

Aspen/Pitkin County Airport

***Emissions Inventory of
Criteria Air Pollutants
2019/2020 Baseline & 2023***

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Executive Summary

This document presents the criteria air pollutants and precursor pollutants emissions inventories for Aspen/Pitkin County Airport (ASE) for the 2019/2020 baseline and 2023 analysis years. To align with the existing baseline for the airport's Greenhouse Gas Inventory and Community Visioning air quality goal, the baseline year emissions were estimated by averaging activity levels from 2019 and 2020 and calculating emissions based on that level of activity.

The criteria air pollutant inventories for the 2019/2020 baseline and 2023 quantify emissions associated with airport-related activities and provide a comprehensive, data-driven assessment to support ASE's long-term emission reduction objectives, consistent with Airport Advisory Board (AAB) Policy Recommendation No. 2023-001 and the Community Visioning Goal to reduce airport-related emissions by 30% by 2030.

The air pollutants inventoried include the U.S. Environmental Protection Agency (EPA) criteria air pollutants: carbon monoxide (CO), sulfur oxides (SO_x), coarse particulate matter with an aerodynamic diameter of 10 microns (PM₁₀), fine particulate matter with an aerodynamic diameter of 2.5 microns (PM_{2.5}), as well as the ozone (O₃) precursors—nitrogen oxides (NO_x) and volatile organic compounds (VOCs).

The emissions inventory was prepared following guidance established by the Federal Aviation Administration (FAA), Transportation Research Board (TRB) Airport Cooperative Research Program (ACRP), and EPA.

Aviation industry-required and -accepted emissions inventory methods, models, and databases designed to quantify airport-related emission sources were used. These include the most up-to-date versions available at the time of the analysis of:

- FAA, Aviation Emissions and Air Quality Handbook (AQ Handbook, Version 4)¹
- FAA, Aviation Environmental Design Tool (AEDT, Version 3g)²
- TRB, ACRP Guidebook for Quantifying Airport Ground Access Vehicle Activity for Emissions Modeling (2017)³
- EPA, AP-42, Compilation of Air Pollutant Emissions Factors⁴
- EPA, MOtor Vehicle Emission Simulator (MOVES, Version 5)⁵

The emissions sources associated with ASE that are included in the 2019/2020 baseline and 2023 analysis year inventories include the following:

- Aircraft emissions below the mixing height,⁶
- Auxiliary Power Units (APUs),
- Ground Support Equipment (GSE),
- Airport fleet vehicles,

¹ FAA, Aviation Emissions and Air Quality Handbook, July 2024, https://www.faa.gov/regulations_policies/policy_guidance/envir_policy/airquality_handbook/.

² FAA, Aviation Environmental Design Tool (AEDT), <https://aedt.faa.gov/>.

³ ACRP Guidebook for Quantifying Airport Ground Access Vehicle Activity for Emissions Modeling, 2017, <https://doi.org/10.17226/24954>

⁴ U.S. EPA, AP-42, Compilation of Air Pollutant Emissions Factors, <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors-stationary-sources>.

⁵ U.S. EPA, Latest Version of MOtor Vehicle Emission Simulator (MOVES), <https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves>.

⁶ The mixing height is the height above ground through which the atmosphere is considered well-mixed and, therefore, represents the atmospheric depth available for air pollutant dispersion and dilution. The average mixing height is approximately 3,000 feet.

- Passenger vehicles traveling on-airport and -off airport roadways, and
- Stationary sources (i.e., boilers, heaters, and emergency generators).

Per ASE's AAB Policy Recommendation No. 2023-001, it was determined that data associated with hotel shuttles, rental vehicles, and airport and tenant employee vehicles commuting to and from the airport exhibit high variability and low reliability and, therefore, should be excluded from the emissions inventories. While not included in the main body of this report, the emission results from these sources are included for disclosure purposes only in **Appendix A**.

The 2019/2020 baseline and 2023 analysis years criteria/precursor pollutant emissions inventory results for ASE are presented in **Table E-1**.

**Table E-1. ASE 2019/2020 Baseline and 2023 Analysis Years
Criteria/Precursor Pollutants Emissions Inventory Results (Short Tons)**

Sources	2019/2020 Baseline Year						2023					
	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Aircraft	179.9	46.2	46.7	8.2	0.9	0.9	213.4	53.7	55.2	9.7	1.1	1.1
Auxiliary Power Units	12.2	2.7	0.42	0.55	0.60	0.60	13.6	3.1	0.5	0.62	0.69	0.69
Ground Support Equipment	43.6	0.90	1.16	<0.01	0.06	0.05	53.7	0.96	1.4	0.01	0.06	0.05
Airport Fleet Vehicles	3.4	5.0	0.4	<0.01	0.3	0.3	2.5	3.1	0.3	<0.01	0.2	0.2
Passenger Vehicles	5.2	0.30	0.16	<0.01	0.04	0.01	5.5	0.24	0.15	<0.01	0.04	0.01
Stationary Sources	0.42	1.0	0.03	0.26	0.03	0.03	0.45	1.1	0.04	0.26	0.03	0.03
Total	244.7	56.1	48.8	9.0	1.9	1.9	289.1	62.1	57.6	10.5	2.1	2.0

Notes: Values may reflect rounding.
CO = Carbon Monoxide, NO_x = nitrogen oxides, VOC = volatile organic compounds, SO_x = sulfur oxides, PM₁₀ = coarse particulate matter, and PM_{2.5} = fine particulate matter.
Per ASE's AAB Policy Recommendation No. 2023-001, it was determined that data associated with hotel shuttles, rental vehicles, and airport and tenant employee vehicles commuting to and from the airport exhibit high variability and low reliability and, therefore, should be excluded from the emissions inventories. Therefore, these emission sources are not included in this table.
Source: CMT and Mead & Hunt, 2026.

Key Findings

Table E-2 summarizes the 2019/2020 baseline and 2023 analysis years emissions by criteria air pollutants and precursor pollutants and presents the associated percent differences.

Table E-1. Emissions Comparison – 2019/2020 Baseline vs 2023 (Short Tons)

Criteria Pollutants/Precursors		2019/2020 Baseline	2023	Percent Difference
Carbon Monoxide	CO	244.7	289.1	18%
Nitrogen Oxides	NO _x	56.1	62.1	11%
Volatile Organic Compounds	VOC	48.8	57.6	18%
Sulfur Oxide	SO _x	9.0	10.5	17%
Particulate Matter	PM ₁₀	1.9	2.1	7%
	PM _{2.5}	1.9	2.0	7%

Notes: Values may reflect rounding.
Source: CMT and Mead & Hunt, 2026.

Overall, the following changes attributed to the percent increase in emissions observed in 2023 relative to the 2019/2020 baseline.

- Aircraft operations increased by 12% in 2023 over the 2019/2020 baseline, predominantly due to air taxi and general aviation aircraft (GA). Air taxi/GA operations increased by 10%, and air carrier operations increased by 19%.
- APU's and GSE emissions increased as a direct result of higher aircraft operational activity.
- Aircraft taxi times increased in 2023 by 8% due to greater operational activity.
- Passenger vehicles traveling on-airport and off-airport roadways increased due to higher passenger activity levels (27%).
- Notably, emissions from airport fleet vehicles decreased due to fleet turnover and the replacement of older units with newer, lower-emitting models.

Introduction

This document describes the assumptions, methodology, and results of the 2019/2020 baseline and 2023 emissions inventories for Aspen/Pitkin County Airport (ASE). The air pollutants inventoried include the U.S. Environmental Protection Agency (EPA) criteria air pollutants: carbon monoxide (CO), sulfur oxides (SO_x), coarse particulate matter with an aerodynamic diameter of 10 microns (PM₁₀), fine particulate matter with an aerodynamic diameter of 2.5 microns (PM_{2.5}), as well as the ozone (O₃) precursor pollutants nitrogen oxides (NO_x) and volatile organic compounds (VOCs).

The criteria air pollutant inventories for the 2019/2020 baseline and 2023 quantify emissions associated with airport-related activities and provide a comprehensive, data-driven assessment to support ASE's long-term emission reduction objectives, consistent with Airport Advisory Board (AAB) Policy Recommendation No. 2023-001 (AAB Policy). To align with the Community Visioning goal, the AAB policy establishes a target of achieving a 30% reduction in emissions relative to the 2019/2020 baseline by 2030.

Airport-related emission sources included in the inventories consist of aircraft, auxiliary power units (APUs), ground support equipment (GSE), airport fleet vehicles, passenger vehicles, and stationary sources. In accordance with AAB policy, emissions from certain sources including hotel shuttles, rental vehicles, and airport and tenant employee commuting were excluded from the primary inventory due to data variability and reliability concerns. For disclosure purposes, emissions inventories inclusive of these sources are provided in **Appendix A**.

Methodology

The emissions inventories were prepared following applicable guidance, methods, and models established by the Federal Aviation Administration (FAA), Transportation Research Board (TRB) Airport Cooperative Research Program (ACRP), and EPA. These included:

- FAA, Aviation Emissions and Air Quality Handbook (AQ Handbook, Version 4).⁷
- FAA, Aviation Environmental Design Tool (AEDT, Version 3g).⁸
- TRB, ACRP Research Report 180, Guidebook for Quantifying Airport Ground Access Vehicle (GAV) Activity for Emissions Modeling (2017).⁹
- EPA, MOtor Vehicle Emission Simulator (MOVES, Version 5).¹⁰
- EPA, AP-42, Compilation of Air Pollutant Emissions Factors.¹¹

The 2023 emissions inventory was developed using activity data representative of actual operating conditions at ASE in 2023, including aircraft operations, vehicle miles traveled (VMT), fuel throughput, and other relevant activity metrics. To develop the 2019/2020 baseline scenario, activity data from 2019 and 2020 were

⁷ FAA, Aviation Emissions and Air Quality Handbook, July 2024, https://www.faa.gov/regulations_policies/policy_guidance/envir_policy/airquality_handbook/.

⁸ FAA, Aviation Environmental Design Tool (AEDT), <https://aedt.faa.gov/>.

⁹ ACRP Guidebook for Quantifying Airport Ground Access Vehicle Activity for Emissions Modeling, 2017, <https://doi.org/10.17226/24954>.

¹⁰ U.S. EPA, Latest Version of MOtor Vehicle Emission Simulator (MOVES), <https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves>.

¹¹ U.S. EPA, AP-42, Compilation of Air Pollutant Emissions Factors, <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors-stationary-sources>.

averaged to represent typical operating conditions. The 2019/2020 emissions were then calculated using the averaged activity levels and the corresponding emission factors applicable to the baseline period.

Emission Sources

The emissions inventories account for the primary airport-related sources associated with operations at ASE. These sources include aircraft operations, which represent emissions generated during landing, taxiing, takeoff, and climb-out activities as well as APU usage. Tenant-owned GSE are included to capture emissions associated with aircraft servicing while on the ground. Airport-owned GSE used to support airfield, terminal, and landside operations are also included. Passenger vehicles traveling to and from the airport terminal, as well as airport-owned fleet vehicles and equipment used for maintenance and operational purposes, are also inventoried. In addition, stationary sources, including boilers, heaters and emergency generators located at the airport, are included to provide a comprehensive assessment of airport-related emissions.

Aircraft and Auxiliary Power Units

Aircraft operations at ASE are categorized as air carriers, air taxis, general aviation (GA), and military. Air carrier operations consist of scheduled commercial passenger flights. Air taxi operations include on-demand commercial services such as charter flights, which are typically conducted using turboprop and business jet aircraft. GA operations include all other non-commercial civil aviation activities, such as corporate, recreational, and training flights, and commonly involve aircraft similar to those used in air taxi operations.

Due to the substantial overlap in aircraft types and performance characteristics between air taxi and GA operations at ASE, these operations were combined into a single category for emissions modeling. This approach reduces uncertainty associated with assigning similar aircraft to separate categories and more accurately represents actual airport activity.

The ASE 2019/2020 baseline and 2023 operations by aircraft category are presented in **Table 1**.

Table 1. Aircraft Operations by Category

Category	2019/2020 Baseline		2023	
	Operations	By Percent	Operations	By Percent
Air Carrier	9,642	23%	11,484	24%
Air Taxi/General Aviation	32,351	76%	35,667	75%
Military	358	1%	230	1%
Total	42,351	100%	47,381	100%
Source: FAA OPSNET and FlightAware, 2026.				

Total aircraft operations for the 2019/2020 baseline and 2023 analysis years were obtained from the FAA Operations Network (OPSNET) database, which provides official counts of aircraft takeoffs and landings at U.S. airports. The aircraft fleet mix, which is the distribution of aircraft and engine types operating at the airport, was developed using data obtained from FlightAware and the FAA Registry. The FlightAware data provided detailed information pertaining to the aircraft at ASE and the associated N-numbers. N-numbers were cross-referenced with the data in the FAA registry to identify the most representative engines. The same aircraft fleet mix was assumed for both the 2019/2020 baseline and the 2023 analysis years.

Aircraft taxi times were derived from FAA's Aviation System Performance Metrics (ASPM) taxi times reports for 2019/2020 baseline and 2023 analysis years.

Aircraft fleet mix, operational activity data, and taxi times were input into AEDT to develop the emissions inventories for the landing and takeoff (LTO) cycle. The LTO cycle includes the approach, taxi/idle/delay, takeoff, and climb-out modes. AEDT was used to calculate emissions associated with these phases of aircraft operation.

Ground Support Equipment

Emissions from tenant-owned GSE were estimated using default aircraft-related GSE assignments within AEDT. AEDT estimates GSE emissions by assigning typical GSE types (e.g., baggage tugs, fuel trucks, ground power units) and activity (e.g., hours of operation) to aircraft based on airframe type and then applies EPA-based emission factors.

Airport Fleet Vehicles

Airport fleet vehicles include, but are not limited to, airport-owned on-road service trucks and vans, as well as offroad equipment such as snow blowers, snowplows, and deicing trucks. Emissions from airport fleet vehicles were estimated using ASE's fleet vehicle inventory list, and a combination of AEDT and MOVES activity data (i.e., hours of operation) and MOVES emission factors.

Passenger Vehicles On- and Off-Airport Roadways

For this assessment, emissions were estimated only for passenger vehicles traveling on-airport and off-airport roadways. Consistent with AAB policy, emissions associated with hotel shuttles, rental vehicles, airport employee vehicles, and tenant employee vehicles traveling on-airport and off-airport roadways were excluded from the emissions inventories due to the lack of reliable activity data. Emissions estimates for these sources are provided separately in **Appendix A**.

Passenger Vehicles On-Airport Roadways

Emissions from passenger vehicles traveling on-airport roadways were estimated using a total on-airport roadway length of 0.4 miles, which represents the cumulative length of roadways within ASE. Accordingly, a one-way passenger vehicle trip includes 0.4 miles of on-airport travel, and a round trip includes 0.8 miles of on-airport road travel.

During the 2019/2020 baseline and 2023 analysis years, ASE recorded 245,210 and 308,786 enplanements, respectively. Based on the vehicle mode split assumed in prior airport emissions inventories and applied consistently to both analysis years, approximately 63% of passengers accessed the airport using personal vehicles, with an average vehicle occupancy of three passengers per vehicle. This results in an estimated 51,494 and 64,845 passenger vehicles accessing the airport in the 2019/2020 baseline and 2023 analysis years, respectively.

Vehicle miles traveled (VMT) were calculated by multiplying the total number of passenger vehicles by the round-trip on-airport travel distance of 0.8 miles per vehicle. The resulting VMT was then combined with MOVES emission factors for Pitkin County for the 2019/2020 baseline and 2023 analysis years generated using the MOVES model and parameters specific to Pitkin County. MOVES is used to estimate air pollutant emissions from on-road mobile sources such as passenger vehicles, buses, and trucks, and accounts for local vehicle fleet characteristics, fuel types, operating conditions, meteorology, and activity data. The model produces emission factors in units of grams per mile, which were directly applied to the calculated VMT to estimate emissions from passenger vehicles traveling on-airport roadways.

Passenger Vehicles Off-Airport Roadways

The total number of passenger vehicles traveling off-airport roadways was determined in the same manner as the on-airport passenger vehicles (i.e., based on enplanements and assuming three passengers to a vehicle).

The passenger vehicle off-airport trip distances were estimated using the gravity model methodology recommended in the ACRP Research Report 180. Passengers were assumed to primarily travel to the resort locations in Aspen and Snowmass Village. Therefore, based on these locations, the estimated average round-trip distance derived from the gravity model was approximately 16 miles. VMT was then estimated by subtracting the on-airport roadway distance (i.e., 0.8 miles) and multiplying the remaining 15.2-mile distance by the number of passenger vehicles.

The 2019/2020 baseline and 2023 analysis years emissions from passenger vehicles traveling off-airport roadways were estimated by applying the VMT to the appropriate MOVES emission factors.

Stationary Sources

Emissions associated with stationary sources include those from boilers, heaters, and emergency generators. Emissions for the 2019/2020 baseline and the 2023 analysis year were estimated using AEDT.

Natural gas usage from boilers and heaters serving ASE's Main Terminal and Airport Operations Center (AOC) buildings were based on ASE's invoice data from meters located at 1001 Owl Creek Road, 233 East Airport Road Main Terminal, and 233 East Main Street. ASE owns and operates two diesel-fired emergency generators. Equipment data, including unit model and horsepower, were obtained from manufacturer specification sheets. Emergency generator operations were assumed to consist of routine testing once per week for one hour, consistent with information provided by ASE.

Activity data used to estimate emissions from stationary sources for the 2019/2020 baseline and 2023 analysis years are presented in **Table 2**.

Table 2. Stationary Source Activity Data

Source	Activity Levels	2019/2020 Baseline	2023
Boilers and Heaters	Total Fuel Usage – Natural Gas (Therms)	60,212	68,934
Emergency Generators	Hours of Operation per Generator	52	52

Source: ASE and CMT, 2026.

Emissions Inventory Results

This section presents the results of the 2019/2020 baseline and 2023 analysis years emissions inventories of criteria air pollutants and precursor pollutants, associated with operations at ASE. Additionally, for comparison purposes the 2019/2020 baseline and 2023 analysis years percent differences are also presented.

2019/2020 Baseline Emissions Inventory Results

The baseline consists of the average emissions from calendar years 2019 and 2020. These emission results are presented in **Table 3** by pollutant and by emission source.

Table 3. ASE 2019/2020 Baseline Analysis
Criteria/Precursor Pollutants Emissions Inventory Results (Short Tons)

Sources	2019/2020 Baseline					
	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Aircraft						
Approach	27.2	10.8	2.7	1.6	0.1	0.1
Taxi/Idle/Delay	140.9	12.6	43.7	4.4	0.5	0.5
Takeoff	4.3	10.8	0.1	1.0	0.1	0.1
Climb out	7.4	12.0	0.2	1.2	0.2	0.2
Aircraft Sub-total	179.9	46.2	46.7	8.2	0.9	0.9
Auxiliary Power Units	12.2	2.7	0.4	0.6	0.6	0.6
Ground Support Equipment	43.6	0.9	1.2	<0.01	0.1	0.1
Airport Fleet Vehicles	3.4	5.0	0.4	0.01	0.3	0.3
Passenger Vehicles On- and Off-Airport Roadways	5.2	0.3	0.2	<0.01	<0.1	<0.1
Stationary Sources	0.4	1.0	<0.1	0.3	<0.1	<0.1
Total	244.7	56.1	48.8	9.0	1.9	1.9
Notes: Values may reflect rounding. CO = Carbon Monoxide, NO _x = nitrogen oxides, VOC = volatile organic compounds, SO _x = sulfur oxides, PM ₁₀ = coarse particulate matter, and PM _{2.5} = fine particulate matter. The baseline consists of the average emissions from calendar years 2019 and 2020. Source: CMT 2026.						

2023 Emissions Inventory Results

The 2023 emission results are presented in **Table 4** by pollutant and by emission source.

Table 4. ASE 2023 Analysis Years
Criteria/Precursor Pollutants Emissions Inventory Results (Short Tons)

Sources	2023					
	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Aircraft						
Approach	30.1	12.3	3.0	1.8	0.2	0.2
Taxi/Idle/Delay	170.4	15.5	51.9	5.4	0.6	0.6
Takeoff	4.8	12.3	0.1	1.1	0.2	0.2
Climb out	8.2	13.5	0.2	1.3	0.2	0.2
Aircraft Sub-total	213.4	53.7	55.2	9.7	1.1	1.1
Auxiliary Power Units	13.6	3.1	0.5	0.6	0.7	0.7
Ground Support Equipment	53.7	1.0	1.4	<0.1	0.1	0.1
Airport Fleet Vehicles	2.5	3.1	0.3	0.01	0.2	0.2
Passenger Vehicles On- and Off-Airport Roadways	5.5	0.2	0.2	<0.01	<0.1	<0.1
Stationary Sources	0.5	1.1	<0.1	0.3	<0.1	<0.1
Total	289.1	62.1	57.6	10.5	2.1	2.0
Notes: Values may reflect rounding. CO = Carbon Monoxide, NO _x = nitrogen oxides, VOC = volatile organic compounds, SO _x = sulfur oxides, PM ₁₀ = coarse particulate matter, and PM _{2.5} = fine particulate matter. Source: CMT 2026.						

2019/2020 Baseline vs 2023 Comparison

Table 5 summarizes the 2019/2020 baseline and 2023 analysis years emissions by criteria air pollutants and precursor pollutants and presents the associated percent differences.

Overall, the following changes attributed to the percent increase in emissions observed in 2023 relative to the 2019/2020 baseline.

- Aircraft operations increased by 12% in 2023, predominantly due to air taxi and general aviation aircraft (GA). Air taxi/GA operations increased by 28%, and air carrier operations increased by 19%
- APU and GSE emissions increased as a direct result of higher aircraft operational activity.
- Aircraft taxi times increased in 2023 by 8% due to greater operational activity, as well as longer taxi-in durations (approximately 40% increase).
- Passenger vehicles traveling on-airport and off-airport roadways increased due to higher passenger activity levels (27%).
- Notably, emissions from airport fleet vehicles decreased due to fleet turnover and the replacement of older units with newer, lower-emitting models.

**Table 5. ASE 2019/2020 Baseline vs 2023 Analysis Years
Criteria/Precursor Pollutants Emissions Inventory Results (Short Tons)**

Sources	2019/2020 Baseline						2023						Percent Difference					
	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Aircraft	179.9	46.2	46.7	8.2	0.9	0.9	213.4	53.7	55.2	9.7	1.1	1.1	19%	16%	18%	18%	16%	16%
Auxiliary Power Units	12.2	2.7	0.4	0.6	0.6	0.6	13.6	3.1	0.5	0.6	0.7	0.67	11%	12%	15%	13%	14%	14%
Ground Support Equipment	43.6	0.9	1.2	<0.01	0.1	0.1	53.7	1.0	1.4	<0.1	<0.1	<0.1	23%	6%	23%	17%	3%	2%
Airport Fleet Vehicles	3.4	5.0	0.4	0.01	0.3	0.3	2.5	3.1	0.3	0.01	0.2	0.2	-27%	-38%	-26%	-4%	-36%	-36%
Passenger Vehicles	5.2	0.3	0.2	<0.01	<0.1	<0.1	5.5	0.2	0.2	<0.01	<0.1	<0.1	6%	-21%	-5%	5%	9%	15%
Stationary Sources	0.4	1.0	<0.1	0.26	<0.1	<0.1	0.5	1.1	<0.1	0.3	<0.1	<0.1	8%	4%	7%	0.1%	3%	3%
Total	244.7	56.1	48.8	9.0	1.9	1.9	289.1	62.1	57.6	10.5	2.1	2.0	18%	11%	18%	17%	7%	7%

Notes: Values may reflect rounding.

CO = Carbon Monoxide, NO_x = nitrogen oxides, VOC = volatile organic compounds, SO_x = sulfur oxides, PM₁₀ = coarse particulate matter, and PM_{2.5} = fine particulate matter.

The baseline consists of the average emissions from calendar years 2019 and 2020.

Source: CMT 2026.

Appendix A: 2019/2020 Baseline and 2023 Analysis Years - Emissions Inventory Results of Hotel Shuttles, Rental Vehicles, Airport Employee and Tenant Employee Vehicles

Per ASE's AAB Policy Recommendation No. 2023-001, it was determined that data associated with hotel shuttles, rental vehicles, and airport and tenant employee vehicles commuting to and from the airport exhibit high variability and low reliability and, therefore, should be excluded from the 2023, 2019/2020 baseline, and prior emissions inventories. However, for disclosure purposes, these sources were estimated for the 2019/2020 baseline and 2023 analysis years inventories in this appendix. The emissions from these sources are detailed in the following sections.

A-1. Hotel Shuttles and Rental Vehicles On-Airport Roadways

In the 2019/2020 baseline and 2023 analysis years, the airport recorded 245,210 and 308,786 enplanements, respectively. Based on the vehicle mode distribution from prior emissions inventories (see **Table A-1**), approximately 37% of passengers accessed the airport using hotel shuttles and rental vehicles, with an average vehicle occupancy of three passengers per vehicle. This results in an estimated 20,434 and 25,732 hotel shuttles; and 9,808 and 12,351 rental vehicles, in the 2019/2020 baseline and 2023 analysis years, respectively. To estimate vehicle miles travelled (VMT), an on-airport round-trip distance of 0.8 miles per vehicle was assumed and multiplied by the total number hotel shuttles/rental vehicles. The VMT for the 2019/2020 baseline and 2023 analysis years was then combined with emission factors specific to Pitkin County using the U.S. Environmental Protection Agency Motor Vehicle Emissions Simulator (MOVES) model.

Table A-1 Vehicle Mix

Category		Percent Mix (%)
Passenger Vehicles	Parking Lot	38%
	Pick-Up/Drop-Off	5%
	Taxi	20%
Hotel Shuttles		25%
Rental Vehicles		12%
Source: ASE 2026.		

A-2. Hotel Shuttles and Rental Vehicles Off-Airport Roadways

The total number of hotel shuttles and rental vehicles traveling on off-airport roadways, as well as the associated vehicle mix, was determined using the same methodology applied to hotel shuttles and rental vehicles on-Airport roadways (see Section A-1).

Hotel shuttle and rental vehicle off-airport trip distances were estimated using the gravity model methodology recommended in the ACRP Research Report 180. Hotel shuttles were assumed to primarily travel to the hotel resort locations in Aspen and Snowmass Village. Therefore, the gravity model determined the average round-trip distance to be approximately 16 miles. Hotel shuttle VMT was then estimated by multiplying the average distance by the number of hotel shuttles in the 2019/2020 baseline and 2023 analysis years. Similarly, rental vehicle VMT was computed using this distance and the total number of rentals in the 2019/2020 baseline and 2023 analysis years.

A-3. Airport Employees On- and Off-Airport Roadways

Emissions associated with airport employee vehicles travelling on- and off-airport roadways were also assessed. These emissions were developed using total number of vehicles, estimated VMT, and MOVES emission factors.

ASE staff provided information for total number of airport employees which amounted to 50 full-time airport employees in the 2019/2020 baseline and 2023 analysis years, each driving one vehicle. VMT was estimated using a round-trip distance of 72 miles multiplied by the number of vehicles. The 72-mile trip distance was estimated using the gravity model methodology recommended in the ACRP Research Report 180. This methodology develops a weighted average trip distance based on the distances to towns, cities, and municipalities where full-time employees are likely to live and the associated populations. The locations applied in this analysis included Basalt, Glenwood Springs, Aspen, Snowmass Village, Carbondale, New Castle, Rifle, and Silt. The round trip distance is assumed to be traveled by each full-time employee five days a week, 50 weeks per year.

The 2019/2020 baseline and 2023 analysis years VMT were then combined with emission factors specific to Pitkin County using MOVES. The EPA's MOVES model is used to estimate air pollutant emissions from on-road mobile sources, such as cars, trucks, and buses. It calculates emission factors based on vehicle type, fuel, operating conditions, and local activity data. MOVES produces emission factors in grams per mile, which can then be directly multiplied with the VMT.

A-4. Tenant Employees On- and Off-Airport Roadways

Emissions associated with tenant employee vehicles travelling on- and off-airport roadways were developed using total number of vehicles, estimated VMT, and MOVES emission factors.

ASE staff provided information for total number of tenant employees which amounted to 101 full-time tenant employees in the 2019/2020 baseline and 2023 analysis years, each driving one vehicle. VMT was estimated using a round-trip distance of 72 miles multiplied by the number of vehicles. This methodology is consistent with the approach described for airport employees. The round trip distance is assumed to be traveled by each full-time employee five days a week, 50 weeks per year. The VMT for the 2019/2020 baseline and 2023 analysis years was then combined with emission factors specific to Pitkin County using MOVES.

A-5. Emissions Inventory Results

Table A-2 presents the results of the 2019/2020 baseline and 2023 analysis years emissions inventories in short tons for all sources assessed.

**Table 4. ASE 2019/2020 Baseline and 2023 Analysis Years
Criteria/Precursor Pollutants Emissions Inventory Results (Short Tons)
All Sources**

Sources	2019/2020 Baseline						2023					
	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Aircraft												
<i>Approach</i>	27.19	10.78	2.71	1.60	0.15	0.15	30.08	12.34	2.99	1.82	0.16	0.16
<i>Taxi/Idle/Delay</i>	140.91	12.58	43.65	4.37	0.47	0.47	170.35	15.48	51.89	5.35	0.56	0.56
<i>Takeoff</i>	4.34	10.82	0.11	1.00	0.14	0.14	4.81	12.31	0.12	1.14	0.15	0.15
<i>Climb out</i>	7.42	11.98	0.18	1.18	0.16	0.16	8.19	13.53	0.20	1.33	0.18	0.18
Aircraft Sub-total	179.86	46.15	46.65	8.15	0.91	0.91	213.43	53.66	55.20	9.65	1.06	1.06
Auxiliary Power Units	12.23	2.74	0.42	0.55	0.60	0.60	13.61	3.08	0.48	0.62	0.69	0.69
Ground Support Equipment	43.62	0.90	1.16	<0.01	0.06	0.05	53.67	0.96	1.43	0.01	0.06	0.05
Airport Fleet Vehicles	3.40	4.96	0.38	0.01	0.29	0.28	2.48	3.09	0.27	0.01	0.19	0.18
Passenger Vehicles On- and Off-Airport Roadways	5.20	0.30	0.16	<0.01	0.04	0.01	5.51	0.24	0.15	<0.01	0.04	0.01
Hotel Shuttles On- and Off-Airport Roadways	2.30	0.18	0.09	<0.01	0.02	0.01	1.92	0.12	0.07	<0.01	0.02	0.01
Rental Vehicles On- and Off-Airport Roadways	1.04	0.06	0.03	<0.01	0.01	<0.01	1.10	0.05	0.03	0.00	0.01	0.00
Airport Employee Vehicles On- and Off-Airport Roadways	5.63	0.32	0.18	<0.01	0.04	0.01	4.75	0.20	0.13	<0.01	0.04	0.01
Tenant Employee Vehicles On- and Off-Airport Roadways	11.38	0.65	0.36	0.01	0.08	0.02	9.59	0.41	0.27	0.01	0.07	0.02
Stationary Sources	0.42	1.04	0.03	0.26	0.03	0.03	0.45	1.08	0.04	0.26	0.03	0.03
Total	265.1	57.3	49.5	9.0	2.1	1.9	306.5	62.9	58.1	10.6	2.2	2.1
Notes: Values may reflect rounding. CO = Carbon Monoxide, NO _x = nitrogen oxides, VOC = volatile organic compounds, SO _x = sulfur oxides, PM ₁₀ = coarse particulate matter, and PM _{2.5} = fine particulate matter. Source: CMT 2026.												



Aspen/Pitkin County Airport

Quarterly Report
April to July, 2026

Prepared for:

Aspen/Pitkin County Airport (ASE)

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August 17, 2026

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1. Introduction

This quarterly report highlights the data collected from April 1 to July 31, 2026, at the Aspen/Pitkin County Airport (ASE). Sites 1 and 2 use EPA reference methods and have undergone initial quality control. Due to extensive equipment replacement and calibration, Sites 1 and 2 plots start on April 9, 2026. Sites 3 to 11 represent data collected by remote samplers and quality control is a function of the download process only. Measurements concentrate on the “criteria” pollutants. That is, the pollutants that have established National Ambient Air Quality Standards (NAAQS) as shown in Table 1. Measurements included carbon monoxide (CO), oxides of nitrogen with nitrogen dioxide (NO₂) being the criteria pollutant, sulfur dioxide (SO₂), and particulate matter with aerodynamic diameters less than 2.5 and 10 micrometers (PM_{2.5} / PM₁₀). Volatile Organic Compounds, although not a criteria pollutant, were also measured and are reported.

Table 1. National Ambient Air Quality Standards (EPA, 2026)

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary (1)	Rolling 3 month average	0.15 µg/m ³	maximum arithmetic mean of 3 consecutive monthly means in a 3-year period
Nitrogen Dioxide (NO₂)		primary	1 hour	100 ppb	Annual 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb (2)	Annual Mean
Ozone (O₃)		primary and secondary (3)	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	PM _{2.5}	primary	1 year	9.0 µg/m ³	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m ³	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m ³	98th percentile, averaged over 3 years
	PM ₁₀	primary and secondary	24 hours	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO₂)		primary (4)	1 hour	75 ppb	Annual 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary (5)	1 year	10 ppb	annual mean, averaged over 3 years

Footnotes are not included. See <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

The measured data is presented graphically for easy review. A wind rose that is based on the wind direction and speed during the measurement period is shown. Evaluated wind effects, in the form of pollutant roses have been created and included. Each pollutant rose has a brief interpretation of the meaning included. To assist in reader understanding, both the wind rose and pollutant rose are defined in the following paragraphs. Initial analyses of the measurement data in a very preliminary format are shown for evaluation of individual aircraft operations to show how a momentary impact occurs and an analysis of traffic effects on local concentrations.

