

# State of Colorado

## Enhanced Monitoring Plan for Ozone

Colorado Department of Public Health and Environment  
Air Pollution Control Division

APCD-TS-B1

4300 Cherry Creek Drive South

Denver, Colorado

80246-1530

August 21, 2019

\*\*\* For Public Comment \*\*\*



**COLORADO**  
**Department of Public  
Health & Environment**

## Introduction

The United States Environmental Protection Agency (EPA) promulgated a revision to the National Ambient Air Quality Standard for ozone on October 26, 2015. These revisions also included new requirements for Photochemical Assessment Monitoring Stations (PAMS). One requirement was that, “State and local monitoring agencies are required to collect and report PAMS measurements at each NCore site required under paragraph 3(a) of this appendix located in a CBSA with a population of 1,000,000 or more, based on the latest available census figures” (40 CFR 58, Appendix D (5)(a)). The Denver Metropolitan area meets this population requirement and a PAMS site was proposed, with a waiver, to be located at the existing Rocky Flats-North site (08-059-0006). This proposal was noticed in the 2017 Colorado Annual Monitoring Network Plan, submitted to the EPA on June 30, 2017, and EPA approval was received on January 17, 2018.

The ozone revision also required, “States with Moderate and above 8-hour O<sub>3</sub> nonattainment areas and states in the Ozone Transport Region as defined in 40 CFR 51.900 shall develop and implement an Enhanced Monitoring Plan (EMP) detailing enhanced O<sub>3</sub> and O<sub>3</sub> precursor monitoring activities to be performed” (40 CFR 58, Appendix D (5)(h)). The Colorado North Front Range Nonattainment Area is currently designated as “moderate” and is in the process of being bumped up to a “serious” designation. This plan is to be submitted to the EPA Regional Administrator no later than October 1, 2019 or two years following the effective date of a designation to a classification of Moderate or above ozone nonattainment, whichever is later. At a minimum, the EMP shall be reassessed and approved as part of the 5-year network assessments as required under 40 CFR 58.10(d). The EMP will include monitoring activities deemed important to understanding the ozone problems in the state. For Colorado, these activities fall into four general categories:

1. Additional ozone monitors beyond those that are required in 40 CFR Part 58 Appendix D, Section 4.1;
2. Additional NO<sub>x</sub> or NO<sub>y</sub> monitors beyond those that are required in 40 CFR Part 58 Appendix D, Section 4.3;
3. Additional speciated volatile organic compounds (VOC) measurements including data gathered during different periods other than those required under 40 CFR Part 58 Appendix D, Section 5(g), or locations other than those required under 40 CFR Part 58 Appendix D, Section 5(a); and
4. Enhanced upper air measurements of meteorology or pollution concentrations.

This EMP was put out for a 30-day public comment period on August 22, 2019, and closed on September 23, 2019.

## Enhanced Monitoring Plan

### *1. Additional ozone monitoring beyond the minimally required*

The Colorado North Front Range is comprised of four metropolitan statistical areas, with a minimum of five required ozone monitoring locations, per 40 CFR Part 58, Appendix D, Section 4.1. Currently the Colorado Department of Public Health and Environment (CDPHE) operates 16 ozone monitoring locations in the Colorado North Front Range Nonattainment Area, resulting in an additional 11 stations beyond what is minimally required by the EPA. These additional stations help support the basic monitoring objectives of public data reporting, air quality mapping, air quality modeling, air quality forecasting, and an understanding of ozone photochemistry. The CDPHE will continue to support these additional stations as part of this EMP and will make adjustments to the network to further align with CDPHE'S air quality monitoring goals and objectives as defined in CDPHE'S 5-year Network Assessment.

Currently, planned adjustments to the ozone network include the possible commissioning of two other stations, one in the North Front Range foothills in Evergreen and another in the Denver-Julesburg oil and gas development area in Weld County. Also planned is the decommissioning of the Aspen Park and Welch stations. The decommissioning of these stations are due to their relocation to Black Hawk and Evergreen (if a suitable location can be identified), respectively. In addition to these regulatory type ozone monitoring stations, the CDPHE also plans to deploy a small network of solar powered ozone analyzer systems (2BTech 205) for short term special purpose air monitoring studies in support of efforts to further understand or define ozone formation in and/or near the Colorado North Front Range Nonattainment Area. Locations for these short term studies have yet to be defined but will be determined on an as needed basis annually. The CDPHE will also support other governmental organizations and researchers, to the extent possible, in their collection of quality ozone data that could be used in further understanding Colorado's ozone problem.

