

# COLORADO

## 2018

# ANNUAL MONITORING NETWORK PLAN



**COLORADO**  
Air Pollution Control Division  
Department of Public Health & Environment

Prepared by the Air Pollution Control Division  
Technical Services Program  
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## **I. INTRODUCTION**

The Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division's (APCD) 2018 Ambient Air Monitoring Network Plan is an examination and evaluation of the APCD's network of air pollution monitoring stations. The Annual Network Plan is required by Title 40, Code of Federal Regulations, Part 58.10(a) [40 CFR 58.10(a)].<sup>1</sup> It is also a simple accounting of monitoring site changes that have taken place over the past year and changes that are expected for the year ahead. It is due on or before July 1<sup>st</sup> of each year to the U.S. Environmental Protection Agency (EPA), after a 30-day public comment period.

This plan was made available for public comment from May 23, 2018 to June 24, 2018.

### **Purpose of Network Plan**

The purpose of the Network Plan is to provide an overview of the APCD's current air quality monitoring network and projected plans for the coming year. This plan shows the general reasoning for monitoring, the location of each monitor, the highest pollutant concentrations, and the type and frequency of measurements taken at each location. The Colorado APCD currently operates air monitors at 52 locations throughout the state of Colorado.

### **Overview of the Colorado Air Monitoring Network**

Particulate monitors, including Particulate Matter 10 microns and smaller ( $PM_{10}$ ) and Particulate Matter 2.5 microns and smaller ( $PM_{2.5}$ ), and ozone monitors are the most abundant and widespread of monitoring types across the state, not taking into consideration the meteorological monitoring sites which also comprise a large portion of the CDPHE sampling network. There are currently 21 meteorological sites in the APCD network. These meteorological monitoring sites all monitor wind speed, wind direction, resultant speed, resultant direction, standard deviation of horizontal wind direction, and temperature. Additionally, relative humidity is also monitored at seven of these locations. Total Solar Radiation is also currently monitored at two sites.

Within the particulate sampling network, APCD operates both continuous and filter based sampling methods for both  $PM_{2.5}$  and  $PM_{10}$ . Continuous monitors sample without the need for filter retrieval and laboratory analysis that is required with filter based equipment. Thus, continuous monitors can constantly record concentrations and send the results back to APCD headquarters on an almost instantaneous basis. Currently, there are  $PM_{10}$  monitors at 27 separate locations throughout the state including both filter based and continuous samplers. Twelve sites are equipped to measure continuous  $PM_{10}$  and of those twelve sites, eight are located at sites with filter based  $PM_{10}$  monitors. Currently, APCD is monitoring  $PM_{2.5}$  at 17 sites around the state. Of those 17 sites, 13 measure  $PM_{2.5}$  on a continuous basis and 10 sites are outfitted with filter based samplers.

Total Suspended Particulate (TSP) monitoring ended in Colorado at the close of 2014 with the removal of the lead/TSP monitor at Centennial Airport. Lead monitoring was also accomplished at APCD's NCore site for two years (2012-2014). Lead monitoring at the NCore site showed very low concentrations, well below that of the national standard. Due to the low levels of lead measured in the past, lead monitoring will only be done by  $PM_{2.5}$  IMPROVE and

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<sup>1</sup> "Annual Monitoring Network Plan and Periodic Network Assessment," 40 Federal Regulations 58.10 (26 Oct. 2015).

Carbon Speciation Network (CSN) monitors, and by PM<sub>10</sub> at the Powell Grand Junction site as part of the National Air Toxics Trends Stations network.

The APCD's gaseous monitoring network consists of continuous Carbon Monoxide (CO), Ozone (O<sub>3</sub>), Nitrogen Dioxide/Oxides of Nitrogen (NO<sub>2</sub>/NO<sub>x</sub>), and Sulfur Dioxide (SO<sub>2</sub>). A majority of the gaseous monitoring conducted by the APCD occurs in the Front Range region. There is one CO monitor that is located on the Western Slope and O<sub>3</sub> monitoring occurs statewide. Currently, the APCD reports data from eight CO monitoring sites, twenty one O<sub>3</sub> monitoring sites, five NO<sub>2</sub>/NO<sub>y</sub> monitoring sites, and four SO<sub>2</sub> monitoring sites. Five of the ozone (O<sub>3</sub>) monitoring sites that are located on the western slope and have data included in this report are operated and maintained by a third party contractor, Air Resource Specialists (ARS). These are the Rifle, Palisade, Cortez, Elk Springs and Paradox Basin monitoring sites (APCD does the data retrievals and validation at Elk Springs and Paradox). ARS keeps the sites in proper working order and performs calibrations, data retrievals, and data validation, while the APCD uploads data to the AQS database and conducts independent audits of the sites for Quality Assurance (QA) purposes. This document provides further detail of the gaseous network in the sections to follow.

