# Bethel Road Dust Study

## May 2025-August 2025


**Department of Environmental Conservation**

**Division of Air Quality**

**Air Monitoring and Quality Assurance Program**

555 Cordova Street

Anchorage, AK 99501



Final

April 2026

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# Abbreviations and Acronyms

| | |
|---|---|
| °F | degrees Fahrenheit |
| °C | degrees Celsius |
| ATV | All-terrain vehicle |
| CAA | Clean Air Act |
| DEC | Department of Environmental Conservation |
| DOT | Department of Transportation |
| E-BAM | Environmental Beta Attenuation Mass Monitor |
| EPA | U.S. Environmental Protection Agency |
| EK35 | road palliative |
| FEM | Federal equivalent method |
| FRM | Federal reference method |
| in | inch |
| mph | miles per hour |
| m/s | meters per second |
| NAAQS | National Ambient Air Quality Standards |
| NOAA | National Oceanic and Atmospheric Administration |
| $PM_{2.5}$ | Particulate matter with a diameter smaller than 2.5 microns |
| $PM_{10}$ | Particulate matter with a diameter smaller than 10 microns |
| QA | Quality assurance |
| QC | Quality control |
| QAPP | Quality Assurance Project Plan |
| SCC | Sharp cut cyclone |
| SOA | State of Alaska |
| µm | micrometer |
| $\mu g/m^3$ | micrograms per cubic meter |
| VSCC | Very sharp cut cyclone |
| YKHC | Yukon-Kuskokwim Health Corporation |

## Acknowledgements

The Alaska Department of Environmental Conservation acknowledges the many individuals and entities who contributed to this project. Thank you to the City of Bethel, the Yukon-Kuskokwim Health Corporation Public Health Department, the Orutsararmiut Native Council, KYKD Bethel, Yuut Elitnaurviat, and the Alaska Department of Transportation.

## Project Summary

This report provides an analysis of particulate matter ($PM_{2.5}$ and $PM_{10}$) data measured and reported by the Alaska Department of Environmental Conservation in Bethel, Alaska from May to August 2025. The goal of the study was to document road dust on a typical residential street in Bethel to determine the concentration of $PM_{10}$ and $PM_{2.5}$ particles in the ambient air. In late May 2025, DEC established three air monitoring sites in Bethel. Two monitoring sites were located on either side of a residential roadway, and the third monitoring site was situated away from the main study location to collect background readings. The data collected during the study demonstrate daily average $PM_{10}$ and $PM_{2.5}$ concentrations consistently reporting below U.S. Environmental Protection Agency National Ambient Air Quality Standards.

# Introduction

Road dust is a primary air quality issue in rural Alaska. Various surveys have indicated that road dust impacts air quality in all ecoregions of the state[1]. Road dust has been monitored in Bethel intermittently over the last 20 years by the State of Alaska. Discussions of a road dust study in Bethel started in 2023, but the plans for the study were postponed due to Alaska Department of Environmental Conservation (DEC) staffing shortages. In January 2025, DEC held a planning meeting in Bethel with project partners to work out details for the study. Site selections occurred in April 2025, and monitoring equipment was installed and ran from May to August 2025.

# Project Partners

For this project, DEC partnered with the City of Bethel, the Orutsararmiut Native Council (ONC), and the Yukon-Kuskokwim Health Corporation (YKHC) to ensure that community stakeholders are meaningfully engaged and benefit from this study.

# Public Health and Air Quality Standards

The Clean Air Act (CAA) authorizes the U.S. Environmental Protection Agency (EPA) to set air quality standards to protect the health and welfare of the public and the environment. The EPA has established National Ambient Air Quality Standards (NAAQS) for select pollutants, including particulate matter with a diameter smaller than 10 microns ($PM_{10}$) and particulate matter with a diameter smaller than 2.5 microns ($PM_{2.5}$). The current NAAQS for $PM_{10}$ is 150 $\mu g/m^3$ for the 24-hour average and 35 $\mu g/m^3$ for the $PM_{2.5}$ 24-hour average. There are no hourly NAAQS values set by the EPA.

Particulate matter is frequently classified by size and is described by using an aerodynamic diameter measured in micrometers, or millionths of a meter (µm). Particles can range in size from large specks of soot to fine grains of dust. $PM_{10}$ particles, like dust, pollen, and mold particles, are generally 10 microns and smaller in diameter and are one-tenth the diameter of a human hair. $PM_{2.5}$ particles, including combustion particles, organic compounds, and metals, are generally 2.5 microns in diameter or smaller and are one-thirtieth the diameter of a human hair.

The state and federal air quality standards focus on ‘inhalable’ size particulates, which include both fine and coarse particles. These materials can accumulate in the respiratory and circulatory systems and are associated with numerous health-related impacts. Exposure to coarse particles is primarily associated with the aggravation of respiratory conditions, such as asthma. Fine particles are more closely associated with increased hospital admissions and emergency room visits for heart and lung disease, increased respiratory symptoms and disease, decreased lung function, and even premature death (United States Environmental Protection Agency, 2025).

[1] For access to historical dust reports and studies, see: “*Relevant Projects & Data Analyses”*

Sensitive groups that appear to be at greatest risk to such effects include the elderly, individuals with cardiopulmonary disease such as asthma, and children.

## Sources of Dust in Rural Communities

The road systems in rural communities are used by pedestrians as well as cars, trucks, motorcycles, all-terrain vehicles (ATVs), and bicycles to transport residents within the community. Bethel has both paved and unpaved roads that act as major thoroughfare through the community. Unpaved roads are constructed from local silt, gravel, and sand. Airborne dust typically results from the disturbance of dry road surfaces by vehicle traffic and winds; areas with little to no ground cover may also contribute to airborne dust during wind events. Traffic from gravel roads tracks dust onto paved roads, leading to airborne dust in and around both types of roads throughout the community. Road dust remains an issue even in the fall freeze-up and winter. During dry weather periods, the freeze-dried dust particulates are entrained by vehicle tires and the dust levels in the air can reach the same levels as during dry summer days. To mitigate the dust, the City of Bethel applies palliatives on roadways and encourages behavioral changes in citizens to reduce driving speeds.

## Bethel Location, Community, and Climate Overview

Bethel, Alaska is located on the Kuskokwim River, 70 river miles inland from the Bering Sea and 400 miles west of Anchorage (Figure 1). The community of 6,300 people lies at approximately 60°47'32.0"N, 161°45'21.0"W and encompasses 43.2 square miles of land and 5.5 square miles of water.

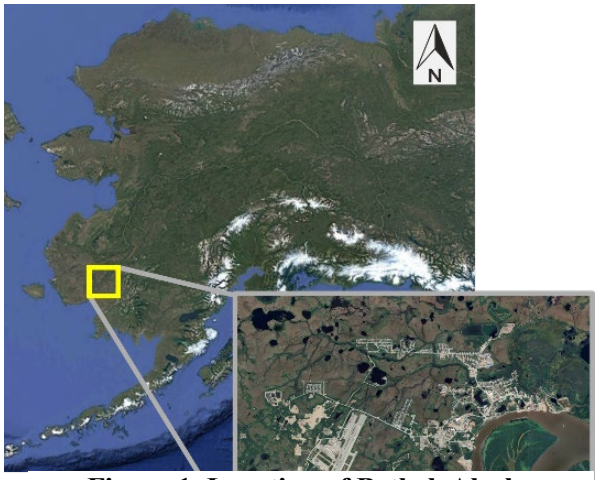


**Figure 1. Location of Bethel, Alaska**

Bethel is a hub community that serves many surrounding villages. Its busy airport has deplaned on average 36,308,467 pounds of mail per year over the past three years (Alaska Department of Transportation, 2025). The river port receives bills of lading at least once a month (excluding winter), and Bethel's large regional hospital is the main access to medical care for most of the Yukon-Kuskokwim Delta (Yukon-Kuskokwim Health Corporation, 2025).

Bethel has a subarctic climate with long, cold winters and short, mild summers. Monthly mean temperatures in Bethel range from 6.6°F in January to 56.1°F in July. The area receives about 19.68 inches of precipitation[2] and 64 inches of snowfall annually, spread across approximately 146 days with precipitation (US Climate Data, 2025). The area has cloudy conditions on

[2] 2025 data is not yet available at time of report; this statistic represents a multi-year average.

approximately 215 days per year. Average wind speeds range from 9 to 13 miles per hour (mph) throughout the year, with stronger gusts often occurring during the winter months.

## Monitoring Equipment

The road dust study employed Met One Environmental Beta Attenuation Mass Monitors (E-BAMs), which automatically measure and record airborne particulate concentration levels using the principle of beta ray attenuation (Met One Instruments, 2025). The E-BAM is not currently designated as an EPA federal equivalent method (FEM) instrument for continuous $PM_{10}$ or $PM_{2.5}$ monitoring, but the unit is designed to accurately predict federal reference method (FRM) or FEM concentration measurements. DEC applied the quality assurance (QA) requirements for the FEM BAM 1020 sampler, which is very similar to the E-BAM in function and performance; these QA requirements are outlined in the project Quality Assurance Project Plan (QAPP) (ADEC, 2025). The study used five E-BAMs: three measuring $PM_{2.5}$ and two measuring $PM_{10}$. One $PM_{2.5}$ E-BAM was stationed at a location away from the study area to act as the control instrument. The other four E-BAMs were located at the study site: two E-BAMs were placed on each side of the roadway with one E-BAM measuring $PM_{2.5}$ and one measuring $PM_{10}$ on each side. Each E-BAM was equipped with temperature and relative humidity sensors and all $PM_{2.5}$ E-BAMs were equipped with winds peed/wind direction sensors. The $PM_{2.5}$ E-BAMs were also equipped with AirSis satellite communication units. The E-BAMs collected hourly average PM data which was then calculated into 24-hour averages.

