible on the satellite imagery.

Smoke Transport: Smoldering fires to the north of Fairbanks are the source of the thin surface smoke, which is causing slightly elevated concentrations in FNSB,

Table 25. Hourly surface observation for Fort Wainwright AAF, July 22, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFB	07/22/2024 00:55 AKDT	0	0			9	58	52
PAFB	07/22/2024 01:55 AKDT	3	90			10	57	52
PAFB	07/22/2024 02:55 AKDT	5	80			10	55	50
PAFB	07/22/2024 03:55 AKDT	0	0			10	55	49
PAFB	07/22/2024 04:55 AKDT	0	0			10	53	50
PAFB	07/22/2024 05:55 AKDT	0	0			10	53	48
PAFB	07/22/2024 06:55 AKDT	3	80			9	56	49
PAFB	07/22/2024 07:55 AKDT	5	70			10	59	49
PAFB	07/22/2024 08:55 AKDT	3	120			10	64	51
PAFB	07/22/2024 09:55 AKDT	0	0			10	67	52
PAFB	07/22/2024 10:55 AKDT	0	0			10	70	52
PAFB	07/22/2024 11:55 AKDT	5	230			10	74	54
PAFB	07/22/2024 12:55 AKDT	5	260			10	79	53
PAFB	07/22/2024 13:55 AKDT	7	270			10	81	52
PAFB	07/22/2024 14:55 AKDT	3	240			10	82	50
PAFB	07/22/2024 15:55 AKDT	3	280			9	84	50
PAFB	07/22/2024 16:55 AKDT	8	210			10	86	49
PAFB	07/22/2024 17:55 AKDT	5	280			10	86	45
PAFB	07/22/2024 18:55 AKDT	6	270			10	86	48
PAFB	07/22/2024 19:55 AKDT	7	300			10	86	45
PAFB	07/22/2024 20:55 AKDT	7	300			10	85	50
PAFB	07/22/2024 21:55 AKDT	7	250			10	82	53
PAFB	07/22/2024 22:55 AKDT	0	0			10	77	56
PAFB	07/22/2024 23:55 AKDT	0	0			10	71	58

Surface Observations: The surface observations from July 22, 2024 indicate three hours of slightly reduced visibility at PAFB station at Fort Wainwright AAF.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough – July 23, 2024

AICC Fire Report Summary:

- **New Fires:** 4 new fires reported.
- **Total Fires Statewide:** 148 fires burning.
- **Acres Burned:** 610,995 acres, with a 24-hour increase of 3,425 acres.

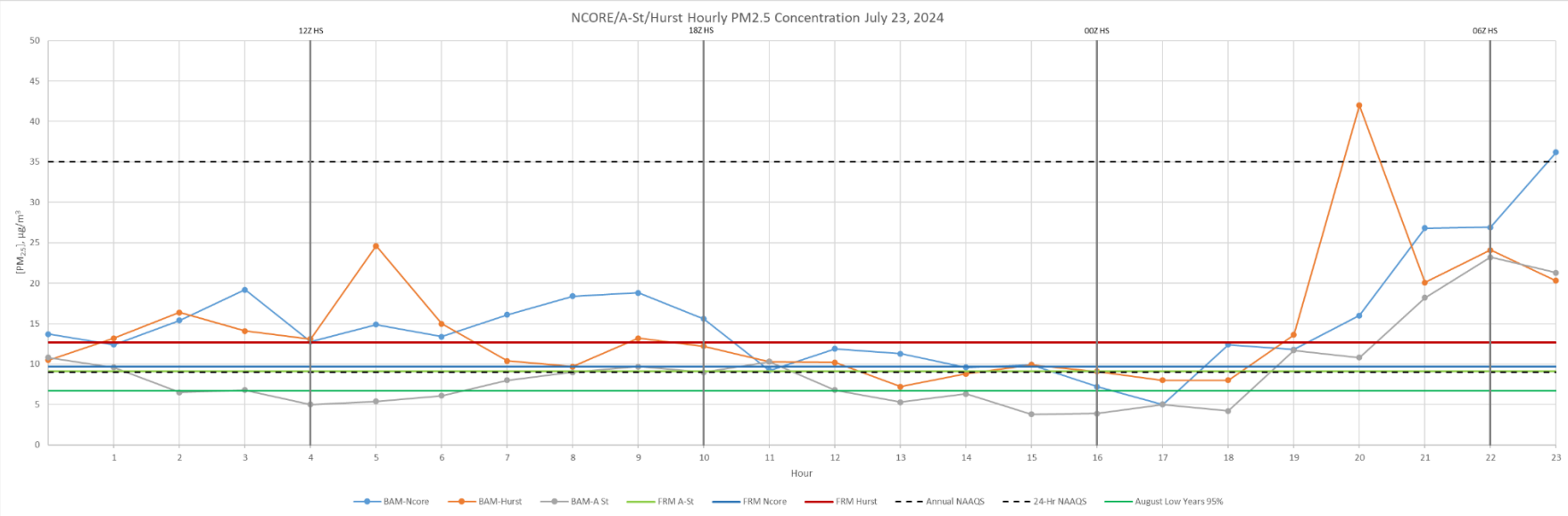

Figure 62: FNSB $PM_{2.5}$ concentrations for July 23, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on July 23, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: $PM_{2.5}$ levels started relatively low, with all sites measuring between 10-15 µg/m³ in the early morning hours (approximately 1:00 AM to 5:00 AM). A sharp spike occurred around 5:00 AM, with BAM-Hurst reaching approximately 25 µg/m³, BAM-NCore peaking at around 20 µg/m³, and BAM-A-St rising to about 5 µg/m³.

Midday Levels: Following the early morning spike, concentrations declined between 6:00 AM and 9:00 AM, falling to around 10-15

µg/m³ across all sites. Levels remained relatively stable through late morning and into the afternoon (9:00 AM to 3:00 PM), hovering between 10-15 µg/m³.

Afternoon to Evening Levels: From 4:00 PM through the evening, $PM_{2.5}$ levels began to rise again, with a significant increase starting around 6:00 PM. Around 8:00 PM, BAM-NCore peaked at approximately 36 µg/m³, BAM-Hurst reached around 42 µg/m³, and BAM-A-St hit about 25 µg/m³.