1.1 Wind Rose

A wind rose allows a quick review of prevailing wind directions and potential pathways for contaminant transport. It is a circular diagram that shows the frequency, direction, and speed of wind observed at a specific location over a defined period. In this case, weather information is for the Aspen meteorology station near the airport. Figure 1 shows this wind rose from April 1 to July 31, 2026, the time of the first quarter monitoring.

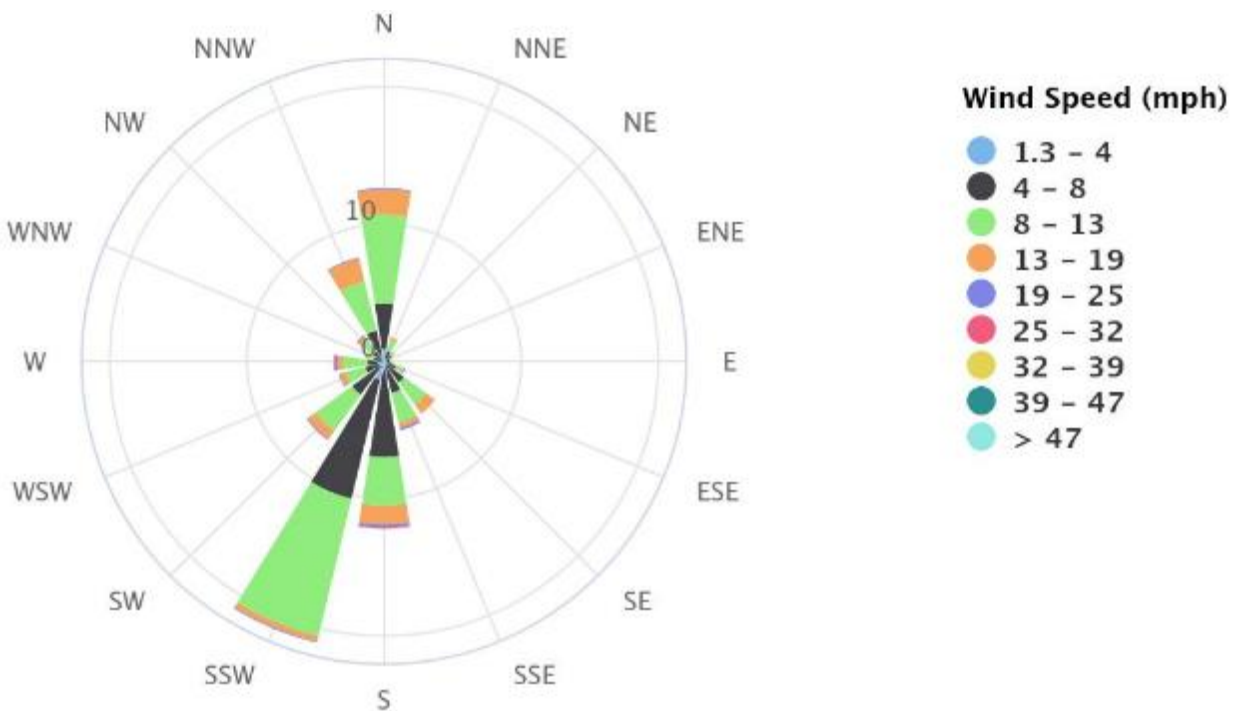


Figure 1. Wind Rose Aspen/Pitkin County Airport; 1Apr2026 – 31July2026

The “spokes” in the diagram point toward the compass direction the wind comes from. The length of each spoke indicates how often the wind blows from that direction. The different colors or bands on each spoke represent ranges of wind speeds according to the legend.

For example, the wind blew from the south-south-west (SSW) most of the time (over 20 percent) and from due north over 10 percent of the time. The greatest occurrences of wind speeds were 8 to 13 miles per hour. Calms are not shown.

1.2 Pollutant Rose

A pollutant rose is like a wind rose but shows the direction a pollutant is coming from based on the concentration of the pollutant and frequency of the wind direction. Wind and concentration are time matched. The center of the graph represents the monitoring location. The patterns indicate directions of a source. As with the wind rose, a distinct spoke in one direction indicates a specific source or activity is influencing the site and the direction to that source. This could be due to sustained wind from a direction or by higher concentrations influencing results. A wide directional range suggests multiple sources, area-wide emissions, and/or regional transport. It should be noted that very high concentrations for a short period of time can influence the results.

In this report, pollutant roses have been placed on a map to help indicate potential sources.

1.3 Monitoring Sites

Equipment at the sites varied as did pollutants measured. Table 2 shows details of each site, including location, equipment, and pollutants measured. A map shown immediately after the table (Figure 2) graphically shows the site locations. Measurement locations were selected at the ends of the runways to better quantify aircraft emissions directly under the path and at low altitudes. These are the two reference locations, Site 1 and 2. Sites 3 to 6 ring the airport to provide a way to review upwind and downwind concentrations. This allows a quasi-mass balance of emissions from the airport for different wind directions. That is, for a specific wind direction, the upwind locations represent the concentration entering the airport while the downwind concentration represents the concentration leaving the airport. This is an approximation and does not account for all parameters affecting the pollutant. Sites 7 to 9 were selected to establish concentrations closer to residential areas. Site 10 was selected to represent a public area near the airport. Site 11, in downtown Aspen was selected to allow a comparison of downtown versus the airport location. Placed near a State monitor, it also permits a comparison to other measured values as a quality control. The NAAQS are also included for reference. Where possible, these have been placed on the measurement graphs for direct comparison. Of note is that measurements for Sites 1 and 2 are always shown as 1-hour averages in this report to emphasize shorter term peaks. Not all pollutants have a 1-hour NAAQS. In those cases for Site 1 and 2, the NAAQS are included in text form. Sites 3 – 11 are shown for time periods that match the NAAQS.

The following sections provide graphical results of the measurements.

Table 2. Measurement Location Details (Green Location Indicates within ASE boundary)

Location	Notes on Locations
1. North of ASE	Reference Enclosure. Near the north end of the runway. Coordinates 338248.72 m E 4344569.83 m N Pollutants to be measured: Continual PM, NO _x , SO ₂ Lead and speciated VOCs monthly Equipment Teledyne API T640 (Real-Time PM Mass Monitors) Teledyne API T700 (Dynamic Dilution Calibrators) Teledyne API T200 (Chemiluminescence Nitrogen Oxides Analyzers) Teledyne API T100 (UV Fluorescence Sulfur Dioxide Analyzers) Teledyne API T701 (Zero Air Systems) Tisch Environmental 5170 TSP (Total Suspended Particulate Samplers) Campbell Data Logger CR3000
2. South of ASE	Reference Enclosure. Coordinates 339222.74 m E 4341710.57 m N Near south end of the runway near FAA Building Pollutants to be measured: Continual PM, NO _x , SO ₂ Lead and speciated VOCs monthly Equipment Teledyne API T640 (Real-Time PM Mass Monitors) Teledyne API T700 (Dynamic Dilution Calibrators) Teledyne API T200 (Chemiluminescence Nitrogen Oxides Analyzers) Teledyne API T100 (UV Fluorescence Sulfur Dioxide Analyzers) Teledyne API T701 (Zero Air Systems) Tisch Environmental 5170 TSP (Total Suspended Particulate Samplers) Campbell Data Logger CR3000 Summa Canisters*
3. NW of Runway	Screening Location. Coordinates 338303.80 m E 4343789.63 m N Northern site along fence line west of runway. North of buildings on Owl Creek Road at bend of fence. Pollutants to be measured: PM _{2.5} PM ₁₀ , NO ₂ + speciated VOCs possible* Equipment QuantaAQ-x Modulair with PM and NO ₂ Summa Canisters*
4. SW of Runway	Screening Location. Coordinates 338774.41 m E 4342470.87 m N Southern site along fence line west of runway. Near the section of fence that has cross members near Owl Creek Road. Pollutants to be measured: PM _{2.5} PM ₁₀ , NO ₂ + speciated VOCs possible* Equipment QuantaAQ-x Modulair with PM and NO ₂ Summa Canisters*
5. NE of Runway	Screening Location. Coordinates 338572.52 m E 4343966.10 m N Northern site along fence line east of runway. Just north of protective airplane roof structure. Pollutants to be measured: PM _{2.5} PM ₁₀ , NO ₂ + speciated VOCs possible* Equipment QuantaAQ-x Modulair with PM and NO ₂ Summa Canisters*
6. SE of Runway	Screening Location. Coordinates 339252.15 m E 4342318.71 m N Southern site along fence line east of runway. South of car wash at fence corner. Pollutants to be measured: PM _{2.5} PM ₁₀ , NO ₂ + speciated VOCs possible* Equipment QuantaAQ-x Modulair with PM and NO ₂ Summa Canisters*
7. ASE Enclosure East of SR82	Screening Location. Coordinates 338909.87 m E 4343583.42 m N Northern site along east side of US82. Fenced area owned by airport. Pollutants to be measured: PM _{2.5} PM ₁₀ , NO ₂ + speciated VOCs possible* Equipment QuantaAQ-x Modulair with PM and NO ₂ Summa Canisters*
8. Rescue Center, East of SR82	Screening Location. Coordinates 339331.46 m E 4342353.50 m N Southern site along east side of US82. At Rescue Center.

Location	Notes on Locations
	Pollutants to be measured: PM_{2.5} PM₁₀, NO₂ + speciated VOCs possible* Equipment QuantAQ-x Modulair with PM and NO₂ Summa Canisters*
9. Pitkin County Dispatch Center	Screening Location. Coordinates 339158.70 m E 4343041.80 m N Near residential area east of airport. At Pitkin County Regional Emergency Dispatch Center. Pollutants to be measured: PM_{2.5} PM₁₀, NO₂ + speciated VOCs possible* Equipment QuantAQ-x Modulair with PM and NO₂ Summa Canisters*
10. Buttermilk	Screening Location. On Buttermilk but exact location TBD. Coordinates 339373.00 m E 4341259.00 m N Pollutants to be measured: PM_{2.5} PM₁₀, NO₂ + speciated VOCs possible* Equipment QuantAQ-x Modulair with PM and NO₂ Summa Canisters*
11. County Monitoring Station	Screening and QA Location. Downtown Aspen. Coordinates 342543.00 m E 4339772.00 m N Collocated with county monitoring station to determine in city and for quality control purposes. Pollutants to be measured: PM_{2.5} PM₁₀, NO₂ Equipment QuantAQ-x Modulair with PM and NO₂ Summa Canisters*

***VOCs using the canister method will be used at screening locations based on prioritizing and rotating locations for short durations.**

Figure 2. Monitors Near Airport



Sites 1 – 10 near airport are shown. Site 11 is at the Yellow Brick Building in downtown Aspen.

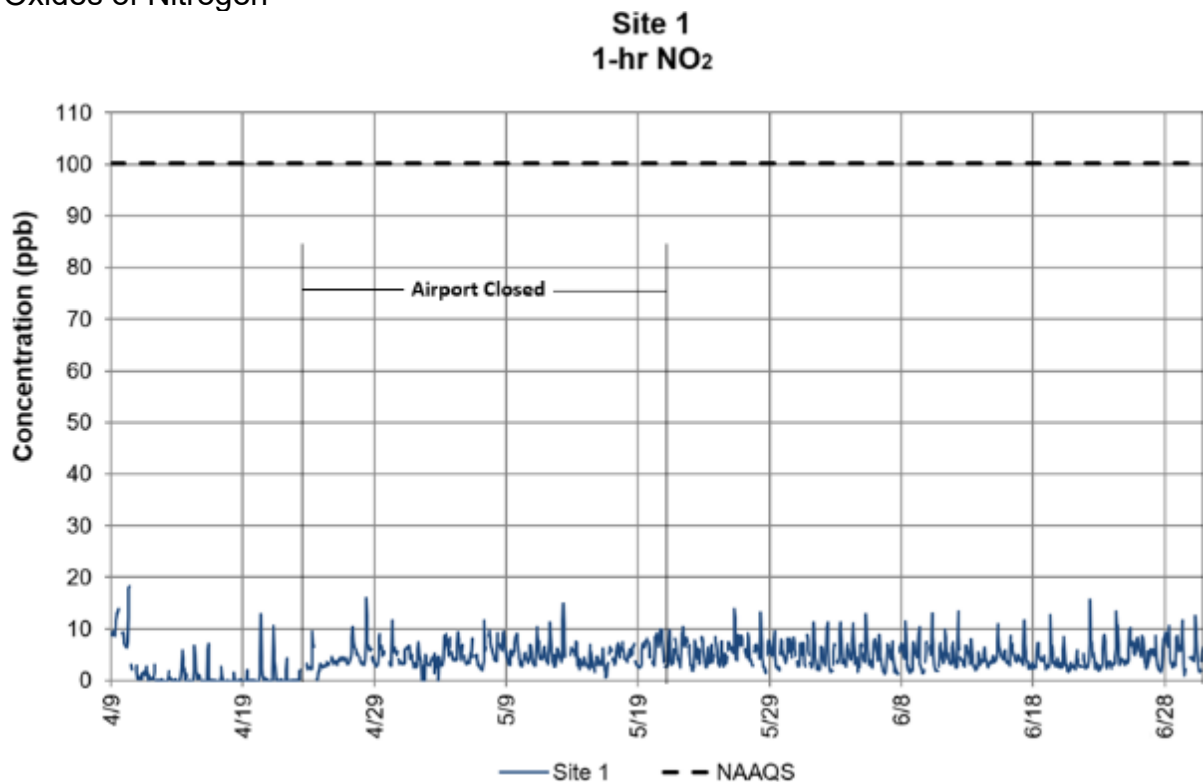
2. Hourly Concentrations Plotted by Date

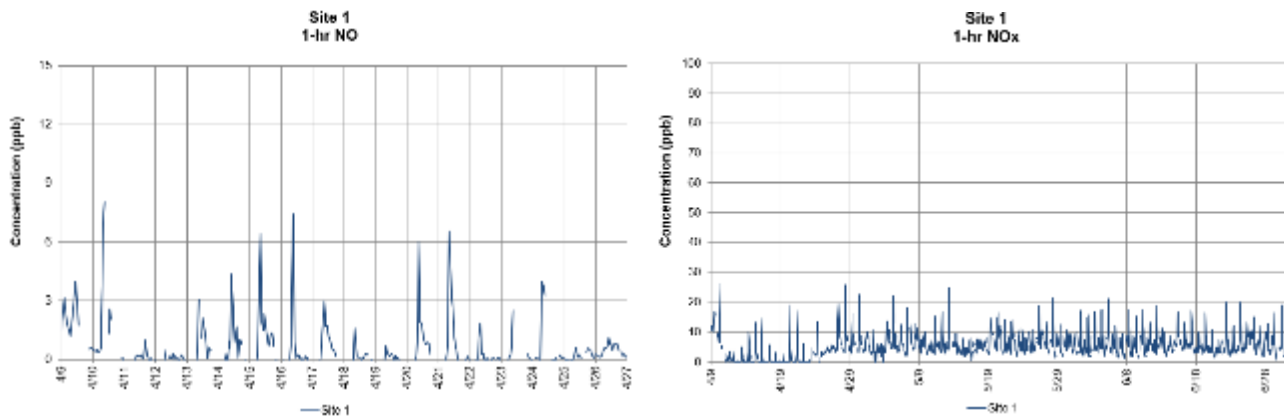
2.1 Site 1. EPA Reference Method Equipment

The purpose of this location is to allow measurements directly under the path of the aircraft at low altitudes to represent maximum concentrations. Due to the numerous figures included, figures are not numbered but simply labeled.



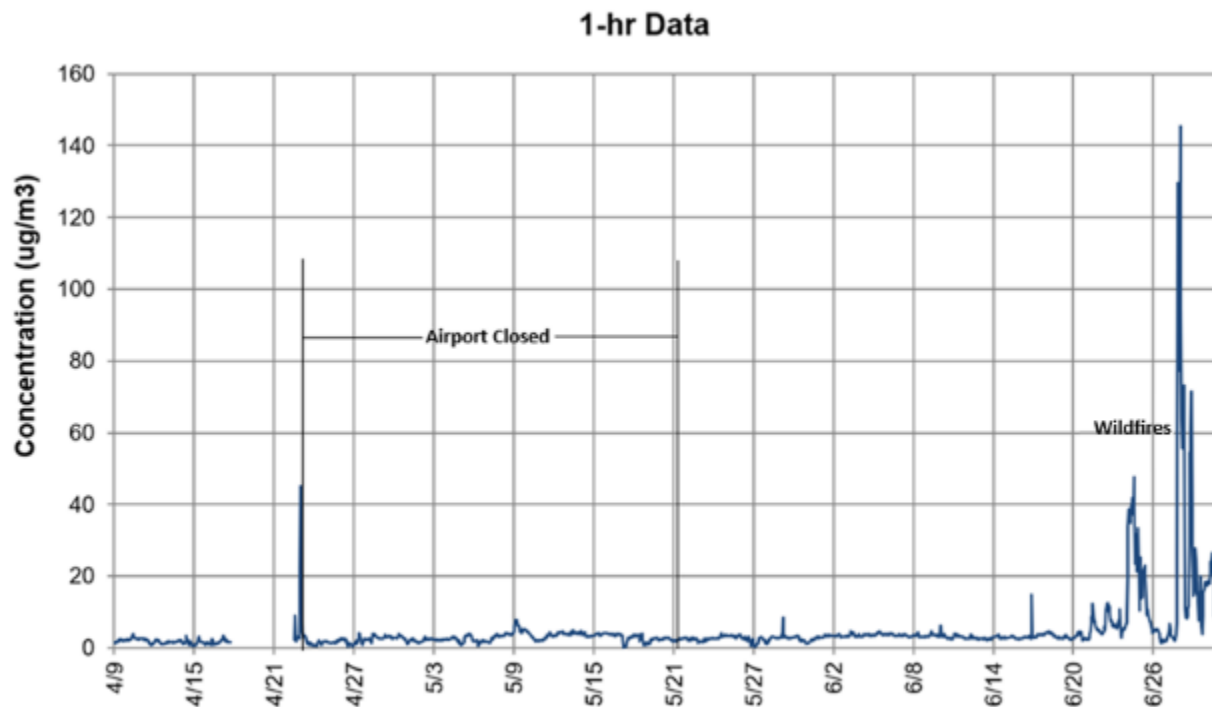
a. Oxides of Nitrogen





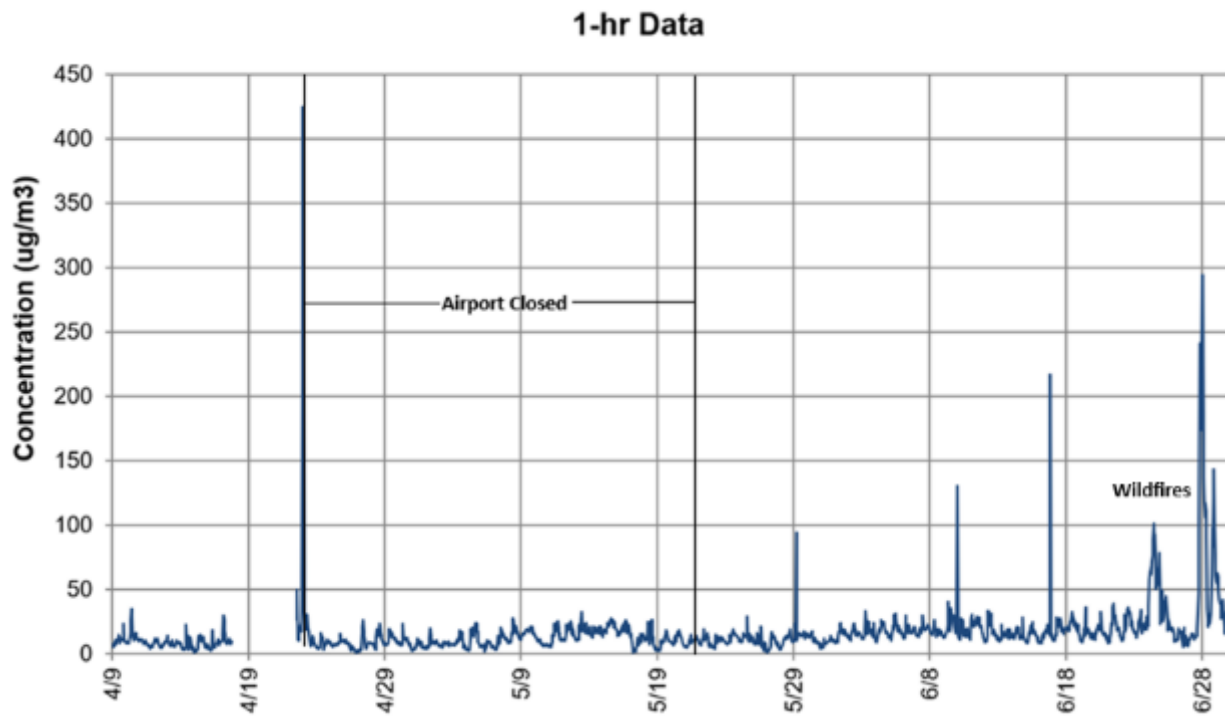
There is no National Ambient Air Quality Standard for NO or NOx.

b. PM_{2.5}



There is no 1-hour NAAQS for PM_{2.5}. The NAAQS if averaged over 24-hours is 35 µg/m³. For a yearly average the NAAQS is 9 µg/m³. Other statistics also apply to these time periods.

c. PM₁₀

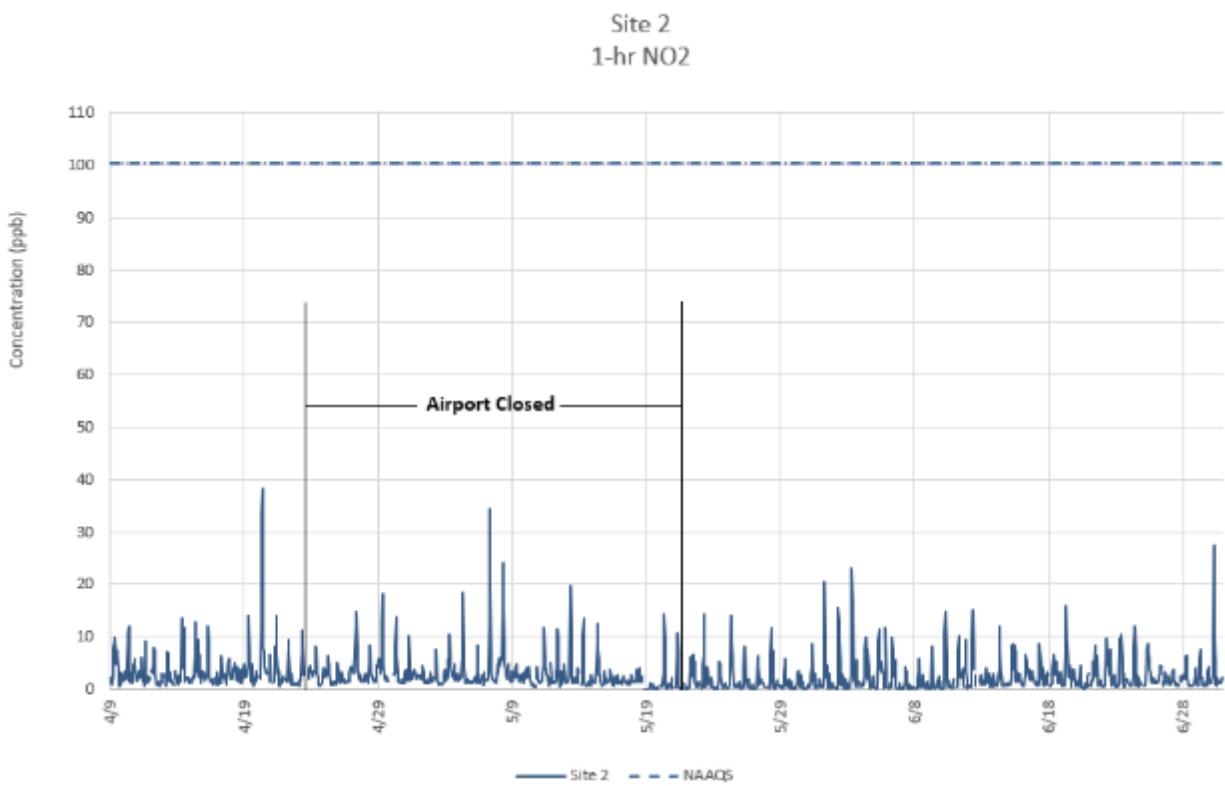


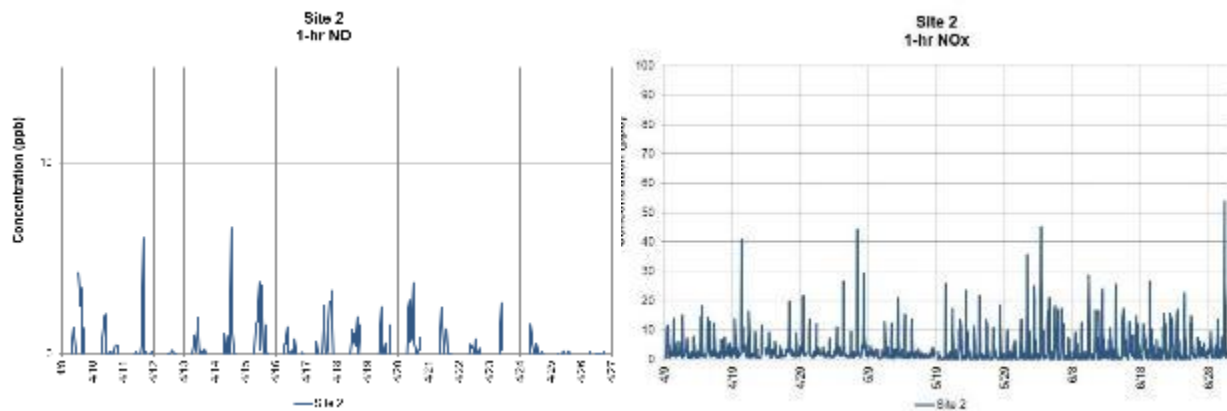
There is no 1-hour NAAQS for PM₁₀. The NAAQS if averaged over 24-hours is 150µg/m³. Other statistics also apply.

2.2 Site 2. EPA Reference Method Equipment



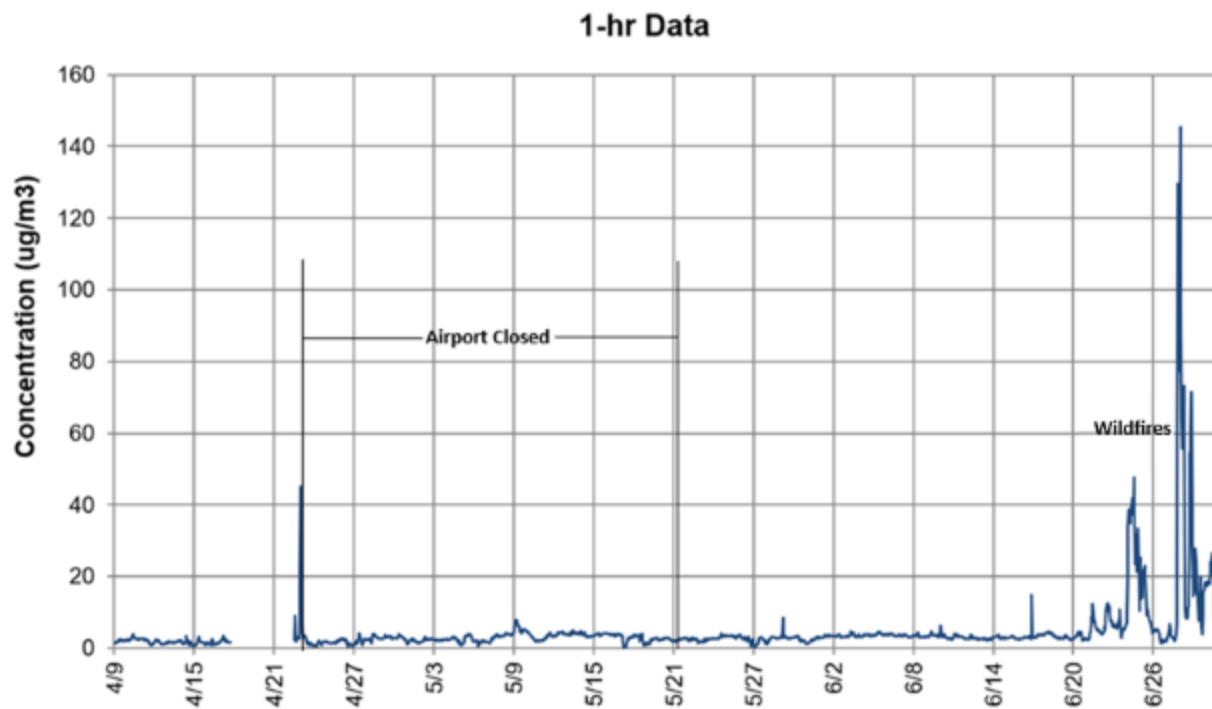
a. Oxides of Nitrogen





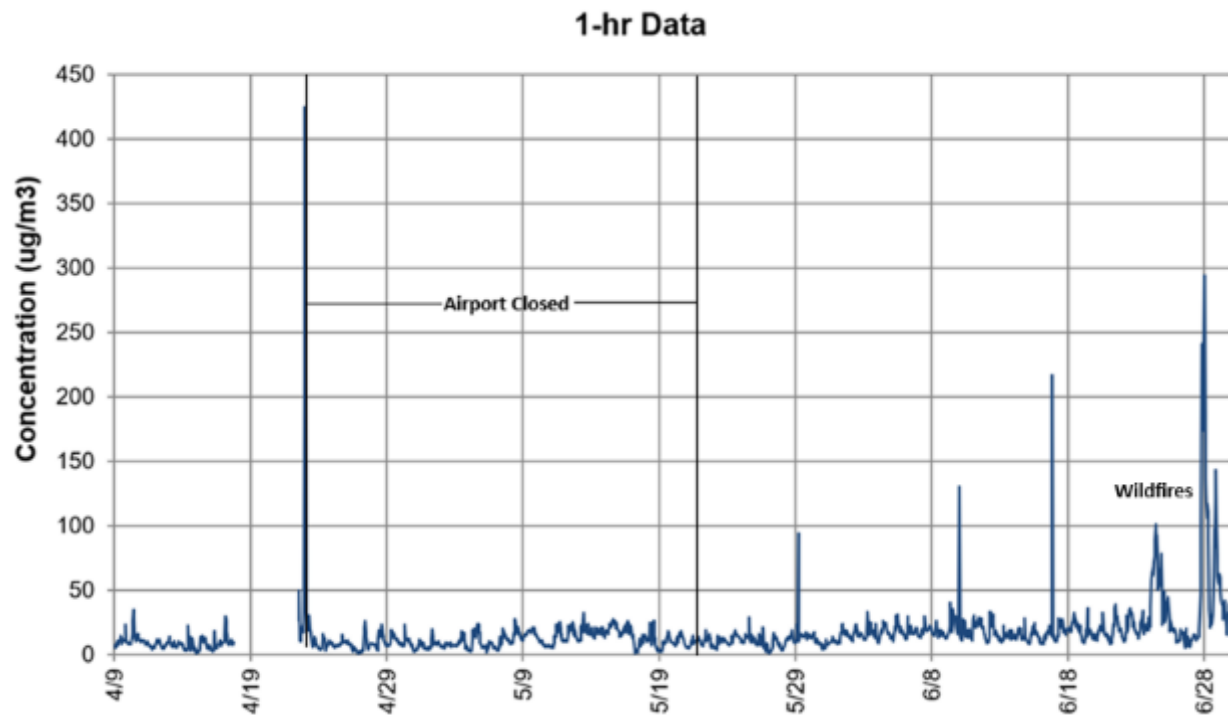
There is no National Ambient Air Quality Standard for NO or NOx.

b. PM_{2.5}



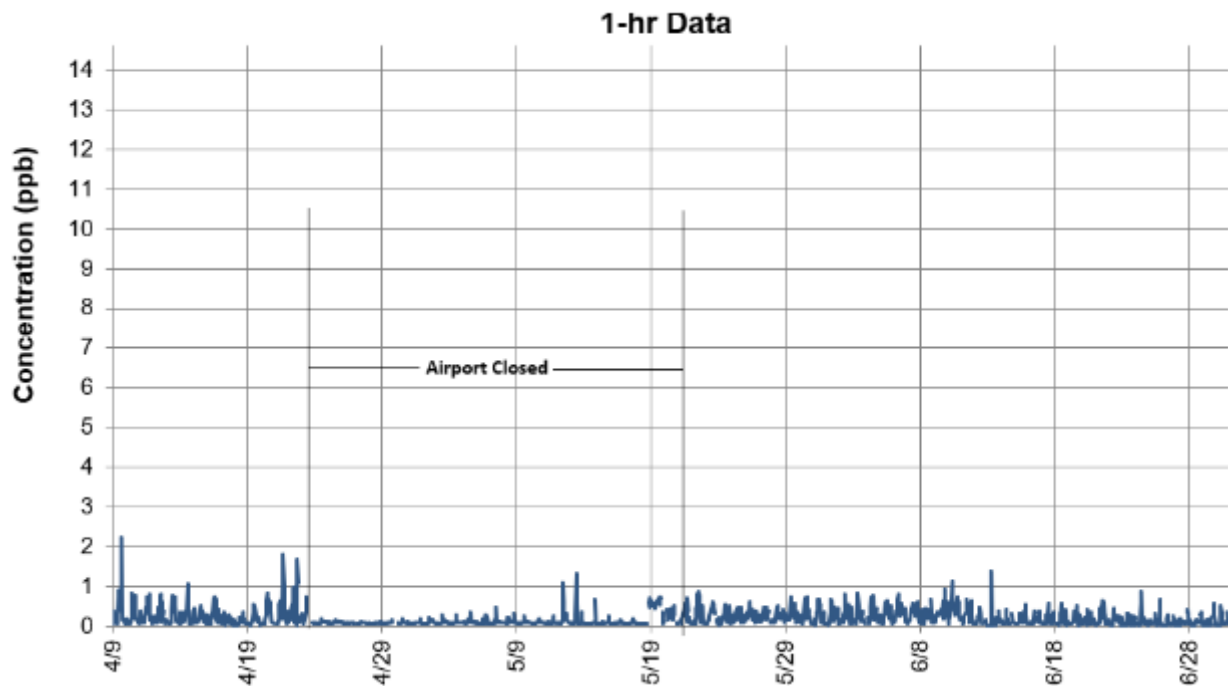
There is no 1-hour NAAQS for PM_{2.5}. The NAAQS if averaged over 24-hours is 35 µg/m³. For a yearly average the NAAQS is 9 µg/m³. Other statistics also apply to these time periods.