## Site Descriptions

Two monitoring sites were established alongside Ptarmigan Street to evaluate ambient levels of particulate matter on a residential gravel road. E-BAMs were placed on each side of the road, with a $PM_{2.5}$ and $PM_{10}$ E-BAM at each monitoring site. A fifth E-BAM ($PM_{2.5}$) was located away from the study location to act as a quality control (QC) site. The two sites on Ptarmigan Street were designated as the Owl Park site and the KYKD site (Figure 16, Appendix A). The third site consisted of the control E-BAM and was situated on the Yuut Elitnaurviat Campus (Figure 17, Appendix A). All sites were secured within six-foot fenced enclosures (Figures 18-23, Appendix B).

## Sampling Procedures

Prior to deployment, the E-BAMs were calibrated and run in a collocation in a controlled environment in Anchorage. The E-BAMs were calibrated again at the study location prior to starting the study. Flow checks were conducted prior to the study, midway through the study, and at the conclusion of the study, set by the QA/QC standards outlined in the project QAPP (ADEC, 2025). An audit was also conducted midway through the study. Calibrations and flow checks were performed using a certified calibration standard device. Routine maintenance was

conducted per the manufacturer's guidelines and documented in the field log and QC forms. Data from each E-BAM was downloaded on a weekly basis, either through the AirSis online platform or manually via Met One Comet data extracting software; data were then stored on DEC's internal server. The E-BAMs ran continuously from late May to early August.

Samples were collected continuously, with hourly averages recorded. All E-BAMs used a $PM_{10}$ size-selective inlet. The $PM_{2.5}$ E-BAMs operated with additional sharp cut cyclones (SCC) or very sharp cut cyclones (VSCC) to eliminate particles larger than 2.5 microns. Both the Owl Park $PM_{2.5}$ E-BAM and the Yuut Campus QC E-BAM operated with a SCC and the $PM_{2.5}$ KYKD E-BAM operated with a VSCC.

Upon set-up, an initial QC check was performed on each instrument on May 21-23, 2025. An internal audit and routine maintenance were performed on June 9-10, 2025. Secondary QC checks and routine maintenance for all instruments occurred on July 8-9, 2025. Final QC checks were performed on the instruments on August 11-12, 2025, upon completion of the study.

## Monitoring Results and Discussion

No exceedances of the NAAQS 24-hour health-based standard for both $PM_{2.5}$ or $PM_{10}$ were recorded. The highest particulate matter concentrations occurred in July, with August reporting the next highest values.

## $PM_{10}$ Summary

$PM_{10}$ data were compared to the NAAQS 24-hour heath-based standard of 150 µg/m$^3$; no exceedances were recorded during the study period. The highest 24-hour $PM_{10}$ value range occurred in July, and the highest daily average was observed on July 5$^{th}$ with a concentration of 106.54 µg/m$^3$. The KYKD site had the highest reading, but the Owl Park site had more readings in a higher range. The Owl Park site had three readings in the 80 µg/m$^3$ range while the KYKD site read between 50 µg/m$^3$ to 60 µg/m$^3$ for the majority of its higher values. Higher PM readings were observed during periods with stronger winds. The highest hourly wind speed values were observed at the end of June through July. Hourly wind speed is displayed in Figure 9 and Figure 10.

**Table 1. $PM_{10}$ First and Second Maximum**

| Date | Concentration | Maximum | Site |
|---|---|---|---|
| 7/5/2025 | 106.54 µg/m$^3$ | 1$^{st}$ | KYKD |
| 6/27/2025 | 86.38 µg/m$^3$ | 2$^{nd}$ | Owl Park |