Overall Trend: On July 23, 2024, $PM_{2.5}$ concentrations began with a baseline of 10-15 µg/m³ across all sites in the early morning, with BAM-NCore starting at 15 µg/m³, BAM-Hurst at 12 µg/m³, and BAM-A-St at 10 µg/m³. A brief spike occurred around 5:00 AM, reaching up to 25 µg/m³ at BAM-Hurst, followed by a decline to 10-15 µg/m³, remaining stable through the midday and afternoon levels began to rise again, with a significant increase starting around 6:00 PM. By 8:00 PM, BAM-NCore peaked at approximately 36 µg/m³, BAM-Hurst reached around 42 µg/m³, and BAM-A-St hit about 25 µg/m³. Concentrations did not exceed the 24-hour National Ambient Air Quality Standard (NAAQS) of 35 µg/m³ but all sites exceeded the annual NAAQS limit of 9 µg/m³ throughout the 24-hour period, reflecting poor conditions.

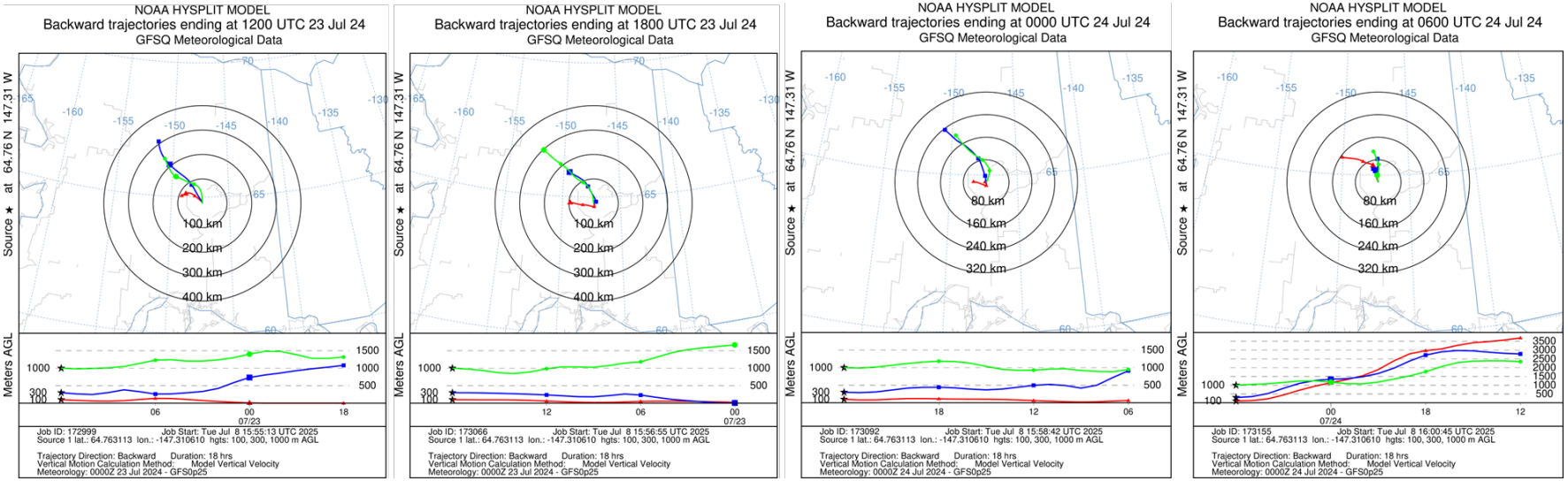

Figure 63: NOAA HYSPLIT model backward trajectory for July 23, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories from July 23 to July 24, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, July 23, 2024): This image shows the backward trajectory ending early in the morning on July 23. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the northwest, converging toward the target location. The vertical profile below the map indicates that the 100m parcel originated in the northwest interior near surface and continued along the surface to target location. The 300m and 1000m trajectories began above 1200m AGL and descended their respective heights above the target.

Image 2 (18:00 UTC, July 23, 2024): The second image shows the backward trajectory ending late morning on July 23. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the northwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the northwest interior at their respective height and continued along that path to the target. The 1000m trajectory began above 1500m AGL and descended to 1000m above the target.

Image 3 (00:00 UTC, July 24, 2024): The third image displays the backward trajectory ending late afternoon on July 23. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the north, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the hills to the north at surface and continued along that path to the target. The 1000m trajectory began above 1500m AGL and descended to 1000m above the target.

Image 4 (06:00 UTC, July 24, 2024): The final image in this series illustrates the backward trajectory ending late evening July 23. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the north converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated from the northern hills above 2500m AGL and descended to 100m and 300m above the target. The 1000m trajectory began above 2000m AGL and descended to 1000m above the target.

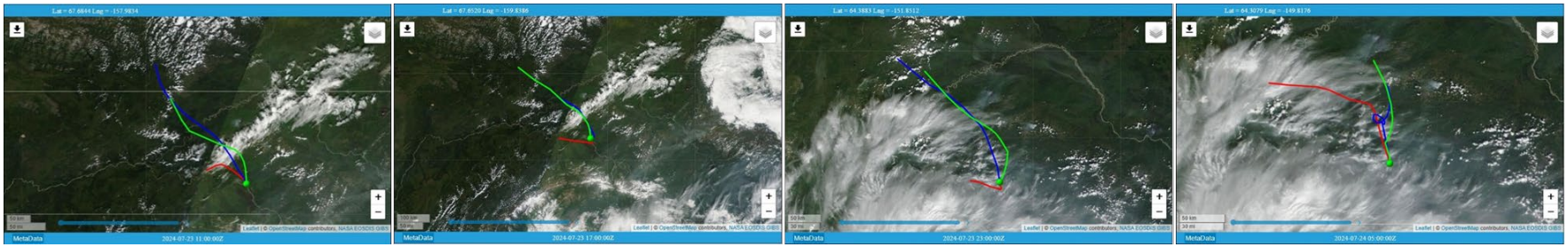

Figure 64: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for July 23, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 3 (23:00 UTC, July 23, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The trajectories at 100m (red), 300m (blue), and 1000m (green) indicate the parcels originated from a northwest through north component converging towards the target location. The 100m trajectory wrapped to the south prior to reaching the target. Calm winds allowed smoke to settle into the flats from the Clear and McDonald fires clearly visible in the image.