### **APCD Monitoring History**

The State of Colorado has been monitoring air quality statewide since the mid-1960s when high volume and tape particulate samplers, dustfall buckets, and sulfation candles were the best technology available for defining the magnitude and extent of the worsening visible air pollution problem. Monitoring for gaseous pollutants (CO, O<sub>3</sub>, NO<sub>2</sub> /NO<sub>x</sub> and SO<sub>2</sub>) began in 1965 when the Federal Government established the CAMP station in downtown Denver at the intersection of 21<sup>st</sup> Street and Broadway. This was the area that was thought to represent the best probability for detecting maximum levels of most of the suspected pollutants. Instruments were primitive by comparison with those of today, and frequently were out of service for maintenance.

Under provisions of the original Federal Clean Air Act of 1970, the Administrator of the EPA established National Ambient Air Quality Standards (NAAQS) designed to protect the public's health and welfare. Standards were set for TSP, CO, O<sub>3</sub>, NO<sub>2</sub> and SO<sub>2</sub>. In 1972, Colorado submitted its' first State Implementation Plan (SIP) to the EPA. It included an air quality surveillance system in accordance with EPA regulations of August 1971. That plan proposed a monitoring network of 100 monitors (particulate and gaseous) statewide. The sampling network, established as a result of that plan and subsequent modifications, consisted of 106 monitors.

The 1977 Clean Air Act Amendments required States to submit revised SIP's to the EPA by January 1, 1979. The portion of the Colorado SIP pertaining to air monitoring was submitted separately on December 14, 1979, after a comprehensive review and upon approval by the Colorado Air Quality Control Commission. The 1979 EPA requirements, as set forth in 40 CFR 58.20, have resulted in considerable modifications to the network. These initial and subsequent modifications were made to ensure the consistency and compliance with Federal monitoring requirements. Station location, probe siting, sampling methodology, quality assurance practices and data handling procedures are all maintained throughout any changes made to the network.

Historically, 36 of the 52 current APCD monitoring locations have been in operation for 10 or more years, 22 of these sites have been in operation for 20 or more years, and 14 of the monitoring locations have been in operation for more than 30 years. Conversely, 17 of the 53

current monitoring locations have been in operation for less than 10 years.

## **APCD Monitoring Operations**

The APCD attempts to operate all of its monitors for, at least, a full calendar year, beginning sampling operations of new monitors in January and terminating existing monitors in December. Circumstances both in and out of the APCD's control can make that desired schedule difficult to achieve. In addition, the APCD does not own either the land or the buildings where most of the monitors are located, and it is becoming increasingly difficult to get property owner's permission for use due to risk management issues. Building roof remodeling and demolition projects can also lead to a loss of sampling time and access to locations.

When modifications to the State and Local Air Monitoring Station (SLAMS) network are required, the APCD will provide the appropriate modification forms prior to any implementation to EPA Region 8 for their approval. All currently operating SLAMS monitors have been approved by EPA. With the exception of some vegetation issues or tall trees, of which APCD has received waivers from EPA, all sites currently meet the requirements set forth in 40 CFR 58, Appendices A, C, D, and E.

## **Network Modification Procedures**

The APCD develops changes to its monitoring network in several ways. In the past, new monitoring locations have been added as a result of community concerns about air quality. Other monitors have been established as a result of special studies, such as the O<sub>3</sub> monitoring in Aurora, Rifle, Cortez, Aspen Park, Palisade, Paradox and Elk Springs.

The most common reasons for monitors being removed from the network are that either the land or building is modified, such that the site no longer meets current EPA siting criteria, the property ownership changes, or the area surrounding the monitor is being modified in a way that necessitates a change in the monitoring location. A few current examples of this are the South Boulder Creek monitoring station and the relocation of the Alsup Elementary school site. The South Boulder Creek site was relocated to the Boulder Reservoir because it had large trees that violated EPA siting requirements. The site also had been negatively impacted by floods in the area. The Alsup Elementary school site was relocated nearby to the Tri County Health Department building due to a reroofing project and some access issues at the property. Monitors are also removed from the network after review of the data shows that the levels have dropped to the point where it is no longer necessary to continue monitoring at that location or if the data obtained from a site is redundant with another monitoring site or if access to the site becomes too restrictive.

Finally, all monitors are reviewed on a regular basis to determine if they are continuing to meet their monitoring objectives. If the population, land use, or vegetation around the monitor has changed significantly since the monitor was established, a more suitable location for the monitor may be examined. An example of this is the O<sub>3</sub> monitor previously located at the Arvada monitoring site. It was shut down, and relocated to the Denver – CAMP location. **Table 1** summarizes the locations and monitoring parameters of each site currently in operation, by county, alphabetically. The shaded lines in the table list the site name, site AQS identification number, site address, site start-up date, site elevation, and site longitude and latitude coordinates. Beneath each site description the table lists each monitoring parameter in operation at that site, the orientation and spatial scale, which national monitoring network it belongs to, the type of

monitor in use, and the sampling frequency. The parameter date is the date when valid data were first collected.