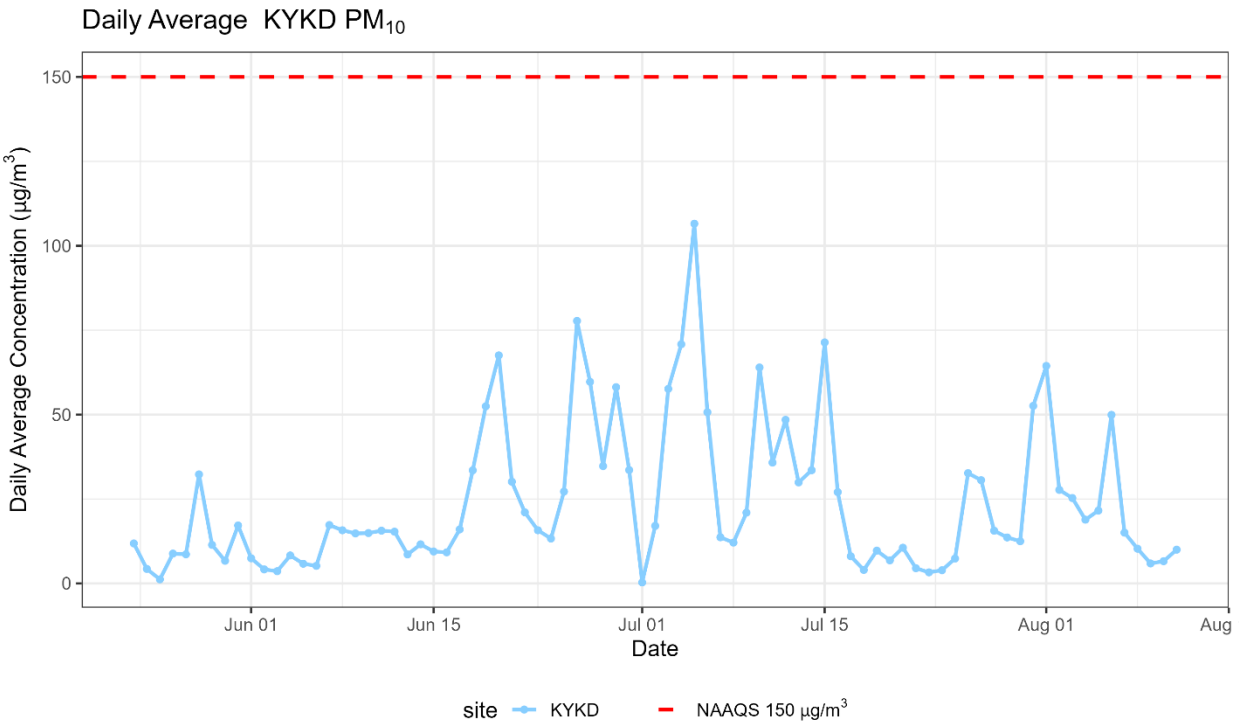


**Figure 2. KYKD Site Daily Average $PM_{10}$**

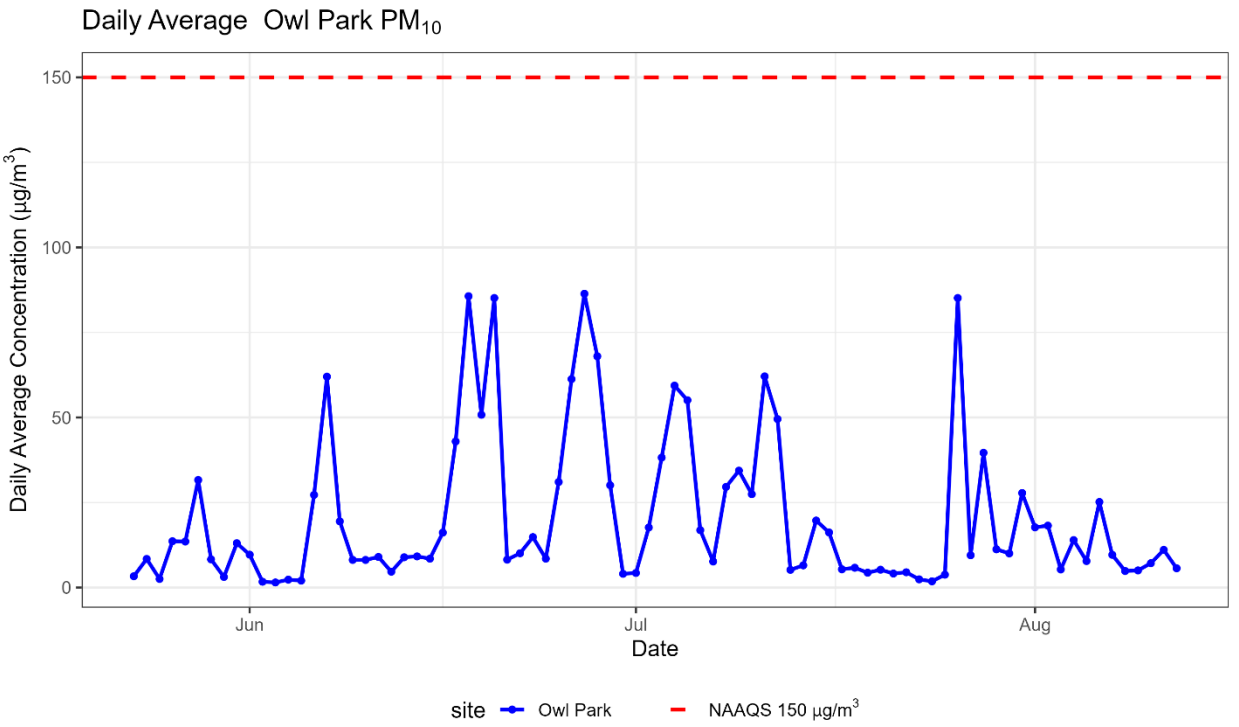


**Figure 3. Owl Park Site Daily Average $PM_{10}$**

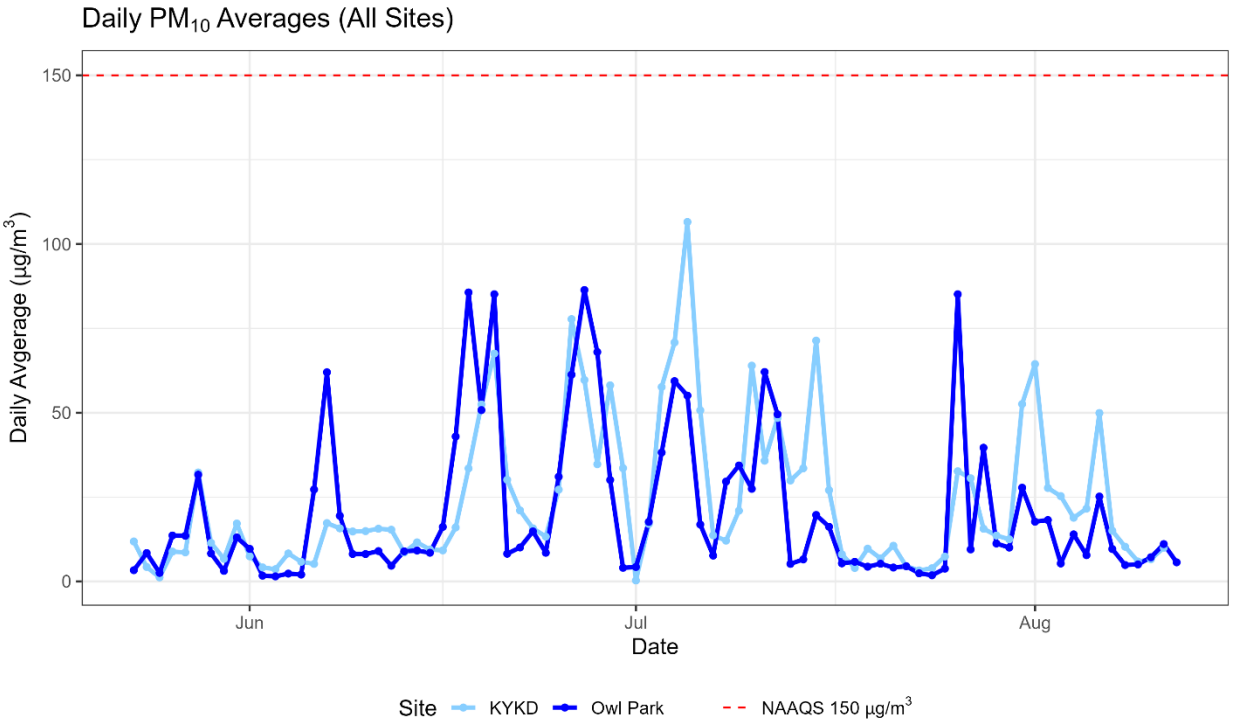


**Figure 4. All Sites Daily Average $PM_{10}$**

## $PM_{2.5}$ Summary

$PM_{2.5}$ data were compared to the NAAQS 24-hour standard of 35 µg/m$^3$; no exceedances were recorded during the study period. The highest 24-hour $PM_{2.5}$ value observed was 13.50 µg/m$^3$ on July 25. Both highest readings came from the Owl Park site and were not mirrored by $PM_{10}$ at the site. For both sites, some of the elevated $PM_{2.5}$ readings coincided with stronger winds. Specifically, the Owl Park site saw spikes of $PM_{2.5}$ in late July and early August which coincided with steady winds that ranged between 4 m/s and 6.6 m/s. Hourly wind speed is displayed in Figure 9 and Figure 10.

**Table 2. $PM_{2.5}$ First and Second Maximum**

| Date | Concentration | Maximum | Site |
|---|---|---|---|
| 7/25/2025 | 13.50 µg/m$^3$ | 1$^{st}$ | Owl Park |
| 7/22/2025 | 11.08 µg/m$^3$ | 2$^{nd}$ | Owl Park |