Smoke Transport: Calm to light winds allowed smoke from smoldering fires to fill the low-lying areas within the flats. The 100m trajectory passed through this smoke and contributed to the elevated concentrations in FNSB.

Table 26. Hourly surface observation for Fort Wainwright AAF, July 23, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFB	07/23/2024 00:55 AKDT	5	280			9	69	57
PAFB	07/23/2024 01:55 AKDT	0	0			10	63	55
PAFB	07/23/2024 02:55 AKDT	0	0			10	61	56
PAFB	07/23/2024 03:55 AKDT	0	0			10	60	56
PAFB	07/23/2024 04:55 AKDT	3	90			10	59	55
PAFB	07/23/2024 05:55 AKDT	5	80			10	58	55
PAFB	07/23/2024 06:55 AKDT	0	0			10	60	54
PAFB	07/23/2024 07:55 AKDT	3	150			10	64	55
PAFB	07/23/2024 08:55 AKDT	3	60			10	65	55
PAFB	07/23/2024 09:55 AKDT	5	100			10	69	55
PAFB	07/23/2024 10:55 AKDT	5	150			10	74	56
PAFB	07/23/2024 11:55 AKDT	0	0			10	78	58
PAFB	07/23/2024 12:55 AKDT	3	270			10	80	58
PAFB	07/23/2024 13:55 AKDT	3	270			10	84	57
PAFB	07/23/2024 14:55 AKDT	6	240			10	86	56
PAFB	07/23/2024 15:55 AKDT	0	0			10	87	54
PAFB	07/23/2024 16:55 AKDT	0	0			10	89	52
PAFB	07/23/2024 17:55 AKDT	0	0			10	88	57
PAFB	07/23/2024 18:55 AKDT	0	0			10	88	58
PAFB	07/23/2024 19:55 AKDT	12	360			10	86	58
PAFB	07/23/2024 20:55 AKDT	6	10			10	84	60
PAFB	07/23/2024 21:55 AKDT	3	360			9	82	61
PAFB	07/23/2024 22:55 AKDT	0	0			10	79	62
PAFB	07/23/2024 23:55 AKDT	0	0			10	70	62

Surface Observations: The surface observations from July 23, 2024 indicate a few hours of slightly reduced visibility at PAFB station at Fort Wainwright AAF indicating the presence of smoke at the location.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough – July 24, 2024

AICC Fire Report Summary:

- **New Fires:** 3 new fires reported.
- **Total Fires Statewide:** 151 fires burning.
- **Acres Burned:** 615,531 acres, with a 24-hour increase of 4,536 acres.

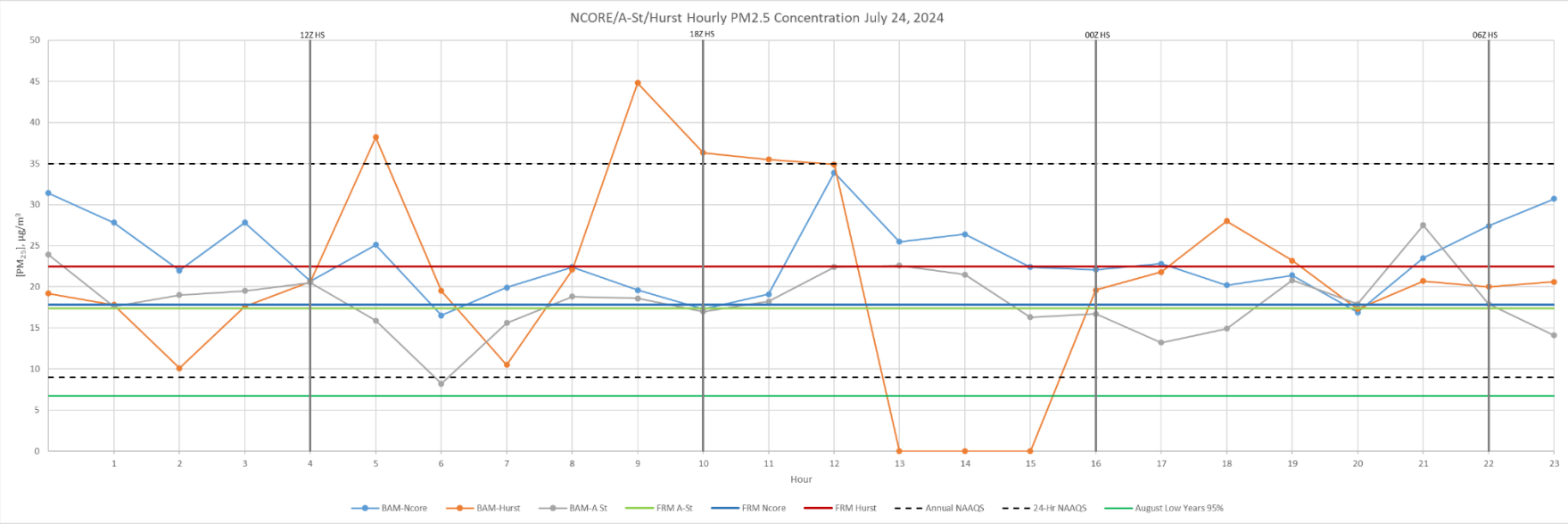

Figure 65: FNSB $PM_{2.5}$ concentrations for July 24, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on July 24, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: $PM_{2.5}$ levels started relatively low, with all sites measuring between 20-30 µg/m³ in the early morning hours indicating moderate air quality. A sharp spike occurred around 5:00 AM, with BAM-Hurst reaching approximately 40 µg/m³.
Midday Levels: Following the early morning spike, concentrations declined between 6:00 AM and 9:00 AM, falling to around 10-25 µg/m³ across all sites. BAM-Hurst spiked again at 9:00 AM to 45 µg/m³, and BAM-NCore rose to 35 µg/m³ by 12:00 PM.

