

# Alaska Department of Environmental Conservation



## **Amendments to: State Air Quality Control Plan**

### **Vol. III: Appendix III.D.7.05**

**{Appendix to Volume II. Analysis of Problems, Control Actions;  
Section III. Area-wide Pollutant Control Program; D. Particulate  
Matter; 7. Fairbanks North Star Borough PM2.5 Control Plan,  
Serious Requirements}**

**Draft**

May 10, 2019

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Governor**

**Jason W. Brune  
Commissioner**

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## **Appendix III.D.7.05**

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Fairbanks North Star Borough Draft Air Quality Monitoring Plan 2017-2018

# DRAFT AIR QUALITY MONITORING PLAN

2017-2018

*Fairbanks North Star Borough*

July 13, 2017

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## **A. Introduction**

### **a. Background**

In December of 2009, the EPA designated a part of the Fairbanks North Star Borough (FNSB) as a non-attainment area for particulate matter 2.5 microns in diameter or smaller (PM<sub>2.5</sub>). Prior to July 2016 the FNSB had operated multiple regulatory monitoring sites and special purpose monitoring stations in the Borough, per the Memorandum of Understanding between the Alaska Department of Environmental Conservation (ADEC) and FNSB. In July of 2016 FNSB returned regulatory air quality monitoring responsibilities to ADEC. The FNSB Assembly passed Ordinance No. 2016-20-1A on August 11, 2016 which appropriated \$290,400 to fund the Community-Based Air Quality Monitoring Program for fiscal years FY17, FY18, and FY19. In June of 2017, the EPA re-classified the FNSB PM<sub>2.5</sub> non-attainment area as a serious area.

Extensive ambient air monitoring has been completed in the non-attainment area, ranging from regulatory monitors to mobile monitors, and a continuation of varied monitoring programs is needed to:

- Further the understanding and extent of the PM<sub>2.5</sub> pollution;
- Provide the FNSB and the public with actionable information; and,
- Gauge progress towards attainment of the ambient standard.

### **b. Roles and Responsibilities**

Stakeholders in the community monitoring program include: FNSB, ADEC, Mayor's Air Quality Working Group, and Contractor(s). Responsibilities of each stakeholder under this monitoring plan are as follows:

FNSB Staff	Manage the community monitoring program including project coordination amongst stakeholders, contract management, and budgeting. Perform monitor calibration, data management, and data validation.
Contractor	Router installation/configuration, monitor installation and maintenance, and monitor inspection.
ADEC	Hosting online data services for personal DataRAMs (pDR), loan six (6) pDR units to FNSB, and providing review/feedback on monitoring plan.
AQ Working Group	Develop purpose for community monitoring program.

**B. Monitoring Program Purpose**

On June 9<sup>th</sup>, 2017 the Mayor's air quality working group met to determine the purpose of the local monitoring program. The purpose of the FNSB monitoring program, ranked in order of importance is to:

1. Provide select elementary schools with local real time PM<sub>2.5</sub> data for decision making, and to display the data for public access;
2. Continue to gather data at previous monitoring sites for continuity;
3. Delineate and gather additional data on hot spots;
4. Co-locate Met One Neighborhood Monitor (NHM) with pDR monitors to develop a correlation; and,
5. To monitor areas of interest where possible air flow drainage into the Air Quality Control Zone (AQCZ) may show PM<sub>2.5</sub> transfer from areas outside the AQCZ.



## **C. Site Selection**

### **a. Process (AQ Working Group)**

At the June 9<sup>th</sup> meeting of the Mayor's AQ working group monitor locations were determined. Beginning with pDR monitors, the working group listed numerous proposed monitor locations, primarily at elementary schools in the Borough. Each proposed pDR location was discussed using the ranked purposes in section B as criteria until consensus was reached on the twelve locations for pDR monitors. Due to the uncertainty of data quality from the NHM monitors, the working group reached consensus that eleven of the NHM monitors would be collocated with each pDR monitor for the purpose of determining data quality and possibly a correlation or correction factor. The remaining NHM locations were determined by consensus using the ranked purposes in section B as criteria. Site locations are as follows:

2017/2018 pDR monitor proposed site locations:

- North Pole Elementary (2016 site) (collocated NHM)
- Badger Rd Elementary (2016 site) (collocated NHM)
- Nordale Elementary (2016 site) (collocated NHM)
- Watershed Elementary (2016 site) (collocated NHM)
- Peger Rd. AQ Office (2016 site)
- Ticasuk Brown Elementary (collocated NHM)
- Hunter Elementary (collocated NHM)
- Ann Wien Elementary (collocated NHM)
- Woodriver Elementary (collocated NHM)
- Bradway and Dennis Fire Station (collocated NHM)
- Badger and Plack Christian School (collocated NHM)
- Rental on Redstone Rd North Pole (collocated NHM)

2017/2018 NHM proposed site locations:

- Tanana Middle School
- Joy Elementary
- University Way Transfer site (West Farmers Loop)
- Alyeska NP site on Nelson
- Jim W. private home
- Chena Lakes Maint. Shop

b. Site Locations

FNSB Air Quality Proposed Monitor Locations

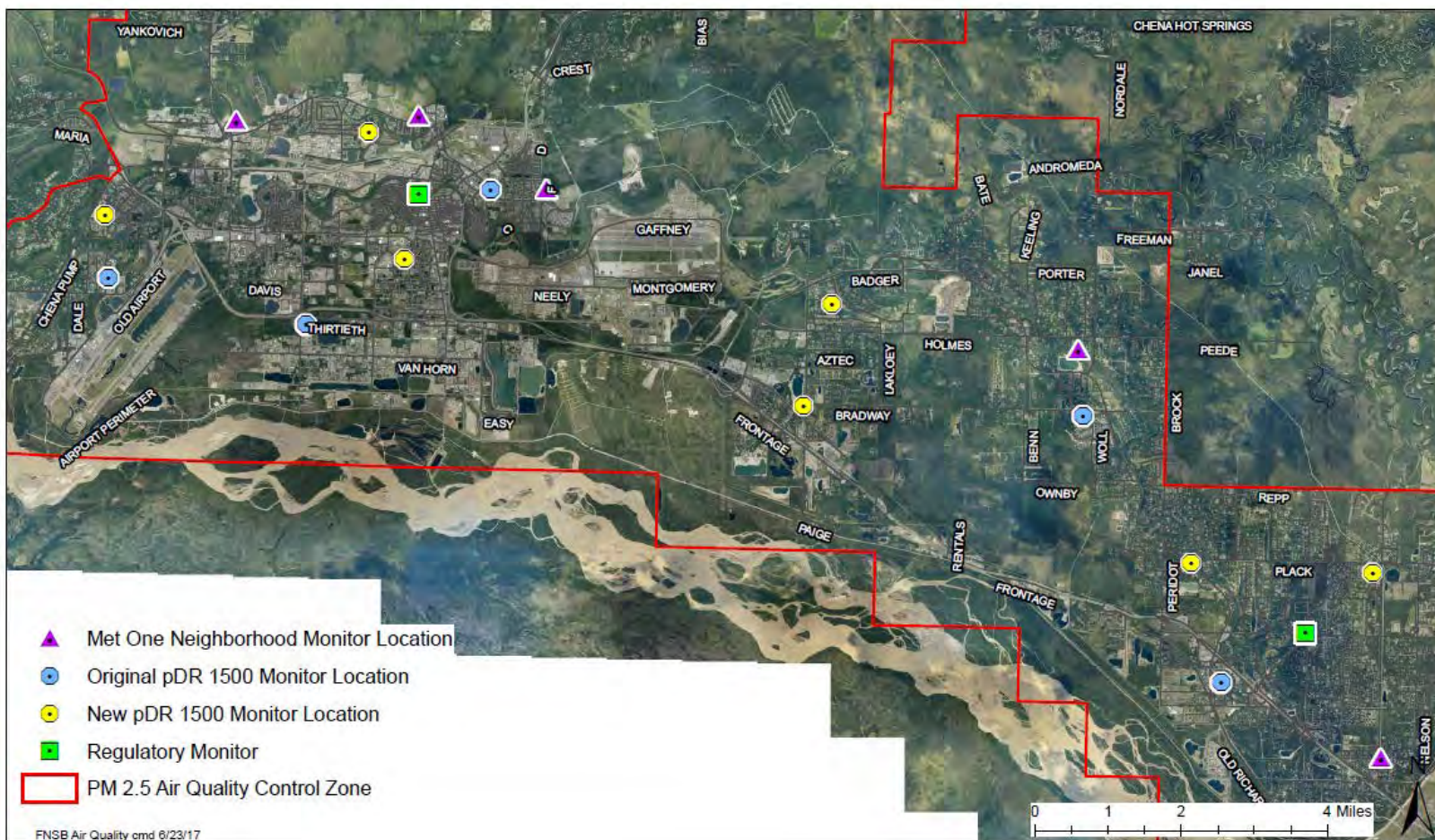


Figure 1. Fairbanks North Star Borough (FNSB) Air Quality Division's proposed monitor locations.

**D. Task description**

**a. Description of Work**

Thirty two low cost air quality monitors will be deployed within the AQCZ to monitor PM<sub>2.5</sub> concentrations at select locations. NHMs will be collocated with pDR units to determine the agreement between the monitoring devices under sub-Arctic conditions. pDR data will be autonomously displayed on the ADEC website and made available to the public. Due to data quality concerns, NHM data will only be available internally to ADEC and FNSB staff.

**b. Schedule of Activities**

**Table 1.** Anticipated project timeline.

	2017						2018							
	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Request for Proposal	█													
Purchasing			█											
Setup/Testing				█										
Data Collection					█									
Retrieval									█					
Data Analysis											█			