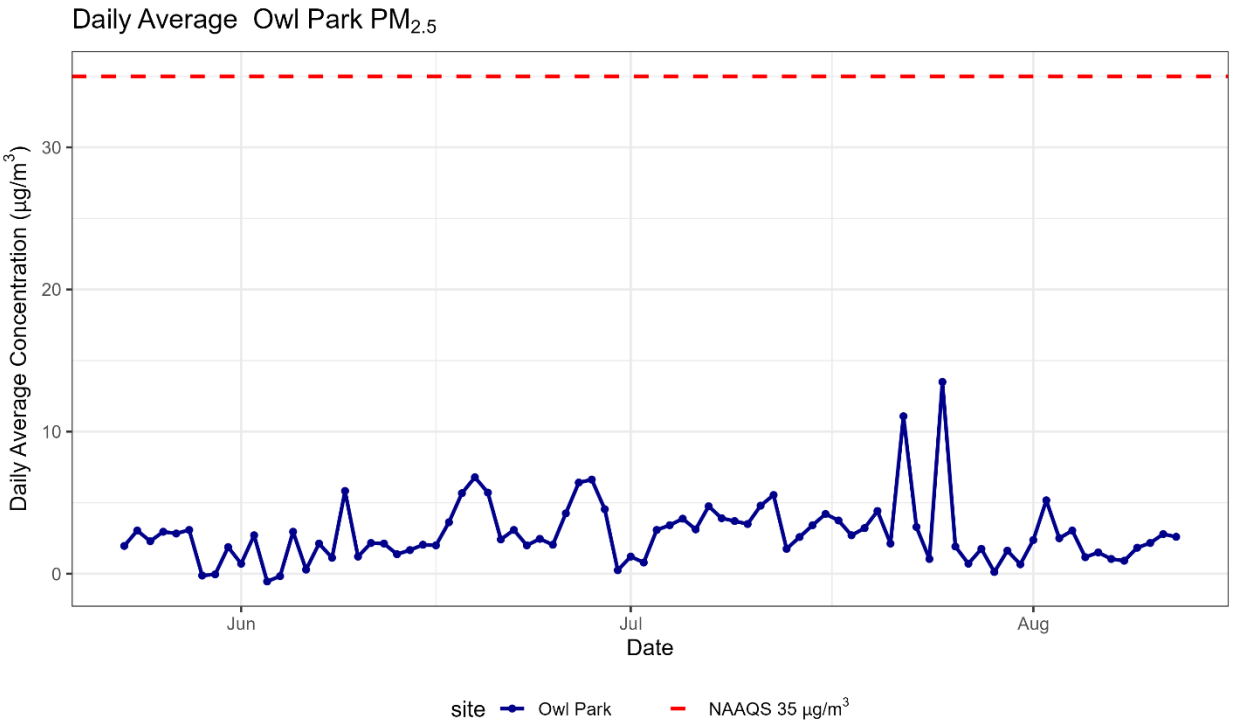


**Figure 5. Owl Park Site Daily Average $PM_{2.5}$**

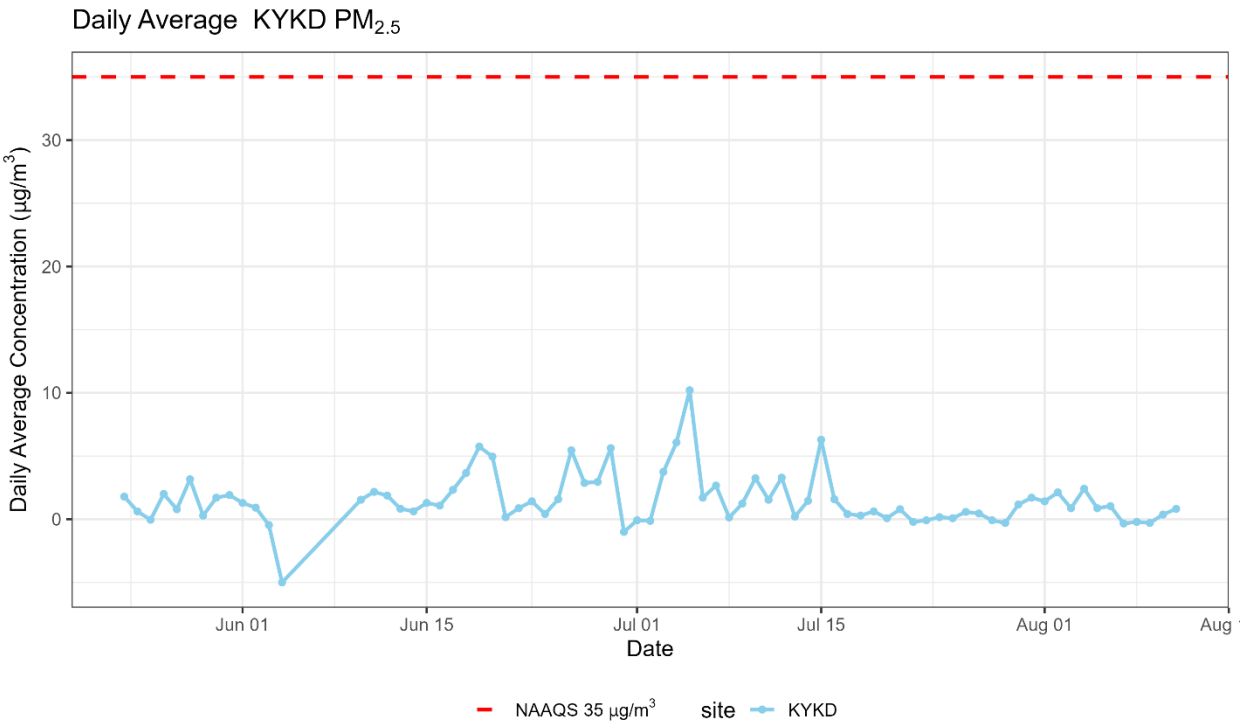


**Figure 6. KYKD Site Daily Average $PM_{2.5}$**

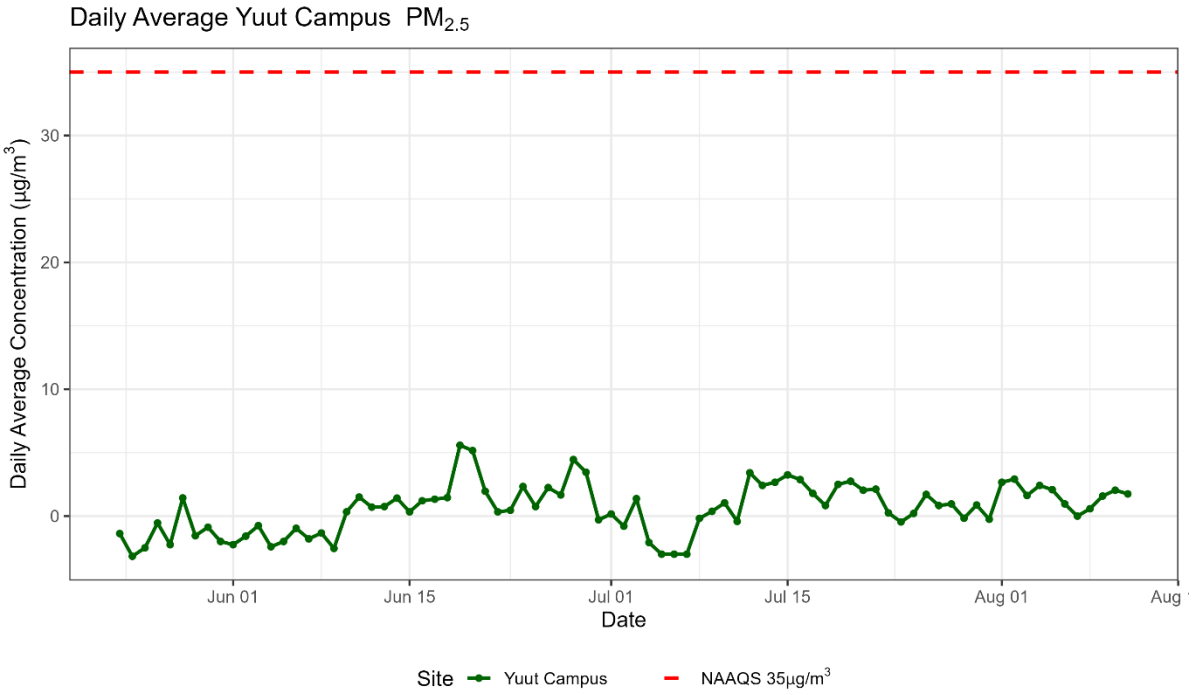


**Figure 7. Yuut Elitnaurviat Campus Daily Average $PM_{2.5}$**

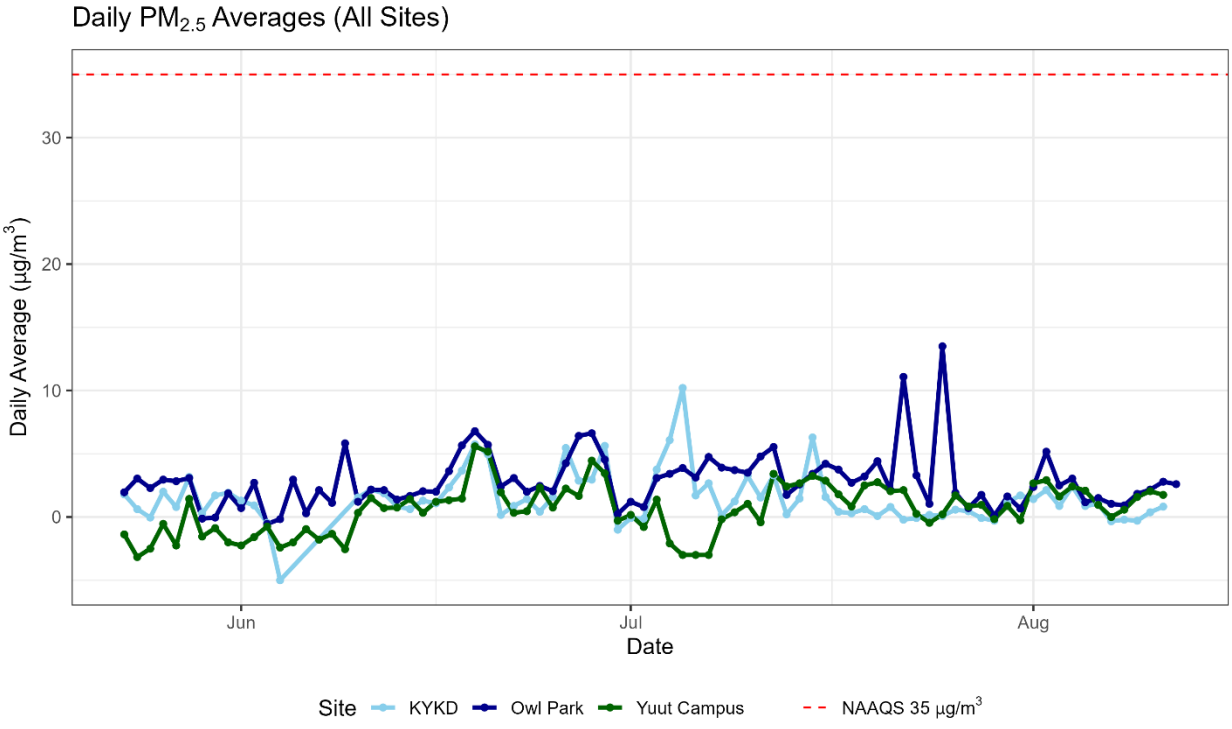


**Figure 8. All Sites Daily Average $PM_{2.5}$**

## Traffic Counts

From May 22 to June 9, 2025, DEC installed two traffic counters on Ptarmigan Street: one east of the study site and one west of the study site. Two more traffic counters were installed on Owl Street, both north and south of the Ptarmigan Street and Owl Street intersection. Refer to Figure 16, Appendix A, for a map showing the traffic counter locations.

Traffic counters were on loan from the Alaska Department of Transportation (DOT). The traffic counters operate via an air-filled tube that spans the width of the road. As vehicles or ATVs drive over, the displaced air in the tube triggers the control unit to tally a vehicle. The weight of a person walking normally does not trigger the counter. The limited battery capacity of the monitors enabled them to operate for approximately one week of the study period.

Just before the study period began, the City of Bethel applied EK35 dust control solution to the study area; this treatment was not part of the planned study design and DEC did not receive advance notice of its timing. The positive effect of the palliative on reducing dust is evident in the data from the beginning of the study, as shown in Figure 13 and Figure 14 comparing weather trends and reported hourly PM concentrations. This is also evident in the traffic graphs (Figures 9-12) that report lower PM values in conjunction with the average traffic pattern, compared to later in the study period with higher PM values.

At the Ptarmigan Street east site, traffic volumes ranged from 1,282 to 4,854 vehicles per day. At the Ptarmigan Street west site, traffic volumes ranged from 1,579 to 3,898 vehicles per day. Some instances of higher traffic volume corresponded with subsequent slight increases in PM concentration for both $PM_{10}$ and $PM_{2.5}$. However, there were also instances of increased PM concentrations without higher traffic volume, as well as instances of increased traffic volume without subsequent increased PM. Days with increased PM concentrations and normal traffic levels can be associated with periods of dry weather. Traffic patterns were averaged over the week-long period of traffic counter operation, with assumptions made that the observed patterns remained consistent for the duration of the study.