Afternoon to Evening Levels: From 4:00 PM through the evening, $PM_{2.5}$ levels remained relatively stable throughout the period, hovering between 15-30 µg/m³ at all sites.

Overall Trend: On July 24, 2024, $PM_{2.5}$ concentrations began with a baseline of 20-40 µg/m³ across all sites in the early morning, with BAM-Hurst starting at 20 µg/m³ and spiking at 5:00 AM to 40 µg/m³. Another spike for BAM- Hurst reached 45 µg/m³ by 9:00 AM. Concentrations did not exceed the 24-hour NAAQS (upper dashed line) of 35 µg/m³ for the day, but all sites exceeded the annual NAAQS (lower dashed line) limit of 9 µg/m³ throughout the 24-hour period, reflecting poor conditions.

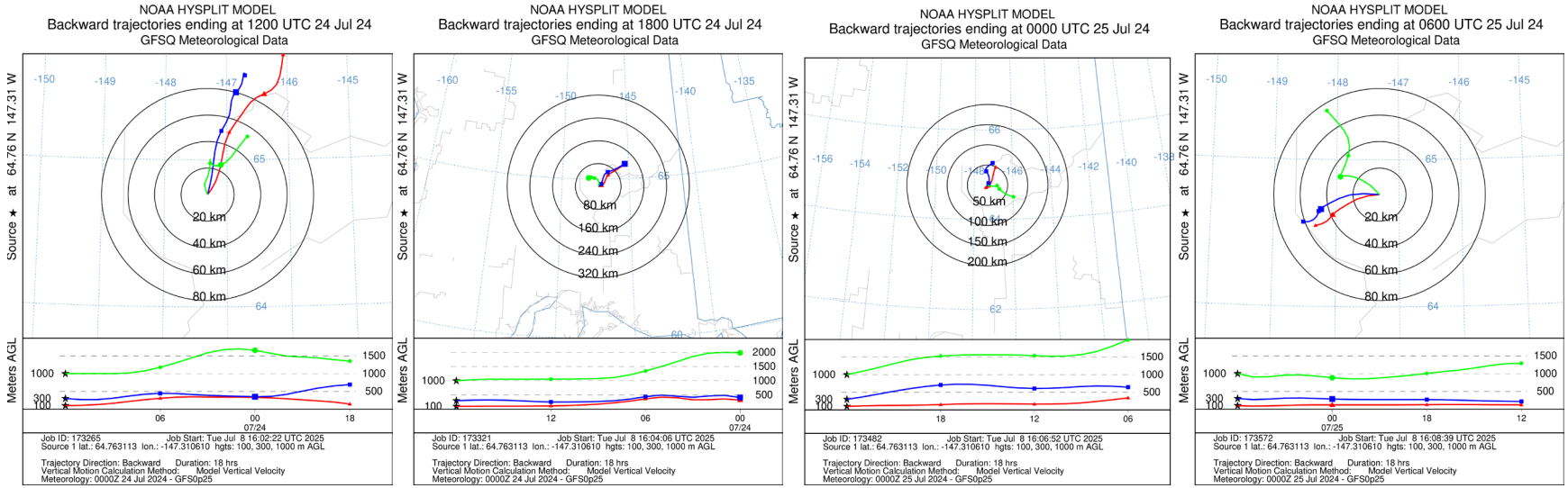

Figure 66: NOAA HYSPLIT model backward trajectory for July 24, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories from July 24 to July 25, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, July 24, 2024): This image shows the backward trajectory ending early in the morning on July 24. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the north, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the north interior at 100m and 700m AGL and continued along that path to the target. The 1000m trajectory began above 1000m AGL and descended to 1000m above the target.

Image 2 (18:00 UTC, July 24, 2024): The second image shows the backward trajectory ending late morning on July 24. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the northeast, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the northeast interior at 400m AGL and continued along that path to the target. The 1000m trajectory began above 2000m AGL and descended to 1000m above the target.

Image 3 (00:00 UTC, July 25, 2024): The third image displays the backward trajectory ending late afternoon on July 24. Trajectories at 100m (red) and 300m (blue) show air parcels originating from the north while the 1000m (green) originated from the east, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the hills to the north 600-300m AGL and descended to 100m and 300m at the target. The 1000m trajectory began above 2000m AGL and descended to 1000m above the target.

Image 4 (06:00 UTC, July 25, 2024): The final image in this series illustrates the backward trajectory ending late evening July 24. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the west converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated from the west above 400 and 600m AGL and descended to 100m and 300m above the target. The 1000m trajectory began above 1300m AGL and descended to 1000m above the target.

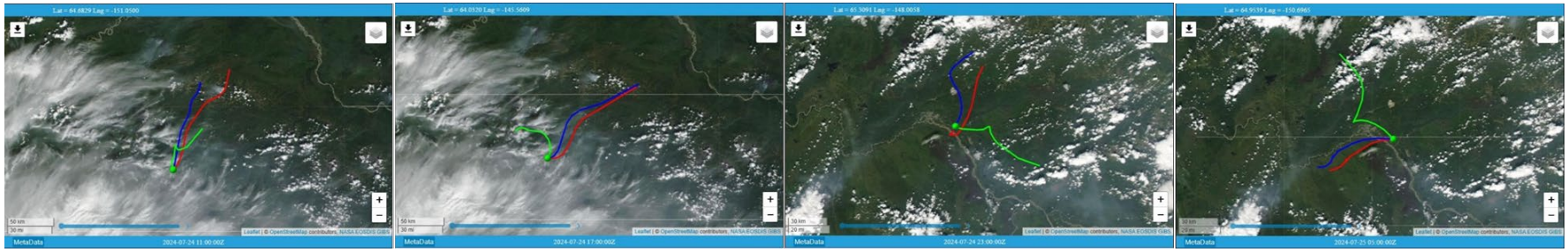

Figure 67: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for July 24, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 3 (23:00 UTC, July 24, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The trajectories at 100m (red) and 300m (blue) show air parcels originating from the north while the 1000m (green) originated from the east, converging toward the target location. Calm winds allowed smoke to settle into the flats from the Clear and McDonald fires clearly visible in the image.