The following abbreviations are used in **Table 1** below, with orientation (Orient) referring to the reason why the monitor was placed in that location, and scale referring to the size of the area that concentrations from the monitor represent.

<b>Orientation</b>	<b>Scale (Area Represented)<sup>2</sup></b>
P.O. - Population oriented	Micro - Micro-scale (several m – 100 m)
Back - Background orientation	Middle - Middle Scale (100 – 500 m)
SPM - Special Purpose Monitor	Neigh - Neighborhood Scale (0.5 – 4 km)
H.C. - Highest Concentration	Urban - Urban Scale (4 – 50 km)
POC - Parameter Occurrence Code	Region - Regional Scale (50 – hundreds of km)
SLAMS - State or Local Air Monitoring Stations	

**Table 1. Monitoring Locations and Parameters Monitored**

AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	POC	Parameter Started	Orient/Scale	Monitor	Type	Sample
<b>Adams</b>							
08 001 0008	Tri County Health		4201 E 72 <sup>nd</sup> Ave.	07/2016	1,574	39.82835	-104.93836
	PM <sub>10</sub>	1	07/ 2016	P.O. Neigh	R&P Partisol 2025	SLAMS	1 in 1
	PM <sub>2.5</sub>	2	07/ 2016	P.O. Neigh	R&P Partisol 2025	SLAMS	1 in 6
	PM <sub>2.5</sub>	3	07/ 2016	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
	PM <sub>2.5</sub> Speciation	5	07/ 2016	P.O. Neigh	SASS	Trends Spec	1 in 6
	PM <sub>2.5</sub> Carbon	5	07/ 2016	P.O. Neigh	URG 3000N	Trends Spec	1 in 6
08 001 3001	Welby		3174 E. 78 <sup>th</sup> Ave.	07/1973	1,554	39.838119	-104.94984
	CO (Trace)	1	07/1973	P.O. Neigh	Thermo 48i-TLE	SLAMS	Continuous
	SO <sub>2</sub>	2	07/1973	P.O. Neigh	TAPI 100E	SLAMS	Continuous
	NO/NO <sub>x</sub>	2	01/1976	P.O. Urban	TAPI 200UP	SPM	Continuous
	NO <sub>2</sub>	1	01/1976	P.O. Urban	TAPI 200EU	SLAMS	Continuous
	O <sub>3</sub>	2	07/1973	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	01/1975	P.O. Neigh	Met - One	SPM	Continuous
	PM <sub>10</sub>	1	02/1992	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 6
	PM <sub>10</sub>	3	06/1990	P.O. Neigh	TEOM-1400ab	SLAMS	Continuous
<b>Alamosa</b>							
08 003 0003	Alamosa – Municipal Bldg.		425 4 <sup>th</sup> St.	04/2002	2,301	37.469584	-105.863175
	PM <sub>10</sub>	1	05/2002	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 1
<b>Arapahoe</b>							
08 005 0002	Highland Reservoir		8100 S. University Blvd	06/1978	1,747	39.567887	-104.957193
	O <sub>3</sub>	1	06/1978	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	07/1978	P.O. Neigh	Met - One	SPM	Continuous

<sup>2</sup> “Appendix D to Part 58 – Network Design Criteria for Ambient Air Quality Monitoring,” 40 Federal Register 58.

AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	POC	Parameter Started	Orient/Scale	Monitor	Type	Sample
08 005 0005	Arapahoe Community College (ACC)		6190 S. Santa Fe Dr.		12/1998	1,636	39.604399 -105.019526
	PM <sub>2.5</sub>	1	03/1999	P.O. Neigh	R&P Partisol 2025	SLAMS	1 in 3
08 005 0006	Aurora - East	36001 E. Quincy Ave.		04/2011	1,552	39.63854 -104.56913	
	O <sub>3</sub>	1	04/2009	P.O. Region	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	06/2009	P.O. Neigh	Met - One	SPM	Continuous
<b>Archuleta</b>							
08 007 0001	Pagosa Springs School	309 Lewis St.		08/1975	2,165	37.26842 -107.009659	
	PM <sub>10</sub>	3	09/1990	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 1
<b>Boulder</b>							
08 013 0003	Longmont-Municipal Bldg.	350 Kimbark St.		06/1985	1,520	40.164576 -105.100856	
	PM <sub>10</sub>	2	09/1985	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 6
	PM <sub>10</sub> Collocated	2	09/2014	P.O. Micro <sup>2</sup>	SA/GMW-1200	SLAMS	1 in 6
	PM <sub>2.5</sub>	1	01/1999	P.O. Neigh	R&P Partisol 2025	SLAMS	1 in 3
	PM <sub>2.5</sub>	3	11/2005	P.O. Neigh	TEOM 1400ab	SPM	Continuous
08 013 0014	Boulder Reservoir	5565 N. 51 <sup>st</sup>		09/2016	1,586	40.070016 -105.220238	
	O <sub>3</sub>	1	09/2016	H.C. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp/RH	1	09/2016	H.C. Urban	RM Young	SPM	Continuous
08 013 0012	Boulder Chamber of Commerce	2440 Pearl St.		12/1994	1,619	40.021097 -105.263382	
	PM <sub>10</sub>	1	10/1994	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 6
	PM <sub>2.5</sub>	1	01/1999	P.O. Middle <sup>3</sup>	R&P Partisol 2025	SLAMS	1 in 3
08 013 1001	Boulder – CU – Athens	2102 Athens St.		12/1980	1,622	40.012969 -105.264212	
	PM <sub>2.5</sub>	3	02/2004	P.O. Neigh	TEOM FDMS	SPM	Continuous
<b>Delta</b>							
08 029 0004	Delta Health Dept	560 Dodge St.		08/1993	1,511	38.739213 -108.073118	
	PM <sub>10</sub>	1	05/1993	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
<b>Denver</b>							
08 031 0002	CAMP	2105 Broadway		01/1965	1,593	39.751184 -104.987625	
	CO (Trace)	2	01/1971	P.O. Micro	Thermo 48i-TLE	SLAMS	Continuous
	SO <sub>2</sub>	1	01/1967	P.O. Neigh	TAPI 100E	SLAMS	Continuous
	O <sub>3</sub>	6	03/2012	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	NO/NO <sub>x</sub>	1	01/1973	Other	TAPI 200EU	Other	Continuous
	NO <sub>2</sub>	1	01/1973	P.O. Neigh	TAPI 200EU	SLAMS	Continuous
	WS/WD/Temp	1	01/1965	P.O. Neigh	Met - One	SPM	Continuous
	PM <sub>10</sub>	1	08/1986	P.O. Micro	SA/GMW-1200	SLAMS	1 in 6
	PM <sub>10</sub> Collocated	2	12/1987	P.O. Micro	SA/GMW-1200	SLAMS	1 in 6
	PM <sub>10</sub>	3	04/2013	P.O. Micro	GRIMM EDM 180	SLAMS	Continuous

AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	POC	Parameter Started	Orient/Scale	Monitor	Type	Sample
08 031 0013	PM <sub>2.5</sub>	1	01/1999	P.O. Micro <sup>3</sup>	R&P Partisol 2025	SLAMS	1 in 1
	PM <sub>2.5</sub> Collocated	2	09/2001	P.O. Micro <sup>3</sup>	R&P Partisol 2025	SLAMS	1 in 6
	PM <sub>2.5</sub>	3	04/2013	P.O. Micro <sup>3</sup>	GRIMM EDM 180	SPM	Continuous
08 031 0016	NJH-E	14 <sup>th</sup> Ave. & Albion St.		01/1983	1,620	39.738578	-104.939925
	PM <sub>2.5</sub>	3	10/2003	P.O. Neigh	TAPI T640	SPM	Continuous
	PM <sub>10</sub>	3	03/2018	P.O. Neigh	TAPI T640	SPM	Continuous
08 031 0016	DESCI	1901 E. 13 <sup>th</sup> Ave.		12/1990	1,623	39.735700	-104.958200
	Transmissometer	1	12/1989	Other	Optec LPV-3	SPM	Continuous
	Nephelometer	1	12/2000	Other	Optec NGN-2	SPM	Continuous
	Relative Humidity	1	12/1989	Other	RM Young	SPM	Continuous
08 031 0026	La Casa	4587 Navajo St.		10/2013	1,594	39.779429	-105.005174
	CO (Trace)	1	10/2012	P.O. Neigh	Thermo 48i-TLE	NCore	Continuous
	SO <sub>2</sub> (Trace)	1	10/2012	P.O. Neigh	TAPI 100EU	NCore	Continuous
	NO <sub>Y</sub>	1	10/2012	P.O. Neigh	TAPI 200EU	NCore	Continuous
	CAPS NO <sub>2</sub>	1	07/2014	P.O. Neigh	TAPI 500U	NCore	Continuous
	O <sub>3</sub>	1	10/2012	Neigh/Urban	TAPI 400E	NCore	Continuous
	WS/WD/Temp	1	10/2012	P.O. Neigh	Met - One	NCore	Continuous
	Relative Humidity	1	10/2012	P.O. Neigh	Met - One	NCore	Continuous
	Total Solar Radiation	1	04/2018	P.O. Neigh	Kipp & Zonen	NCore	Continuous
	Temp (Lower)	2	10/2012	P.O. Neigh	Met - One	NCore	Continuous
	PM <sub>10</sub>	1	10/2012	P.O. Neigh	R&P Partisol 2025	SLAMS	1 in 3
	PM <sub>10</sub> Collocated	2	10/2012	P.O. Neigh	R&P Partisol 2025	SLAMS	1 in 6
	PM <sub>10</sub>	3	02/2014	P.O. Neigh	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub>	1	10/2012	P.O. Neigh	R&P Partisol 2025	NCore	1 in 3
	PM <sub>2.5</sub>	3	02/2014	P.O. Neigh	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub> Speciation	5	10/2012	P.O. Neigh	SASS	Suppl. Speciation	1 in 3
	PM <sub>2.5</sub> Carbon	5	10/2012	P.O. Neigh	URG 3000N	Suppl. Speciation	1 in 3
08 031 0027	I-25 Denver	971 W. Yuma Street		06/2013	1,586	39.732146	-105.015317
	CO (Trace)	1	06/2013	Near Road	Thermo 48i-TLE	SLAMS	Continuous
	NO <sub>2</sub>	1	06/2013	Near Road	TAPI 200E	SLAMS	Continuous
	NO/NO <sub>x</sub>	1	06/2013	Near Road	TAPI 200E	SPM	Continuous
	WS/WD/Temp	1	06/2013	Near Road	Met - One	SPM	Continuous
	PM <sub>10</sub>	3	12/2013	Near Road	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub>	1	01/2014	Near Road	R&P Partisol 2025	SLAMS	1 in 6
	PM <sub>2.5</sub>	3	12/2013	Near Road	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub> Carbon	5	10/2013	Near Road	API 633	SPM	Continuous