Note that the following figures (Figure 9-12) are shown in hourly concentrations, not 24-hour concentrations. The EPA does not set NAAQS for hourly concentrations.

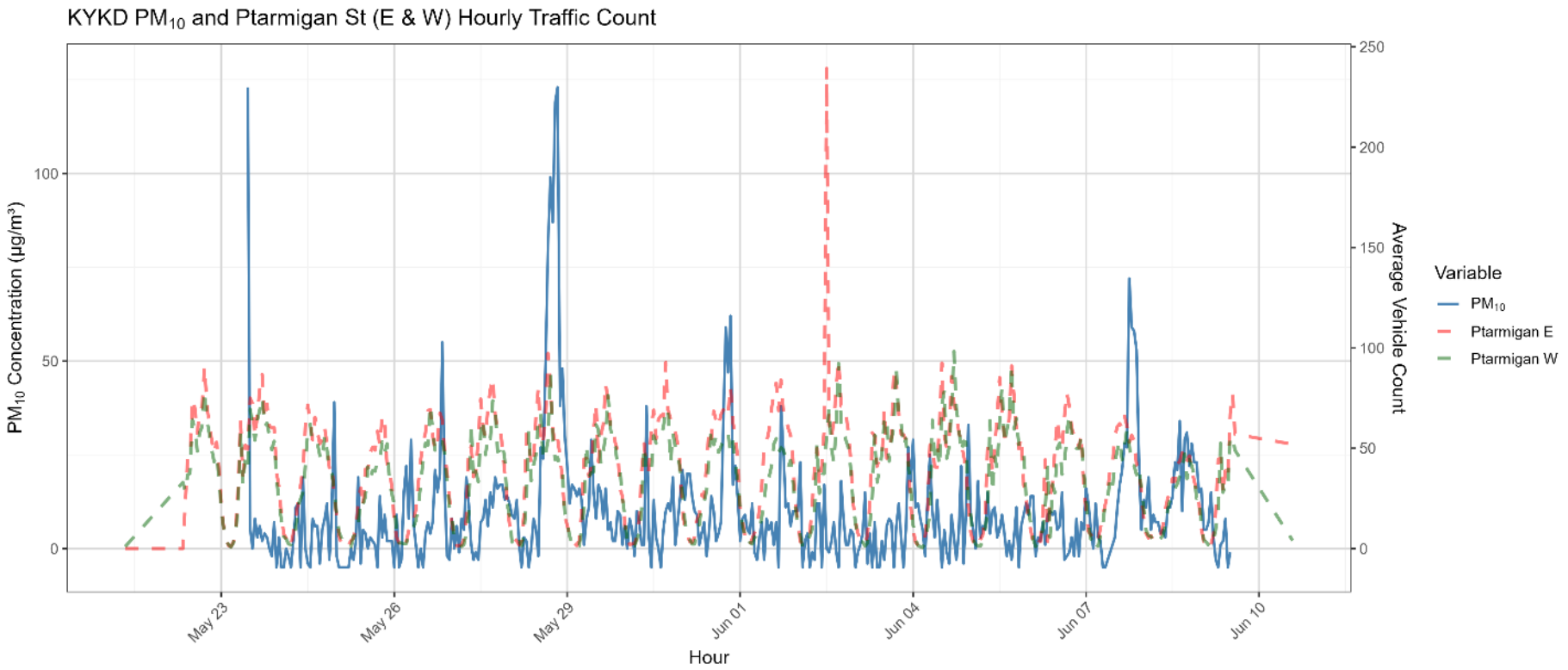


**Figure 9. KYKD Site $PM_{10}$ with Ptarmigan Street Traffic Counts**

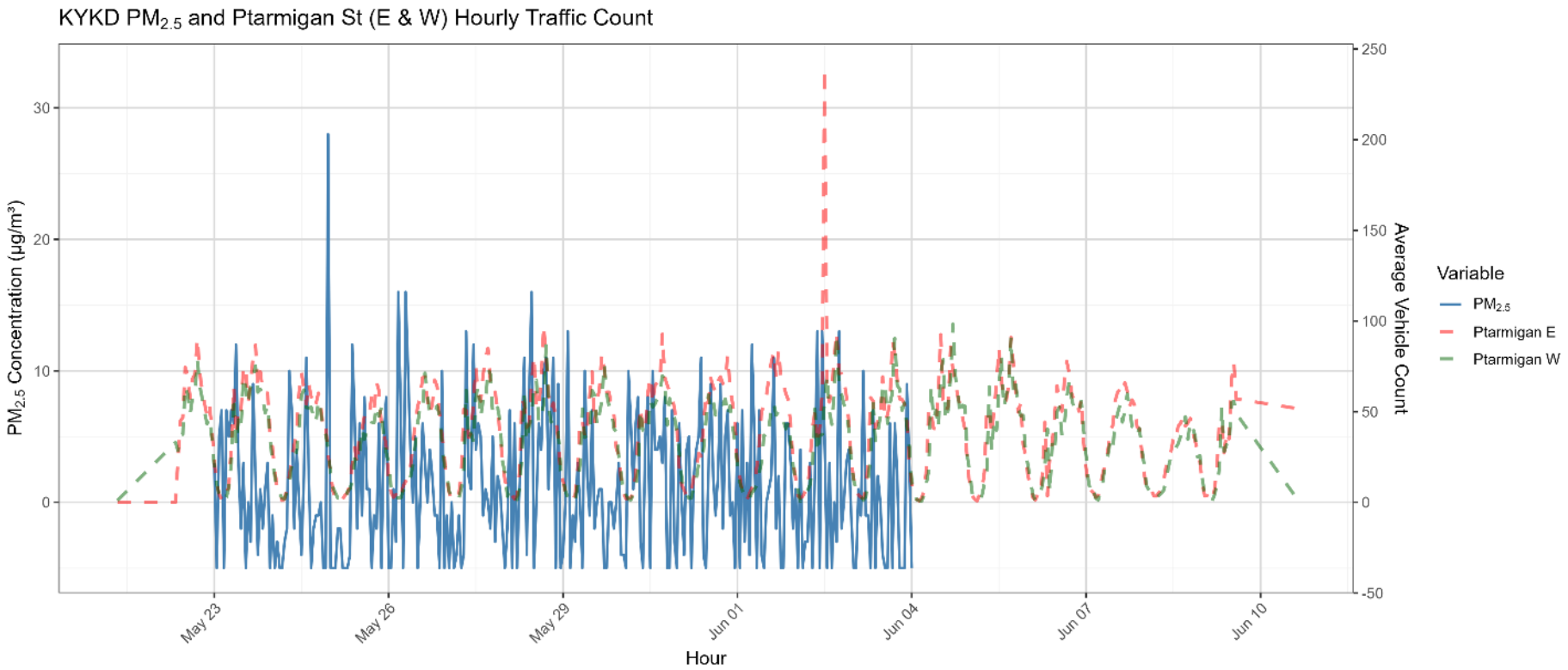


**Figure 10. KYKD Site $PM_{2.5}$ with Ptarmigan Street Traffic Counts**

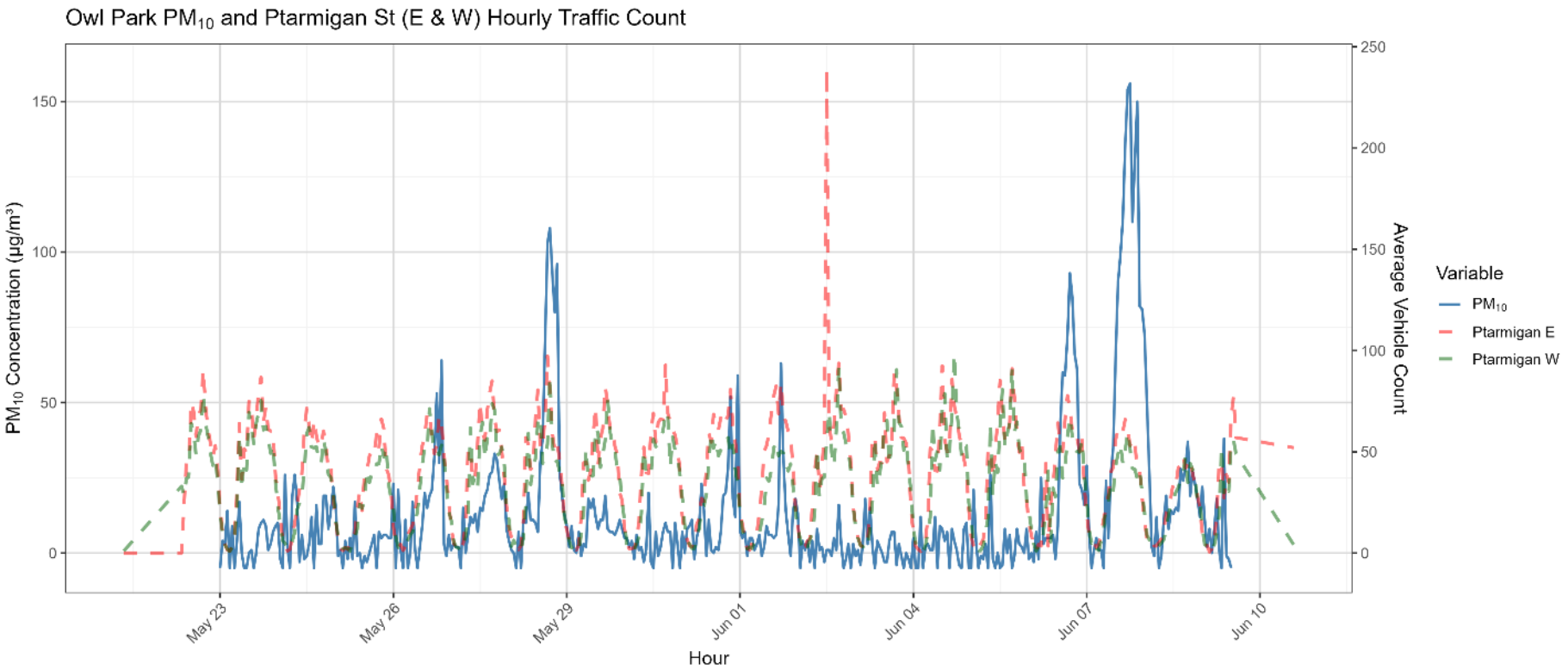


**Figure 11. Owl Park Site $PM_{10}$ with Ptarmigan Street Traffic Counts**

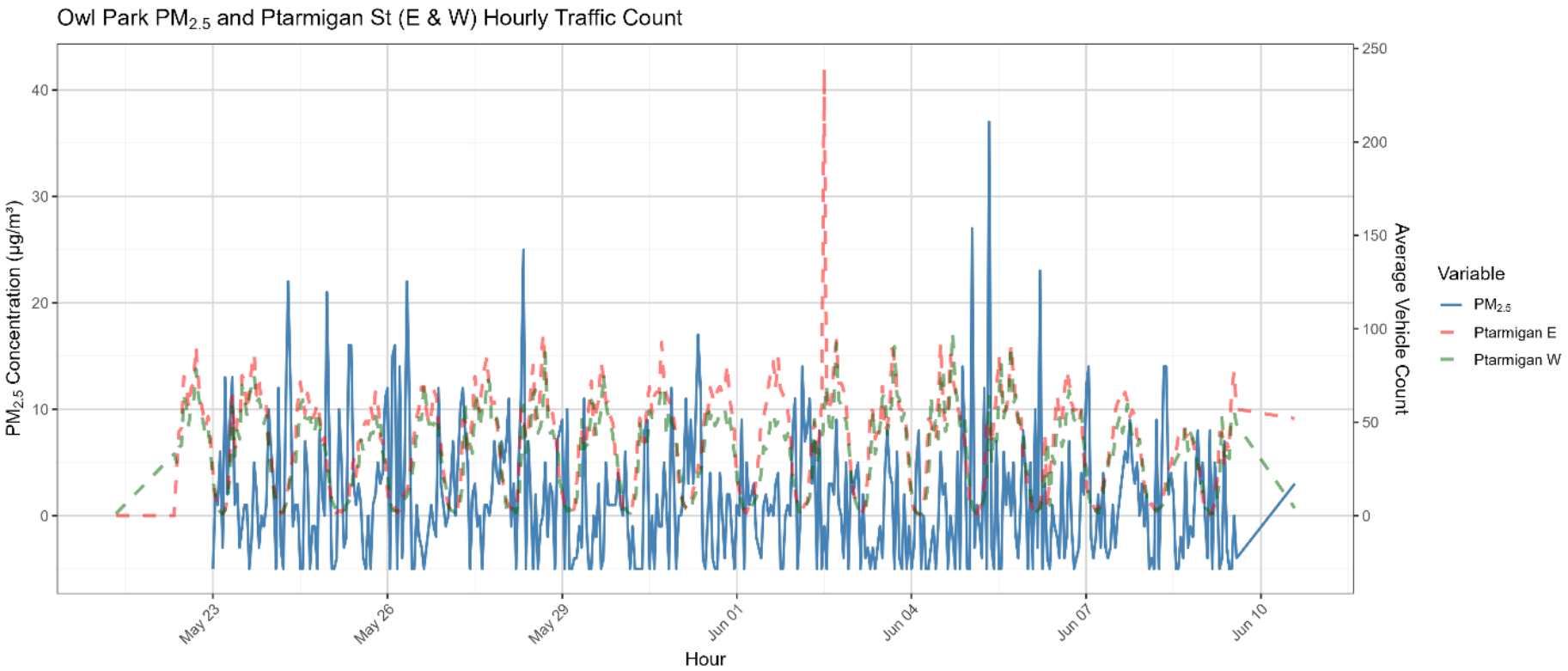


**Figure 12. Owl Park Site $PM_{2.5}$ with Ptarmigan Street Traffic Counts**

# Hourly Weather and PM

E-BAMs measuring $PM_{2.5}$ were equipped with wind speed and wind direction sensors. Meteorological data from the National Oceanic and Atmospheric Administration (NOAA), including precipitation totals, is provided in Appendix C. PM concentrations increased during periods of drier and windier weather, while PM concentrations decreased during wetter periods. Figure 13 and Figure 14 show the hourly PM concentrations, temperature, and wind speed patterns during the study period at both the KYKD site and the Owl Park Site.