Smoke Transport: Calm to light winds allowed smoke from smoldering fires fill the low-lying areas within the flats. The 1000m trajectory passed through this smoke and contributed to the elevated concentrations in FNSB.

Table 27. Hourly surface observation for Fort Wainwright AAF, July 24, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFB	07/24/2024 00:55 AKDT	0	0			8	68	62
PAFB	07/24/2024 01:55 AKDT	0	0			10	64	60
PAFB	07/24/2024 02:55 AKDT	0	0			9	63	59
PAFB	07/24/2024 03:55 AKDT	0	0			9	62	58
PAFB	07/24/2024 04:55 AKDT	0	0			9	59	56
PAFB	07/24/2024 05:55 AKDT	0	0			9	60	56
PAFB	07/24/2024 06:55 AKDT	3	80			7	63	57
PAFB	07/24/2024 07:55 AKDT	3	60			10	67	58
PAFB	07/24/2024 08:55 AKDT	0	0			10	70	58
PAFB	07/24/2024 09:55 AKDT	0	0		7	7	73	59
PAFB	07/24/2024 10:55 AKDT	0	0		7	7	75	59
PAFB	07/24/2024 11:55 AKDT	0	0		7	7	79	59
PAFB	07/24/2024 12:55 AKDT	0	0		7	6	80	61
PAFB	07/24/2024 13:55 AKDT	3	180		7	6	83	59
PAFB	07/24/2024 14:55 AKDT	3	260		7	6	85	60
PAFB	07/24/2024 15:55 AKDT	3.45	230		7	6	84.56	58.82
PAFB	07/24/2024 16:55 AKDT	3	220			10	85	55
PAFB	07/24/2024 17:55 AKDT	0	0			10	87	56
PAFB	07/24/2024 18:55 AKDT	6	240			10	87	55
PAFB	07/24/2024 19:55 AKDT	6	200			10	86	57
PAFB	07/24/2024 20:55 AKDT	8	240			9	84	61
PAFB	07/24/2024 21:55 AKDT	6	260			10	81	63
PAFB	07/24/2024 22:55 AKDT	5	230			10	80	64
PAFB	07/24/2024 23:55 AKDT	5	130			10	71	64

Surface Observations: The surface observations from July 24, 2024 indicate seven hours of reduced visibility at PAFB station at Fort Wainwright AAF indicating the presence of smoke at the location.

Daily Evaluation of Air Quality Impacts: Fairbanks North Star Borough – July 25, 2024

AICC Fire Report Summary:

- **New Fires:** 4 new fires reported.
- **Total Fires Statewide:** 156 fires burning.
- **Acres Burned:** 619,189 acres, with a 24-hour increase of 3,658 acres.

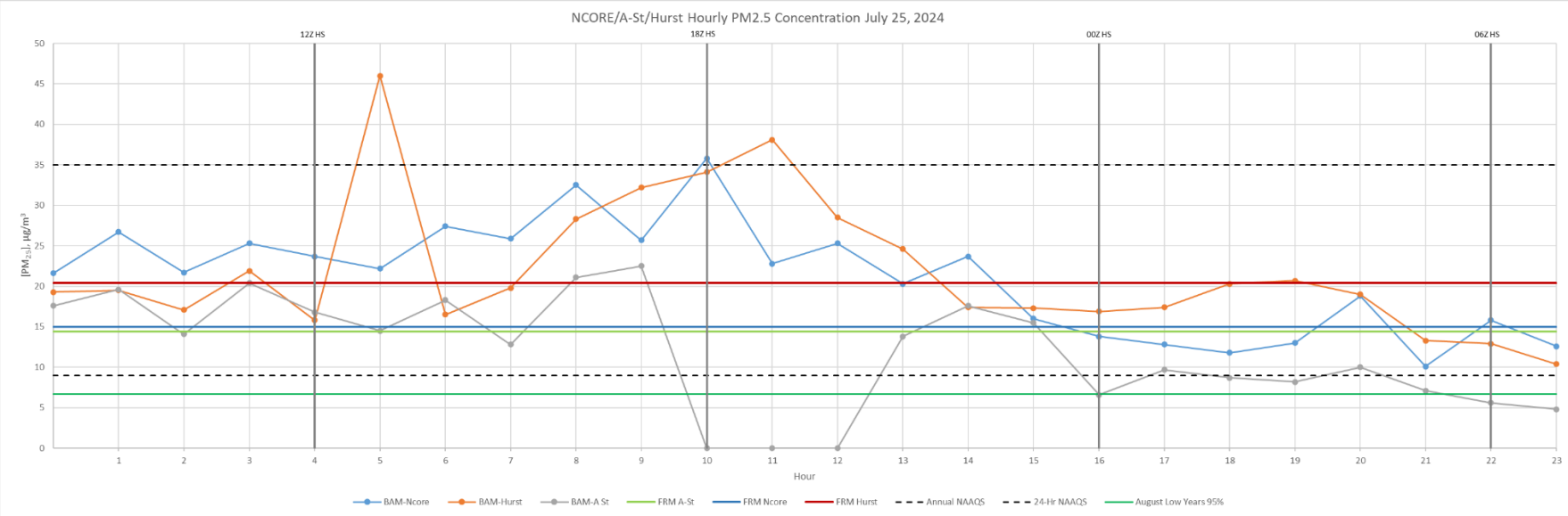

Figure 68: FNSB $PM_{2.5}$ concentrations for July 25, 2024.

The chart above illustrates the hourly $PM_{2.5}$ concentrations measured at various monitoring sites (NCore, A-Street, and Hurst Road) on July 25, 2024. The data includes readings from both BAM and FRM instruments at each site.

Early Morning Levels: $PM_{2.5}$ levels started relatively low, with all sites measuring between 15-25 µg/m³ in the early morning hours, indicating moderate air quality. A sharp spike occurred around 5:00 AM, with BAM-Hurst reaching approximately 45 µg/m³.
Midday Levels: Following the early morning BAM-Hurst spike, concentrations rose slightly between 6:00 AM and 9:00 AM to around 20-35 µg/m³ across all sites. BAM-A-Street stopped reporting for a few hours but came back online at 1:00 PM.