c. PM₁₀



There is no 1-hour NAAQS for PM₁₀. The NAAQS if averaged over 24-hours is 150µg/m³. Other statistics also apply to these time periods.

d. SO₂

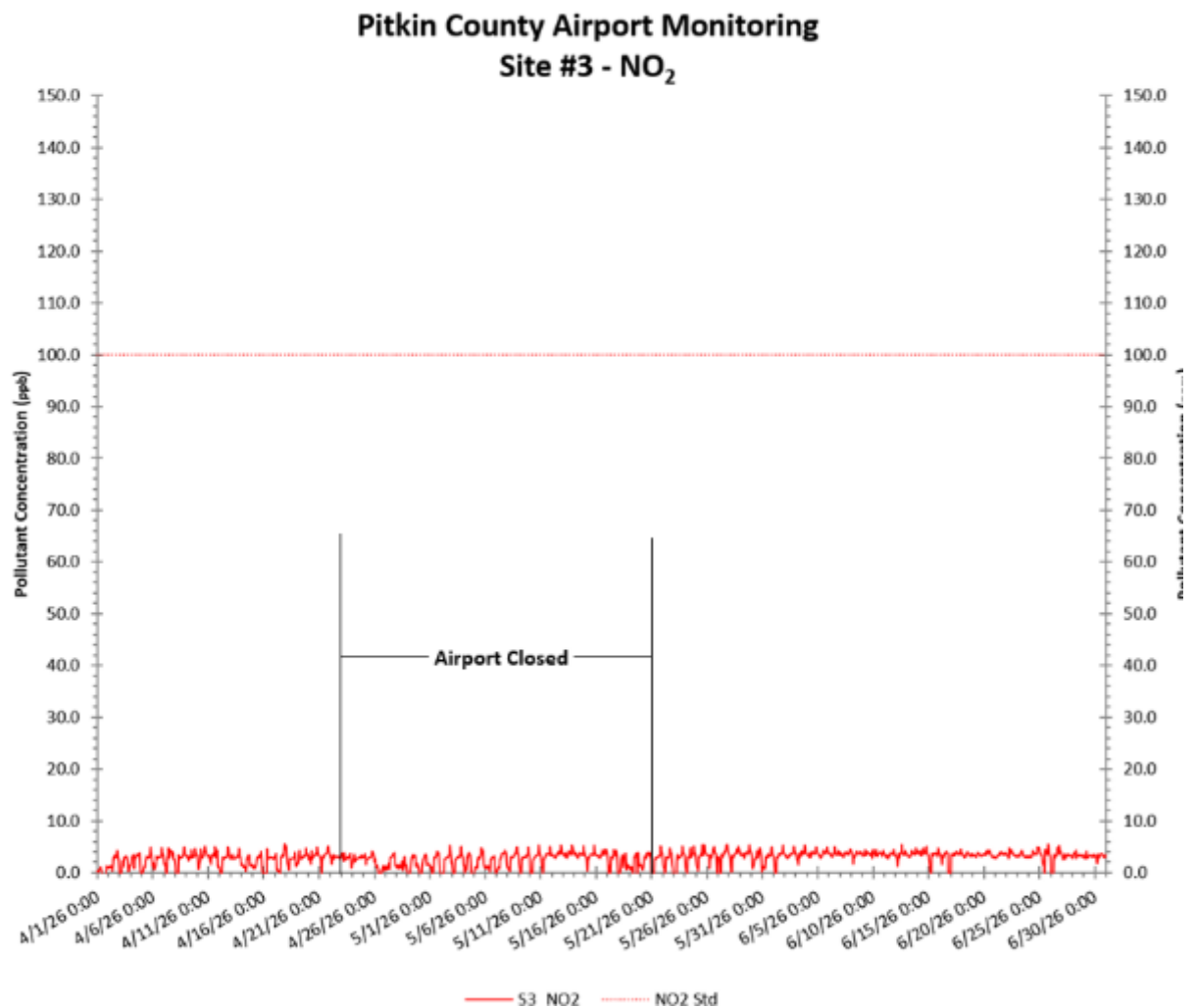


The 1-hour NAAQS for SO₂ is 75 ppb. It is not shown here so that the trend with and without airport operations can more clearly be seen in the graph.

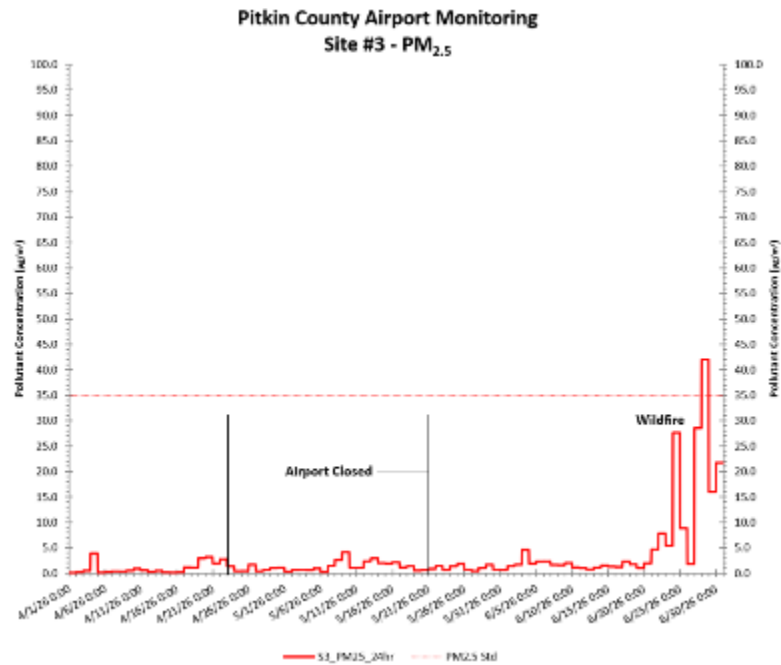
2.3 Site 3. Remote Samper



a. NO₂ (1-hour average)

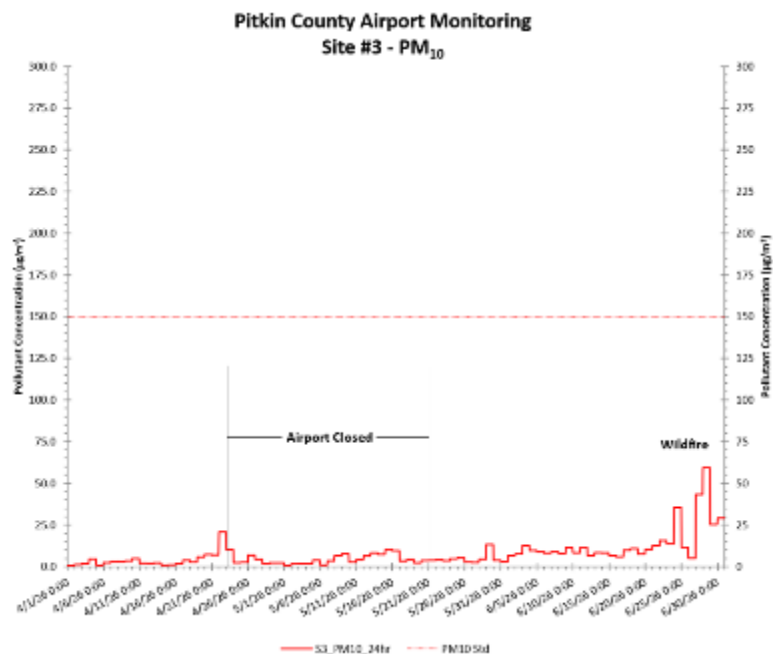


b. PM_{2.5} (24-hour average)

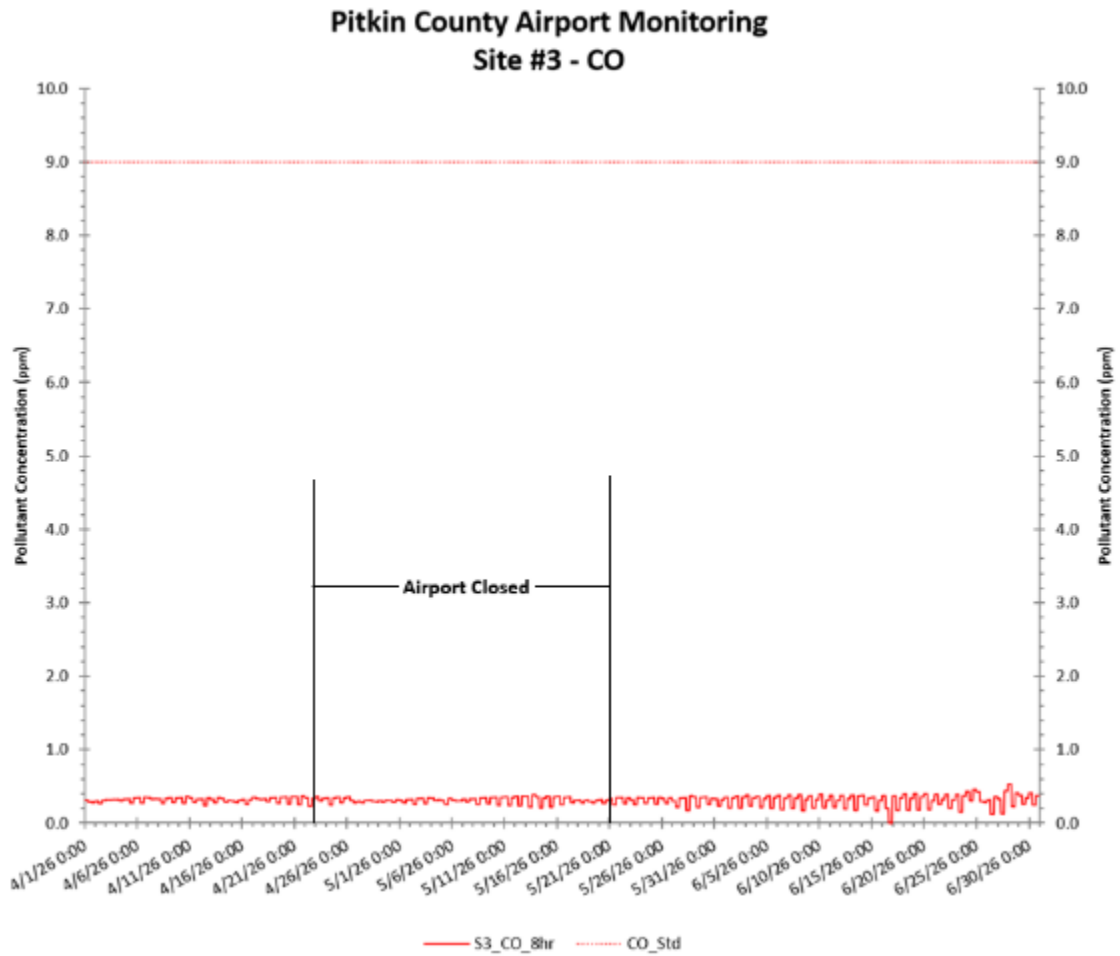


There is also a 1-year primary NAAQS for PM_{2.5} of 9 µg/m³. We do not have 1-year of data currently.

c. PM₁₀: (24-hour average)



d. CO (8-hour average)

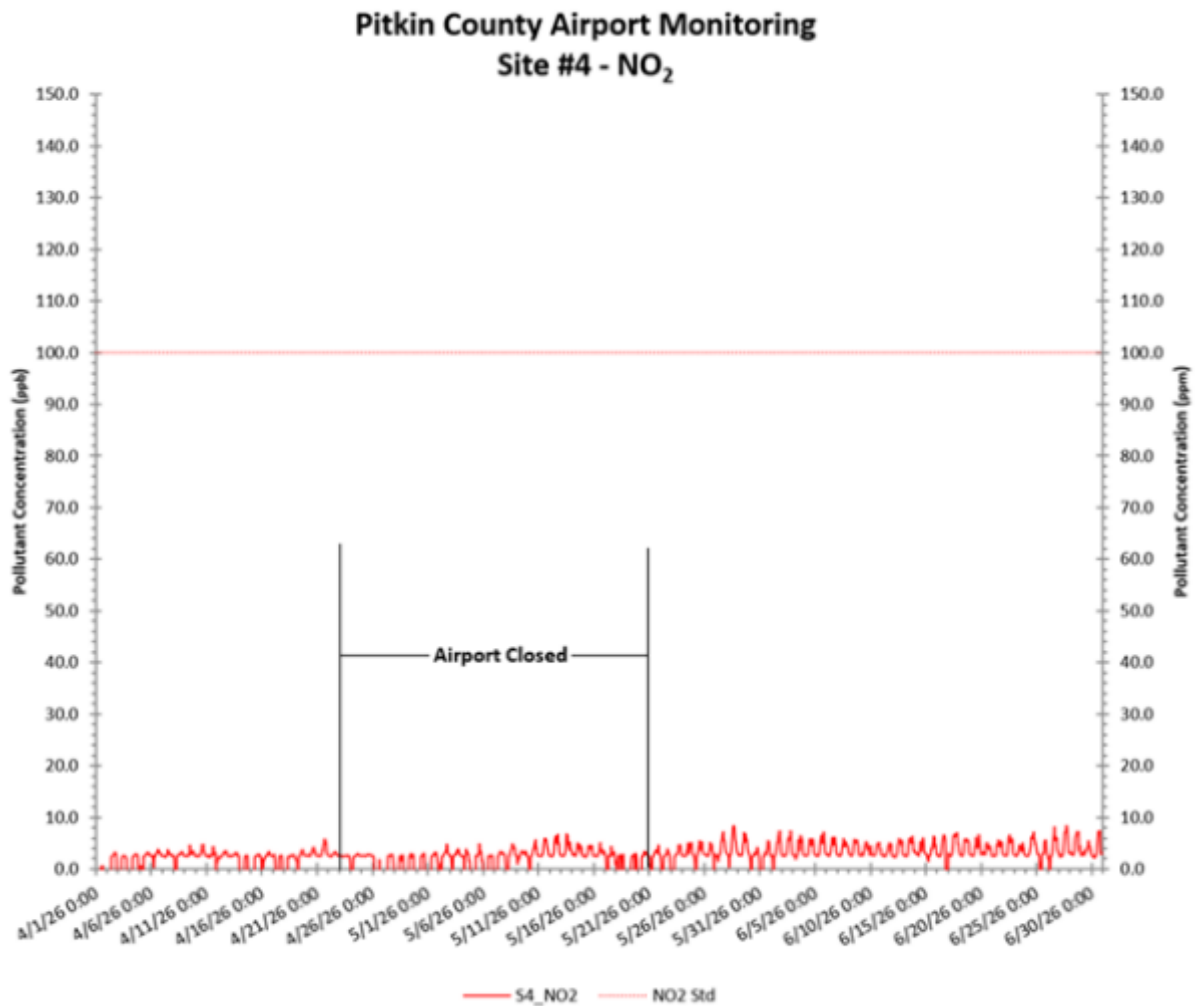


The 8-hour NAAQS for CO is shown. There is also a 1-hour NAAQS of 35 ppm.

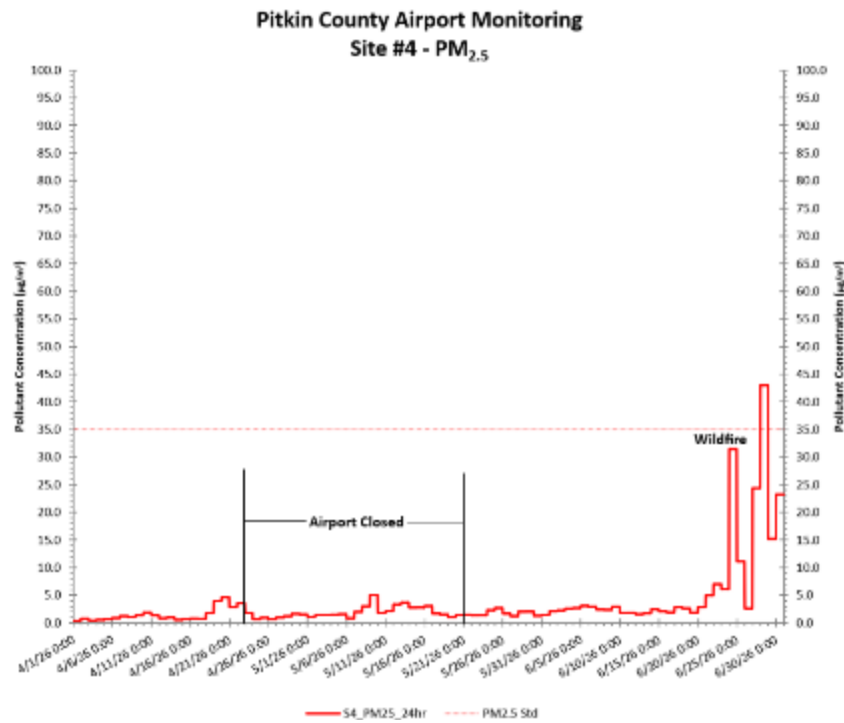
2.4 Site 4: Remote Sampler



a. NO₂ (1-hour average)

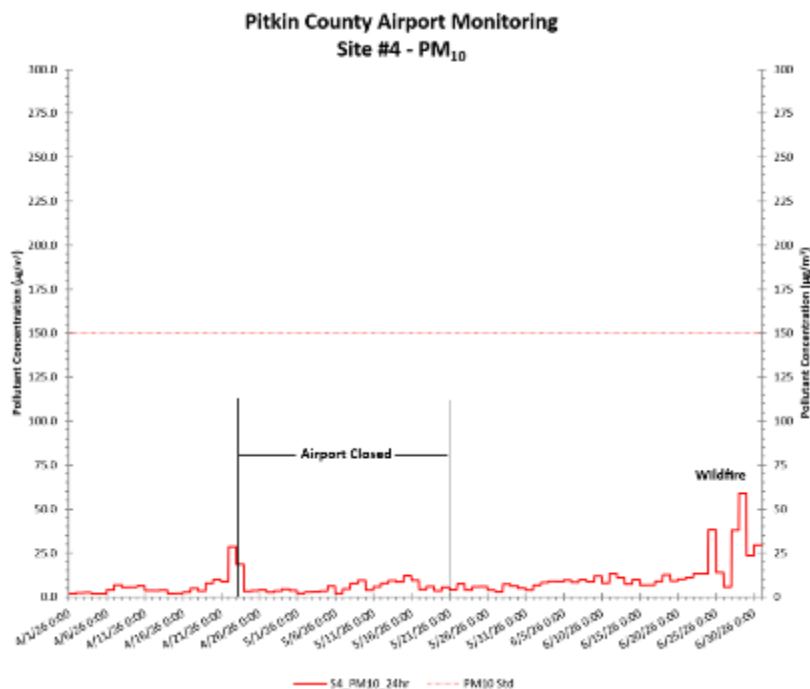


b. PM_{2.5} (24-hour average)

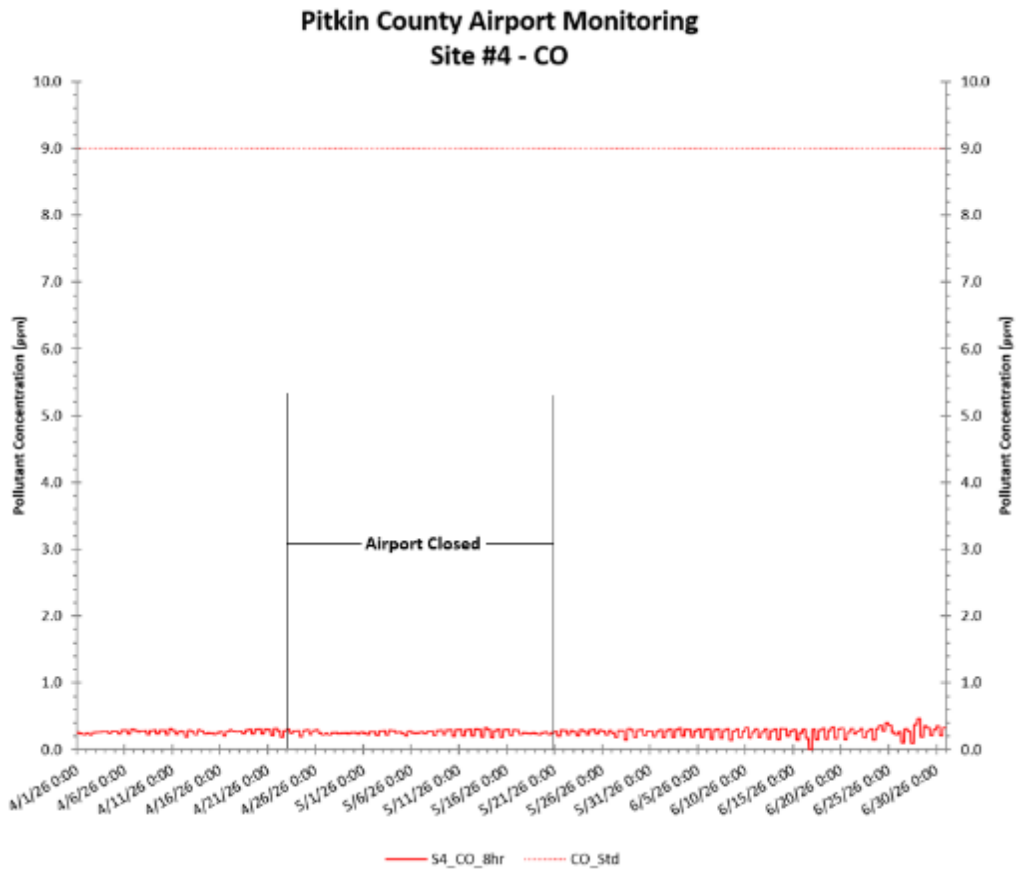


There is also a 1-year primary NAAQS for PM_{2.5} of 9 µg/m³. We do not have 1-year of data currently.

c. PM₁₀ (24-hour average)



d. CO (8-hour average)

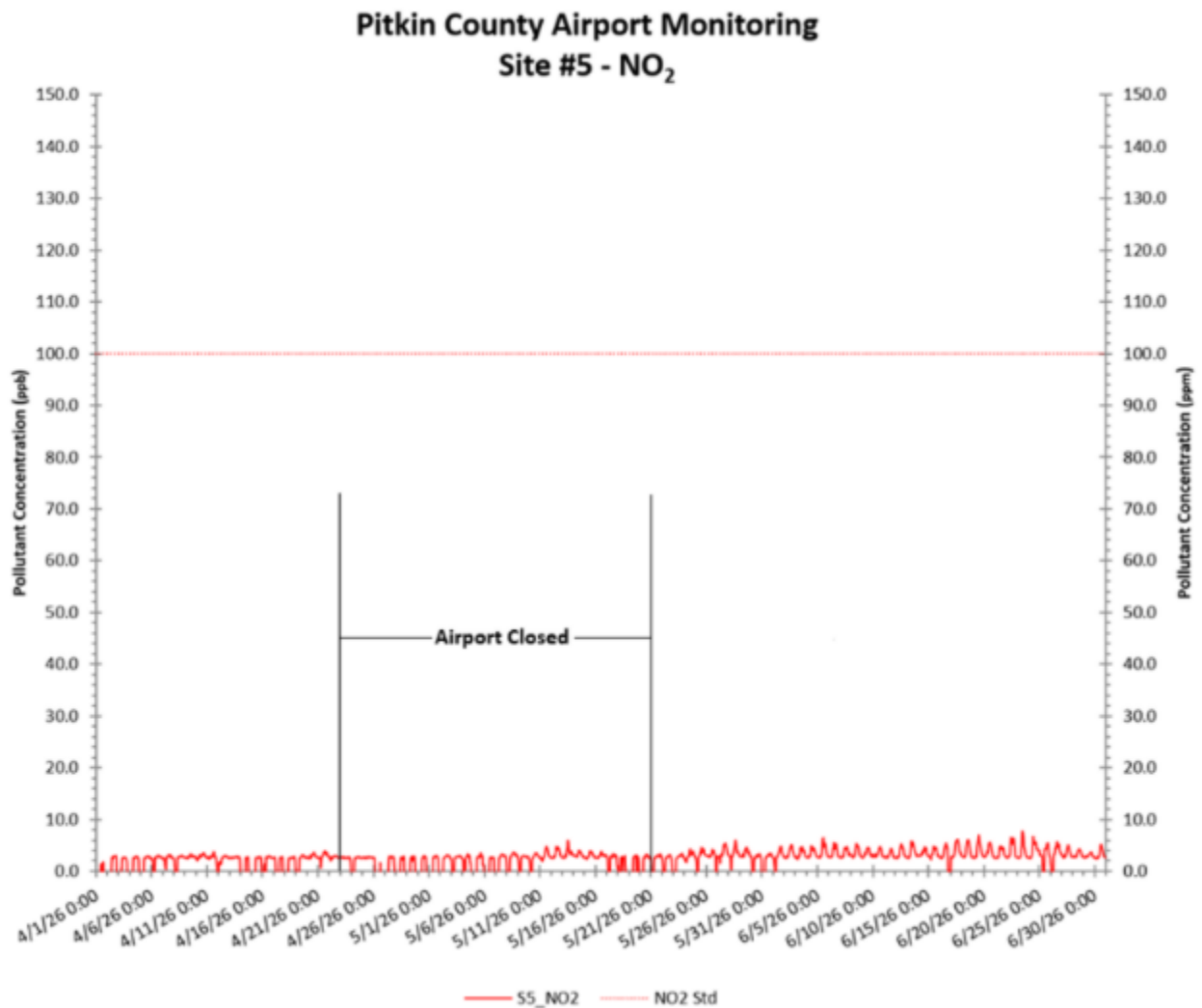


The 8-hour NAAQS for CO is shown. There is also a 1-hour NAAQS of 35 ppm.

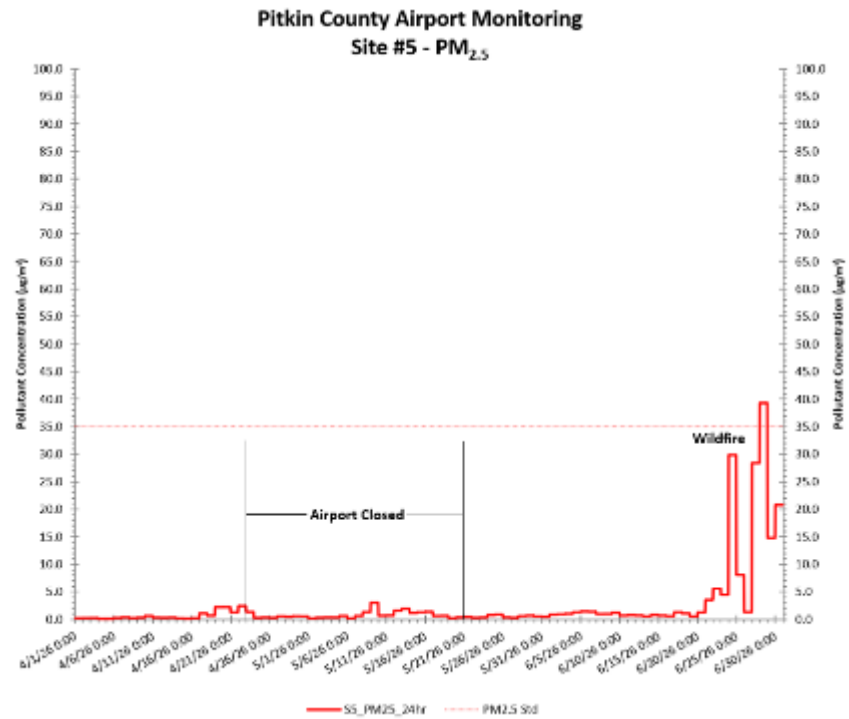
2.5 Site 5: Remote Sampler



a. NO₂ (1-hour average)

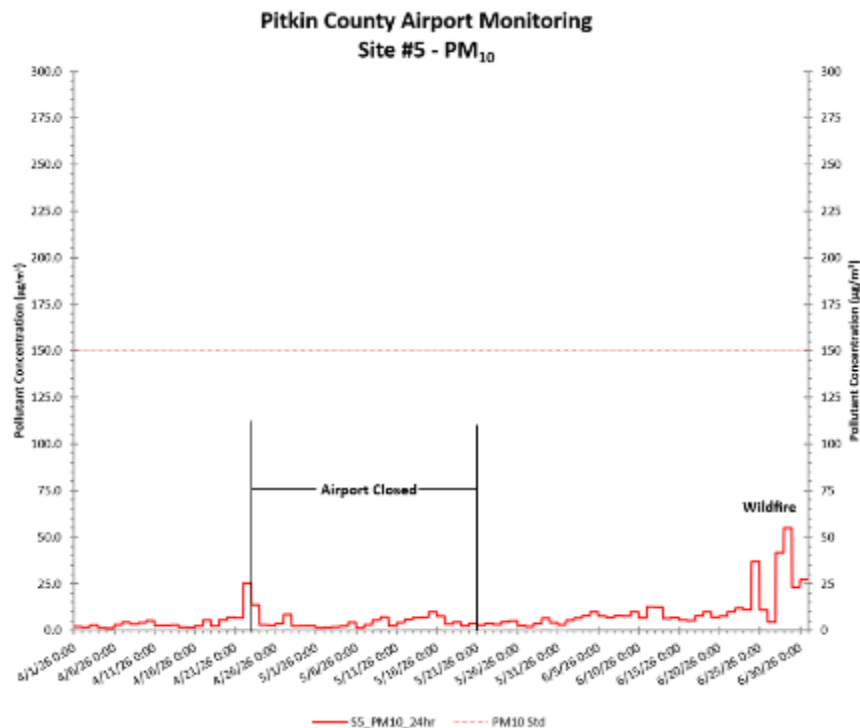


b. PM_{2.5} (24-hour average)

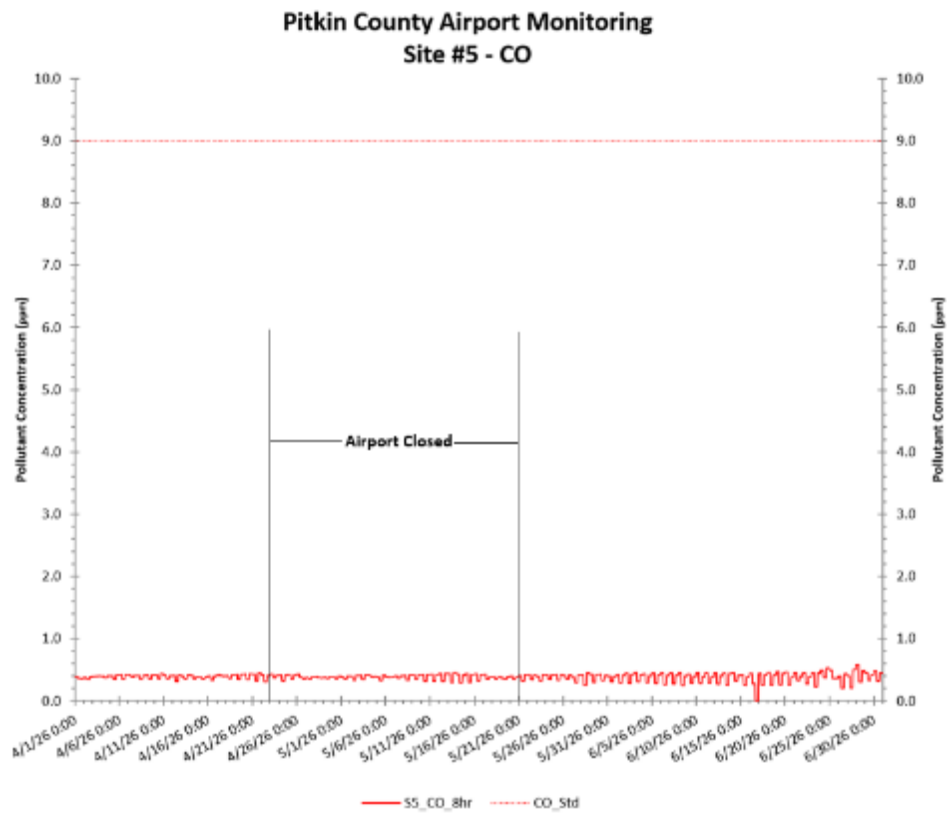


There is also a 1-year primary NAAQS for PM_{2.5} of 9 µg/m³. We do not have 1-year of data currently.

c. PM₁₀ (24-hour average)



d. CO

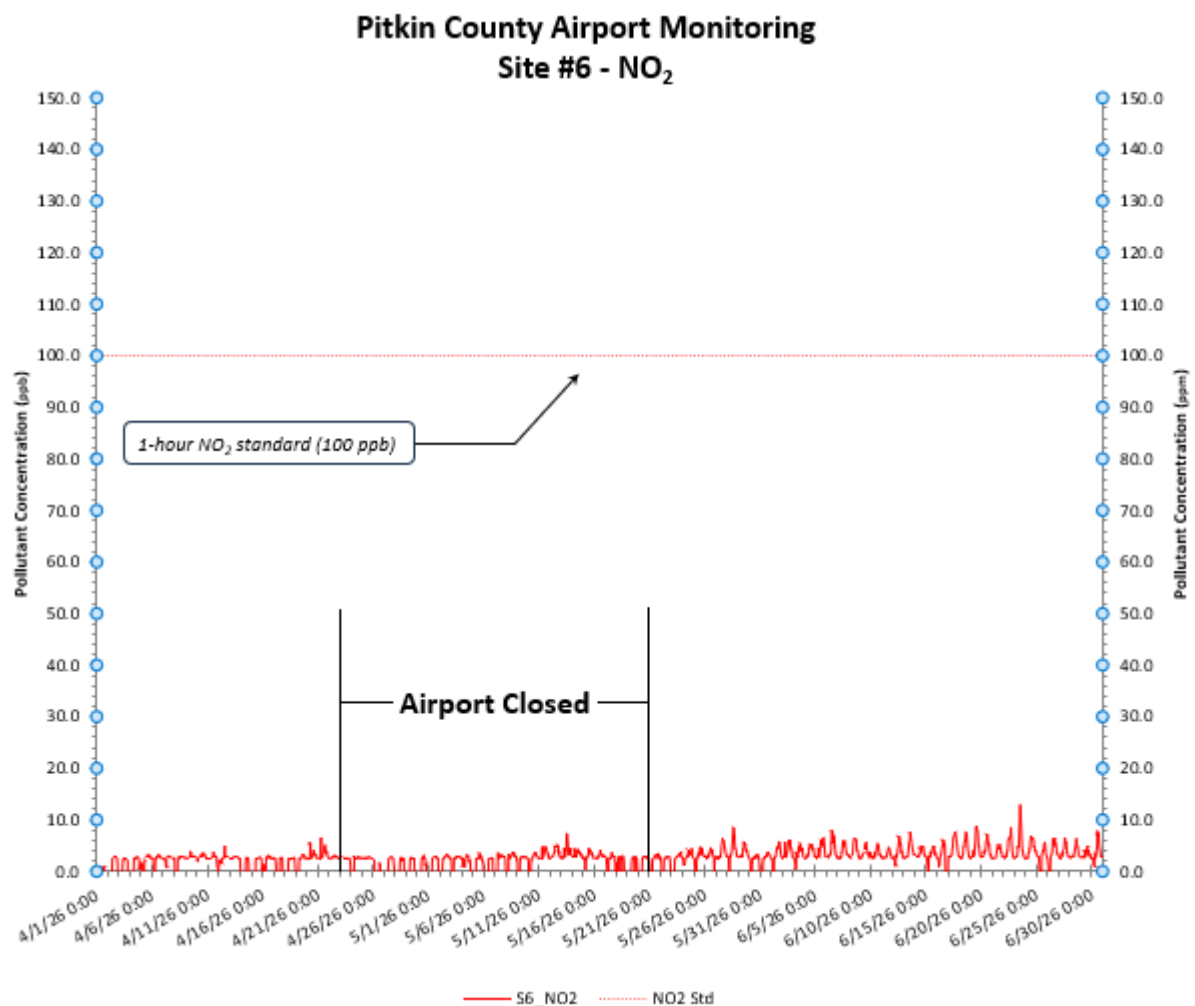


The 8-hour NAAQS for CO is shown. There is also a 1-hour NAAQS of 35 ppm.