Table 1 shows a list of all current North Front Range ozone monitoring stations and a list of proposed ozone monitoring stations that may be implemented under this plan.

### *2. Additional oxides of nitrogen monitoring beyond the minimally required*

Per 40 CFR Part 58 Appendix D, Section 4.3, the Colorado North Front Range Nonattainment Area is required to operate five nitrogen dioxide (NO<sub>2</sub>) monitoring stations. These include two near-road monitoring stations (Section 4.3.2), one PAMS true NO<sub>2</sub> monitoring station (Section 5(b)(4)), one area-wide monitoring station (Section 4.3.3), and one Regional Administration monitoring station in support of EPA's national effort to expand monitoring protections of susceptible and vulnerable populations (Section 4.3.4). Currently the CDPHE operates six NO<sub>2</sub> analyzers in the North Front Range area, two of which are true NO<sub>2</sub> analyzers that are run tandem with NO<sub>y</sub> analyzers. These six analyzers meet and exceed the minimum monitoring requirements for regulatory monitoring. The CDPHE will continue to

support these stations/analyzers as part of this EMP and will make adjustments to the network to further align with CDPHE'S air quality monitoring goals and objectives as defined in CDPHE's 5-year Network Assessment.

Despite the decreased relevance of NO<sub>2</sub> as an ambient air pollutant, the CDPHE feels that the monitoring network should be expanded due to the importance of NO<sub>2</sub> as an ozone precursor. Specifically, the CDPHE recognizes the need for new NO<sub>2</sub> monitoring in the Denver-Julesburg oil and gas development area. It is CDPHE's intent to centrally locate a station within the Denver-Julesburg Basin in Weld County to provide an estimate of NO<sub>2</sub> within the basin. In addition to these regulatory type NO<sub>2</sub> monitoring stations, the CDPHE also has a 2BTech 405 NO/NO<sub>2</sub>/NO<sub>x</sub> monitor that can be used for short term special purpose air monitoring studies in support of efforts to further understand or define NO<sub>2</sub> emissions and/or photochemistry in or near the Colorado North Front Range Nonattainment Area. These short term studies have yet to be defined but will be determined on an as needed basis annually. The CDPHE will also support other governmental organizations and researchers, to the extent possible, in their collection of quality NO<sub>2</sub> data that could be used in further understanding Colorado's ozone problem.

Table 2 shows a list of all current North Front Range nitrogen dioxide monitoring stations and a list of proposed NO<sub>2</sub> monitoring stations that may be implemented under this plan.

### *3. Additional VOC monitoring beyond the minimally required*

Included in EPA's revision to the 2015 Ozone NAAQS is a redesign of the PAMS network. Specifically, this redesign required state and local air monitoring agencies to collect and report PAMS measurements at each NCore station in CBSA with a population of 1,000,000 or more based on the latest available census data (40 CFR Part 58 Appendix D (5)(a)). Included in the rule was a waiver option to relocate the PAMS station to an alternative location other than the NCore station. Colorado's Denver-Boulder CBSA has a population in excess of 1,000,000 and is thus required to install a PAMS monitoring station. A waiver request was made in Colorado's 2017 Annual Monitoring Network Plan to Locate its PAMS monitoring station at the Rocky Flats North (08-059-0006) monitoring site instead of the NCore monitoring site (La Casa, 08-031-0026). This waiver request was granted by EPA on January 17, 2018. This station was to be operational by June 1, 2019. The CDPHE has yet to begin full PAMS monitoring due to limited funding and staffing resources. Because of support limitations, the EPA has proposed an extension of the implementation date. It is anticipated that a two year implementation date extension will be promulgated in the CFR by the end of 2019. The CDPHE will implement PAMS monitoring once EPA provides the resources necessary to procure supplies and operate the station. Hourly averaged speciated VOC measurements are required at all PAMS locations as well as carbonyls, ozone, NO/NO<sub>2</sub>/NO<sub>x</sub>/NO<sub>y</sub>, meteorology and mixing height.