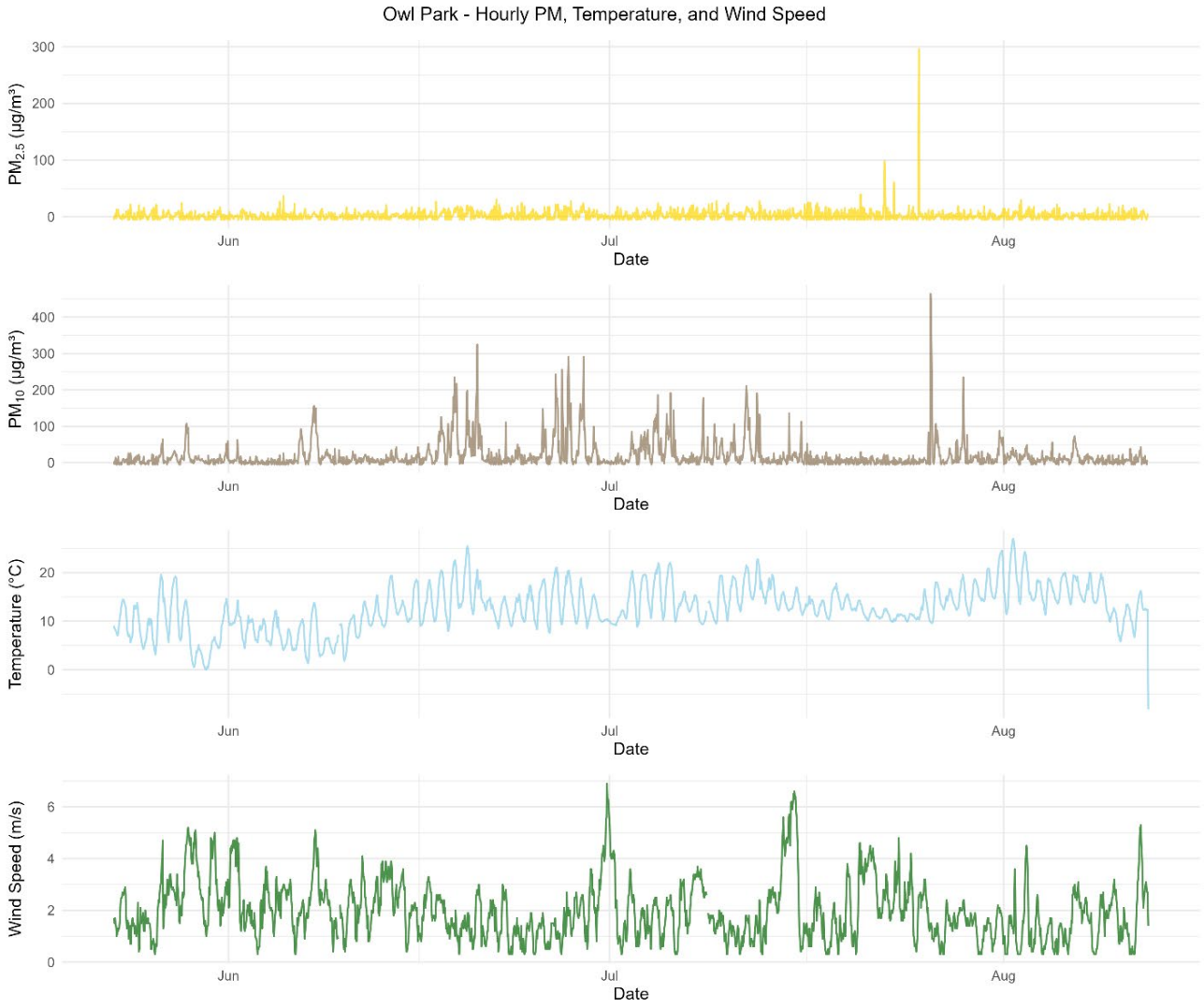


**Figure 13. Owl Park Site Hourly PM, Temperature and Wind Speed**


**Figure 14. KYKD Site Hourly PM, Temperature and Wind Speed**

# Conclusions

The 2025 Bethel Road Dust Study conducted by DEC in partnership with the City of Bethel, Yukon-Kuskokwim Health Corporation Public Health Department, Orutsararmiut Native Council, KYKD Bethel, Yuut Elitnaurviat, and the Alaska Department of Transportation, documented ambient concentrations of particulate matter ($PM_{10}$ and $PM_{2.5}$) in a residential area of Bethel, Alaska. Over the course of three months (late May to early August), data collected from five strategically placed E-BAM monitors revealed significant fluctuations in daily average concentrations of both $PM_{10}$ and $PM_{2.5}$, however, levels did not exceed the EPA's 24-hour NAAQS of 150 $\mu g/m^3$ for $PM_{10}$ and 35 $\mu g/m^3$ for $PM_{2.5}$, during the monitoring period.