<sup>3</sup> The CAMP PM<sub>2.5</sub> site is technically a micro-scale site, but the APCD demonstrated to EPA in 2001 that the CAMP site is representative of a much larger area of similar land use, meteorology, and emissions around downtown Denver, and has therefore been approved to meet the Neighborhood scale criteria for PM<sub>2.5</sub> concentrations. The same is true for the Boulder Chamber of Commerce PM<sub>2.5</sub> site, which is technically a middle scale site.

AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	POC	Parameter Started	Orient/Scale	Monitor	Type	Sample
08 031 0028	I-25 Globeville	4905 Acoma Street		10/1/2015	1,587	39.785823	-104.988857
	NO <sub>2</sub>	1	10/1/2015	Near Road	TAPI 200E	SLAMS	Continuous
	NO/NO <sub>x</sub>	1	10/1/2015	Near Road	TAPI 200E	SPM	Continuous
	WS/WD/Temp/RH	1	10/1/2015	Near Road	RM Young	SPM	Continuous
	PM <sub>10</sub>	3	10/1/2015	Near Road	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub>	3	10/1/2015	Near Road	GRIMM EDM 180	SLAMS	Continuous

### Douglas

08 035 0004	Chatfield State Park	11500 N. Roxborough Pk. Rd		04/2004	1,676	39.534488	-105.070358
	O <sub>3</sub>	1	05/2005	H.C. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	04/2004	P.O. Neigh	Met - One	SPM	Continuous
	PM <sub>2.5</sub>	1	07/2005	P.O. Neigh	R&P Partisol 2025	SPM	1 in 3
	PM <sub>2.5</sub>	3	05/2004	P.O. Neigh	TAPI T640	SPM	Continuous
	PM <sub>10</sub>	3	06/2017	P.O. Neigh	TAPI T640	SPM	Continuous

### El Paso

08 041 0013	U. S. Air Force Academy	USAFA Rd. 640		05/1996	1,971	39.958341	-104.817215
	O <sub>3</sub>	1	06/1996	H.C. Urban	TAPI 400E	SLAMS	Continuous
08 041 0015	Highway 24	690 W. Hwy. 24		11/1998	1,824	39.830895	-104.839243
	CO (Trace)	1	11/1998	P.O. Micro	Thermo 48i-TLE	SLAMS	Continuous
	SO <sub>2</sub>	1	01/2013	P.O. Micro	TAPI 100EU	SLAMS	Continuous
	WS/WD/Temp	1	08/2014	P.O. Micro	RM Young	SPM	Continuous
08 041 0016	Relative Humidity	1	08/2014	P.O. Micro	RM Young	SPM	Continuous
	Manitou Springs	101 Banks Pl.		04/2004	1,955	38.853097	-104.901289
08 041 0017	O <sub>3</sub>	1	04/2004	H.C. Neigh	TAPI 400E	SLAMS	Continuous
	Colorado College	130 W. Cache La Poudre		12/2007	1,832	38.848014	-104.828564
	PM <sub>10</sub>	1	12/2007	P.O. Neigh	R&P Partisol 2025	SLAMS	1 in 6
	PM <sub>10</sub>	3	06/2016	P.O. Neigh	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub>	3	12/2007	P.O. Neigh	GRIMM EDM 180	SLAMS	Continuous