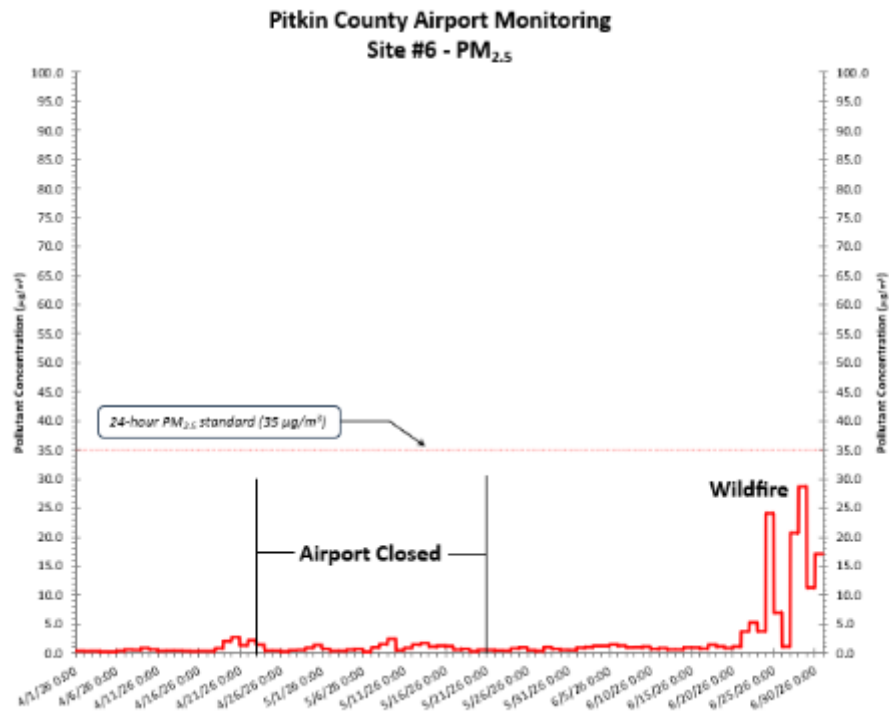
2.6 Site 6. Remote Sampler



a. NO₂ (1-hour average time)

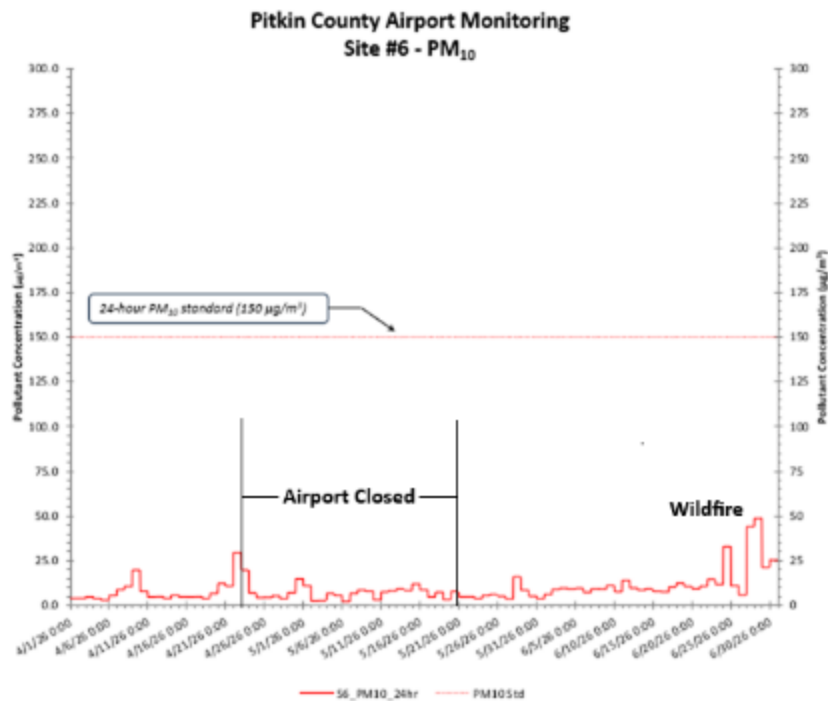


b. PM_{2.5} (24-hour average)

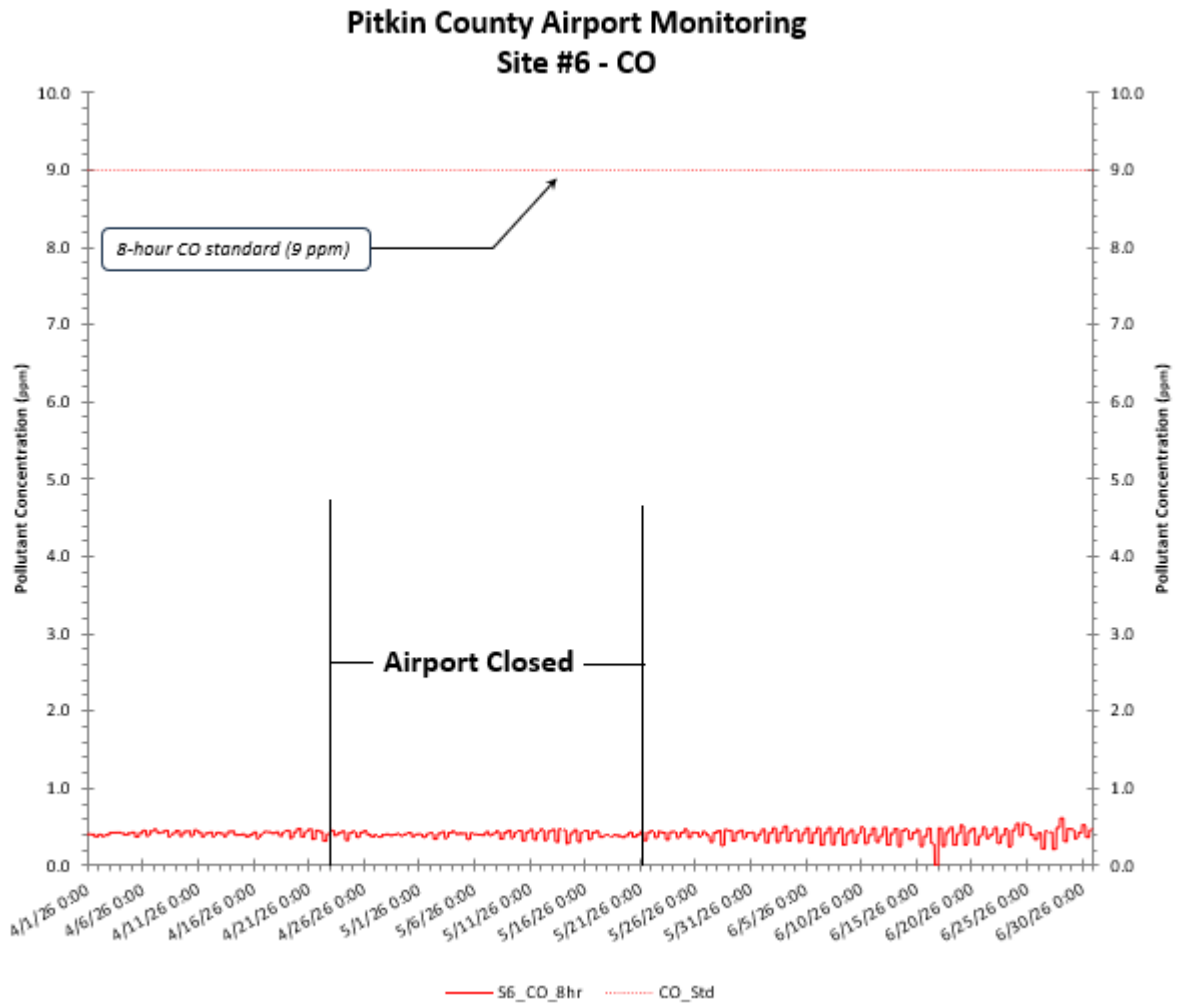


There is also a 1-year primary NAAQS for PM_{2.5} of 9 µg/m³. We do not have 1-year of data currently.

c. PM₁₀ (24-hour average)



d. CO (8-hour average)

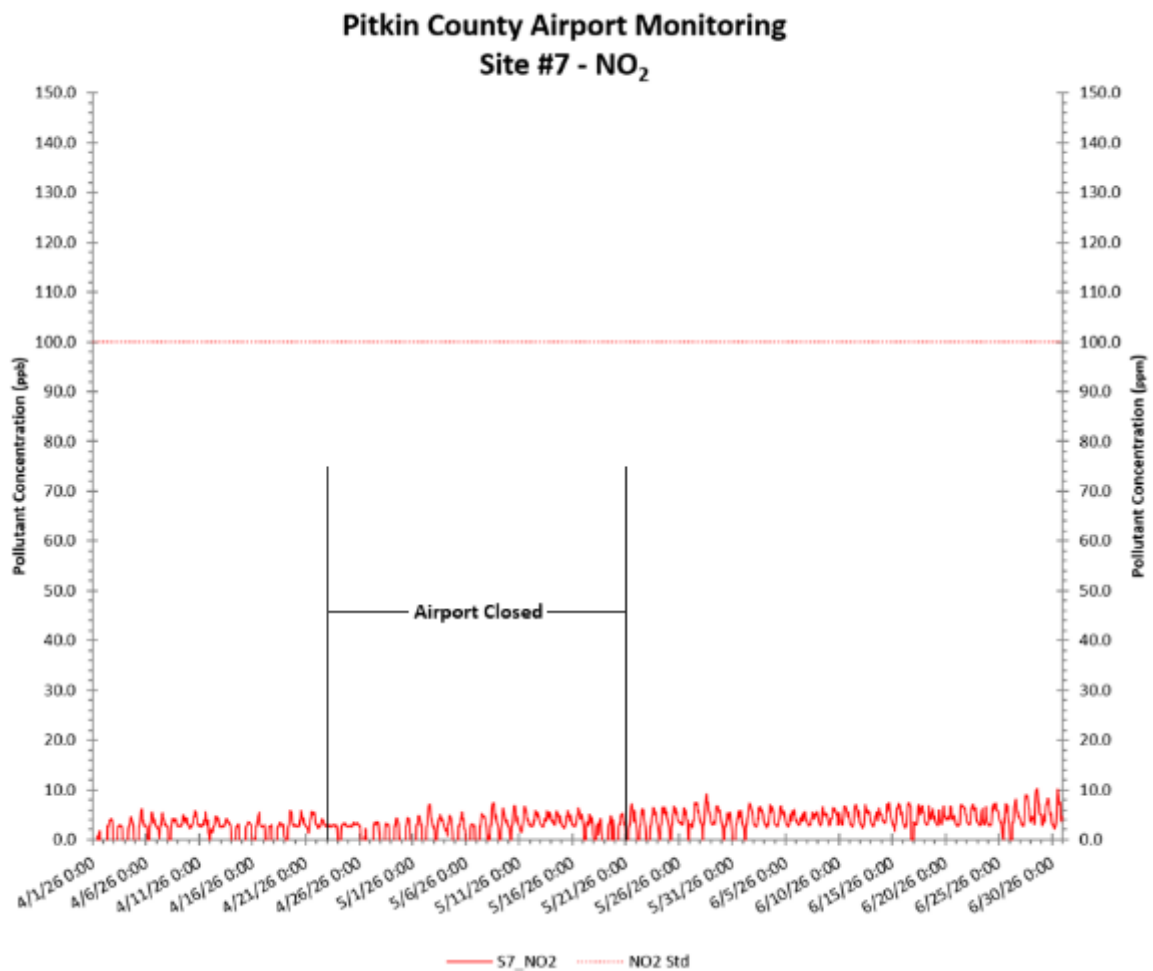


The 8-hour NAAQS for CO is shown. There is also a 1-hour NAAQS of 35 ppm.

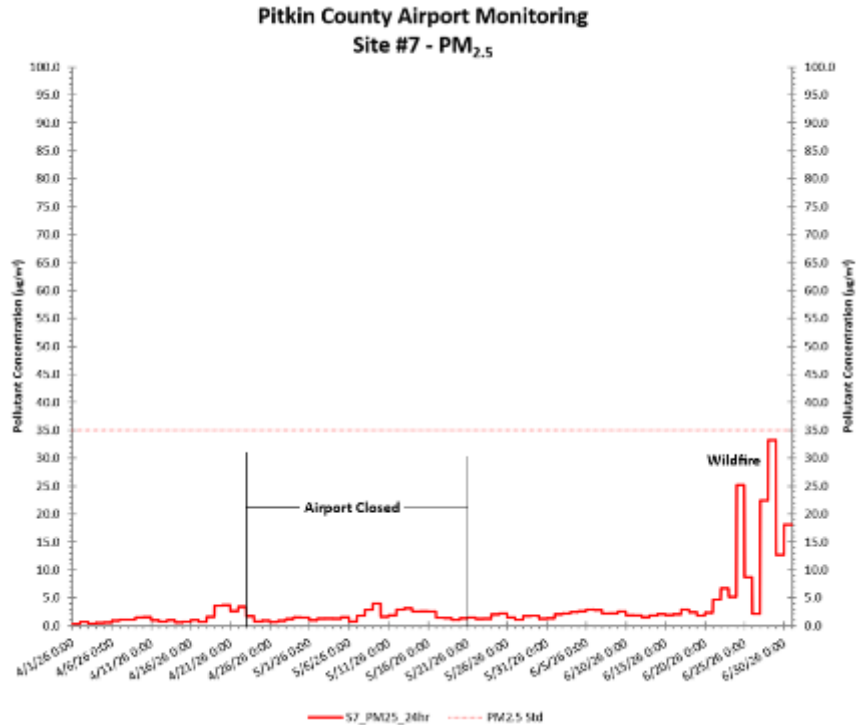
2.7 Site 7: Remote Sampler



a. NO₂ (1-hour average)

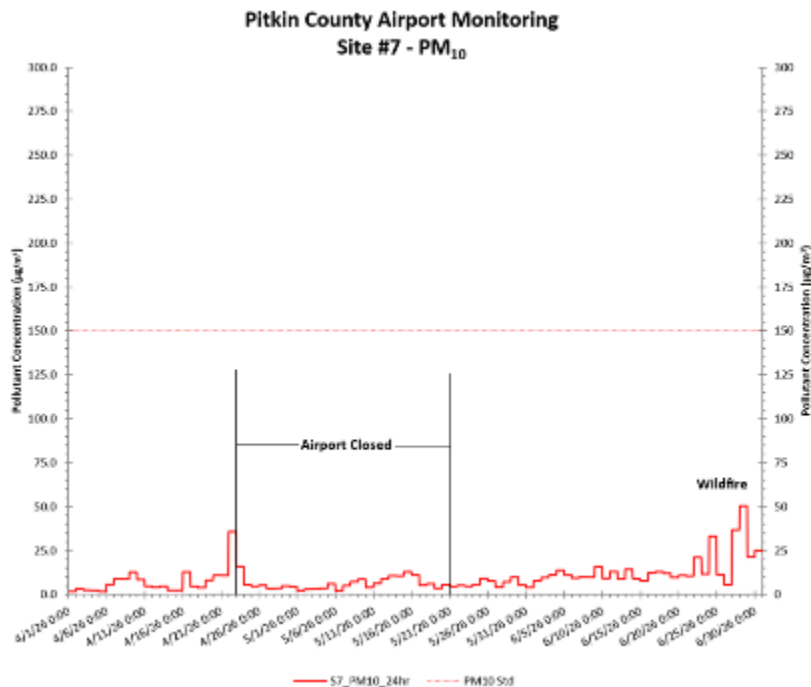


b. PM_{2.5} (24-hour average)

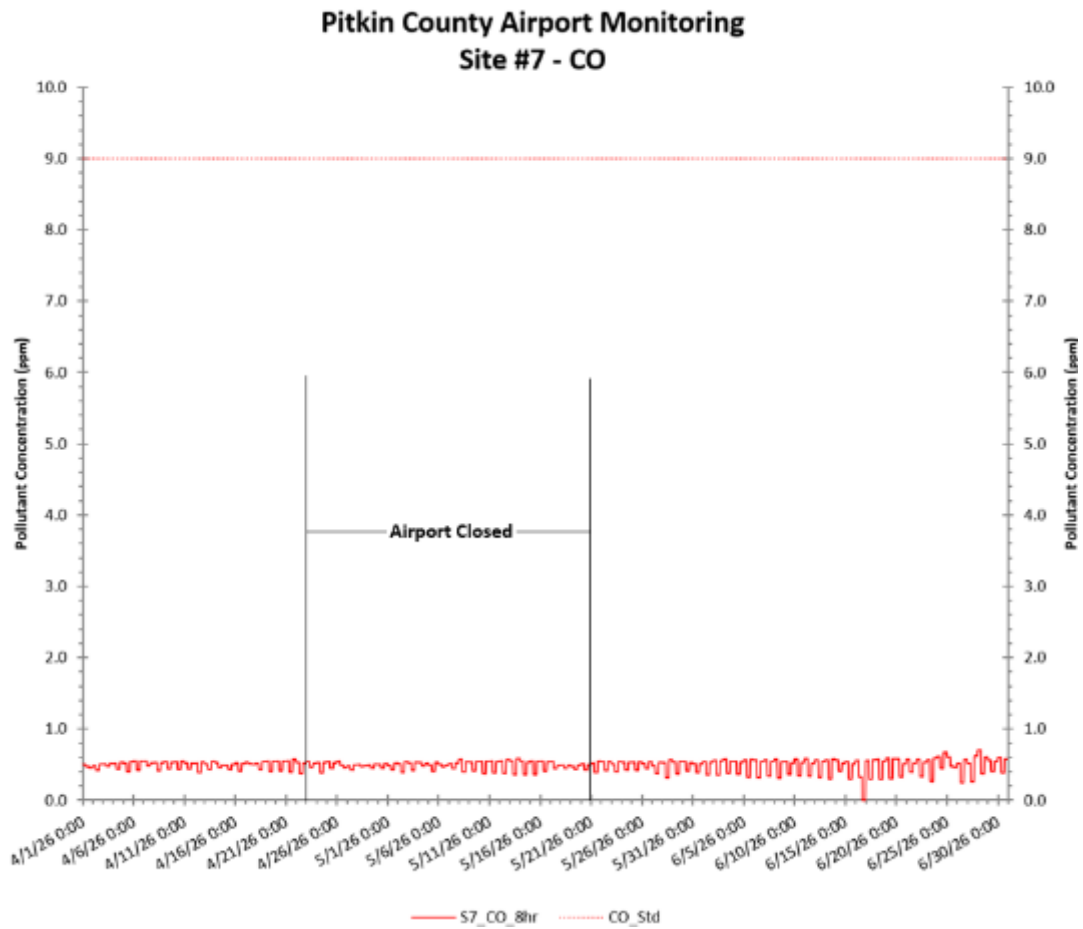


There is also a 1-year primary NAAQS for PM_{2.5} of 9 µg/m³. We do not have 1-year of data currently.

c. PM₁₀ (24-hour average)



d. CO (8-hour average)

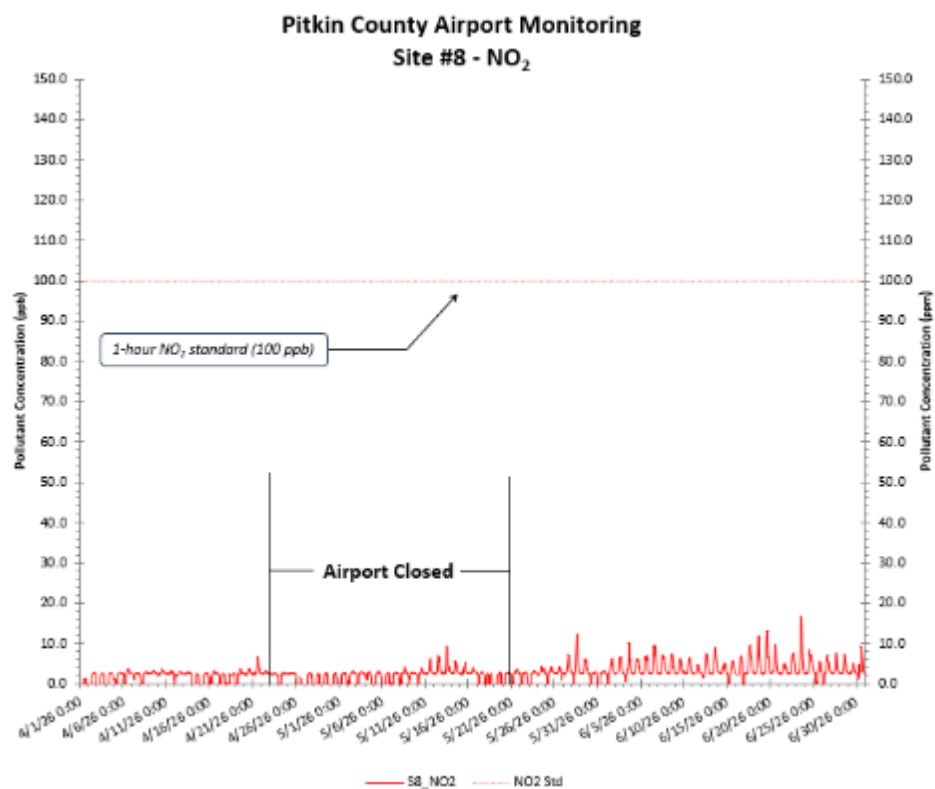


The 8-hour NAAQS for CO is shown. There is also a 1-hour NAAQS of 35 ppm.

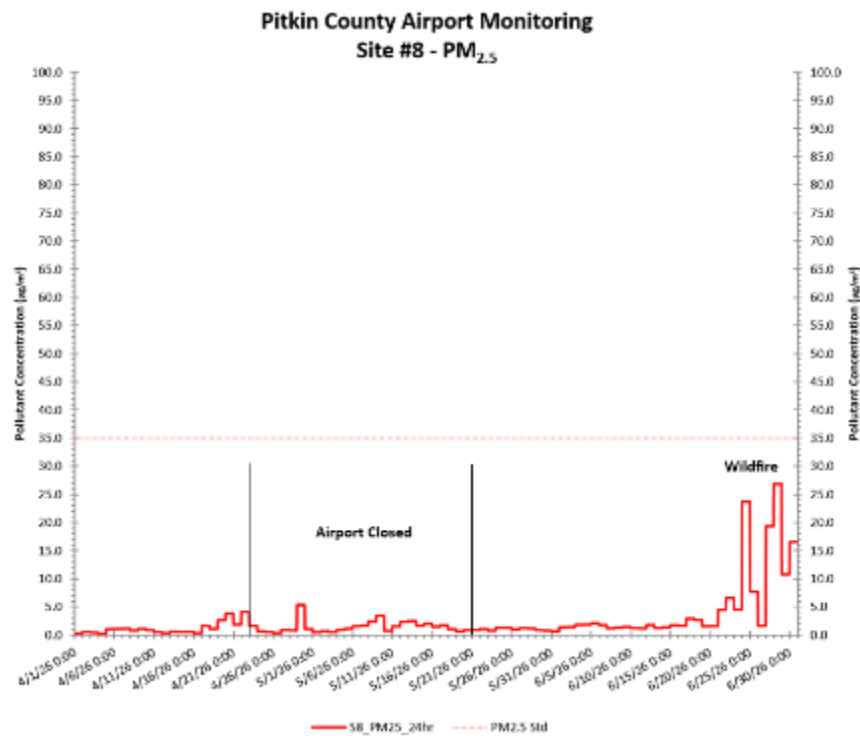
2.8 Site 8. Remote Sampler



a. NO₂ (1-hour average)

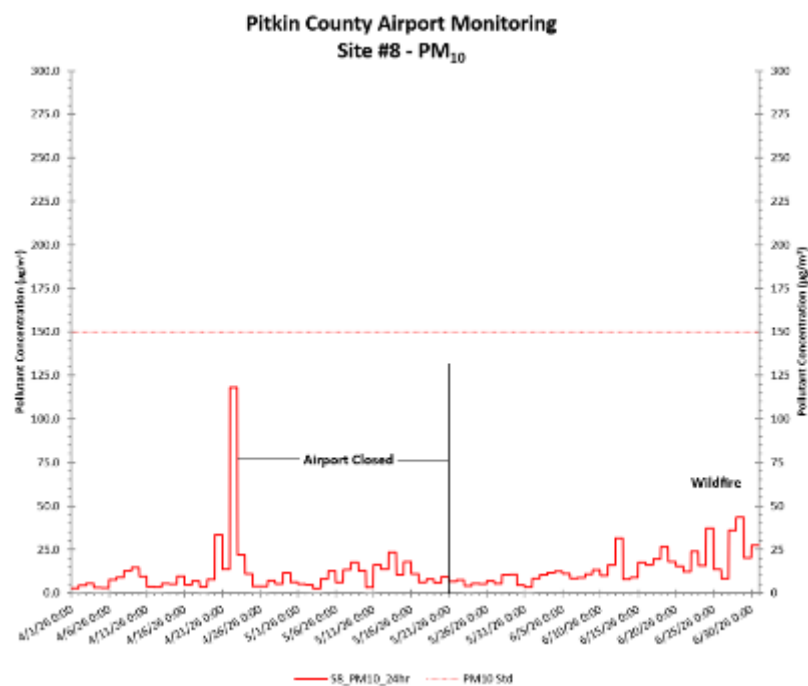


b. PM_{2.5} (24-hour average)

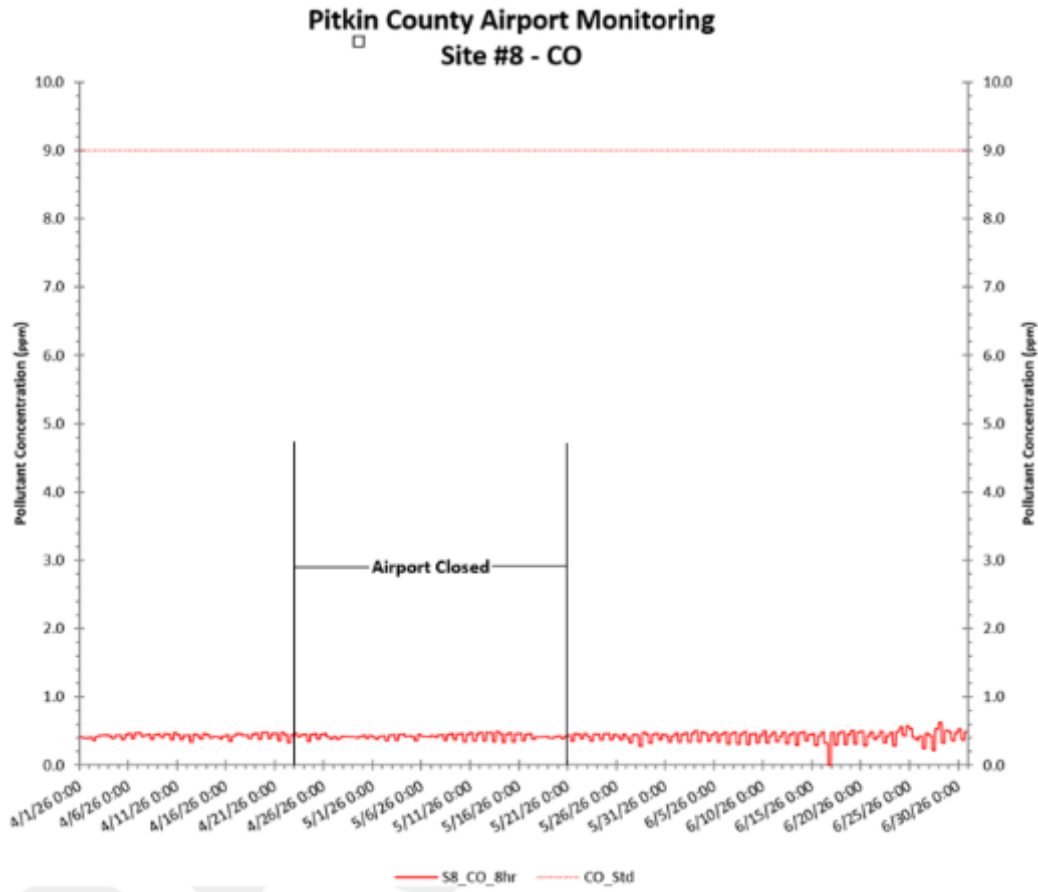


There is also a 1-year primary NAAQS for PM_{2.5} of 9 µg/m³. We do not have 1-year of data currently.

c. PM₁₀ (24-hour average)



d. CO (8-hour average)

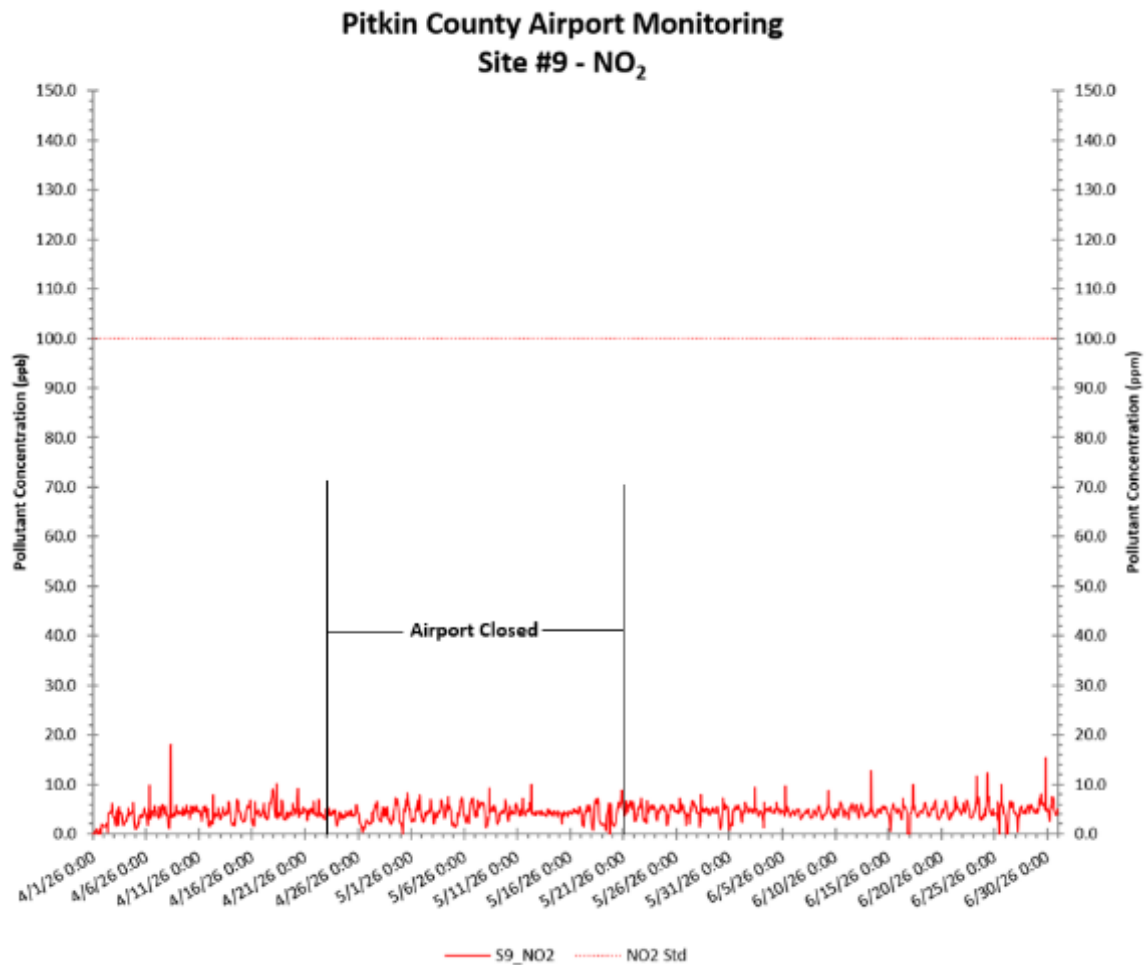


The 8-hour NAAQS for CO is shown. There is also a 1-hour NAAQS of 35 ppm.