**E. Data Acquisition**

**a. Sampling Methods**

Sampling will be conducted using pDRs and NHMs; continuous and stationary nephelometers used for the detection of PM<sub>2.5</sub>. Twenty NHMs and twelve pDRs will be deployed throughout the FNSB, eleven of these sites will be used to collect data from a collocated NHM and pDR for comparability (Fig. 1). At sites of collocation, pDR units will be placed inside a warm building with the air-intake tube running directly outside. The air intake will be outfitted with a 110 VAC pipe heater in order to heat the incoming air to approximately 0 °C to insure small ice crystals do not skew PM<sub>2.5</sub> concentrations. NHM monitors will operate entirely outside of the heated building. Both air intakes at collocated sites will be positioned at the same height and will be within 3m of one another.

**b. Sampling Equipment**

All nephelometers (NHM and pDRs ) are already in hand and, those requiring it, will be calibrated before the winter season. The FNSB currently has four WR-11 routers available for data transmittance from the pDRs. The 2016-2017 monitoring contractor recommends that all future router purchases are the newer 4G LTE compatible WR-21 units and that the older WR-11 routers are replaced with the same.

**Table 2.** Equipment required for data collection, transmittance and regular maintenance.

<b>Item</b>	<b>Description</b>	<b>Current Quantity</b>
pDR	Aerometric nephelometer with adjustable particle size selecting cyclone	12
NHM	Aerometric nephelometer with fixed particle size selecting cyclone	20
Router (Digi WR-11)	3G/4G LTE cellular router for wireless data uplink	4
BGI TetraCal	NIST Traceable Standard for volumetric airflow calibrator	1
934-AH Filters	Whatman glass microfiber filters	200

**c. Sampling System Corrective Action**

Data from the Peger Road monitor located at the Air Quality office is not of particular interest to meet the purpose of the monitoring plan, but is placed at the Air Quality office for troubleshooting purposes. In addition, the pDR located at the Air Quality office will be utilized as a backup in the event of a mechanical failure at one of the other sampling locations. If any of the eleven NHMs collocated with a pDR requires maintenance, a solitary unit will be relocated to continue the data collection at the collocated location.