In addition to PAMS VOC monitoring, the CDPHE operates two other VOC monitoring stations. One station is located at CDPHE's Platteville station and the other is at the downtown

Denver CAMP station. The Platteville station (08-123-0008) was selected due to its central location in the Denver-Julesburg oil and gas development area, and as an existing CDPHE monitoring location. The Denver CAMP station (08-031-0002) was selected due to its proximity to motor vehicle and other urban sources, and as an existing CDPHE monitoring location. These stations operate on a 1/6 day schedule where ambient air samples are collected via Summa canisters from 6:00 am to 9:00 am in the morning and are analyzed for the PAMS compound list. It is CDPHE's intent to continue operations of these stations as part of this EMP.

In addition to these existing VOC monitoring stations, the CDPHE recognizes the need for additional VOC monitoring in the Denver-Julesburg oil and gas development area to support photochemical modeling, current emissions inventories and the evaluation of VOC trends. Two additional VOC monitoring stations that would also use Summa canisters are under investigation, one in the northern part of the basin near Greeley, and the other in the southern part of the basin west of Brighton. The CDPHE will also support other governmental organizations and researchers, to the extent possible, in their collection of quality VOC data that could be used in further understanding Colorado's ozone problem.

Table 3 shows a list of all current North Front Range VOC monitoring stations and a list of proposed VOC monitoring stations that may be implemented under this plan.

#### *4. Additional meteorological monitoring beyond the minimally required*

Per 40 CFR Part 58 Appendix D, Section 3(b) and Section 5(a), the Colorado North Front Range Nonattainment Area is required to operate two meteorological monitoring stations. One at Colorado's NCore station (La Casa) and the other at Colorado's PAMS station (Rocky Flats North). Currently the CDPHE operates 15 meteorological stations in the North Front Range area, resulting in an additional 13 stations beyond what is minimally required by the EPA. The CDPHE will continue to support all of these stations as part of this EMP and will make adjustments as necessary to the network to further align with CDPHE'S air quality monitoring goals and objectives as defined in CDPHE's 5-year Network Assessment.

Two of CDPHE's 15 meteorological stations are tentatively scheduled to be closed and relocated. These two stations are Aspen Park and Welch. The Aspen Park meteorological tower and sensors will be relocated to the Black Hawk station and the Welch tower and sensors will be relocated to the proposed Evergreen station. The CDPHE is also planning on installing a meteorological tower and sensors at the Fort Collins-West ozone site. In addition to these relocations and addition, the CDPHE is tentatively planning on installing an air monitoring station in the central Denver-Julesburg oil and gas development area that will also include a meteorological tower and sensors. The development of this station is pending the identification of viable location.

Table 4 shows a list of all current North Front Range meteorological monitoring stations and a list of proposed meteorological monitoring stations that may be implemented under this plan.

Table 1: North Front Range Ozone Monitoring Stations

Monitor Count	AQS ID	Station Name	County
1	08-001-3001	Welby	Adams
2	08-005-0002	Highlands	Arapahoe
3	08-005-0006	Aurora East	Arapahoe
4	08-013-0014	Boulder Reservoir	Boulder
5	08-019-0006	Mines Peak *	Clear Creek
6	08-031-0002	CAMP	Denver
7	08-031-0026	La Casa (NCore)	Denver
8	08-035-0004	Chatfield	Douglas
9	08-047-0003	Black Hawk	Gilpin
10	08-059-0005	Welch (to be closed)	Jefferson
11	08-059-0006	Rocky Flats North (PAMS)	Jefferson
12	08-059-0011	NREL	Jefferson
13	08-059-0013	Aspen Park (to be closed)	Jefferson
14	08-069-0011	Fort Collins - West	Larimer
15	08-069-1004	Fort Collins - CSU/Mason	Larimer
16	08-123-0009	Weld County Tower	Weld
<b>Proposed Enhanced Monitoring Plan Stations:</b>			
17	TBD	Front Range Foothills (Evergreen)	Jefferson
18	TBD	Central DJ Basin (Platteville area)	Weld
19	TBD	Special Studies	TBD
* Mines Peak O <sub>3</sub> is only used for forecasting purposes and not for comparison to the NAAQS.			