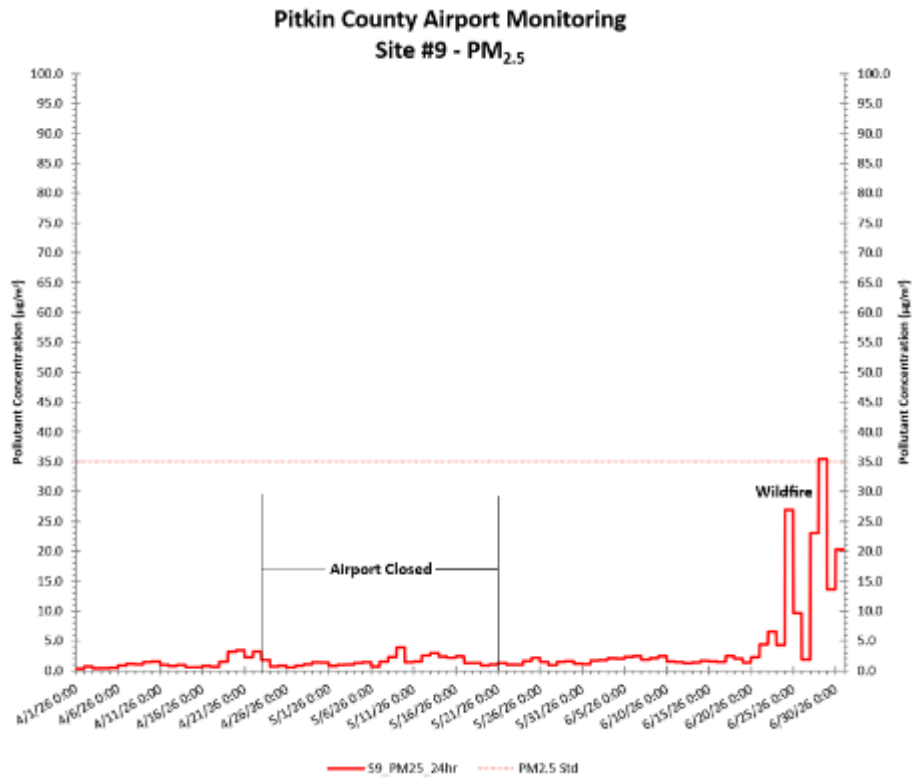
2.9 Site 9: Remote Sampler



a. NO₂ (1-hour average)

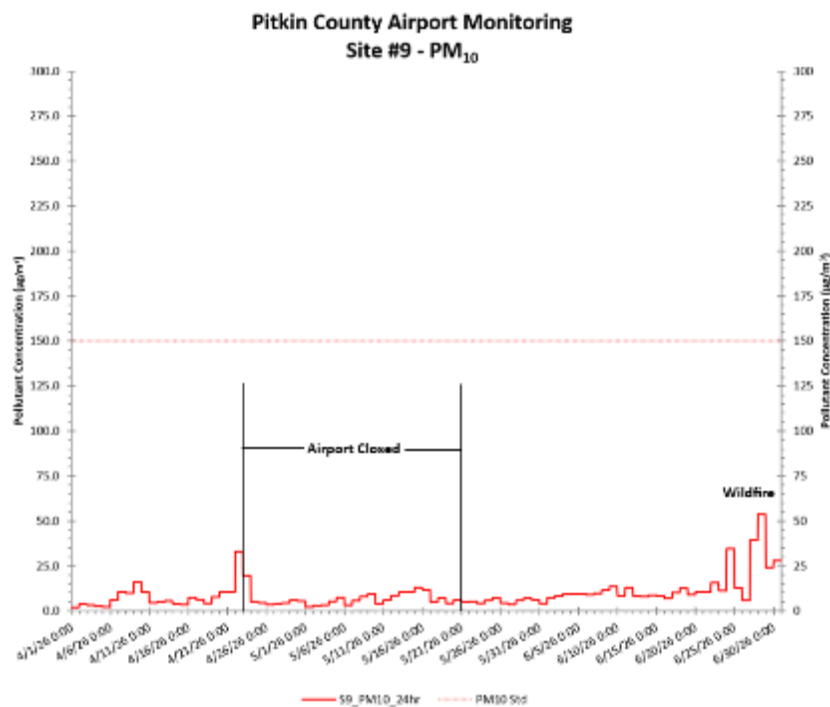


b. PM_{2.5} (24-hour average)

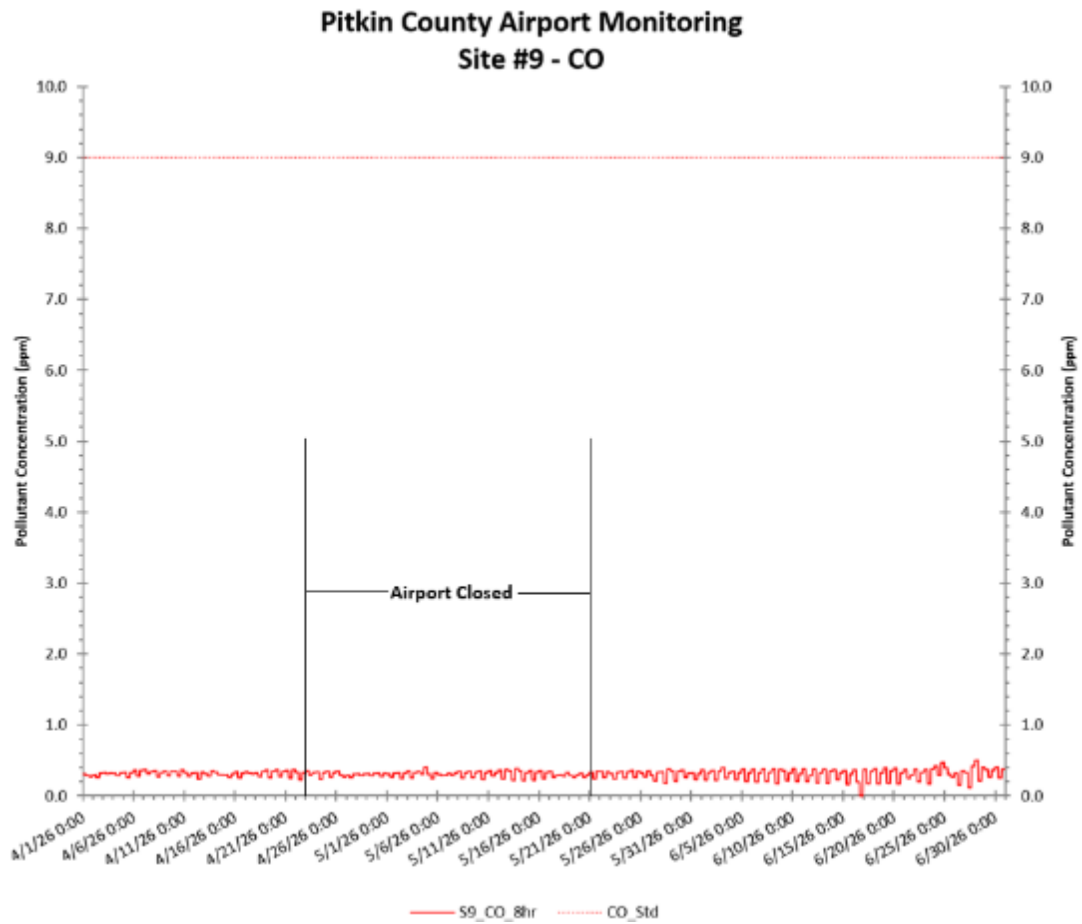


There is also a 1-year primary NAAQS for PM_{2.5} of 9 µg/m³. We do not have 1-year of data currently.

c. PM₁₀ (24-hour average)



d. CO (8-hour average)

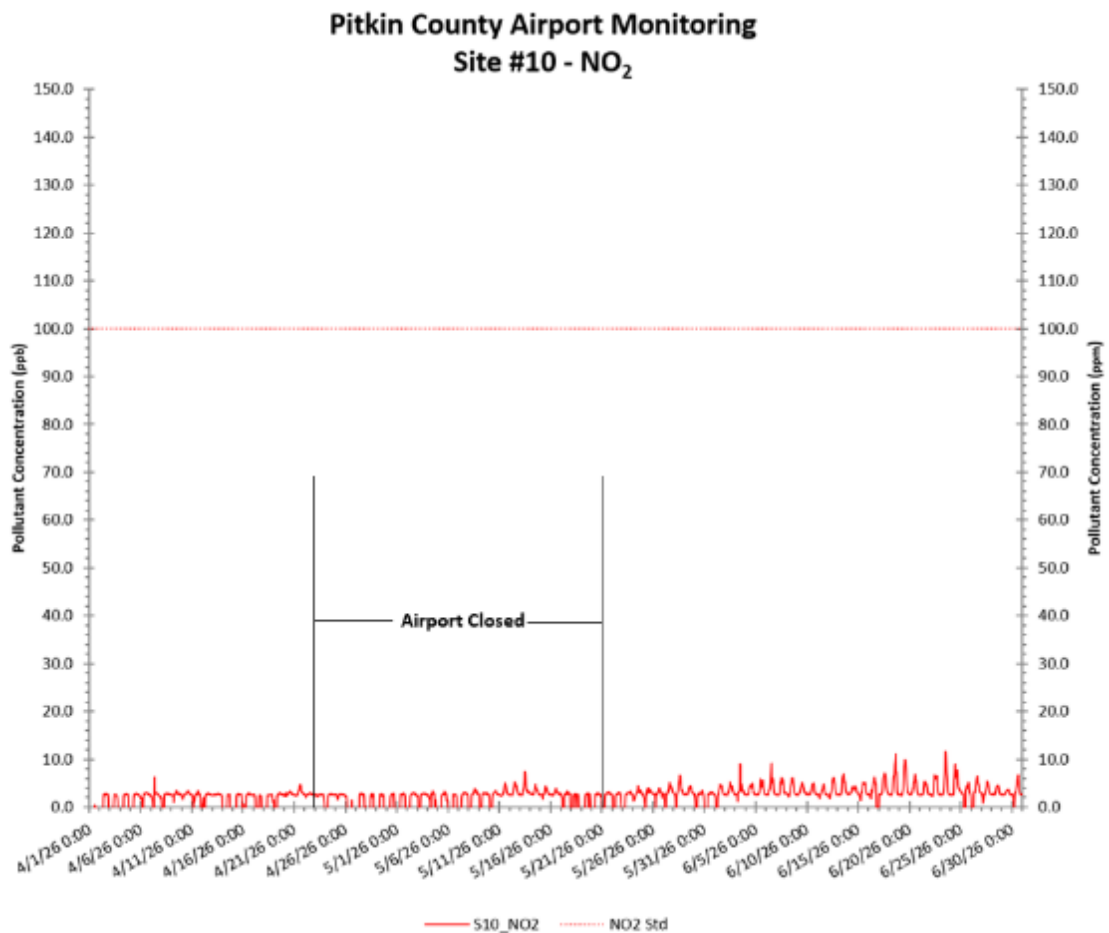


The 8-hour NAAQS for CO is shown. There is also a 1-hour NAAQS of 35 ppm.

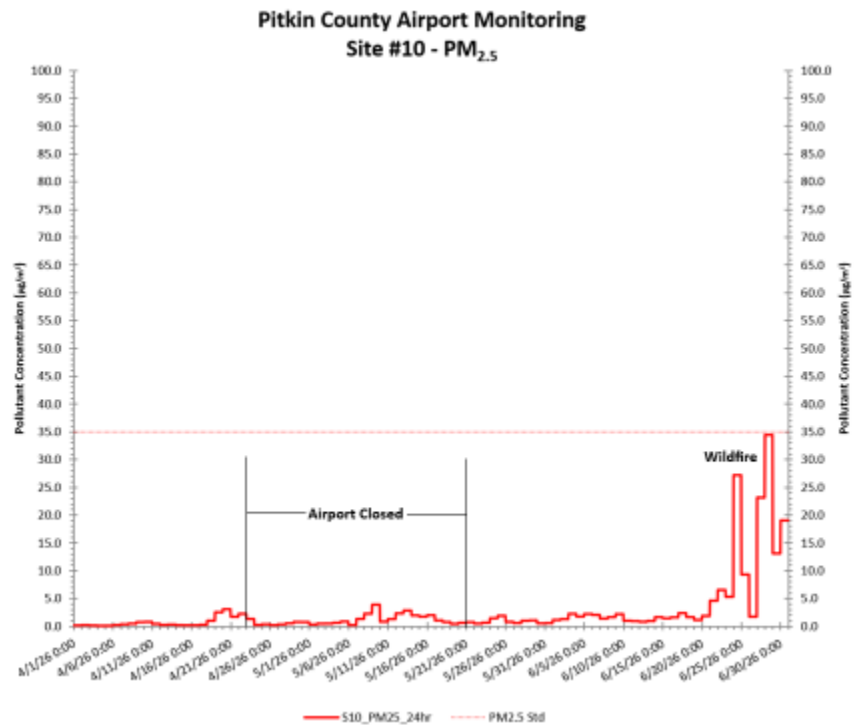
2.10 Site 10: Remote Sampler



a. NO₂ (1-hour average)

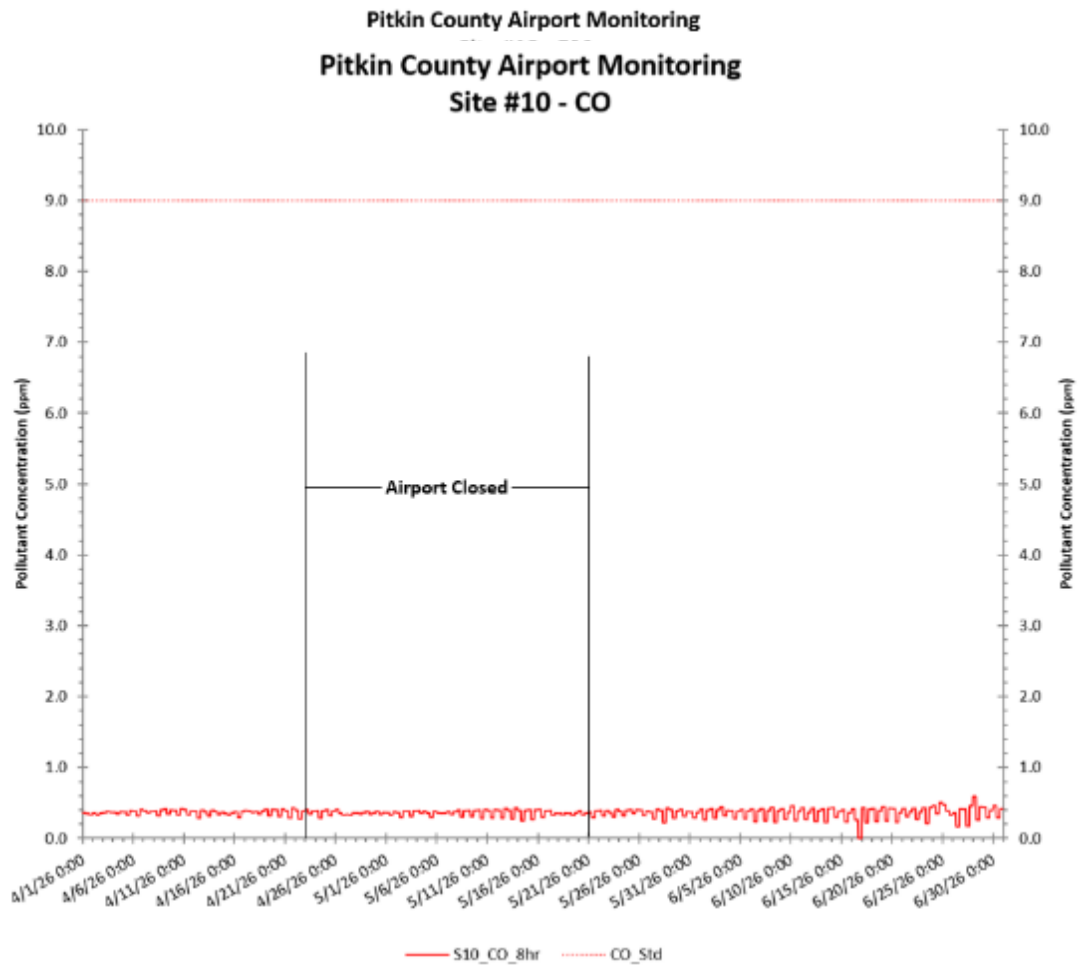


b. PM_{2.5} (24-hour average)



There is also a 1-year primary NAAQS for PM_{2.5} of 9 µg/m³. We do not have 1-year of data currently.

c. PM₁₀ (24-hour average)



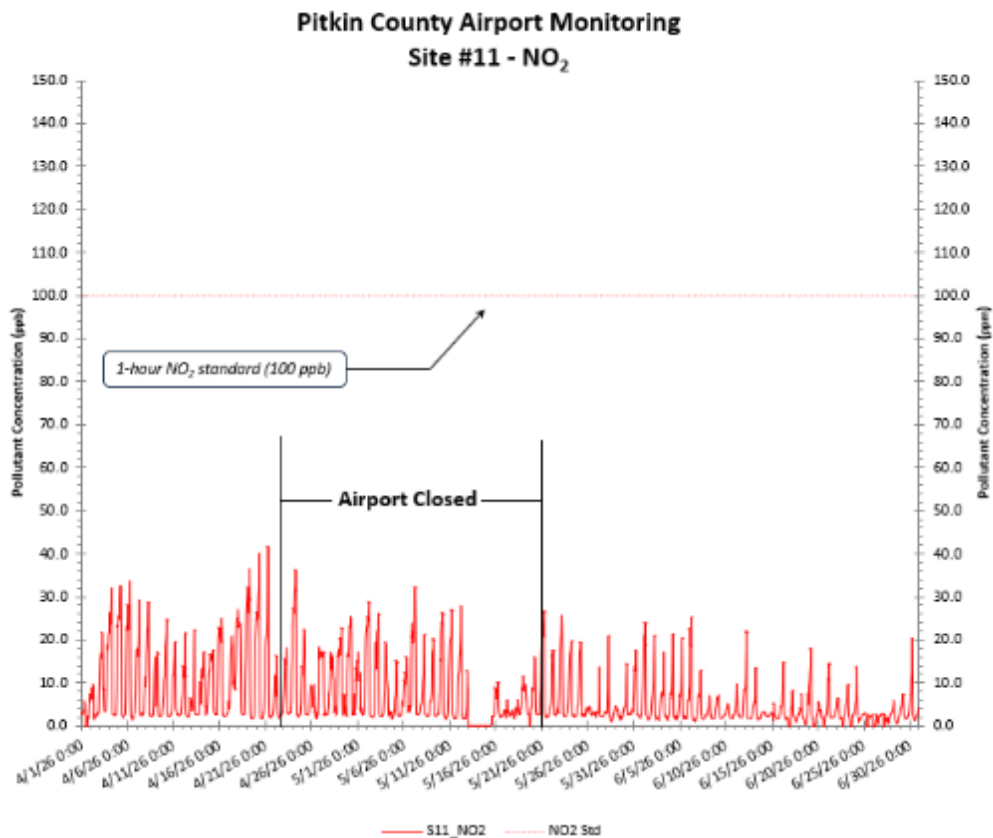
d. CO (8-hour average)

The 8-hour NAAQS for CO is shown. There is also a 1-hour NAAQS of 35 ppm.

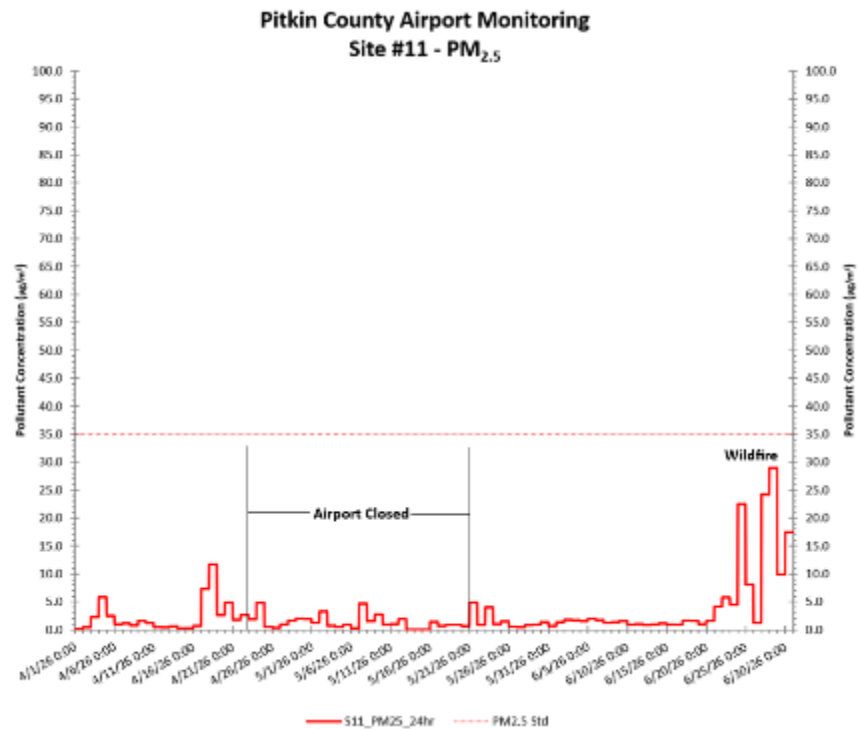
2.11 Site 11: Remote Sampler (Downtown Aspen atop the Yellow Brick School)



a. NO₂ (1-hour average)

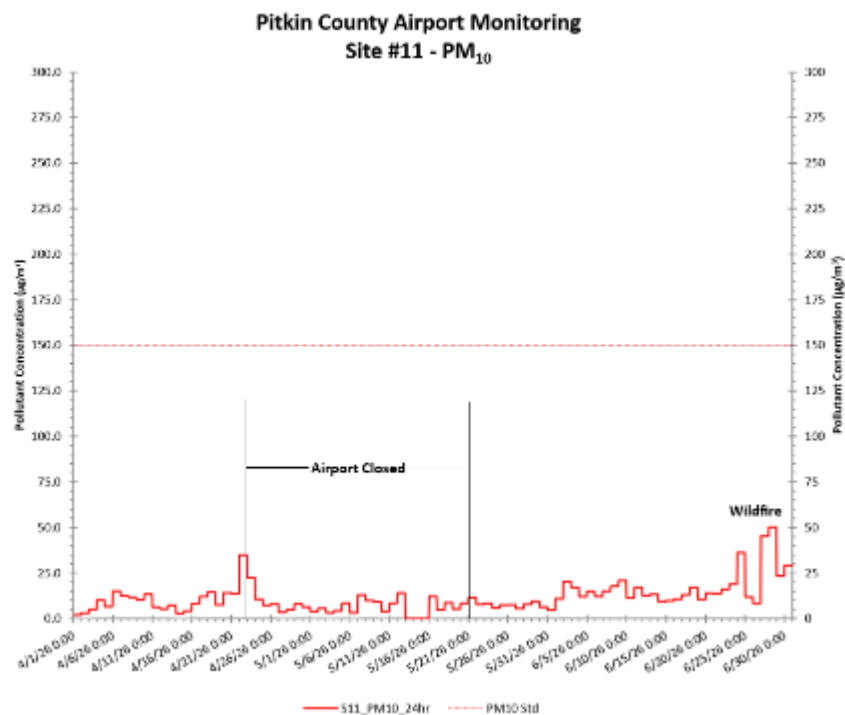


b. PM_{2.5} (24-hour average)

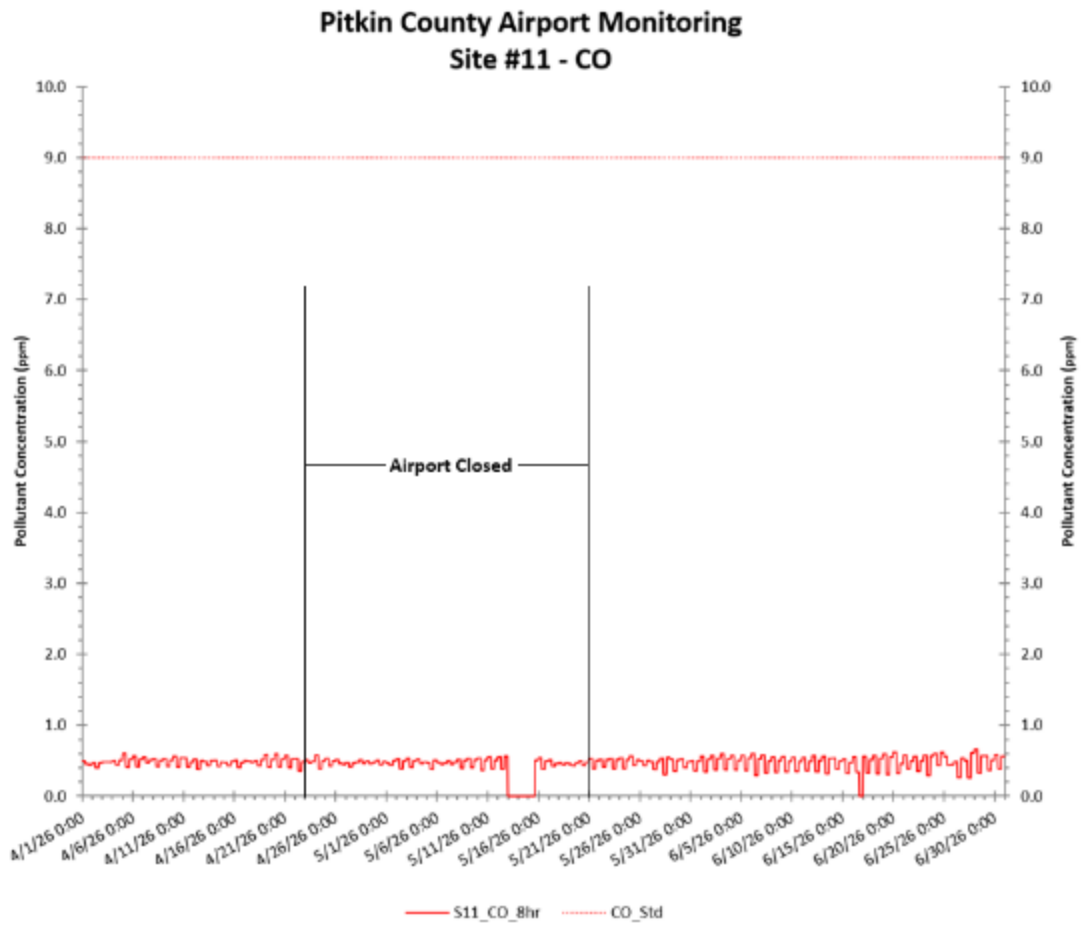


There is also a 1-year primary NAAQS for PM_{2.5} of 9 µg/m³. We do not have 1-year of data currently.

c. PM₁₀ (24-hour average)



d. CO (8-hour average)



The 8-hour NAAQS for CO is shown. There is also a 1-hour NAAQS of 35 ppm.

3. Pollutant Roses

This section presents the pollution roses with comments. Again, due to numerous figures, the figures are not number but are notated.



Site 1: NO₂ (ppb)

From this pollutant rose, we can see that there appears to be equal contributions from State Road 82 and the airport during the measurement period.



Site 1: PM_{2.5} (µg/m³)

This pollutant rose indicates a greater concentration of PM_{2.5} from the airport than State Road 82 for this time period. However, a source to the ESE at about 110 degrees had a large effect on the overall concentrations. It is suspected that this was caused by the Willow wildfire with the smoke channeling into the Aspen area through the mountain valleys to the East. Also note the spoke at about 170 degrees.



Site 1: PM₁₀ (µg/m³)

PM₁₀ shows a slightly greater effect from the airport than the roadway at Site 1 during the measurement period. The large effect from the ESE is still very apparent. The spoke at 170 degrees still appears.



Site 2: NO₂ (ppb)

At Site 2, for NO₂, the roadway indicates a greater effect on the concentrations than the airport. This is thought to occur by the nearby major intersection that becomes heavily congested during rush hour. The aircraft operations exist for a much shorter duration.



Site 2: PM_{2.5} (µg/m³)

For PM_{2.5} the airport displays a slightly greater impact. However, the large effect from the east is still very strong. Also of note is the spoke to the south at about 170 degrees.



Site 2: PM₁₀ (µg/m³)

PM₁₀ at Site 2 shows a slightly larger contribution from the airport than the roadway. The large effect from the east is still present as is the spoke at about 170 degrees.



Site 2: SO₂ (ppb)

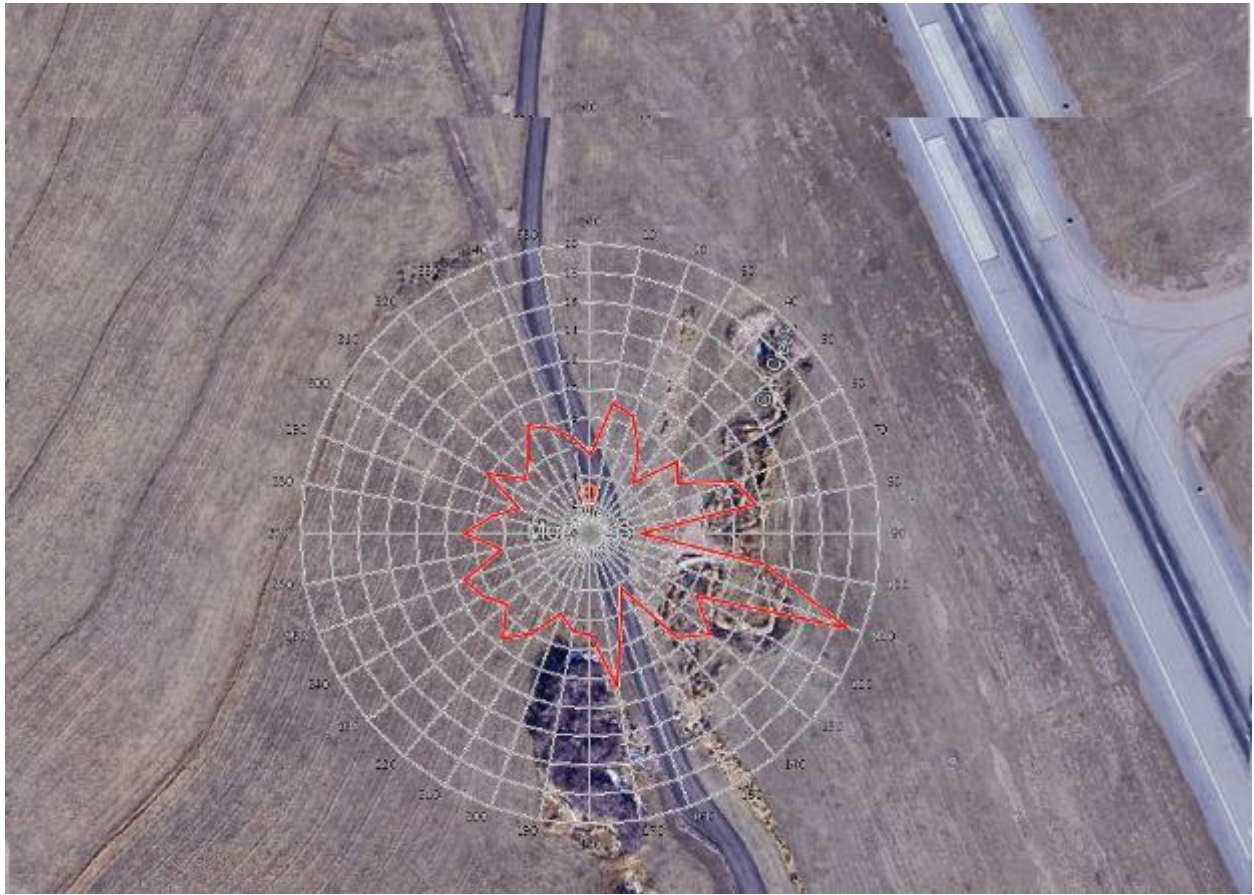
No directional effect is prevalent for SO₂.

No major directional effect is noted from NO₂ at Site 3.