The study highlighted the persistent presence of road dust in Bethel and underscored the role of unpaved roads, vehicle traffic, and dry weather conditions in contributing to airborne particulate levels. Shortly after monitoring began, the study area received an application of EK35 dust palliative. This treatment was not part of the planned study design, and DEC did not receive advance notice of its timing. As a result, the dataset reflects a period in which roadway conditions changed during the study, with lower particulate levels observed immediately following the application. In addition to the palliative application, temporary road closures associated with local infrastructure projects also influenced roadway conditions toward the end of the study period. This context is important for interpreting the temporal patterns in PM concentrations observed throughout the monitoring period.

This project not only provided valuable baseline data for future air quality assessments but also demonstrated the effectiveness of community collaboration in addressing public health concerns. The findings support continued monitoring and mitigation efforts, including the use of dust suppressants, public education on driving behaviors, and infrastructure planning to reduce particulate emissions. Ultimately, the study contributes to a broader understanding of air quality challenges in rural Alaska and reinforces the importance of localized data in shaping responsive environmental health strategies.

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# Appendix A – Study Site Maps


**Figure 15. Map of Bethel, AK and Study Locations**


**Figure 16. KYKD and Owl Park Study Locations**

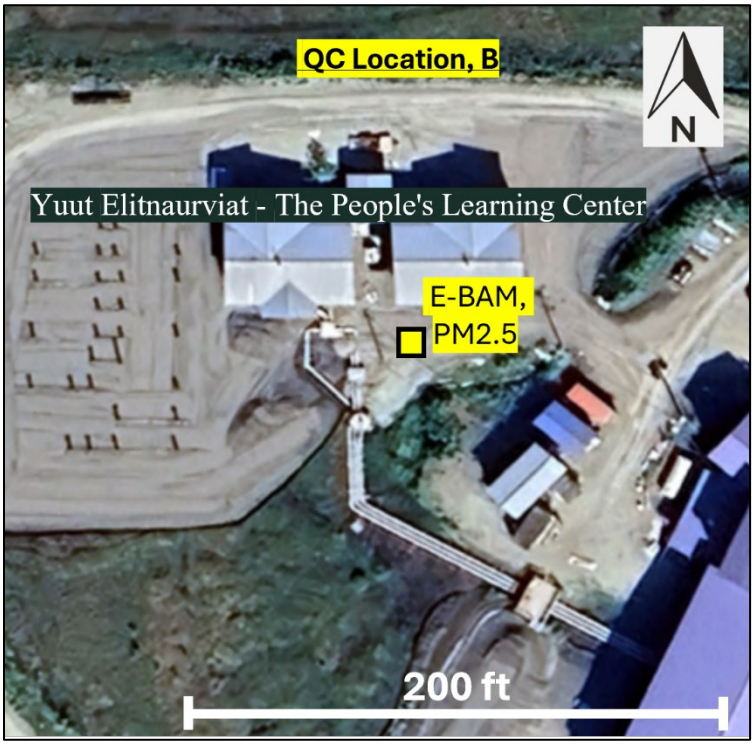


**Figure 17. Yuut Elitnaurviat QC Location**

# Appendix B – Site Photos

**Figure 18. KYKD Site looking inwards, from left: North, South, East, West**

**Figure 19. KYKD Site looking outwards, from left: North, South, East, West**

**Figure 20. Owl Park Site looking inwards, from left: North, South, East, West**

**Figure 21. Owl Park Site looking outwards, from left: North, South, East, West**


**Figure 22. QC Site looking inwards, from left: North, South, East, West**

**Figure 23. QC Site looking outwards, from left: North, South, East, West**

# Appendix C – Meteorological Data

Daily weather data for Bethel for each month of the study (May through August) is provided below. Data were retrieved from National Oceanic and Atmospheric Administration (NOAA) online weather data tool (NOAA Online Weather Data). Daily maximum, minimum and average temperature (degrees F), average temperature departure from normal (degrees F), and precipitation are recorded for all days of each month.

*Please note the following:*

- *Precipitation: A 'T' indicates that only a trace of precipitation fell. Trace is defined as less than the smallest measurable amount:*
  - *Liquid precipitation – less than 0.005 inches*
  - *Snowfall – less than 0.05 inches*
- *Cells in Gold have the highest temperature value for the month*
- *Cells in Blue have the lowest temperature value for the month*
- *Cells in Green have the greatest amount of precipitation for the month*

**Table 3. Meteorological Data for Bethel Area, AK - May 2025**

| Date | Maximum (°F) | Minimum (°F) | Average (°F) | Departure | Precipitation (in) |
|---|---|---|---|---|---|
| 2025-05-01 | 50 | 30 | 40.0 | 1.9 | T |
| 2025-05-02 | 46 | 31 | 38.5 | 0.0 | 0.00 |
| 2025-05-03 | 45 | 30 | 37.5 | -1.4 | 0.00 |
| 2025-05-04 | 53 | **28** | 40.5 | 1.2 | 0.02 |
| 2025-05-05 | 53 | 35 | 44.0 | 4.3 | 0.00 |
| 2025-05-06 | 39 | 32 | 35.5 | -4.5 | 0.03 |
| 2025-05-07 | 40 | **28** | 34.0 | -6.4 | 0.00 |
| 2025-05-08 | 45 | 31 | 38.0 | -2.7 | T |
| 2025-05-09 | 56 | 33 | 44.5 | 3.5 | 0.00 |
| 2025-05-10 | 58 | 34 | 46.0 | 4.7 | 0.00 |
| 2025-05-11 | 53 | 33 | 43.0 | 1.4 | **0.45** |
| 2025-05-12 | 45 | 36 | 40.5 | -1.4 | 0.02 |
| 2025-05-13 | 46 | 35 | 40.5 | -1.7 | 0.12 |
| 2025-05-14 | 54 | 33 | 43.5 | 1.0 | 0.00 |
| 2025-05-15 | 54 | 42 | 48.0 | 5.2 | T |
| 2025-05-16 | 54 | 38 | 46.0 | 3.0 | 0.03 |
| 2025-05-17 | 44 | 38 | 41.0 | -2.3 | 0.02 |
| 2025-05-18 | 43 | 32 | 37.5 | -6.1 | T |
| 2025-05-19 | 43 | 32 | 37.5 | -6.4 | T |

| Date | Maximum (°F) | Minimum (°F) | Average (°F) | Departure | Precipitation (in) |
|---|---|---|---|---|---|
| 2025-05-20 | 45 | 33 | 39.0 | -5.2 | 0.03 |
| 2025-05-21 | 53 | 38 | 45.5 | 1.0 | 0.09 |
| 2025-05-22 | 52 | 41 | 46.5 | 1.7 | 0.03 |
| 2025-05-23 | 56 | 43 | 49.5 | 4.4 | 0.01 |
| 2025-05-24 | 55 | 40 | 47.5 | 2.1 | T |
| 2025-05-25 | 50 | 37 | 43.5 | -2.3 | 0.03 |
| 2025-05-26 | **66** | 37 | 51.5 | 5.4 | T |
| 2025-05-27 | 65 | 41 | 53.0 | 6.6 | 0.00 |
| 2025-05-28 | 57 | 37 | 47.0 | 0.2 | T |
| 2025-05-29 | 39 | 31 | 35.0 | -12.2 | 0.00 |
| 2025-05-30 | 44 | 29 | 36.5 | -11.0 | 0.01 |
| 2025-05-31 | 57 | 36 | 46.5 | -1.4 | 0.01 |