Afternoon to Evening Levels: From 4:00 PM through the evening, $PM_{2.5}$ levels declined slightly and remained relatively stable throughout the period, hovering between 5-20 µg/m³.

Overall Trend: On July 25, 2024, $PM_{2.5}$ concentrations began with a baseline of 15-25 µg/m³ across all sites in the early morning, with BAM-Hurst starting at 18 µg/m³ and spiking at 5:00 AM to 45 µg/m³. Another spike for BAM- Hurst reached 38 µg/m³ by 11:00 AM. Concentrations did not exceed the 24-hour NAAQS (upper dashed line) of 35 µg/m³ for the day, but all sites exceeded the annual NAAQS (lower dashed line) limit of 9 µg/m³ throughout the 24-hour period, reflecting poor conditions.

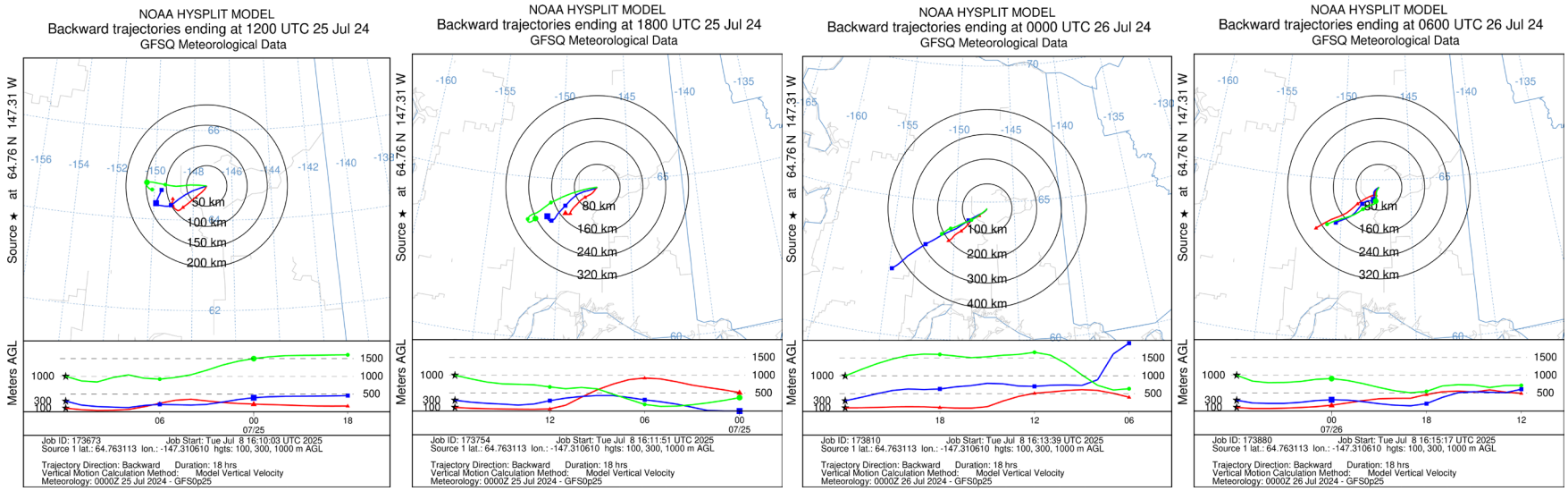

Figure 69: NOAA HYSPLIT model backward trajectory for July 25, 2024. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The above images provide NOAA HYSPLIT model backward trajectories from July 25 to July 26, 2024. These backward trajectories trace the path of air parcels backward in time, indicating the origin of air masses arriving at a specific location. The vertical profile below each map provides a detailed view of the altitude changes over time. The analysis of these trajectories helps identify potential sources of pollutants and smoke impacting the area.

Image 1 (12:00 UTC, July 25, 2024): This image shows the backward trajectory ending early in the morning on July 25. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest through west, converging toward the target location. The vertical profile below the map indicates that the 100m and 300m parcels originated in the southwest interior at 100m and 500m AGL and continued along that path to the target. The 1000m trajectory began above 1500m AGL and descended to 1000m above the target.

Image 2 (18:00 UTC, July 25, 2024): The second image shows the backward trajectory ending late morning on July 25. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 300m and 1000m parcels originated in the southwest interior were well below their respective heights over target. The 100m trajectory began above 500m AGL and descended to 100m above the target.

Image 3 (00:00 UTC, July 26, 2024): The third image displays the backward trajectory ending late afternoon on July 25. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates that the 100m and 1000m parcels originated closer to target location than that of the 300m parcel. The 100m parcel originated around 400 AGL and descended to 100m at the target. The 300m trajectory began above 1500m AGL then descended to 300m above the target. Lastly, the 1000m parcel began just above 500m AGL and ascended to 1000m over target.

Image 4 (06:00 UTC, July 26, 2024): The final image in this series illustrates the backward trajectory ending late evening on July 25. Trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest, converging toward the target location. The vertical profile below the map indicates all parcels originated in the southwest interior near 500m AGL.

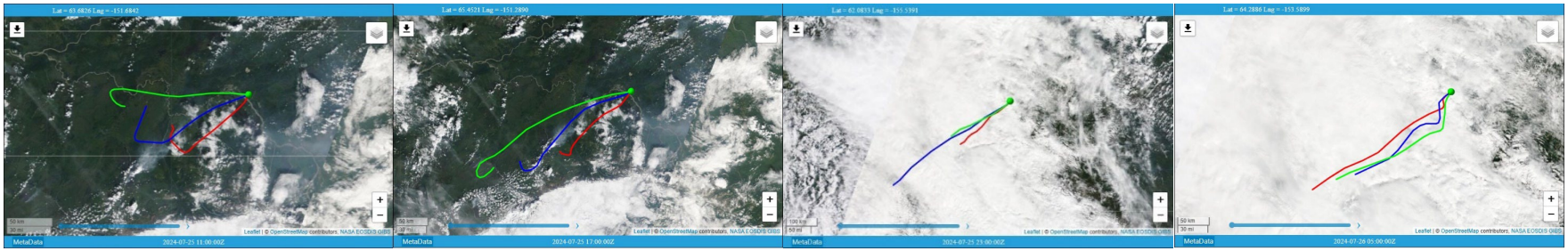

Figure 70: MODIS Imagery with HYSPLIT Overlay. Air parcel backward trajectories are shown at 100m AGL (red), 300m AGL (blue), and 1000m AGL (green).