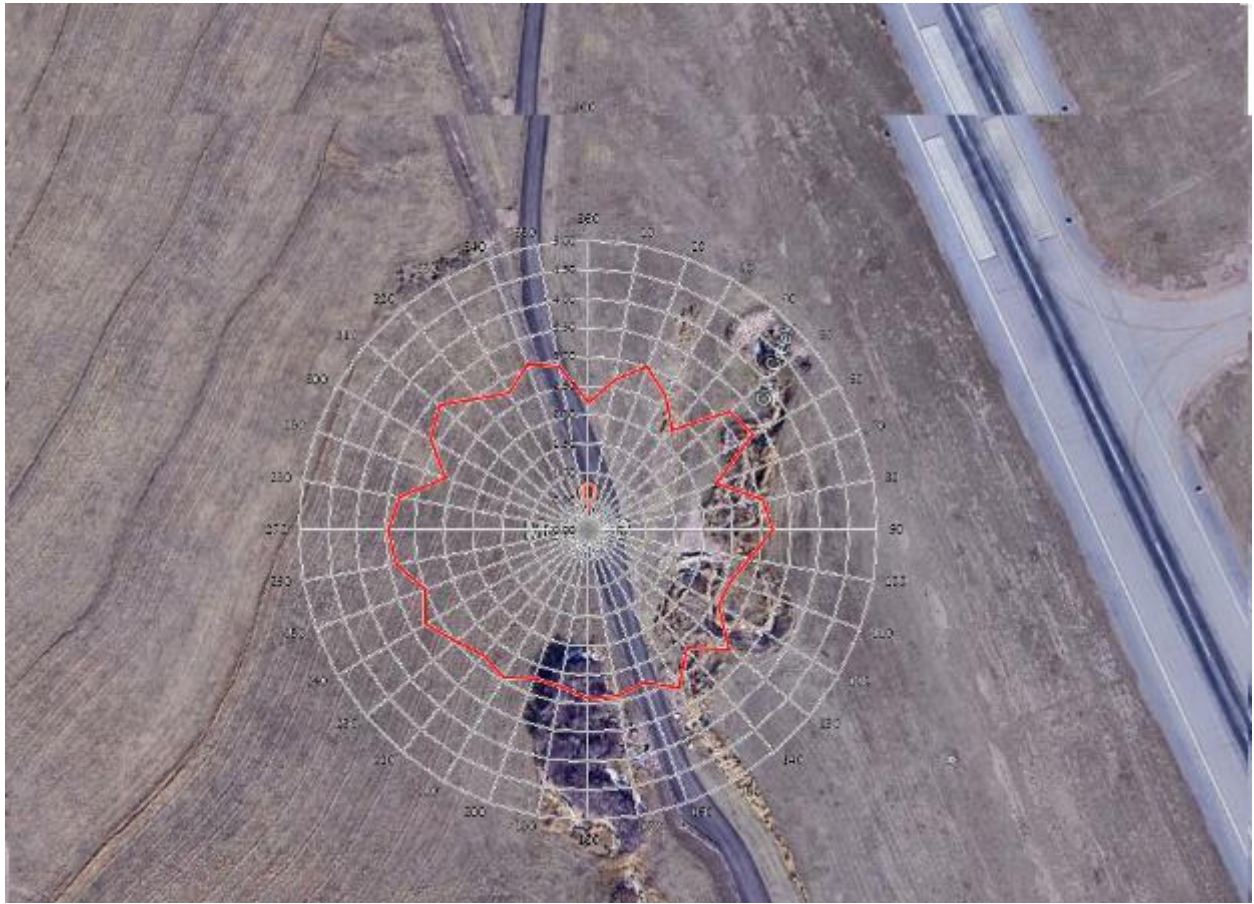
Site 3: PM_{2.5} (µg/m³)

At Site 3, the dominant source is from the east and the spoke at 170 degrees for PM_{2.5}. A source in the direction of Owl Creek Road is also shown.



Site 3: PM₁₀ (µg/m³)

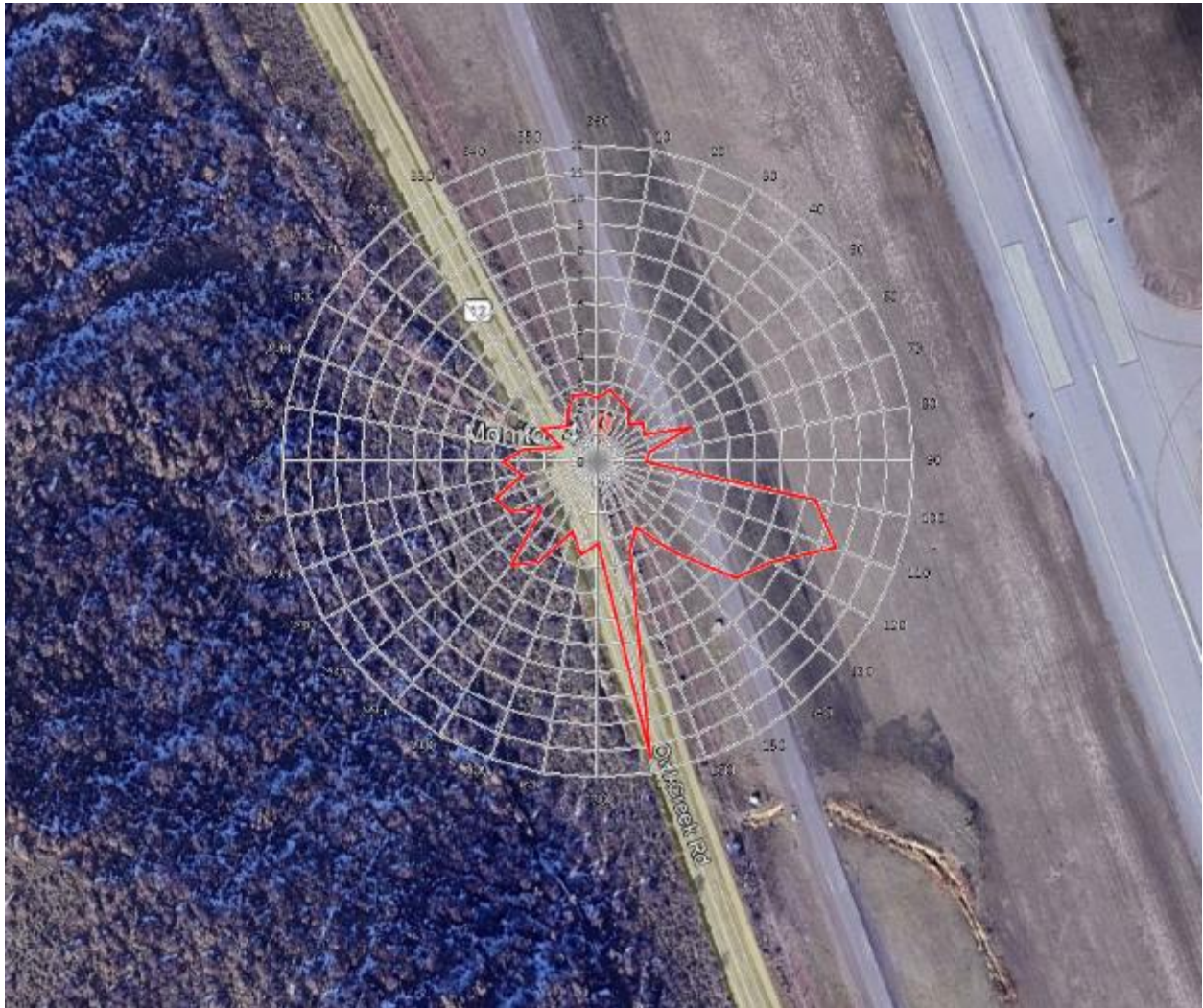
Other than the effect from the east and the spoke at 170 degrees we do not see a dominant source at Site 3 for PM₁₀.



Site 3: CO (ppm)

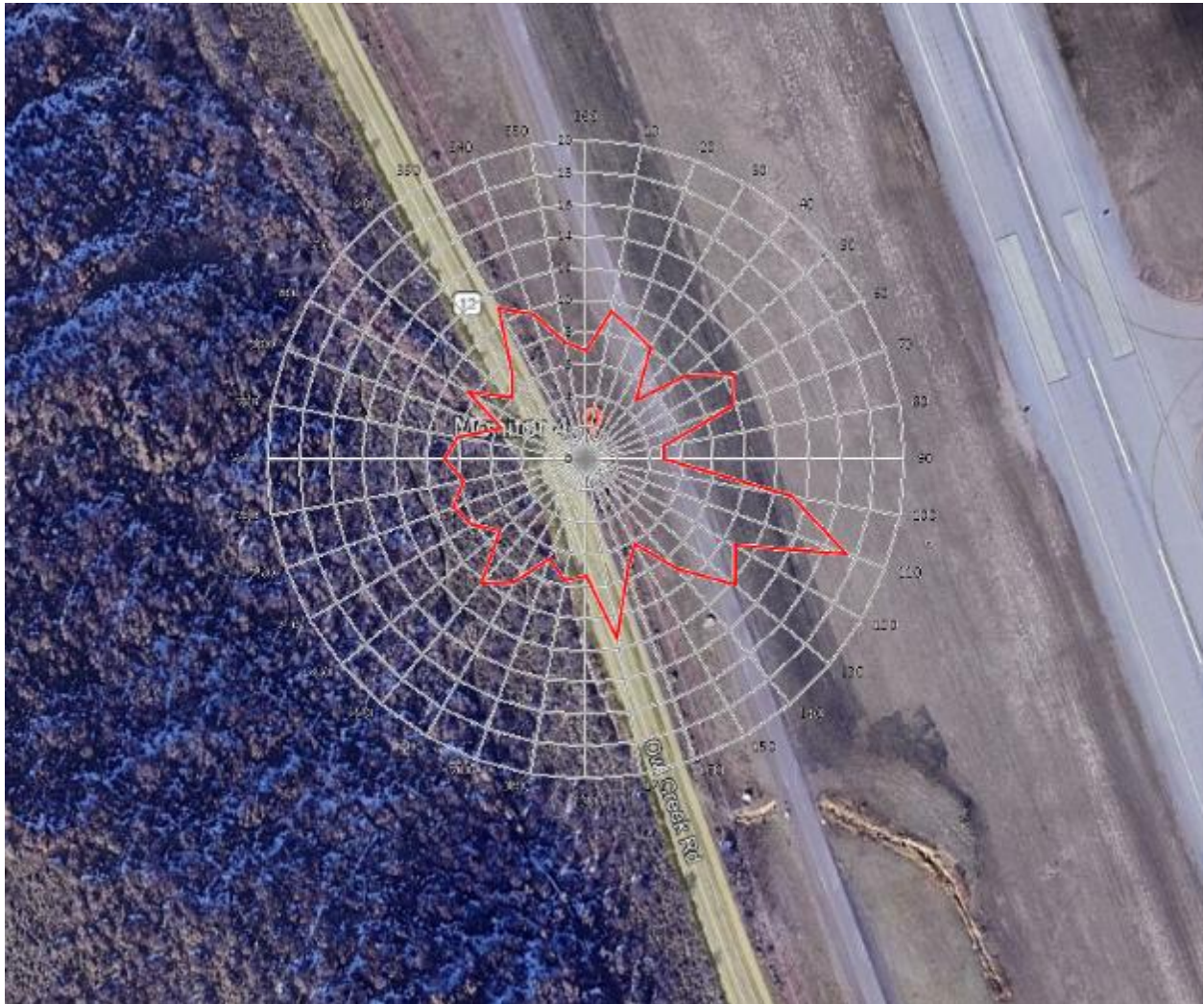
CO would appear to be more of an area source.

At Stie 4 we see a stronger contribution from Owl Creek Road but a contribution for the airport as well for NO₂.



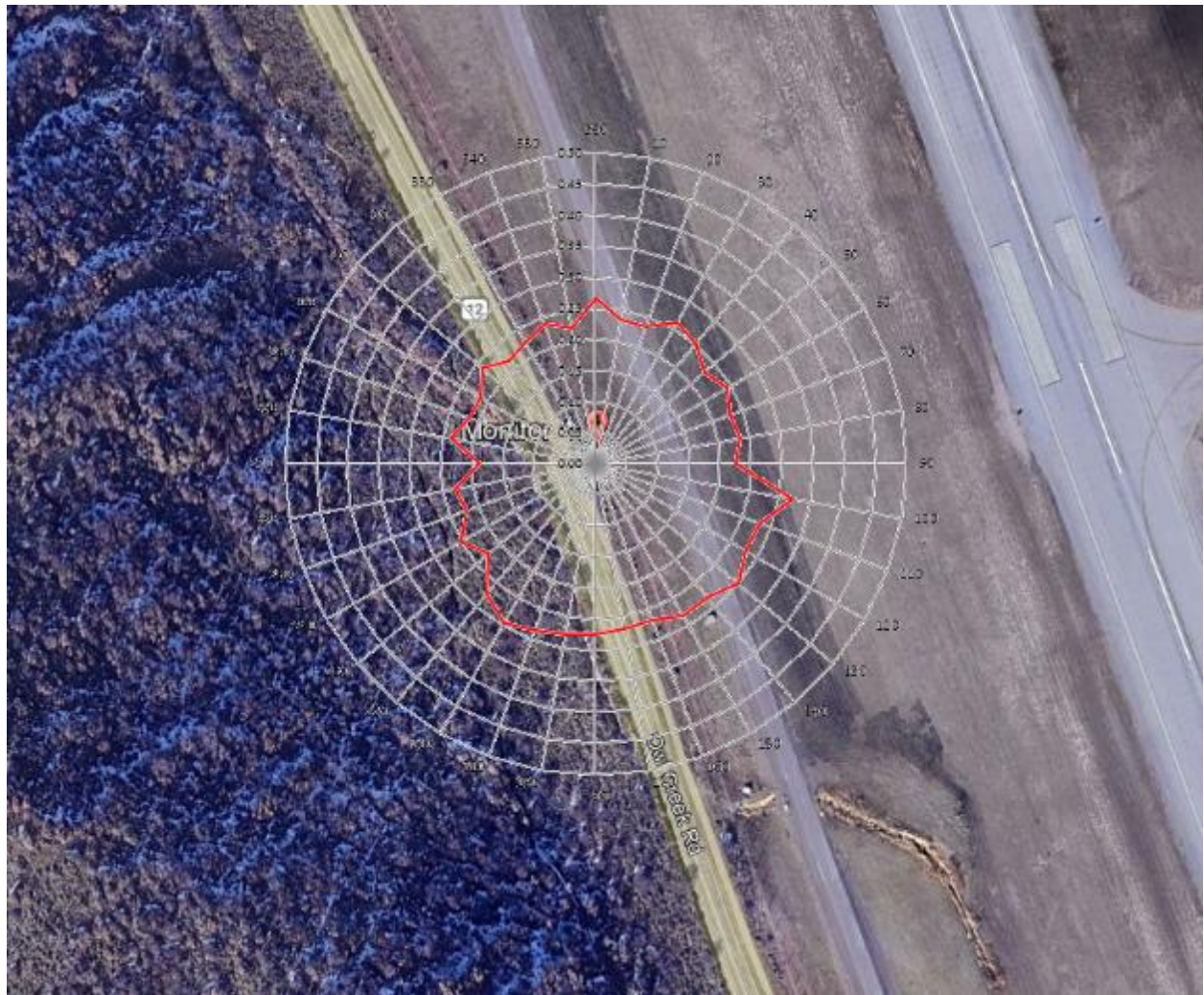
Site 4: PM_{2.5} (µg/m³)

Road contribution noticeable but the spokes to the east and at 170 degrees for PM_{2.5} at Site 4 are the most notable.



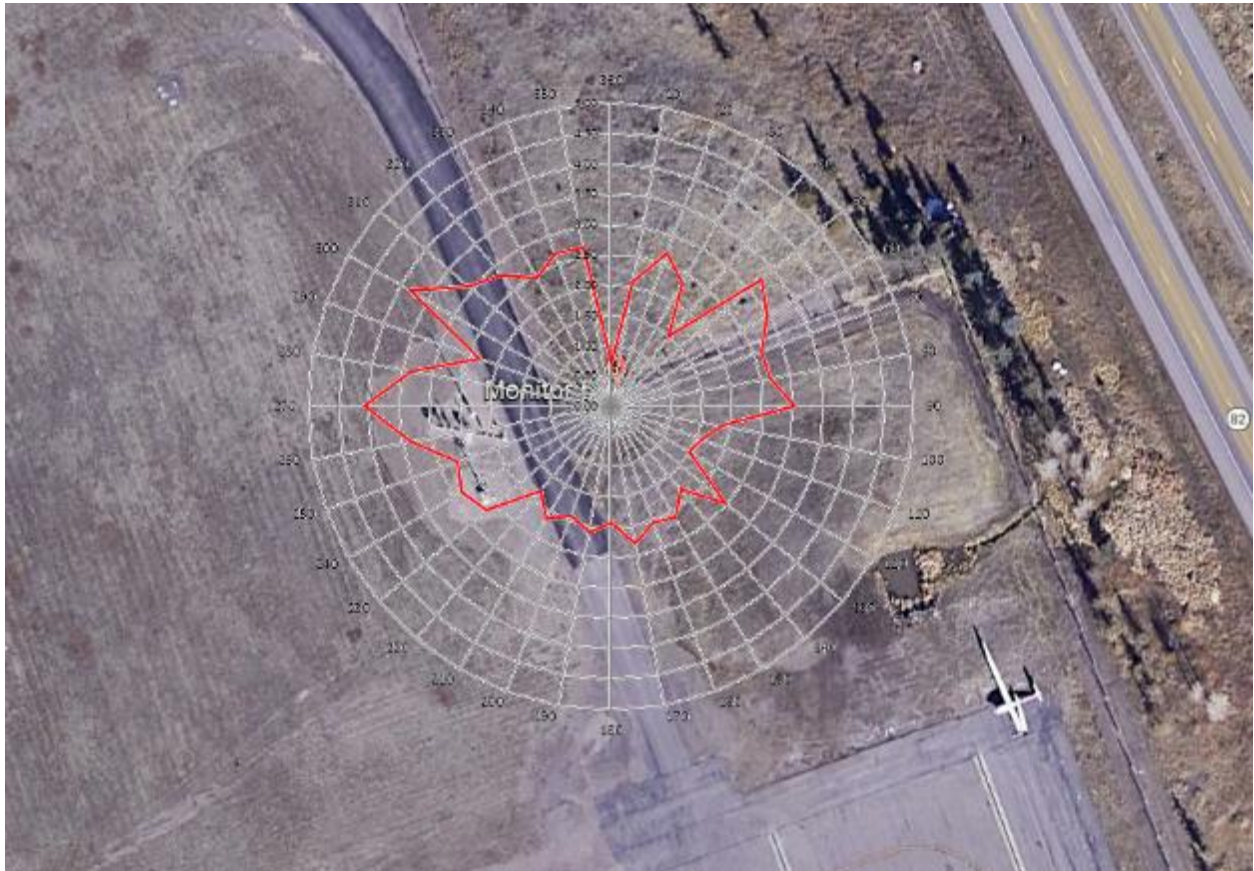
Site 4: PM₁₀ (µg/m³)

The airport has a larger contribution than Owl Creek Road at Site 5 for PM₁₀. However, the spoke to the east from suspected wildfire is most notable. The spoke at 170 degrees is also present.



Site 4: CO (ppm)

As before, CO is more of an area source with slightly more from the east.



Site 5: NO₂ (ppb)

At Site 5 for NO₂ we see the airport and roadway show the most contribution.



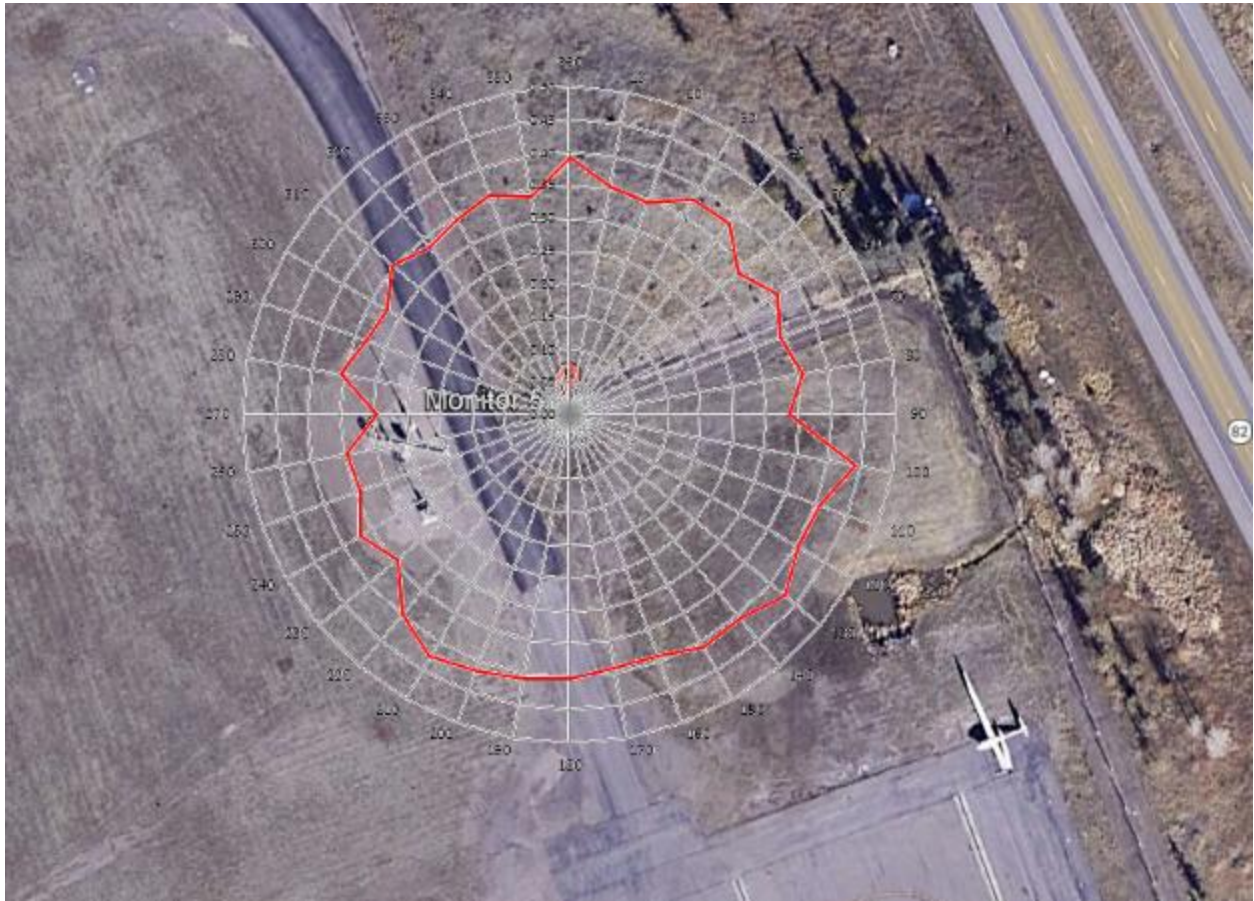
Site 5: PM_{2.5} (µg/m³)

PM_{2.5} at Site 5 shows an airport influence but we have the large spokes to the east and at 170 degrees as before.



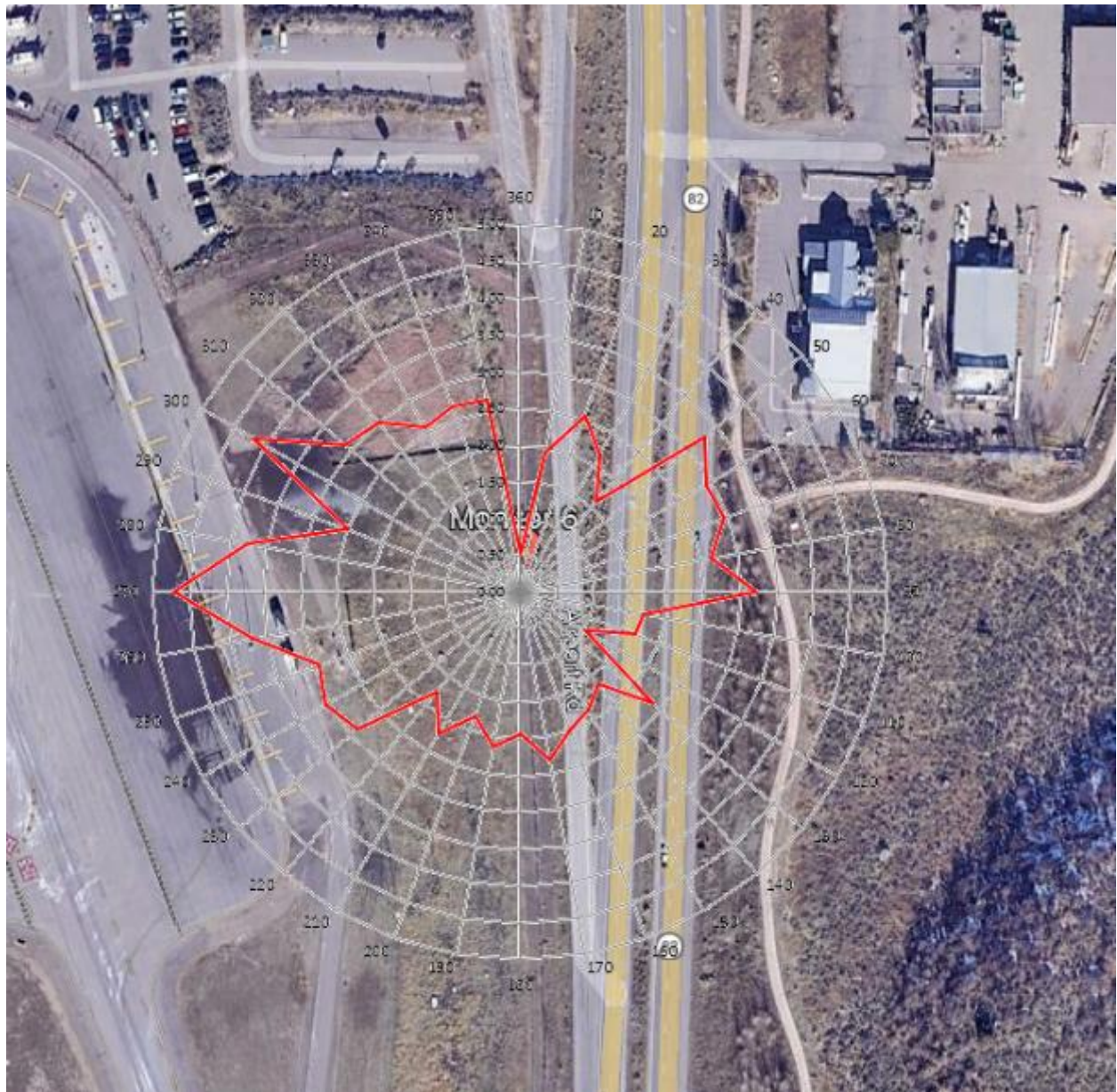
Site 5: PM₁₀ (µg/m³)

PM₁₀ is influenced by the airport and the roadway at Site 5 but the large spoke to the east still is significant. The spoke at 170 degrees is still present but not as evident due to the other nearby sources.



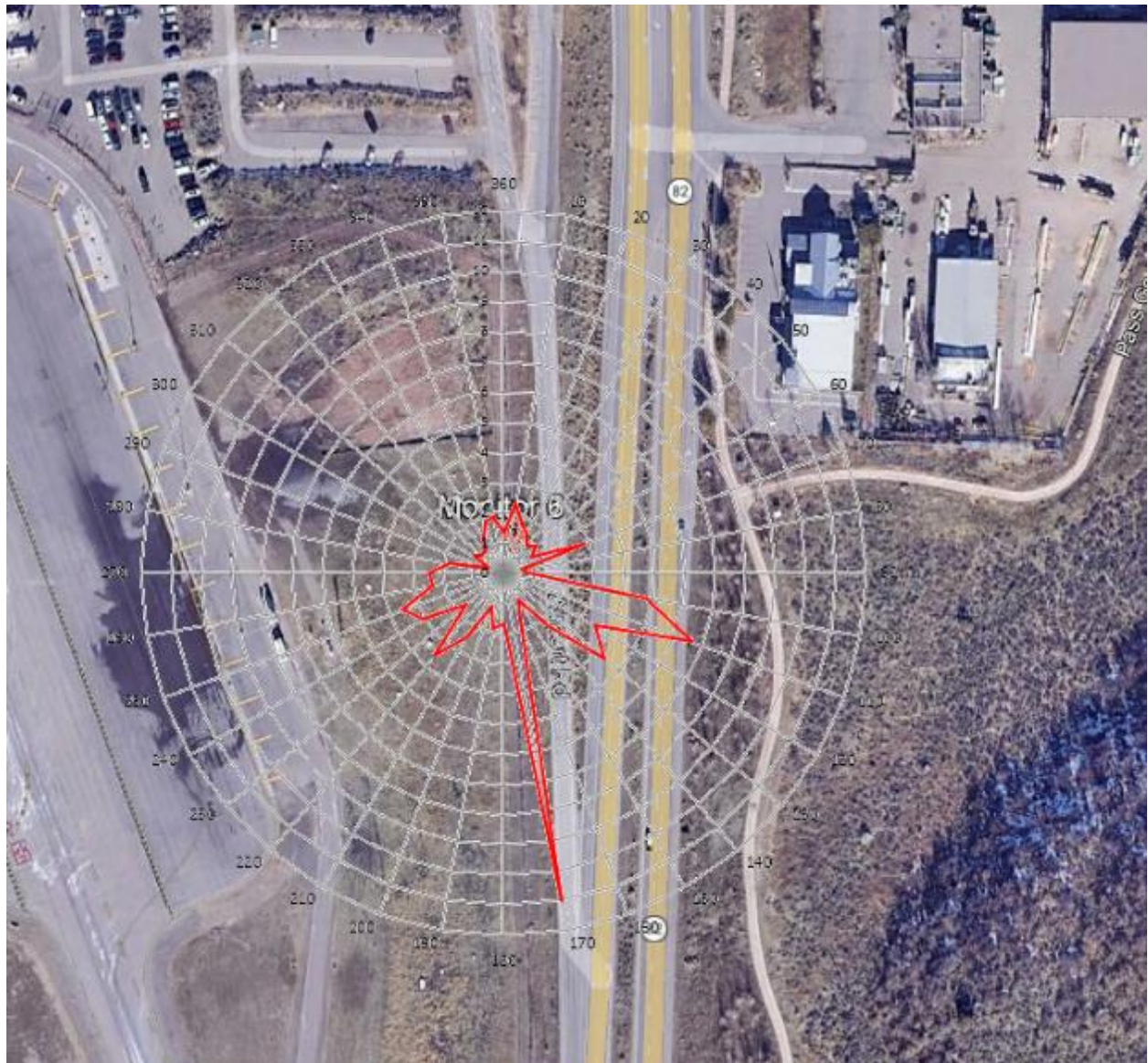
Site 5: CO (ppm)

CO continues to look like an area source.



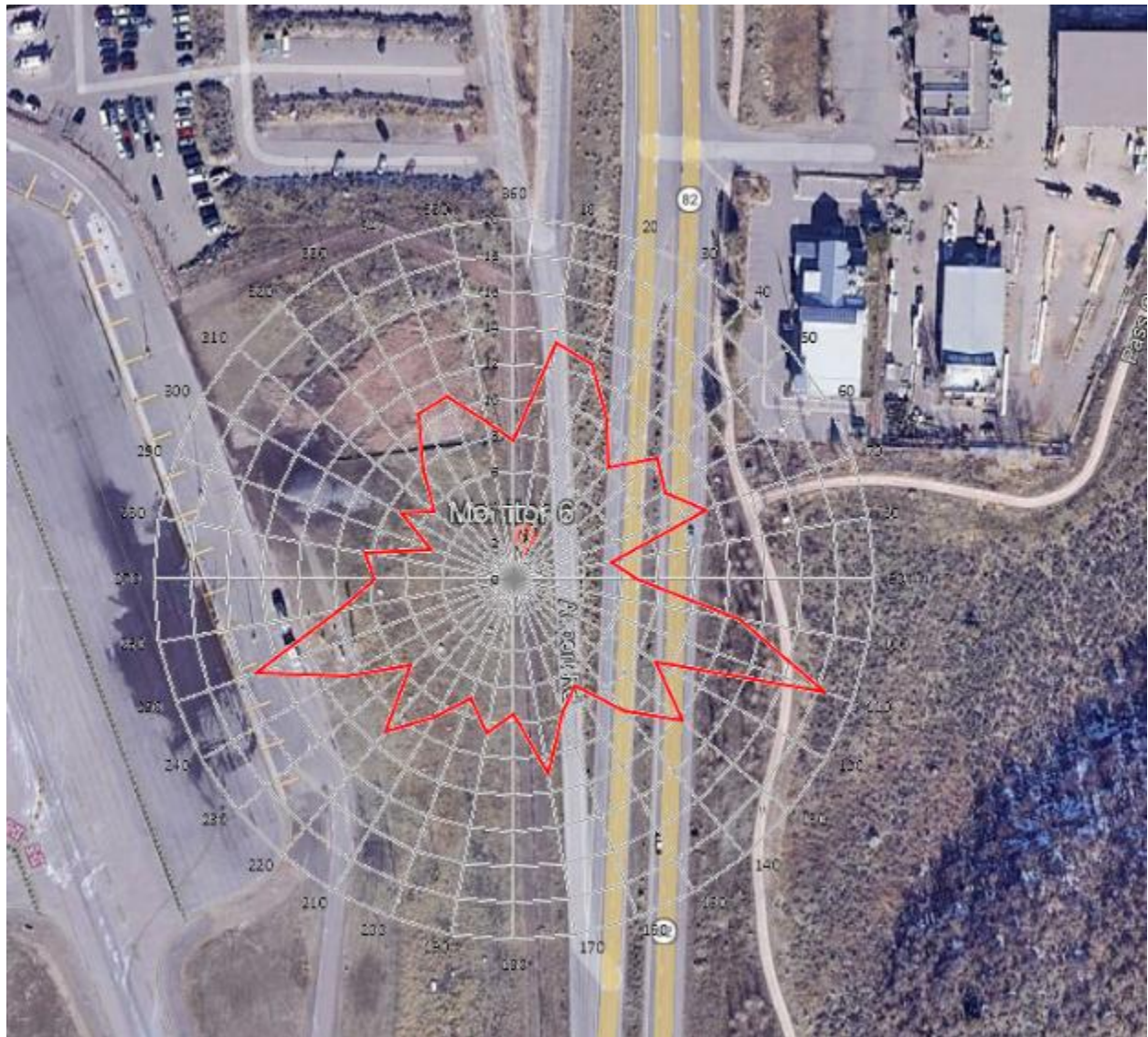
Site 6: NO₂ (ppb)

NO₂ shows a large influence by the airport and State Road 82 at Site 6.