**Table 4. Meteorological Data for Bethel Area, AK - June 2025**

| Date | Maximum (°F) | Minimum (°F) | Average (°F) | Departure | Precipitation (in) |
|---|---|---|---|---|---|
| 2025-06-01 | 59 | 43 | 51.0 | 2.7 | 0.01 |
| 2025-06-02 | 51 | 35 | 43.0 | -5.6 | 0.04 |
| 2025-06-03 | 51 | 39 | 45.0 | -4.0 | 0.08 |
| 2025-06-04 | 53 | 39 | 46.0 | -3.4 | 0.22 |
| 2025-06-05 | 46 | 37 | 41.5 | -8.3 | 0.02 |
| 2025-06-06 | 49 | 37 | 43.0 | -7.2 | 0.00 |
| 2025-06-07 | 56 | 32 | 44.0 | -6.6 | 0.00 |
| 2025-06-08 | 42 | 35 | 38.5 | -12.5 | 0.00 |
| 2025-06-09 | 49 | 36 | 42.5 | -8.9 | 0.03 |
| 2025-06-10 | 51 | **31** | 41.0 | -10.8 | 0.00 |
| 2025-06-11 | 56 | 39 | 47.5 | -4.6 | T |
| 2025-06-12 | 59 | 44 | 51.5 | -1.0 | 0.07 |
| 2025-06-13 | 67 | 45 | 56.0 | 3.1 | T |
| 2025-06-14 | 57 | 49 | 53.0 | -0.2 | T |
| 2025-06-15 | 65 | 47 | 56.0 | 2.4 | 0.06 |
| 2025-06-16 | 63 | 47 | 55.0 | 1.1 | T |
| 2025-06-17 | 66 | 46 | 56.0 | 1.8 | 0.00 |
| 2025-06-18 | 71 | 44 | 57.5 | 3.0 | 0.00 |
| 2025-06-19 | **75** | 53 | 64.0 | 9.2 | 0.00 |
| 2025-06-20 | 70 | 49 | 59.5 | 4.4 | T |

| Date | Maximum (°F) | Minimum (°F) | Average (°F) | Departure | Precipitation (in) |
|---|---|---|---|---|---|
| 2025-06-21 | 57 | 47 | 52.0 | -3.3 | 0.04 |
| 2025-06-22 | 58 | 42 | 50.0 | -5.6 | 0.00 |
| 2025-06-23 | 58 | 45 | 51.5 | -4.3 | 0.03 |
| 2025-06-24 | 62 | 47 | 54.5 | -1.5 | 0.47 |
| 2025-06-25 | 66 | 44 | 55.0 | -1.2 | 0.00 |
| 2025-06-26 | 69 | 40 | 54.5 | -1.9 | 0.00 |
| 2025-06-27 | 67 | 43 | 55.0 | -1.5 | 0.27 |
| 2025-06-28 | 64 | 47 | 55.5 | -1.1 | T |
| 2025-06-29 | 58 | 44 | 51.0 | -5.8 | 0.01 |
| 2025-06-30 | 52 | 47 | 49.5 | -7.4 | **1.15** |

**Table 5. Meteorological Data for Bethel Area, AK - July 2025**

| Date | Maximum (°F) | Minimum (°F) | Average (°F) | Departure | Precipitation (in) |
|---|---|---|---|---|---|
| 2025-07-01 | 52 | 46 | 49.0 | -7.9 | 0.43 |
| 2025-07-02 | 67 | 49 | 58.0 | 1.0 | 0.15 |
| 2025-07-03 | 67 | **42** | 54.5 | -2.5 | T |
| 2025-07-04 | 70 | 50 | 60.0 | 3.0 | 0.00 |
| 2025-07-05 | 71 | 47 | 59.0 | 1.9 | 0.00 |
| 2025-07-06 | 59 | 48 | 53.5 | -3.6 | 0.32 |
| 2025-07-07 | 58 | 48 | 53.0 | -4.0 | 0.00 |
| 2025-07-08 | 55 | 47 | 51.0 | -6.0 | 0.00 |
| 2025-07-09 | 65 | 47 | 56.0 | -1.0 | T |
| 2025-07-10 | 66 | 48 | 57.0 | 0.1 | 0.00 |
| 2025-07-11 | 69 | 53 | 61.0 | 4.2 | 0.00 |
| 2025-07-12 | 73 | 56 | 64.5 | 7.7 | 0.10 |
| 2025-07-13 | 66 | 54 | 60.0 | 3.3 | T |
| 2025-07-14 | 60 | 52 | 56.0 | -0.6 | T |
| 2025-07-15 | 62 | 51 | 56.5 | 0.0 | 0.00 |
| 2025-07-16 | 58 | 50 | 54.0 | -2.4 | 0.38 |
| 2025-07-17 | 56 | 50 | 53.0 | -3.3 | 0.40 |
| 2025-07-18 | 62 | 48 | 55.0 | -1.2 | 0.01 |
| 2025-07-19 | 58 | 52 | 55.0 | -1.1 | 0.16 |
| 2025-07-20 | 56 | 50 | 53.0 | -3.0 | 0.18 |
| 2025-07-21 | 53 | 48 | 50.5 | -5.4 | 0.03 |
| 2025-07-22 | 53 | 49 | 51.0 | -4.9 | 0.13 |

| Date | Maximum (°F) | Minimum (°F) | Average (°F) | Departure | Precipitation (in) |
|---|---|---|---|---|---|
| 2025-07-23 | 51 | 48 | 49.5 | -6.3 | 0.31 |
| 2025-07-24 | 51 | 48 | 49.5 | -6.2 | **0.50** |
| 2025-07-25 | 59 | 48 | 53.5 | -2.1 | 0.00 |
| 2025-07-26 | 62 | 47 | 54.5 | -1.0 | 0.00 |
| 2025-07-27 | 59 | 53 | 56.0 | 0.6 | T |
| 2025-07-28 | 65 | 52 | 58.5 | 3.2 | 0.00 |
| 2025-07-29 | 63 | 49 | 56.0 | 0.7 | 0.00 |
| 2025-07-30 | 67 | 54 | 60.5 | 5.3 | 0.00 |
| 2025-07-31 | **74** | 56 | 65.0 | 9.9 | 0.00 |

**Table 6. Meteorological Data for Bethel Area, AK - August 2025**

| Date | Maximum (°F) | Minimum (°F) | Average (°F) | Departure | Precipitation (in) |
|---|---|---|---|---|---|
| 2025-08-01 | **78** | 49 | 63.5 | 8.4 | T |
| 2025-08-02 | 74 | 51 | 62.5 | 7.5 | T |
| 2025-08-03 | 64 | 54 | 59.0 | 4.0 | 0.02 |
| 2025-08-04 | 65 | 50 | 57.5 | 2.6 | T |
| 2025-08-05 | 67 | 53 | 60.0 | 5.1 | T |
| 2025-08-06 | 66 | 52 | 59.0 | 4.2 | T |
| 2025-08-07 | 67 | 54 | 60.5 | 5.7 | 0.01 |
| 2025-08-08 | 67 | 54 | 60.5 | 5.8 | T |
| 2025-08-09 | 54 | 43 | 48.5 | -6.2 | 0.04 |
| 2025-08-10 | 54 | 40 | 47.0 | -7.6 | 0.03 |
| 2025-08-11 | 59 | 41 | 50.0 | -4.6 | 0.00 |
| 2025-08-12 | 56 | 51 | 53.5 | -1.0 | 0.08 |
| 2025-08-13 | 56 | 48 | 52.0 | -2.4 | 0.15 |
| 2025-08-14 | 58 | 45 | 51.5 | -2.9 | 0.00 |
| 2025-08-15 | 57 | 42 | 49.5 | -4.8 | T |
| 2025-08-16 | 57 | 47 | 52.0 | -2.2 | T |
| 2025-08-17 | 57 | 50 | 53.5 | -0.6 | 0.01 |
| 2025-08-18 | 57 | 51 | 54.0 | 0.0 | T |
| 2025-08-19 | 64 | 50 | 57.0 | 3.1 | 0.03 |
| 2025-08-20 | 62 | 42 | 52.0 | -1.8 | 0.00 |
| 2025-08-21 | 59 | 52 | 55.5 | 1.9 | 0.06 |
| 2025-08-22 | 58 | 50 | 54.0 | 0.5 | 0.02 |
| 2025-08-23 | 62 | 53 | 57.5 | 4.2 | 0.05 |

| Date | Maximum (°F) | Minimum (°F) | Average (°F) | Departure | Precipitation (in) |
|---|---|---|---|---|---|
| 2025-08-24 | 60 | 56 | 58.0 | 4.8 | 0.08 |
| 2025-08-25 | 60 | 51 | 55.5 | 2.5 | 0.33 |
| 2025-08-26 | 56 | 50 | 53.0 | 0.2 | **1.86** |
| 2025-08-27 | 57 | 45 | 51.0 | -1.6 | 0.20 |
| 2025-08-28 | 51 | 42 | 46.5 | -5.9 | 0.02 |
| 2025-08-29 | 56 | **37** | 46.5 | -5.7 | T |
| 2025-08-30 | 51 | 47 | 49.0 | -2.9 | 0.07 |
| 2025-08-31 | 56 | 50 | 53.0 | 1.3 | 0.17 |

**Table 7. Meteorological Average Data for Bethel, AK**

| Month Avg | Maximum (°F) | Minimum (°F) | Average (°F) | Departure | Precipitation (in) |
|---|---|---|---|---|---|
| **May** | 50.3 | 34.6 | 42.5 | -0.5 | 0.03 |
| **June** | 58.9 | 42.4 | 50.7 | -2.6 | 0.08 |
| **July** | 61.5 | 49.7 | 55.6 | -0.7 | 0.10 |
| **August** | 60.2 | 48.4 | 54.3 | 0.4 | 0.10 |