### Fremont

08 043 0003	Cañon City – City Hall	128 Main St.		10/2004	1,626	38.43829	-105.24504
	PM <sub>10</sub>	1	10/2004	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 6

### Garfield

08 045 0005	Parachute – Elem. School	100 E. 2nd St.		01/1982	1,557	38.453654	-108.053269
	PM <sub>10</sub>	1	05/2000	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
08 045 0023	Rifle–Garfield County Library	207 East Avenue		01/2017	1,629	39.53068	-107.78225
	PM <sub>10</sub>	1	02/2017	P.O. Neigh	SA/GMW-1200	SPM	1 in 3
08 045 0012	Rifle – Health Dept.	195 W. 14th Ave.		06/2008	1,629	39.54182	-107.784125
	O <sub>3</sub>	1	06/2008	P.O. Neigh	TAPI 400E	SLAMS	Continuous

### Gunnison

08 051 0004	Crested Butte	603 6th St.		09/1982	2,714	38.867595	-106.981436
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AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	POC	Parameter Started	Orient/Scale	Monitor	Type	Sample
	PM <sub>10</sub>	2	03/1997	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
	PM <sub>10</sub> Collocated	3	10/2008	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 6

### Jefferson

08 059 0002	Arvada	9101 W. 57th Ave.		01/1973	1,640	39.800333	-105.099973
	WS/WD/Temp	1	01/1975	P.O. Neigh	Met - One	SPM	Continuous
08 059 0005	Welch	12400 W. Hwy. 285		08/1991	1,742	39.638781	-105.13948
	O <sub>3</sub>	1	08/1991	P.O. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	11/1991	P.O. Neigh	Met - One	SPM	Continuous
08 059 0006	Rocky Flats - N	16600 W. Hwy. 128		06/1992	1,802	39.912799	-105.188587
	O <sub>3</sub>	1	09/1992	H.C. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	09/1992	P.O. Neigh	Met - One	SPM	Continuous
08 059 0011	NREL	2054 Quaker St.		06/1994	1,832	39.743724	-105.177989
	O <sub>3</sub>	1	06/1994	H.C. Urban	TAPI 400E	SLAMS	Continuous
08 059 0013	Aspen Park	26137 Conifer Rd.		04/2011	2,467	39.540321	-105.296512
	O <sub>3</sub>	1	04/2011	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	06/2011	P.O. Neigh	Met - One	SPM	Continuous

### La Plata

08 067 0004	Durango – River City Hall	1235 Camino del Rio		09/1985	1,988	37.277798	-107.880928
	PM <sub>10</sub>	1	12/2002	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3

### Larimer

08 069 0009	Fort Collins – CSU - Edison	251 Edison Dr.		12/1998	1,524	40.571288	-105.079693
	PM <sub>10</sub>	1	07/1999	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
	PM <sub>10</sub>	3	06/2015	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
	PM <sub>2.5</sub>	3	06/2015	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
08 069 0011	Fort Collins - West	3416 La Porte Ave.		05/2006	1,571	40.592543	-105.141122
	O <sub>3</sub>	1	05/2006	H.C. Urban	TAPI 400E	SLAMS	Continuous
08 069 1004	Fort Collins - Mason	708 S. Mason St.		12/1980	1,524	40.57747	-105.07892
	CO (Trace)	1	12/1980	P.O. Neigh	Thermo 48i-TLE	SLAMS	Continuous
	O <sub>3</sub>	1	12/1980	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	01/1981	P.O. Neigh	Met - One	SPM	Continuous

### Mesa

08 077 0017	Grand Junction – Powell Bldg.	650 South Ave.		02/2002	1,398	39.063798	-108.561173
	PM <sub>10</sub> & NATTS Metals	3	01/2005	P.O. Neigh	R&P Partisol 2025	SLAMS	1 in 3
	PM <sub>10</sub> Collocated & NATTS	4	03/2005	P.O. Neigh	R&P Partisol 2025	SLAMS	1 in 6
	PM <sub>10</sub>	3	01/2014	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
	PM <sub>2.5</sub>	3	01/2014	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
08 077 0018	Grand Junction - Pitkin	645 1/4 Pitkin Ave.		01/2004	1,398	39.064289	-108.56155
	CO (Trace)	1	01/2004	P.O. Micro	Thermo 48i-TLE	SLAMS	Continuous
	WS/WD/Temp	1	01/2004	P.O. Neigh	RM Young	SPM	Continuous