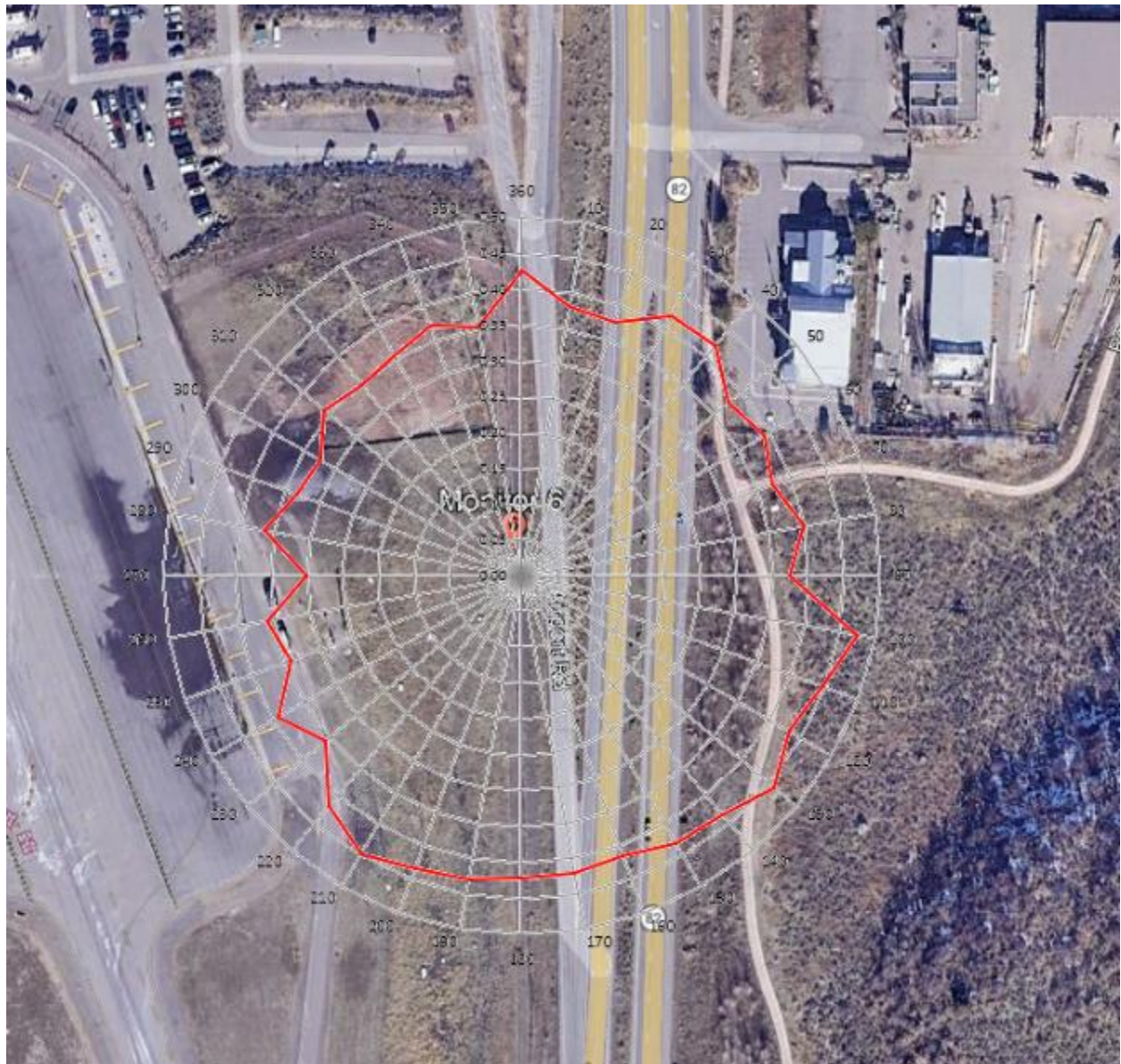
Site 6: PM_{2.5} (µg/m³)

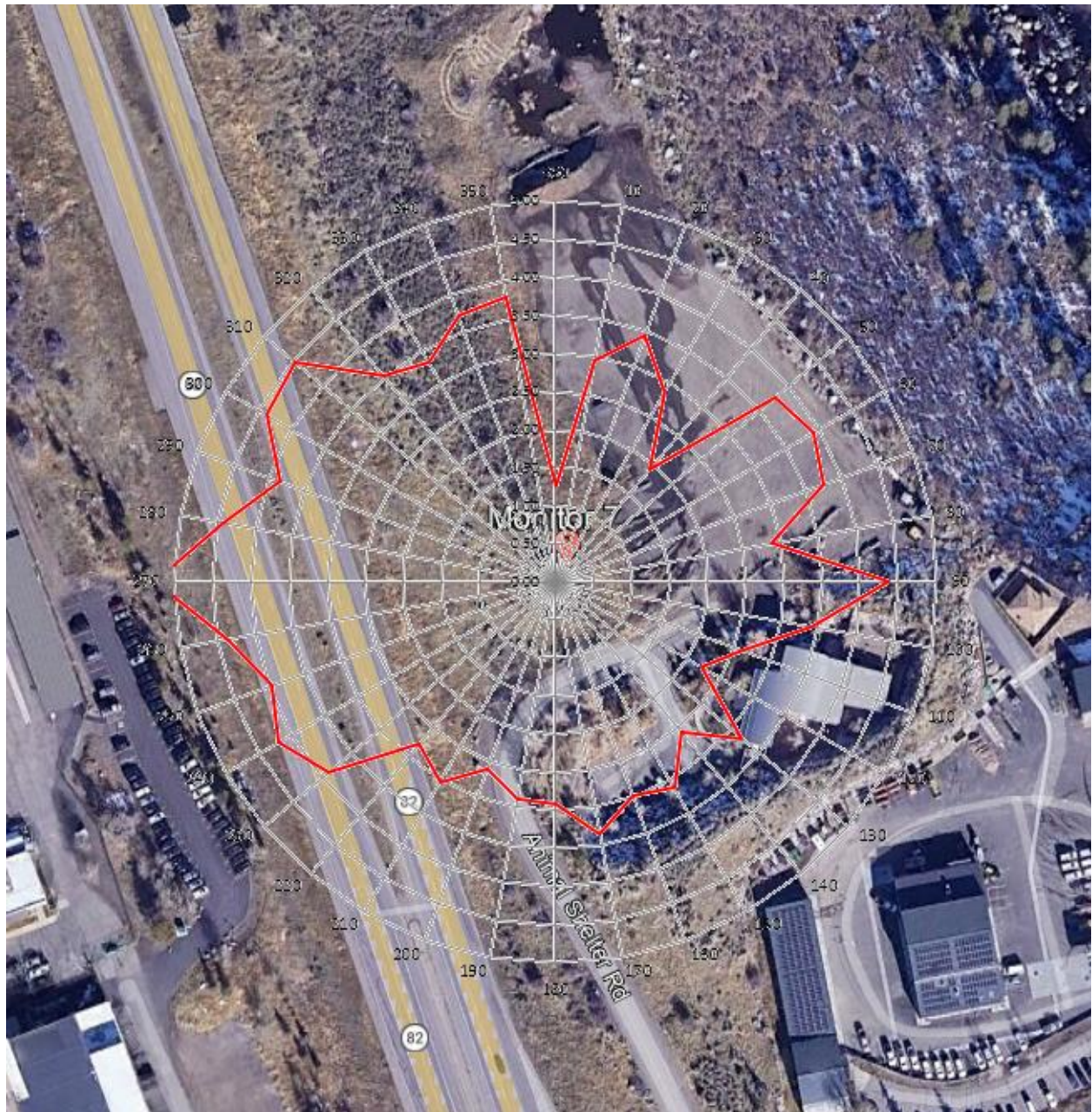
At Site 6 for PM_{2.5} we see an effect from the airport but the spoke to the east and the spoke at 170 degrees are the most significant.



Site 6: PM₁₀ (µg/m³)

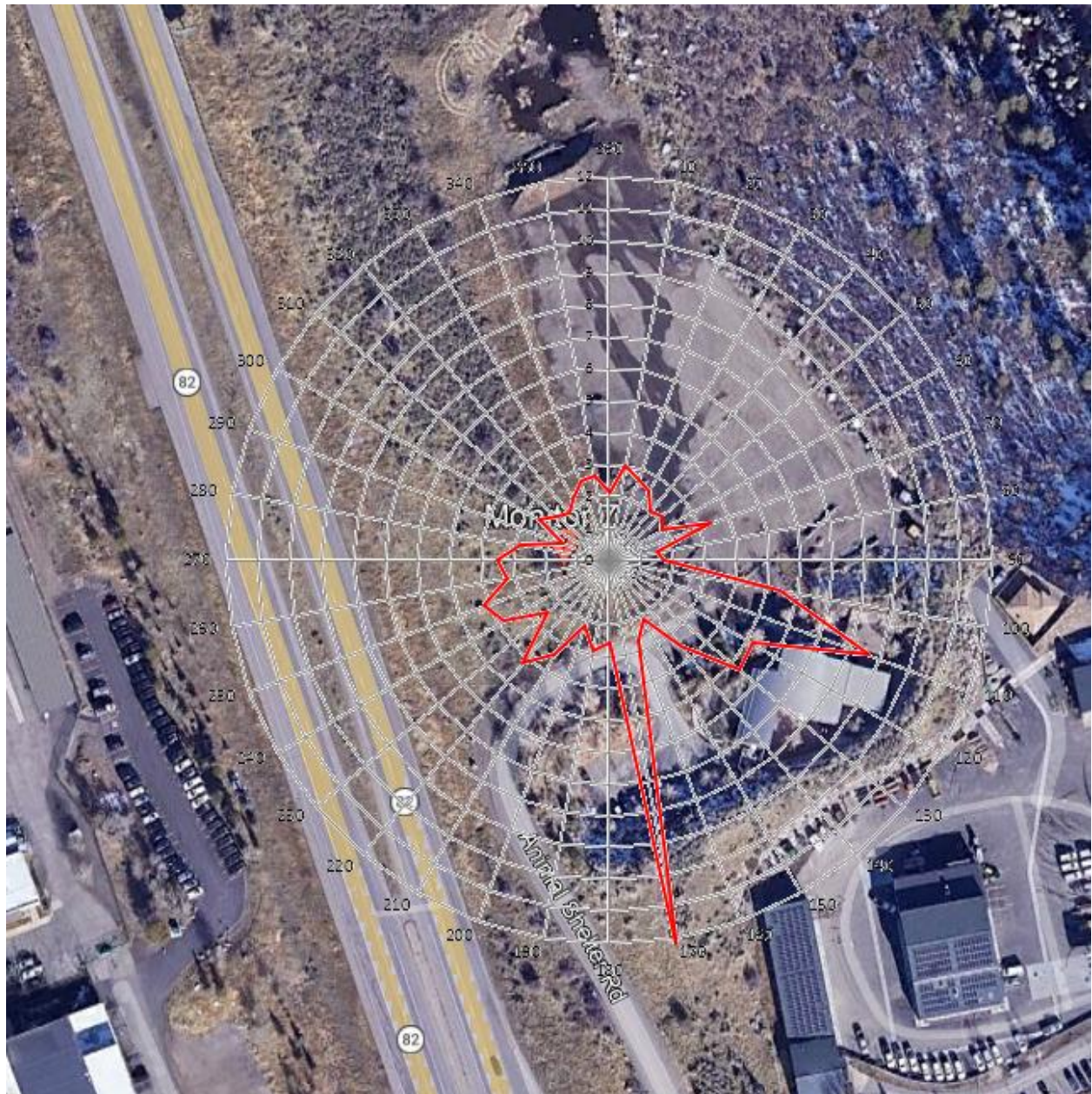
For Site 6, we see about equal impact from the airport and State Road 82. The Spokes to the east and 170 degrees are still present.





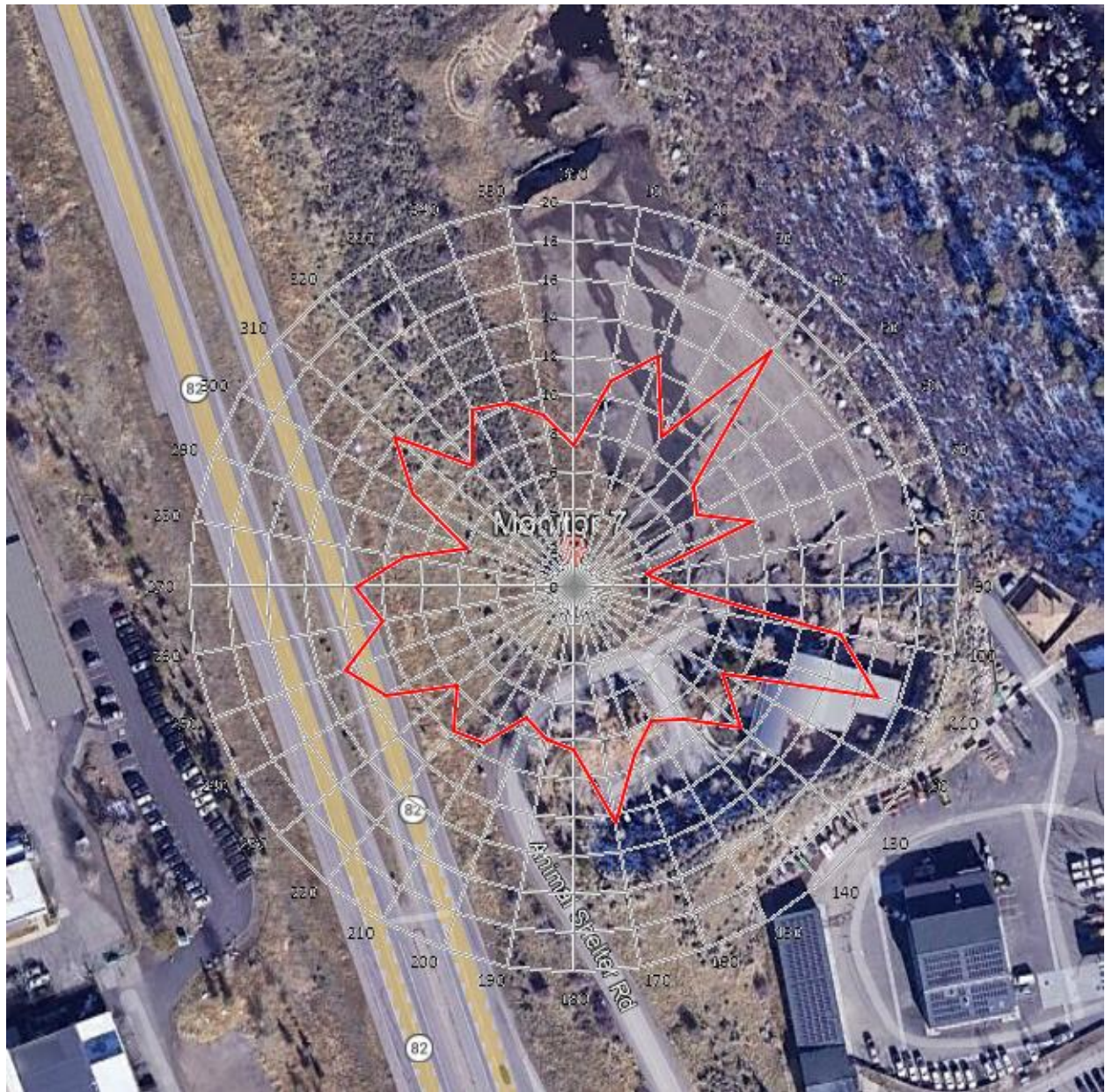
Site 7: NO₂ (ppb)

NO₂ at Site 7 is influenced by State Road 82 and the airport. Due to proximity, it appears State Road 82 may have a greater contribution based on the spokes to the northwest.



Site 7: PM_{2.5} (µg/m³)

For PM_{2.5} at Site 7, the greatest influences are the spokes to the east and 170 degrees. Again, we think the spoke to the east was caused by smoke from the Willow wildfire and have considered the spoke at 170 degrees to be from the Hammer wildfire.



Site 7: PM₁₀ (µg/m³)

PM₁₀ appears to be from multiple sources (airport, State Road 82, and possibly from heavy equipment and maintenance activities) but the spokes to the east and 170 degrees still occur.



Site 7: CO (ppm)

CO appears again as an area source.



Site 8: NO₂ (ppb)

At Site 8 for NO₂, we see the definite effect from the airport and State Road 82. But there also seems to be an effect from nearby activity to the east.



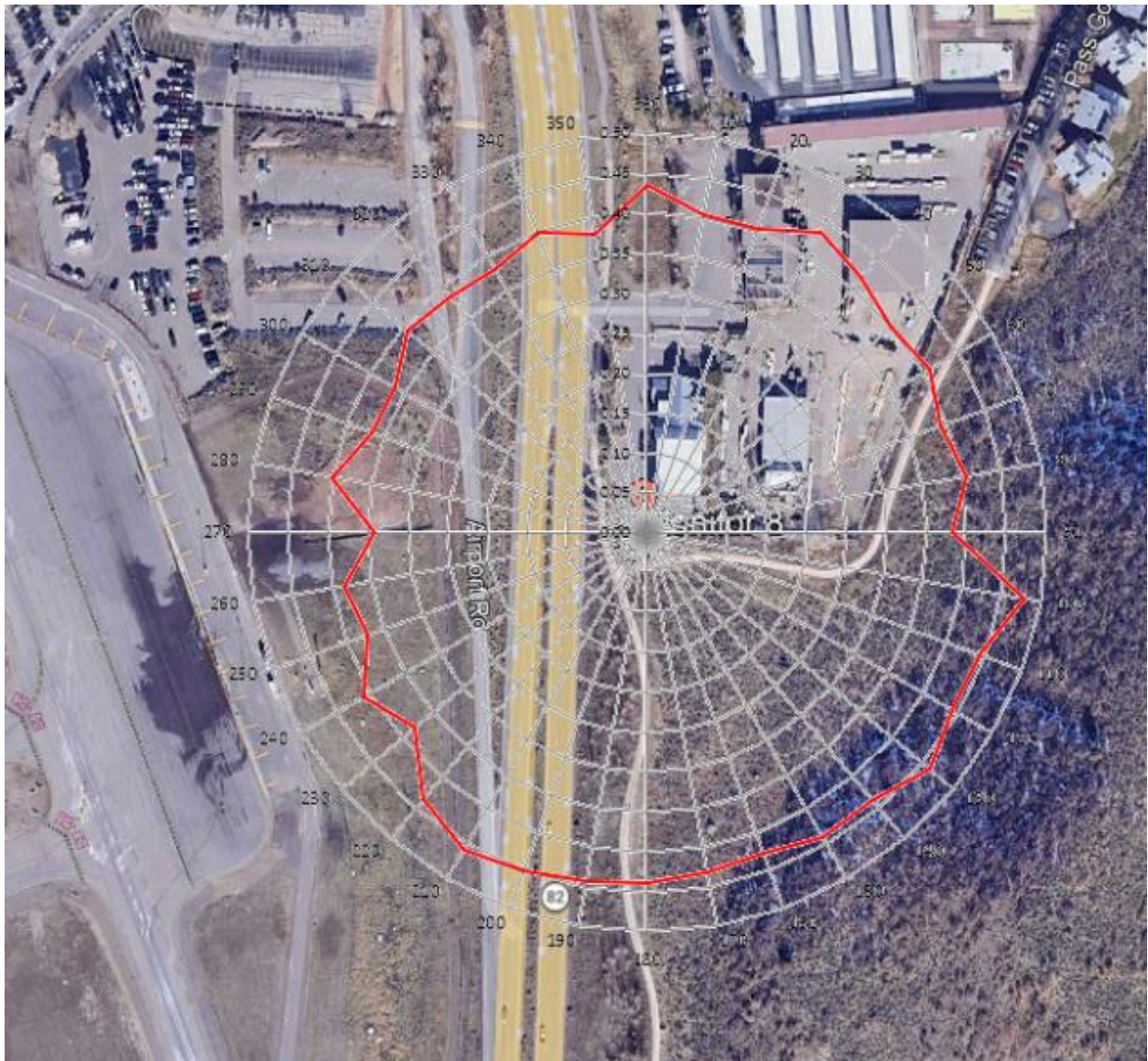
Site 8: PM_{2.5} (µg/m³)

Site 8 PM_{2.5} shows influence from the airport and State Road 82, but also from nearby activity to the east. The large spokes to the east and at 170 degrees are very significant.



Site 8: PM₁₀ (μg/m³)

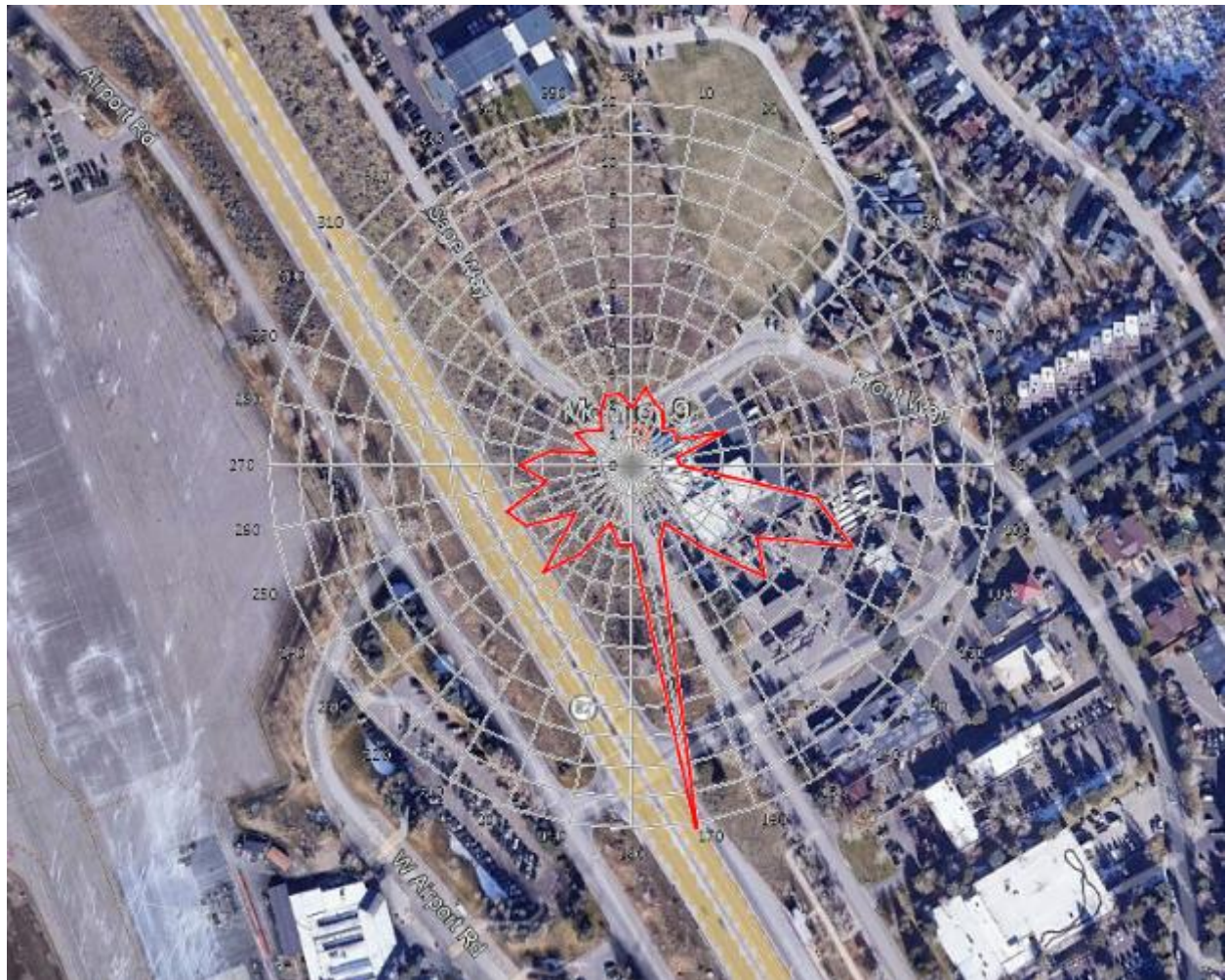
PM₁₀ at Site 8 is dominated by the airport and State Road 82, somewhat obscuring the spokes to the east. Of note is the spokes to the south and at 170 degrees would seem to be obscured due to the other influences.



Site 8: CO (ppm)

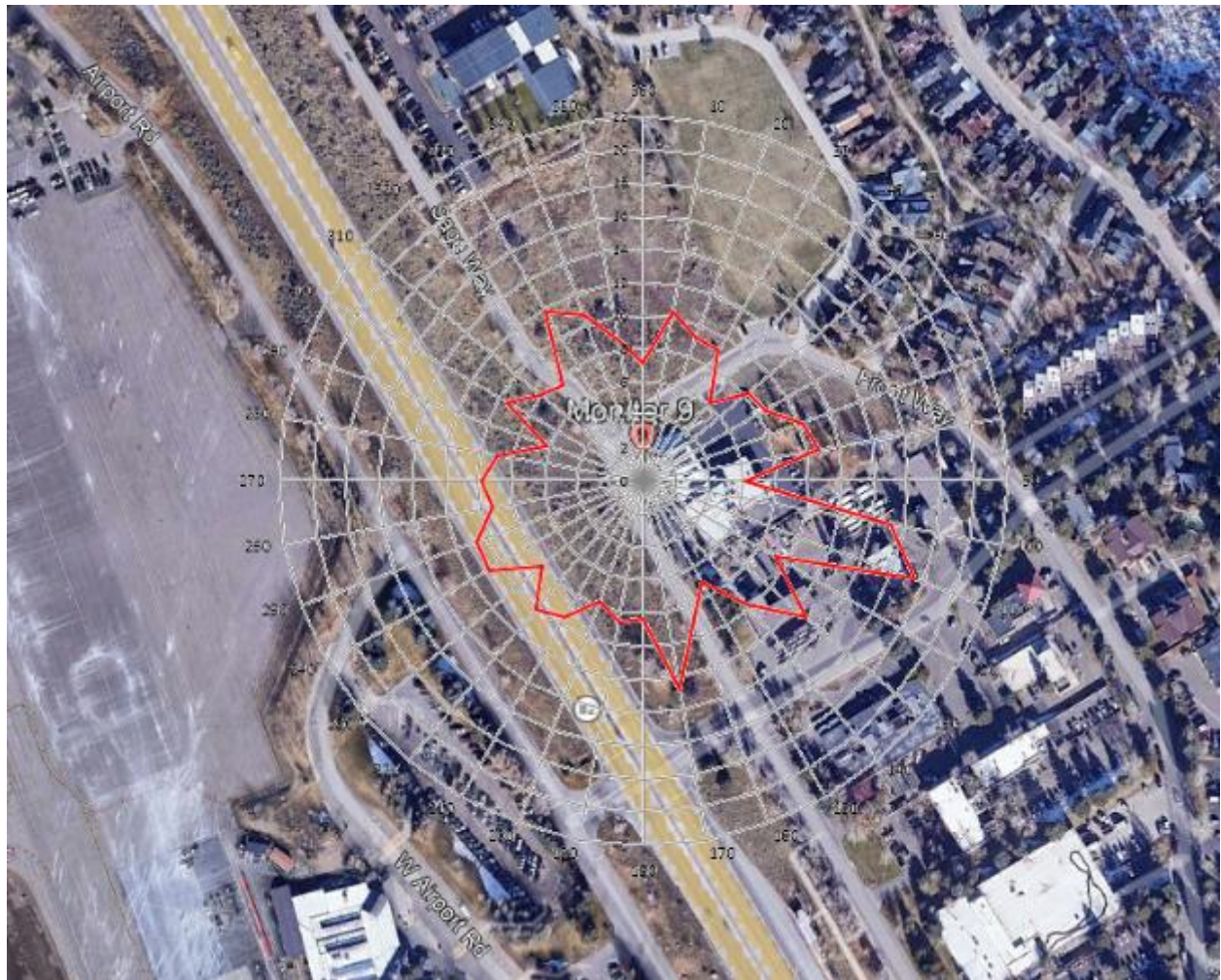
Again, at Site 8, CO is more of an area source.

Of interest is that NO₂ at Site 9 seems to be equally coming from all directions which includes the airport, State Road 82, and nearby neighborhoods.



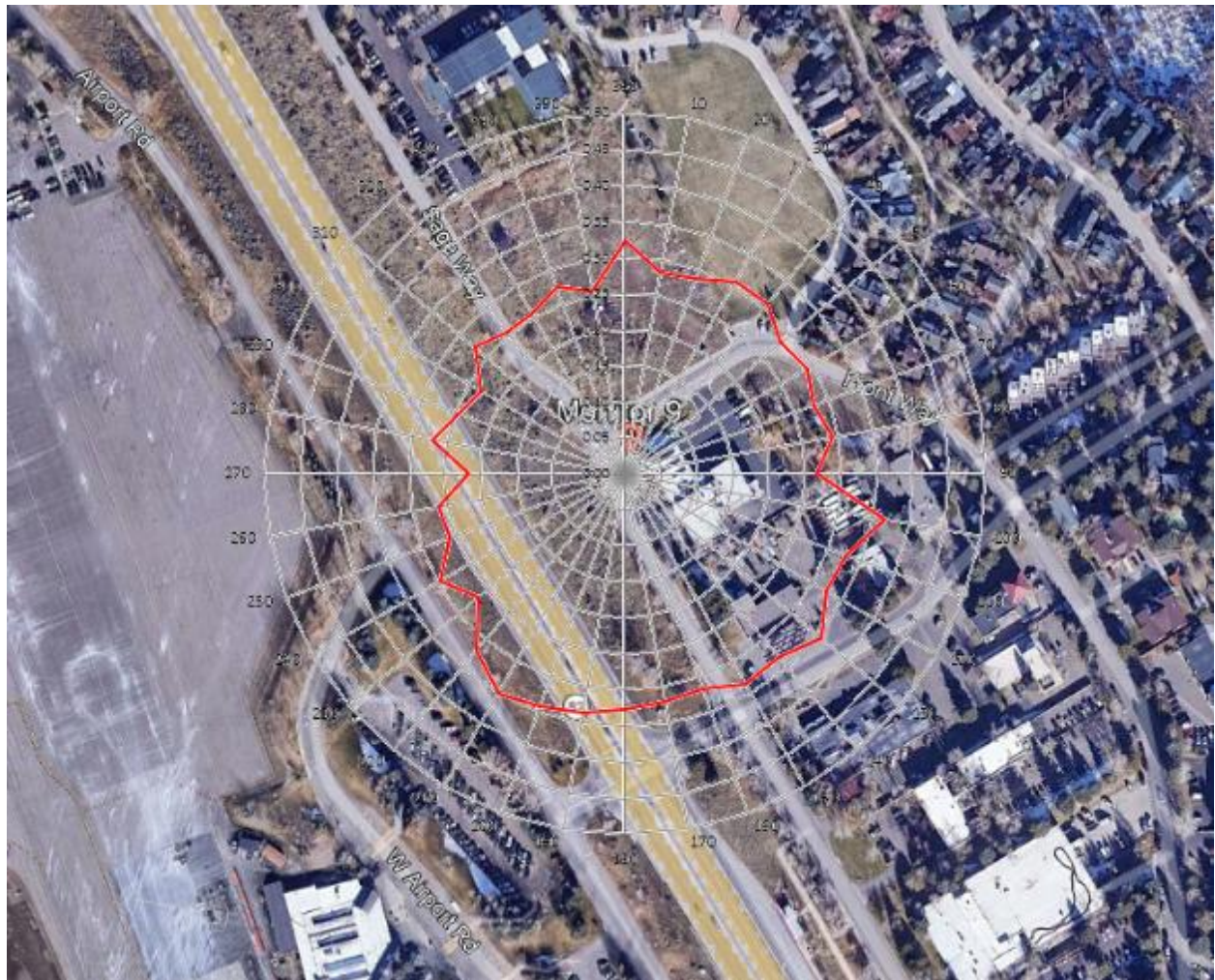
Site 9: PM_{2.5} (µg/m³)

Site 9 PM_{2.5} would seem to be influenced by the airport and roadway but still has significant pollution from the east as well as from 170 degrees.