Table 2: North Front Range Oxides of Nitrogen Monitoring Stations

Monitor Count	AQS ID	Station Name	County	Parameters
1	08-001-3001	Welby (regional administrator site)	Adams	NO/NO <sub>2</sub> /NO <sub>x</sub>
2	08-031-0002	CAMP	Denver	NO/NO <sub>2</sub> /NO <sub>x</sub>
3	08-031-0026	La Casa (NCore)	Denver	NO/NO <sub>y</sub> -NO/ NO <sub>y</sub> /True NO <sub>2</sub> /NO <sub>x</sub>
4	08-031-0027	I-25 Denver (near road site)	Denver	NO/NO <sub>2</sub> /NO <sub>x</sub>
5	08-031-0028	I-25 Globeville (near road site)	Denver	NO/NO <sub>2</sub> /NO <sub>x</sub>
6	08-059-0006	Rocky Flats North (PAMS)	Jefferson	NO/NO <sub>y</sub> -NO/ NO <sub>y</sub> /True NO <sub>2</sub> /NO <sub>x</sub>
<b>Proposed Enhanced Monitoring Plan Stations:</b>				
7	TBD	Central DJ Basin (Platteville area)	Weld	NO/NO <sub>2</sub> /NO <sub>x</sub>
8	TBD	Special Studies (TBD)	TBD	NO/NO <sub>2</sub> /NO <sub>x</sub>

Table 3: North Front Range VOC Monitoring Stations

Monitor Count	AQS ID	Station Name	County	Sample Type
1	08-031-0002	CAMP	Denver	VOC (Summa canisters)/ carbonyls (DNPH cartridges)
2	08-123-0008	Platteville Middle School	Weld	VOC (Summa canisters)/ carbonyls (DNPH cartridges)
Proposed Enhanced Monitoring Plan Stations:				
3	08-059-0006	Rocky Flats North (PAMS)	Jefferson	VOC (AutoGC)/ carbonyls (DNPH cartridges)
4	TBD	Northern DJ Basin (Greeley area)	Weld	VOC (Summa canisters)
5	TBD	Southern DJ Basin (west of Brighton)	Adams	VOC (Summa canisters)

Table 4: North Front Range Meteorological Monitoring Stations

Monitor Count	AQS ID	Station Name	County	Parameters
1	08-001-3001	Welby	Adams	WS/WD/Temp
2	08-005-0002	Highlands	Arapahoe	WS/WD/Temp
3	08-005-0006	Aurora East	Arapahoe	WS/WD/Temp
4	08-013-0014	Boulder Reservoir	Boulder	WS/WD/Temp/RH
5	08-031-0002	CAMP	Denver	WS/WD/Temp
6	08-031-0026	La Casa (NCore)	Denver	WS/WD/Temp/Temp Diff/ RH/Solar
7	08-031-0027	I-25 Denver	Denver	WS/WD/Temp
8	08-031-0028	I-25 Globeville	Denver	WS/WD/Temp/RH
9	08-035-0004	Chatfield	Douglas	WS/WD/Temp
10	08-059-0002	Arvada	Jefferson	WS/WD/Temp
11	08-059-0005	Welch (to be closed)	Jefferson	WS/WD/Temp
12	08-059-0006	Rocky Flats North (PAMS)	Jefferson	WS/WD/Temp/Temp Diff/RH/BP/Solar/ Precip/mixing height
13	08-059-0013	Aspen Park (to be closed)	Jefferson	WS/WD/Temp
14	08-069-1004	Fort Collins - CSU/Mason	Larimer	WS/WD/Temp
15	08-123-0009	Weld County Tower	Weld	WS/WD/Temp
Proposed Enhanced Monitoring Plan Stations:				
16	08-047-0003	Black Hawk	Gilpin	WS/WD/Temp
17	08-069-0011	Fort Collins - West	Larimer	WS/WD/Temp
18	TBD	Front Range Foothills (Evergreen)	Jefferson	WS/WD/Temp
19	TBD	Central DJ Basin (Platteville)	Weld	WS/WD/Temp