The series of images presented above shows MODIS satellite imagery overlaid with NOAA HYSPLIT backward trajectories for July 25, 2024. These images provide valuable insight into the transport pathways of smoke and pollutants from nearby fires, helping to understand their potential impact on air quality in the FNSB.

Image 2 (17:00 UTC, July 25, 2024): This image depicts a backward trajectory ending in the late morning at a point in FNSB. The trajectories at 100m (red), 300m (blue), and 1000m (green) show air parcels originating from the southwest through west, converging toward the target location. Lights winds allowed smoke to settle into the flats from the Clear and McDonald fires clearly visible in the image. Also smoke from a fire to the southwest is visible in the image and shows the 300m parcel passing on the northern edge of the smoke field.

Smoke Transport: Calm to light winds allowed smoke from smoldering fires to fill the low-lying areas within the flats. The 300m trajectory passing through the smoke to the southwest also helped transport smoke into FNSB.

Table 28. Hourly surface observation for Fort Wainwright AAF, July 25, 2024

Station	Date/Time	SPD (MPH)	DIR (From)	Gust (MPH)	WX Condition	VIS (SM)	TEMP (F)	DPt (F)
PAFB	07/25/2024 00:55 AKDT	0	0			7	71	64
PAFB	07/25/2024 01:55 AKDT	0	0			7	68	63
PAFB	07/25/2024 02:55 AKDT	6	100			9	65	61
PAFB	07/25/2024 03:55 AKDT	6	70			7	64	61
PAFB	07/25/2024 04:55 AKDT	3	80			7	64	59
PAFB	07/25/2024 05:55 AKDT	5	80			7	64	60
PAFB	07/25/2024 06:55 AKDT	7	80			7	64	60
PAFB	07/25/2024 07:55 AKDT	6	80		1045	6	65	61
PAFB	07/25/2024 08:55 AKDT	3	90			7	64	62
PAFB	07/25/2024 09:55 AKDT	5	80			9	67	63
PAFB	07/25/2024 10:55 AKDT	0	0		7	7	72	63
PAFB	07/25/2024 11:55 AKDT	5	190		7	7	75	62
PAFB	07/25/2024 12:55 AKDT	5	230			7	77	60
PAFB	07/25/2024 13:55 AKDT	9	220			9	80	60
PAFB	07/25/2024 14:55 AKDT	7	210			10	81	60
PAFB	07/25/2024 15:55 AKDT	5	240			10	82	59
PAFB	07/25/2024 16:55 AKDT	5	230			10	84	57
PAFB	07/25/2024 17:55 AKDT	0	0			10	84	56
PAFB	07/25/2024 18:55 AKDT	0	0			10	84	57
PAFB	07/25/2024 19:55 AKDT	3	170			10	84	58
PAFB	07/25/2024 20:55 AKDT	0	0			10	83	58
PAFB	07/25/2024 21:55 AKDT	17	200			10	79	57
PAFB	07/25/2024 22:55 AKDT	0	0			9	74	59
PAFB	07/25/2024 23:55 AKDT	7	280			10	73	55

Surface Observations: The surface observations from July 25, 2024 indicate fifteen hours of reduced visibility at PAFB station at Fort Wainwright AAF indicating the presence of smoke at the location.

Summary of 2024 Event Period

The late June to mid-July 2024 fire event markedly impacted air quality across the Fairbanks North Star Borough (FNSB), driven by smoke from wildfires in close proximity to the region. The primary mechanism for smoke advection was a prevailing west-to-southwest wind flow, which transported emissions from fires, including the McDonald Fire (176,413 acres burned, centered approximately 100-150 km southwest of Fairbanks), into FNSB. $PM_{2.5}$ concentrations exceeded the National Ambient Air Quality Standards (NAAQS) on multiple occasions during this period, with elevated levels persisting across several days. These exceedances coincided with intensified wildfire activity, sparked by approximately 5,000 cloud-to-ground lightning strikes between June 25 and July 10, igniting 179 fires amid dry conditions following a warmer-than-normal June (Fairbanks mean: 65.05°F, 4.0°F above average; Delta Junction mean: 61.14°F, 2.6°F above average) with below-normal precipitation (Fairbanks: 0.5 inches; Delta Junction: 1.5 inches).

NOAA HYSPLIT model backward trajectories confirmed that air parcels reaching FNSB during late June and early July originated from wildfire-affected areas to the west and southwest. Surface observations in Fairbanks documented visibility reductions to 1-3 miles due to dense smoke, consistent with high $PM_{2.5}$ concentrations recorded at FNSB monitoring stations. Nighttime stagnation and morning inversions, exacerbated by cooler overnight lows (e.g., Fairbanks: 45.0°F on July 19; Delta Junction: 44.0°F on July 29), allowed smoke to pool in the Tanana Flats, further degrading air quality in FNSB. A shift to wetter conditions by mid-July, with Fairbanks recording 4.2 inches of precipitation (1.9 inches above norm), brought temporary relief, reducing $PM_{2.5}$ levels as rainfall suppressed fire activity. However, drier-than-average conditions in Delta Junction (July precipitation: 1.1 inches, 1.2 inches below norm) sustained localized smoke production into early August, though impacts lessened as August precipitation in Fairbanks (2.8 inches, 0.7 inches above norm) maintained higher soil moisture.

During the 2024 fire season, preliminary estimates indicate five exceedances of the 24-hour $PM_{2.5}$ NAAQS in FNSB, concentrated during the late June to mid-July peak, with prolonged elevated $PM_{2.5}$ exposure resulting in approximately nine days surpassing the annual 9 $\mu g/m^3$ standard. These air quality impacts, despite a total burned area of 667,064 acres statewide, reflect the significant influence of early-summer meteorological patterns — warm, dry June conditions escalating fire risk, followed by July's cooling and wetting trends that curtailed the season's duration.