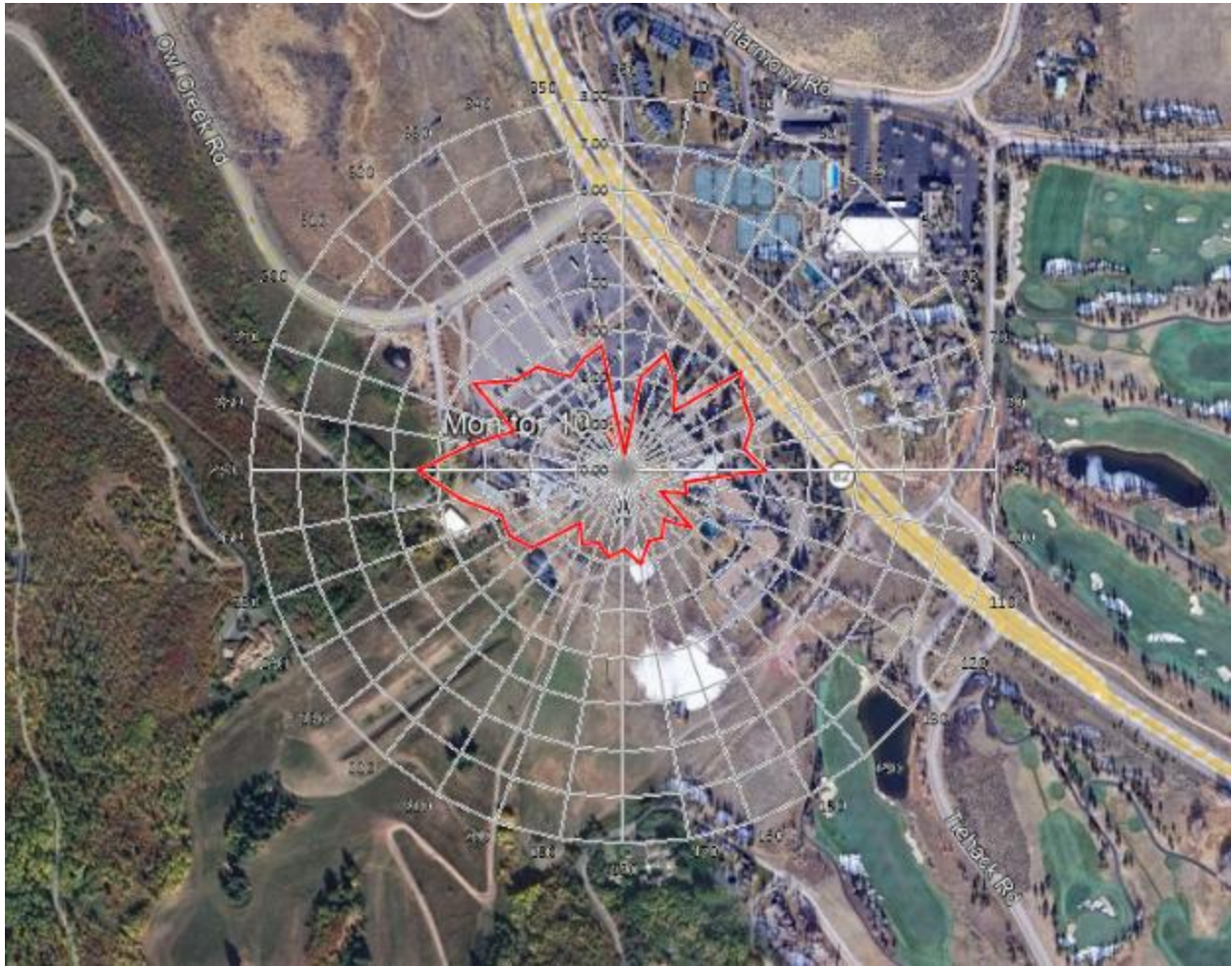
Site 9: PM₁₀ (µg/m³)

PM₁₀ at Site 9 would appear to be coming from multiple sources surrounding it. The influence from the east and 170 degrees still show up.



Site 9: CO (ppm)

CO continues to be more of an area source.



Site 10: NO₂ (ppb)

At the nearby ski lodge, we see influence from the northeast and State Road 82 on NO₂. However, the nearby buildings could be distorting the direction of the pollutant rose to the north as local wind flow could be redirected.



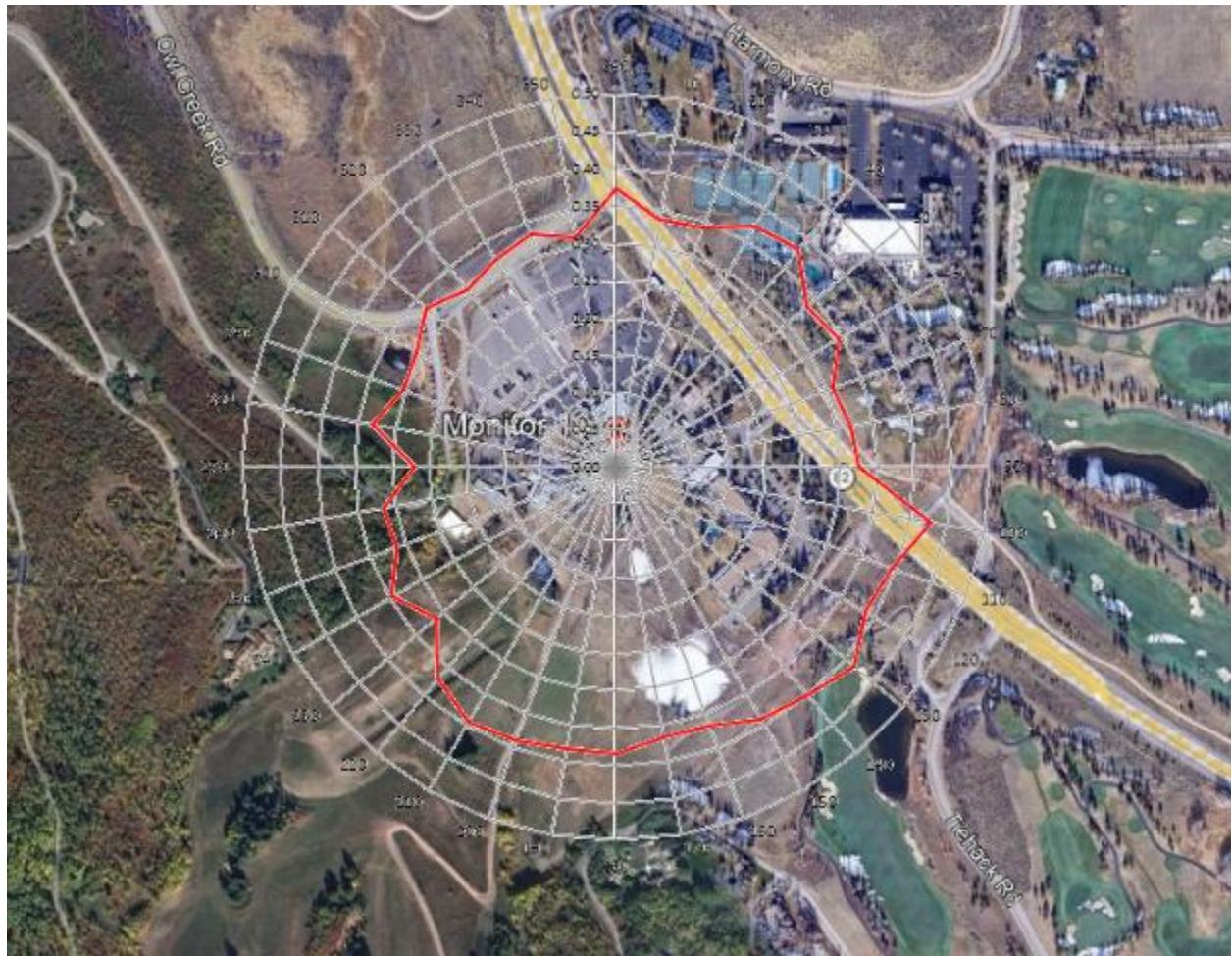
Site 10: PM 2.5 ($\mu\text{g}/\text{m}^3$)

PM_{2.5} at Site10 is dominated by the source to the east and the spoke at 170 degrees.



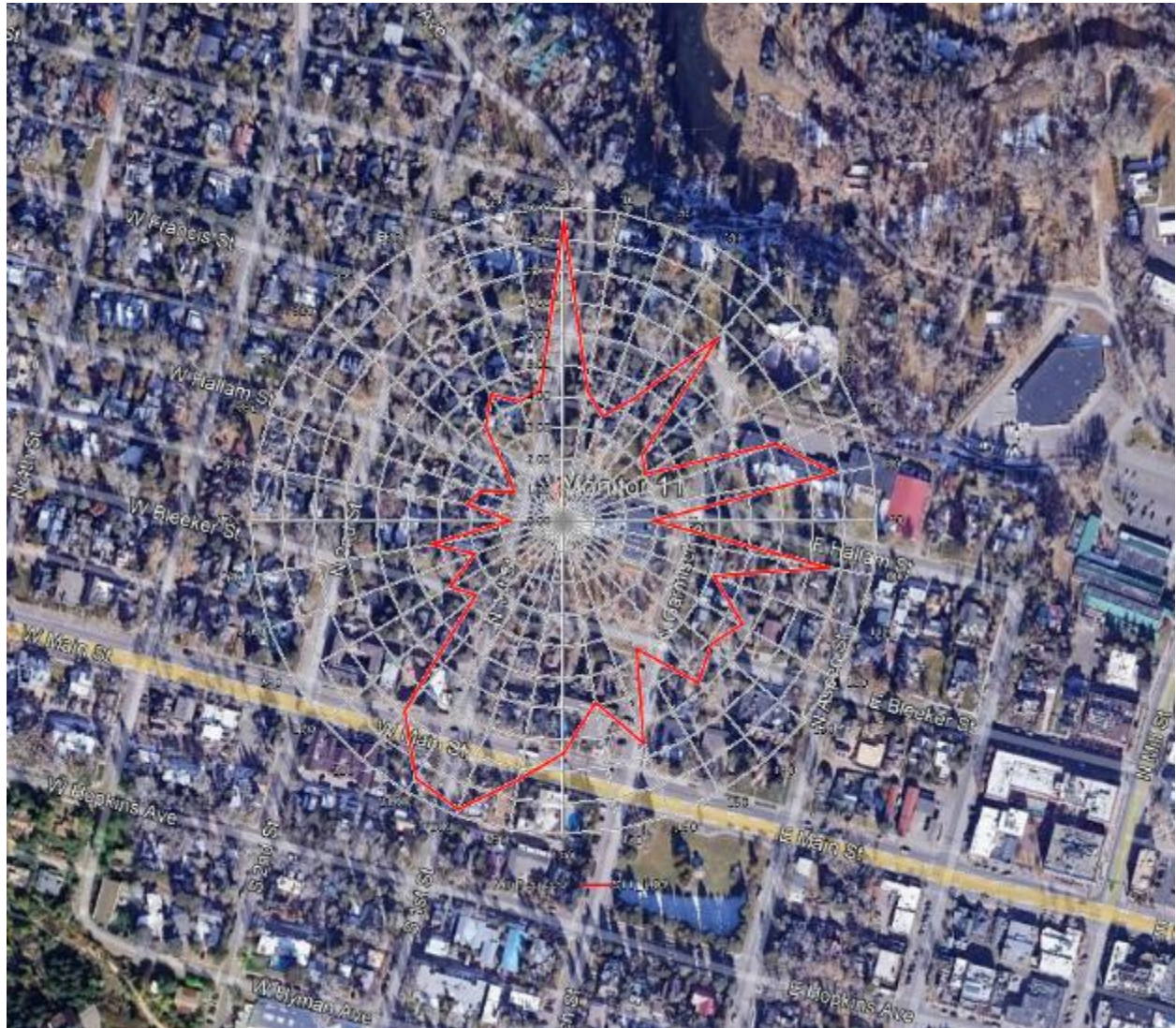
Site 10: PM₁₀ (µg/m³)

PM₁₀ shows sources from most directions. This could be a combination of sources such as the airport, State Road 82, on-site venting from cooking, as well as other sources. The influence from the east and 170 degrees are still present, especially from the east.



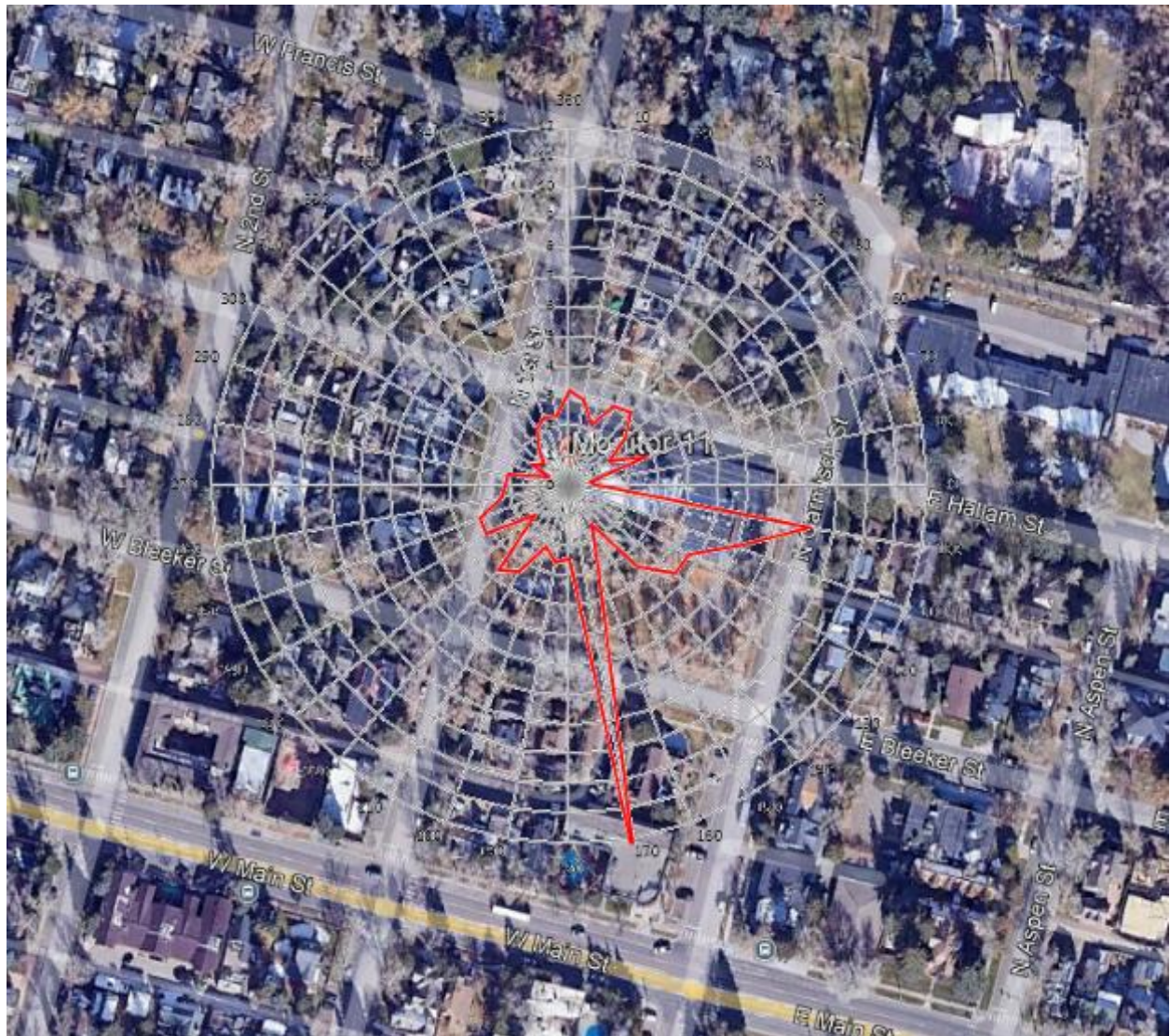
Site 10: CO (ppm)

CO again appears to be more of an area source. Of note is that the very low concentrations measured also affect these results.



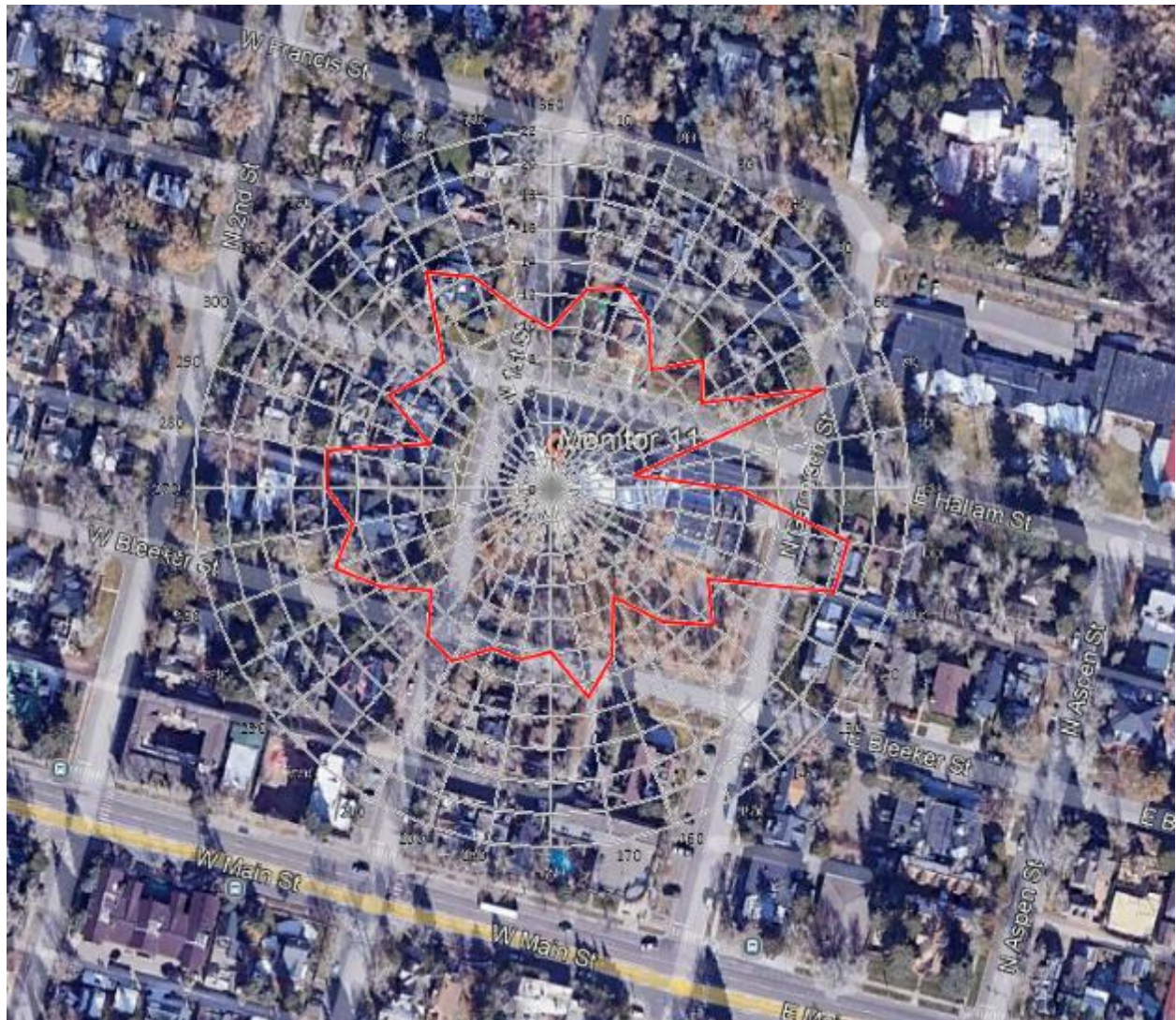
Site 11: NO₂ (ppb)

For NO₂ at Site 11, downtown Aspen, Main Street has a definite effect as you would expect from motor vehicle traffic. But spokes also indicate contributions from most local streets near the Yellow Brick School Building as well.



Site 11: PM_{2.5} (µg/m³)

PM_{2.5} at Site 11 is coming from the general area, most likely traffic. However, the major spokes show the effect of the source to the east and 170 degrees. It should be noted that these two major sources at all measurement locations indicate the pollution is from outside the Aspen area. The large contribution from the east is believed to be from the Willow wildfire. The spoke at 170 degrees, present at all locations and especially the downtown measurements strongly indicate the source was from south of the area. Dates tend to indicate this could have been due to the Hammer wildfire.



Site 11: PM₁₀ (µg/m³)

PM₁₀ at Site 11 shows a general contribution from all angles, indicating perhaps from local motor vehicle traffic. The spokes still show the contribution from the east and to a smaller extent, 170 degrees.



Site 11: CO (ppm)

As before, CO shows up as more of a general area source. Since this is true at all measurement locations, CO has been considered more of an area sources in nature.

4. Volatile Organic Compounds

Although not a criteria pollutant, we also sampled Volatile Organic Compounds (VOCs). Many of these are listed as hazardous air pollutants. The samples are taken by using a specially prepared evacuated canisters from a certified laboratory, Eurofins Environmental Testing. As shown in Figure 3, We use a sample train that allows us to catch a uniform 24-hour sample.

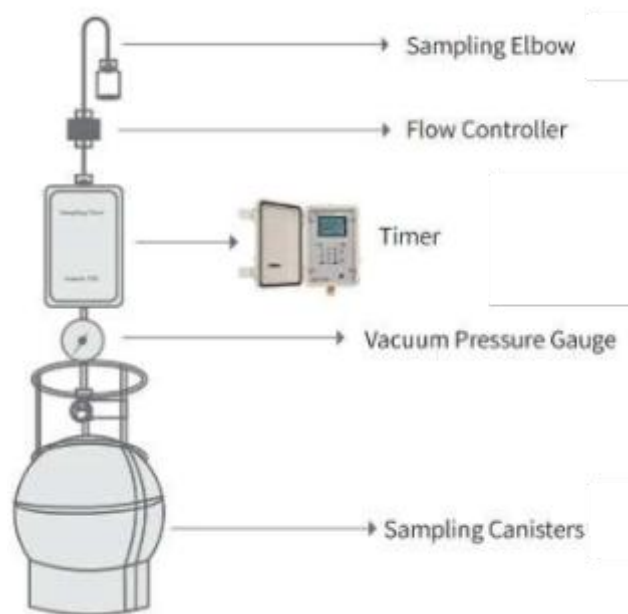


Figure 3. Volatile Organic Compound Sampling Setup

The canisters are then sent to the certified laboratory for analysis by the USEPA Method TO-15 which uses gas chromatographs and mass spectrometers. Although 62 compounds are analyzed, many are below the method detection limit (MDL). Table 3 shows a detection summary from the laboratory for a 24-hour sample beginning on May 15, 2026.

A 24-hour sample was also taken beginning on July 27, 2026. The final results have not yet been received, but preliminary results, comparing the May and July sampling, are shown in Table 4 show very similar results. The key provided in Table 3 applies to both tables.

All reported values were compared to the USEPA Regional Screening Levels (RSLs). All reported concentrations were below these screening levels. USEPA Regional Screening Levels are risk-based concentrations used to screen environmental contaminants. They are not regulatory standards, but screening values that help identify chemicals that may warrant further evaluation. The RSL tables are applicable for both residential and worker exposure scenarios.

Table 3. Measured Volatile Organic Compounds

Detection Summary

Client: AECOM
Project/Site: Pitkin County

Job ID: 650-12077-1

Client Sample ID: Site 1-Pitkin

Lab Sample ID: 650-12077-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
2-Butanone (MEK)	8.3		3.4	1.1	ppb v/v	1.711		TO-15	Total/NA
Acetone	67		8.6	2.9	ppb v/v	1.711		TO-15	Total/NA
Benzene	0.39	J	0.86	0.29	ppb v/v	1.711		TO-15	Total/NA
Freon 12	0.51	J	0.86	0.29	ppb v/v	1.711		TO-15	Total/NA
Heptane	0.55	J	0.86	0.29	ppb v/v	1.711		TO-15	Total/NA
Hexane	1.1		0.86	0.29	ppb v/v	1.711		TO-15	Total/NA
Tetrahydrofuran	1.2		0.86	0.29	ppb v/v	1.711		TO-15	Total/NA
Toluene	1.1	J	1.7	0.56	ppb v/v	1.711		TO-15	Total/NA
Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
2-Butanone (MEK)	24		10	3.4	ug/m3	1.711		TO-15	Total/NA
Acetone	160		20	6.8	ug/m3	1.711		TO-15	Total/NA
Benzene	1.3	J	2.7	0.93	ug/m3	1.711		TO-15	Total/NA
Freon 12	2.5	J	4.2	1.4	ug/m3	1.711		TO-15	Total/NA
Heptane	2.2	J	3.5	1.2	ug/m3	1.711		TO-15	Total/NA
Hexane	3.8		3.0	1.0	ug/m3	1.711		TO-15	Total/NA
Tetrahydrofuran	3.4		2.5	0.86	ug/m3	1.711		TO-15	Total/NA
Toluene	4.3	J	6.4	2.1	ug/m3	1.711		TO-15	Total/NA

Client Sample ID: Site 2-Pitkin

Lab Sample ID: 650-12077-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Acetone	4.2	J	8.9	3.0	ppb v/v	1.785		TO-15	Total/NA
Freon 12	0.49	J	0.89	0.30	ppb v/v	1.785		TO-15	Total/NA
Tetrachloroethene	1.6		0.89	0.30	ppb v/v	1.785		TO-15	Total/NA
Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Acetone	9.9	J	21	7.1	ug/m3	1.785		TO-15	Total/NA
Freon 12	2.4	J	4.4	1.5	ug/m3	1.785		TO-15	Total/NA
Tetrachloroethene	11		6.1	2.1	ug/m3	1.785		TO-15	Total/NA

Key

24-hour Sample

RL = Reporting Limit, the lowest concentration a lab can reliably quantify and report

MDL = Method Detection Limit

J = Result is less than the RL but greater than or equal to the MDL

Table 4. Comparison of Volatile Organic Compound results from May and July 2026

Pitkin County					
Pitkin Site 1					
May 15, 2026 To July 27, 2026					
Num.	Compound Name	GC/MS (ppb v/v)			
		5/15/2026		7/27/2026	
7	Dichlorodifluoromethane	2.5	J	ND	ND
25	Ethanol	ND	ND	7.1	J
27	Acetone	67		64	
60	2-Butanone	8.3		8.7	
66	n-Hexane	3.8		ND	ND
79	Benzene	1.3	J	ND	ND
95	n-Heptane	2.2	J	ND	ND
111	Toluene	1.1	J	ND	ND
317	1,2-Dichloroethane-d4	105		89	
543	Toluene-d8	101		98	
635	1-Bromo-4-fluorobenzene	95		102	
665	Tetrahydrofuran	3.4		2.5	J
ND	Not Detected.				
ND	The Compound analyzed for but not detected above the MDL value.				
J	Estimated value for target compound hits above the MDL value, but below the RL.				
Pitkin County					
Pitkin Site 2					
May 15, 2026 To July 27, 2026					
Num.	Compound Name	GC/MS (ug/m3)			
		5/15/2026		7/27/2026	
7	Dichlorodifluoromethane	0.49	J	0.41	J
27	Acetone	9.9	J	19	J
125	Tetrachloroethylene	1.6		ND	ND
317	1,2-Dichloroethane-d4	102		85	
543	Toluene-d8	100		100	
635	1-Bromo-4-fluorobenzene	97		101	
ND	Not Detected.				
ND	The Compound analyzed for but not detected above the MDL value.				
J	Estimated value for target compound hits above the MDL value, but below the RL				

5. Initial Analysis of Measurement Data

Although early in the process, as we continue to collect data, analyses to quantify sources has begun. Included are two examples of the methodologies underway.

a. Aircraft

The NAAQS are based on several factors including health-based standards. As such, the standards are based on overall dose. Dose depends on three variables: toxicity, time of exposure, and the concentration an individual is exposed to. Toxicity, time of exposure, and concentration are specific for each criteria pollutant. This is the reason for different concentrations levels and times being specified for the criteria pollutants. Exposure to a person for an individual aircraft event is of interest to many. In our analysis we will be combining overall averages to compares to the NAAQS but are also reviewing aircraft peak concentrations. Figure 4 shows short-term sampling for the time-period 10:30 AM until 12:00 noon on April 2, 2026. Samples are 5-minute averages. This time period was chosen to reduce the influence due to local traffic. Using provided times of aircraft operations, the major peak shown was found to be likely due to aircraft operation. Of importance is that even in this short time frame, the concentration is well below the NAAQS. We plan to look closely at operations for specific aircraft to determine when the peaks occur, maximum concentration of the peaks, and the overall effect on the time-averaged concentrations. Meteorology and aircraft types will also be included in our analysis.

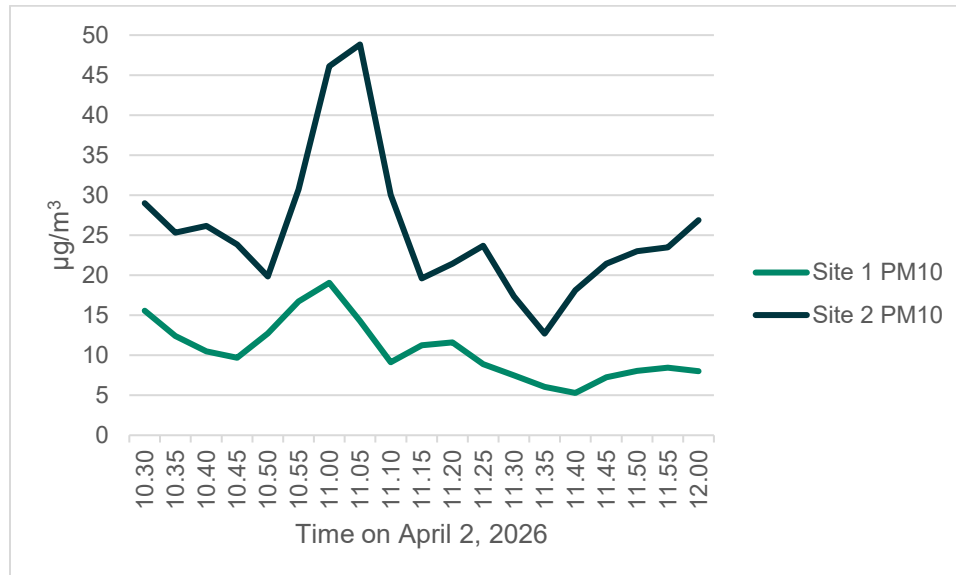


Figure 4. Review of aircraft peak concentration

b. Motor Vehicles

Another significant source near the airport is State Road 82. We can also employ a quasi-mass balance to determine a rough measure of the source strength due to the measurements locations selected. While in the early stage, it is good to take a quick look at the activity underway. Figure 5 shows two graphs of 1-hour average NO_2

concentrations. On the left is June 8, 2026, the right June 17, 2026. The wind is coming from primarily the south on June 8 and the north on June 17. The graphs are not actual concentrations but the differences between Site 6 and 8 for each hour. Since Site 8 was subtracted from Site 6, positive values indicated Site 6 has a greater concentration. Negative values indicated that Site 8 has a greater concentration at a given time. During the morning hours Site 6 between the airport and the roadway has a greater concentration. In the afternoon, during peak traffic, Site 8 shows the increased concentration of State Road 82. Over the first quarter Site 8 averages about 3 ppb greater than Site 6, indicating how State Road 82 may add to the overall area concentrations. This provides the beginning of reviewing the source strengths of each and we will look at more specific wind directions in our analysis. Work is continuing.

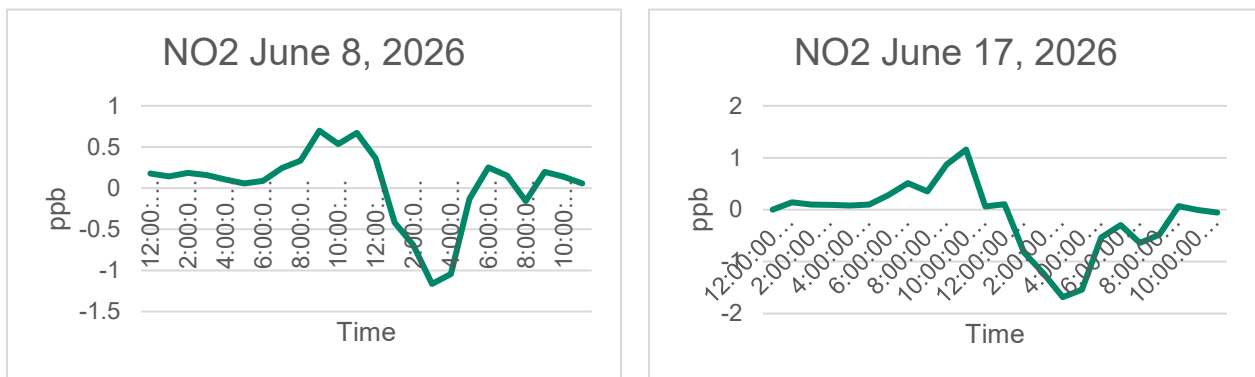


Figure 5. A comparison of Site 6 and Site 8 for NO₂

6. Preliminary Conclusions

With only one quarter of data, the analysis is incomplete but there are some preliminary conclusions:

- ✓ This data represents spring meteorology and downtime for the airport. Meteorology changes by season and differences can be expected.
- ✓ Concentrations infer no exceedances of the National Ambient Air Quality Standards for normal events. However, measurements are continuing.
- ✓ Locations 1 – 10 are influenced by the airport and SR82. Site 11 more by the urban traffic.
- ✓ Wildfires had a large effect on overall particulate matter concentrations as seen by the pollutant roses. It appears that smoke from the Willow wildfire was channeled by the mountain valleys and entered the Aspen area from the southeast. A strong spoke on all wind roses about June 22 for PM indicates a strong source south of the Aspen area. It is speculated that this may have been caused by the Hammer wildfire which occurred at that time.

- ✓ Concentrations are very low for some pollutants making it difficult to get a trend determination until additional quarterly data is collected
- ✓ Monitoring is continuing, and we continue working with others such as the County to better analyze traffic and aircraft events.

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