**F. Instrument/Equipment Testing, Inspection, and Maintenance**

**a. Quality Assurance and Quality Control (QA/QC)**

QA/QC will comply with select components of the EPA’s *QA Handbook Volume II, Appendix D*. Flow rate will be verified according to the schedule in Table 3, NHM monitors must remain within 10% of the 2.0 liters per minute (lpm) flow rate and pDRs will remain within 10% of the 1.52 lpm flow rate. A leak check will be performed monthly. Maintenance and calibration will be conducted at least as frequently as described in Table 3. Filter changes and cleaning may require more frequent attention if PM<sub>2.5</sub> concentrations are high for an extended period, it will be the contractor’s duty to determine if the monitors will require a more frequent maintenance schedule.

**Table 3.** Monitor maintenance and frequency; MetOne Neighborhood Monitor (NHM), personal DataRAM (pDR).

<b>Monitor</b>	<b>Maintenance Item</b>	<b>Frequency</b>
pDR	Filter change	3-7 Days
	Clean cyclone	3-7 Days
	Flow audit	3-7 Days
	Background check/zero	3-7 Days
	Leak check	1 Month
	Factory service/calibration	12 Months
NHM	Clean sharp-cut cyclone	Biweekly
	Clean particle trap	Biweekly
	Clean inlet	Biweekly
	Flow audit	Biweekly
	Leak check	1 Month
	Factory service/calibration	24 Months

**b. Equipment Inspection**

Monitors will be inspected on a weekly basis to verify they are in proper working condition. Inspection will include verification of power, warming and restarting if required, removal of ice, snow and frost. Any damaged items will be documented, reported and repaired if possible as soon as can be feasibly done.

**c. Pre and Post sampling linearity testing**

Monitors will be located next to a Met One BAM for 24-72 hours at the beginning and end of the winter to determine a correlation to the BAM data. This linearity test can be used to adjust the data for final data validation and analysis.

## **G. Data Management**

### **a. Data Recording**

#### **NHM**

NHMs, connected to the internet, interface with the MetOne cloud based service, “GroveStreams.” The data is stored in the cloud for two years. A responsible party at the FNSB Air Quality Division will ensure that data is downloaded from the cloud regularly and at the end of the season to secure and backup the data.

#### **pDR**

pDRs connect to the internet through Digi TransPort routers. Data will be available through ADEC, a responsible party at the FNSB Air Quality Division will ensure that data is downloaded from ADEC and/or the pDRs regularly, and at the end of the season, to insure the data is backed up and secured.

### **b. Data Validation**

It will be assumed that the monitors are functioning optimally for the duration between two equipment checks and flow verification passes. These equipment checks will be conducted on a weekly basis, verifying the past weeks’ worth of data collection. In the event of a failed test, the data collected from the last passed check and flow verification will be flagged, and will be excluded from future analyses. A responsible party at the FNSB Air Quality Division will perform weekly data validation.

### **c. Data Transmittal**

#### **NHM**

NHMs are turn-key systems outfitted with a stock cellular based router. The units will be set up by the technician and accessed through the unique URLs provided by MetOne. Due to data quality concerns, these data will be for internal use only and not made available to the public.

#### **pDR**

pDR data will be connected to a remote server and transmitted via the wireless router at least four times per minute. Hourly averages will be displayed on the ADEC real-time AQ page as both actual concentration of PM<sub>2.5</sub> and Air Quality Index (AQI). The borough currently has four Digitransport WR-11 wireless routers but more will need to be purchased and setup by the contractor. If possible, retirement of the older WR-11 routers (3G) for the newer WR-21 (4G) is advised to improve coverage and connectivity.

### **d. Data Analysis**

Data analysis will be conducted using statistical computing software. Expected products include regressions of each pDR and NHM pairing to determine the strength of correlation of the pair. A Bland-Altman Plot, or other appropriate test, will be used to show whether the paired nephelometers differ significantly from one another ( $p \leq 0.05$ ). 95% confidence intervals will be determined for NHMs for use with future deployments. Data analysis will be conducted by FNSB staff or another qualified entity.

## **H. Assessment and Oversight**

### **a. Reporting**

Monitor failures, estimated repair time and return to service will be documented by the contractor and reported to FNSB within one week. A detailed record of date, time and location will be kept of monitor placement and movements. Weekly maintenance and activity logs will be kept by the contractor and provided upon request. Regular communication with the contract manager will take place as often as once per week.

### **b. Data interpretation and summary report**