Mitigation

DEC continues to work closely with Alaska Fire Service, the AICC, and the Fire Weather Forecasters to ensure Air Quality Advisory Notifications are sent to the public as rapidly as possible. In-place procedures allow DEC to send Air Quality Advisories via Twitter and email, greatly reducing the time required to contact government agencies and the public (see Appendix B).

DEC, the federal land management agencies, and Alaskan tribes developed an interagency plan, the Alaska Interagency Wildland Fire Management Plan (AIWFMP), to address controlling wildland fires. The AIWFMP requires an annual, pre-season land manager(s)/owner(s) review of the fire protection needs on land under their management authority. In addition, responsibilities and actions taken to mitigate impacts of wildfire smoke are outlined in the "Alaska's Enhanced Smoke Management Plan for Prescribed Fire, Procedures Manual June 3, 2019." The purpose of the Enhanced Smoke Management Plan (ESMP) is to provide a clear and equitable regulatory basis for smoke management in Alaska. The ESMP also outlines procedures for monitoring ambient air quality in the event of wildfire.

Procedural Requirements

In accordance with the exceptional events rule 40 CFR §50.14(c)(2)(vi)(A), twenty- two data points were flagged in the state's AQS data submission for 2024. There were twelve days over the $PM_{2.5}$ annual NAAQS limit but below the 24-Hour NAAQS limit, seven days over the $PM_{2.5}$ 24-Hour NAAQS limit and one day over the PM_{10} 24-Hour NAAQS limit at the NCore site. DEC requests that EPA exclude these flagged data points when determining compliance with the 24-hour NAAQS for the NCore, A-Street and Hurst Road sites.

Conclusions

This document describes the wildfires in Alaska in the summer of 2024 by location and acreage burned. The cause of the major fires was lightning ignitions of very dry fuels. Large fires do not occur unless meteorological and fuel conditions are favorable, which occurs frequently during summer months in Interior Alaska.

The smoke from these fires impacted the FNSB and resulted in multiple days of increased $PM_{2.5}$

and PM_{10} concentrations. This natural event data should not be used in the determination of compliance with the NAAQS for FNSB. Without the wildfires, the $PM_{2.5}$ and PM_{10} concentrations at Fairbanks NCore, A-Street and North Pole's Hurst sites would have been much lower. Data from low fire years provide an estimate of background summertime $PM_{2.5}$ concentrations with mean and median concentrations of 3.2-4.7 and 2.8-3.6 $\mu g/m^3$, respectively, depending on the monitoring site.

These wildfires will recur and are not controllable. The state of Alaska ESMP and Air Quality Advisory procedures adequately cover actions to be taken when these events occur.

References

- Draxler, R.R., and G.D. Hess, 1997: Description of the HYSPLIT_4 modeling system. NOAA Tech. Memo. ERL ARL-224, NOAA Air Resources Laboratory, Silver Spring, MD, 24 pp.
- Draxler, R.R., and G.D. Hess, 1998: An overview of the HYSPLIT_4 modeling system of trajectories, dispersion, and deposition. *Aust. Meteor. Mag.*, **47**, 295-308.
- Draxler, R.R., 1999: HYSPLIT4 user's guide. NOAA Tech. Memo. ERL ARL-230, NOAA Air Resources Laboratory, Silver Spring, MD.
- G. Wendler, et, Climatology of Alaskan wildfires with special emphasis on the extreme year 2004, Springer-Verlag 2010.
- Wildland Fire Summary and Statistics Annual Report – AICC, Alaska Fire Season 2024
- https://dec.alaska.gov/air/anpms/communities/fbks-particulate-matter/
- https://www.epa.gov/naaqs/particulate-matter-pm-standards-planning-documents-current-review
- https://dec.alaska.gov/air/anpms/projects-reports/
- https://dec.alaska.gov/air/air-monitoring/guidance/exceptional-events/
- 2024 Alaska Fire Statistics, BLM
- Ward, Tony, et al., 2012. Source Apportionment of $PM_{2.5}$ in a Subarctic Airshed – Fairbanks, AK, *Aerosol and Air Quality Research* 12, 536-543.
- Draxler, R.R. and Rolph, G.D., 2011. HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory) Model access via NOAA ARL READY Website (http://ready.arl.noaa.gov/HYSPLIT.php). NOAA Air Resources Laboratory, Silver Spring, MD.
- Rolph, G.D., 2011. Real-time Environmental Applications and Display system (READY) Website (http://ready.arl.noaa.gov). NOAA Air Resources Laboratory, Silver Spring, MD.
- Rolph, G.D., et al., 2009. Description and Verification of the OA Smoke Forecasting System: The 2007 Fire Season, *Weather and Forecasting,* **24**, 361-378.
- Stein, A.F., et al., 2009. Verification of the NOAA Smoke Forecasting System: Model Sensitivity to the Injection Height, *Weather and Forecasting,* **24**, 379-394.

Abbreviations

AFS	Alaska Fire Service
AGL	Above Ground Level
AICC	Alaska Interagency Coordination Center
AIWFMP	Alaska Interagency Wildland Fire Management Plan
AKDT	Alaska Daylight Time
AQI	Air Quality Index
AQS	Air Quality System
BAM	Beta Attenuation Monitor
BUI	Buildup Index
CFR	Code of Federal Regulations
DEC	Department of Environmental Conservation
EEWR	Exceptional Event Waiver Request
EPA	Environmental Protection Agency
ESMP	Alaska Enhanced Smoke Management Plan
FEM	Federal Equivalent Method
FNSB	Fairbanks North Star Borough
FRM	Federal Reference Method
HYSPLIT	Hybrid Single-Particle Lagrangian Integrated Trajectory
ISI	Initial Spread Index
MODIS	Moderate Resolution Imaging Spectroradiometer satellite imagery
NAAQS	National Ambient Air Quality Standard
NCDC	National Climate Data Center
NCEP	National Centers for Environmental Prediction
NCore	National Core Multi-Pollutant Monitoring Stations
NOAA	National Oceanic and Atmospheric Administration
PM	Particulate Matter
SOB	State Office Building
UTC	Coordinated Universal Time
WD	Wind Direction
WS	Wind Speed