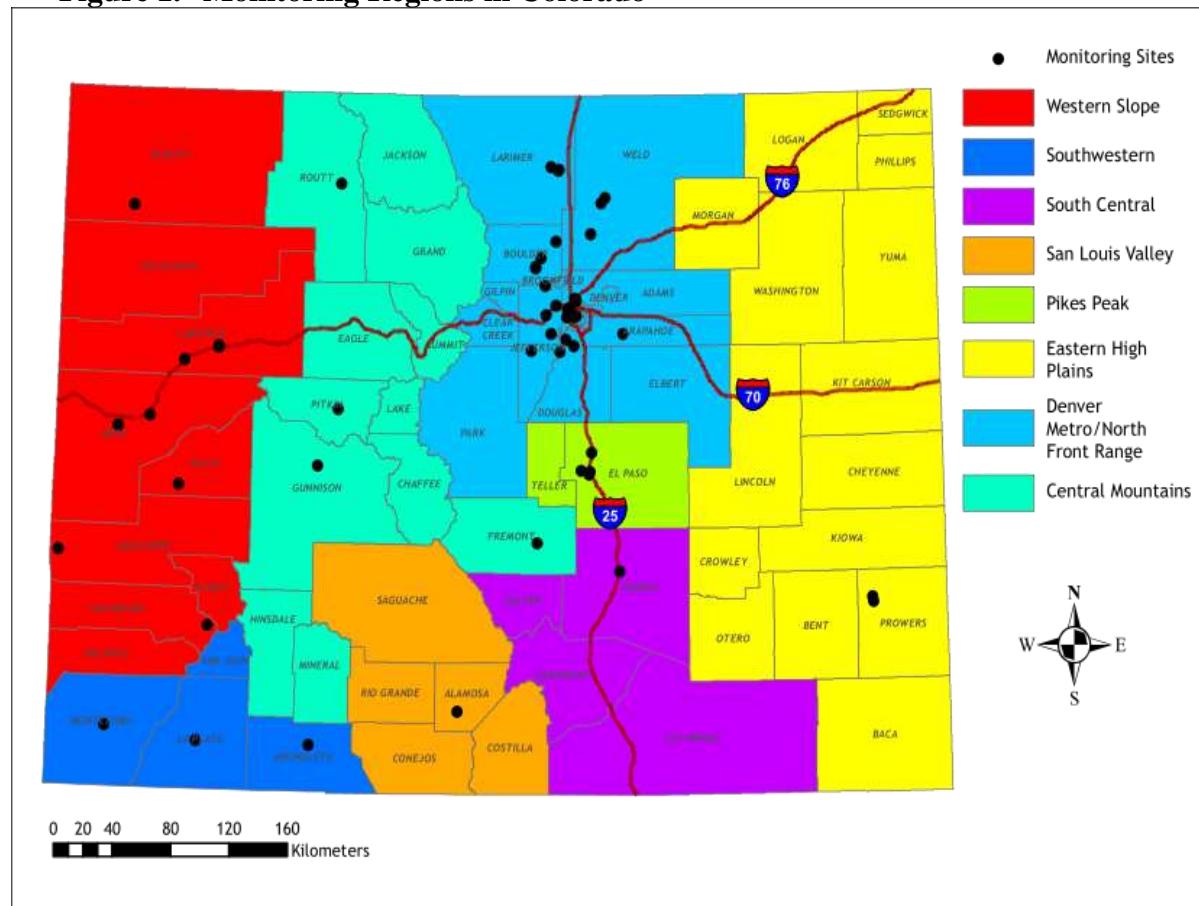
AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	POC	Parameter Started	Orient/Scale	Monitor	Type	Sample
	Relative Humidity	1	01/2004	P.O. Neigh	RM Young	SPM	Continuous
08 077 0020	Palisade Water Treatment	Rapid Creek Rd.		05/2008	1,512	39.130575	-108.313853
	O <sub>3</sub>	1	04/2008	P.O. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	04/2008	P.O. Neigh	RM Young	SPM	Continuous
<b>Moffat</b>							
08 081 0003	Elk Springs	33902 Old US Hwy. 40		08/2015	1,902	40.329253	-108.494240
	O <sub>3</sub>	1	08/2015	BG Regional	TAPI 400E	SPM	Continuous
	WS/WD/Temp/RH	1	08/2015	BG Regional	RM Young	SPM	Continuous
	Total Solar Radiation	1	08/2015	BG Regional	Kipp & Zonen	SPM	Continuous
<b>Montezuma</b>							
08 083 0006	Cortez – Health Dept.	106 W. North St.		06/2006	1,890	37.350054	-108.592337
	O <sub>3</sub>	1	06/2008	P.O. Urban	TAPI 400E	SLAMS	Continuous
<b>Montrose</b>							
08 085 0005	Paradox	7250 County Rd. 5		03/2016	1,582	38.342743	-108.944950
	O <sub>3</sub>	1	03/2016	BG Regional	Thermo 49C	SPM	Continuous
	WS/WD/Temp/RH	1	03/2016	BG Regional	RM Young	SPM	Continuous
<b>Pitkin</b>							
08 097 0006	Aspen – Yellow Brick	215 N. Garmisch St.		01/2015	2,408	39.192958	-106.823257
	PM <sub>10</sub>	1	02/2015	P.O. Neigh	SA/GWM 1200	SLAMS	1 in 3
<b>Prowers</b>							
08 099 0002	Lamar Municipal	104 E. Parmenter St.		12/1976	1,107	38.084688	-102.618641
	PM <sub>10</sub>	2	03/1987	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 1
08 099 0003	Lamar Port of Entry	7100 US Hwy. 50		03/2005	1,108	38.113792	-102.626181
	WS/WD/Temp	1	03/2005	P.O. Neigh	Met - One	SPM	Continuous
<b>Pueblo</b>							
08 101 0015	Pueblo – Fountain School	925 N. Glendale Ave.		06/2011	1,433	38.276099	-104.597613
	PM <sub>10</sub>	1	04/2011	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
	PM <sub>2.5</sub>	1	04/2011	P.O. Neigh	R&P Partisol 2025	SLAMS	1 in 3
<b>Routt</b>							
08 107 0003	Steamboat Springs	136 6th St.		09/1975	2,054	40.485201	-106.831625
	PM <sub>10</sub>	2	03/1987	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 1
<b>San Miguel</b>							
08 113 0004	Telluride	333 W. Colorado Ave.		03/1990	2,684	37.937872	-107.813061
	PM <sub>10</sub>	1	03/1990	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
<b>Weld</b>							
08 123 0006	Greeley-Hospital	1516 Hospital Rd.		04/1967	1,441	40.414877	-104.70693
	PM <sub>10</sub>	2	03/1987	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
	PM <sub>2.5</sub>	3	02/1999	P.O. Neigh	GRIMM EDM 180	SPM	Continuous

AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	POC	Parameter Started	Orient/Scale	Monitor	Type	Sample
08 123 0008	Platteville Middle School	1004 Main St.		12/1998	1,469	40.209387	-104.82405
	PM <sub>2.5</sub>	1	08/1999	P.O. Region	R&P Partisol 2025	SLAMS	1 in 3
	PM <sub>2.5</sub> Speciation	5	08/1999	P.O. Region	SASS	Spec Trends	1 in 6
	PM <sub>2.5</sub> Carbon	5	04/2011	P.O. Neigh	URG 3000N	Spec Trends	1 in 6
08 123 0009	Greeley-County Tower	3101 35th Ave.		06/2002	1,484	40.386368	-104.73744
	O <sub>3</sub>	1	06/2002	H.C. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	02/2012	P.O. Neigh	Met – One	SPM	Continuous
	CO (Trace)	1	04/2016	P.O. Neigh	Thermo 48i-TLE	SLAMS	Continuous

### Description of Monitoring Areas in Colorado

The state has been divided into eight multi-county areas that are generally based on topography and have similar airshed characteristics. These areas are the Central Mountains, Denver Metro/North Front Range, Eastern High Plains, Pikes Peak, San Luis Valley, South Central, Southwestern, and Western Slope regions. **Figure 1** shows the approximate boundaries of these areas.

**Figure 1. Monitoring Regions in Colorado**



## **Central Mountains Region**

The Central Mountains Region consists of 12 counties in the central area of the state. The Continental Divide passes through much of this region. Mountains and mountain valleys are the dominant landscape. Leadville, Steamboat Springs, Cañon City, Salida, Buena Vista and Aspen represent the larger communities. The population of this region is approximately 255,043 according to U.S. Census Bureau 2015 estimates. Skiing, tourism, ranching, mining, and correctional facilities are the primary industries. Black Canyon of the Gunnison National Park is located in this region. All of the area complies with federal air quality standards.

The primary monitoring concern is with particulate pollution from wood burning and road sanding. Currently, there are no gaseous and five particulate monitoring sites operated by the APCD in the Central Mountains region.

## **Denver Metro/North Front Range Region**

The Denver-Metro/North Front Range Region encompasses the 13 counties of Adams, Arapahoe, Boulder, Broomfield, Clear Creek, Denver, Douglas, Elbert, Gilpin, Jefferson, Larimer, Weld, and Park. It includes the largest population area in the state according to 2015 estimates, with approximately 3,068,024 people living in the eleven-county Denver-metro area and another 601,992 people living in the northern Colorado area of Larimer and Weld counties. This area includes Rocky Mountain National Park and several wilderness areas.

Since 2002, the region has complied with all National Ambient Air Quality Standards, except for the 8-hour ozone standard. The area has been exceeding the federal ozone standards since the early 2000s, and in 2007 was formally designated as a “nonattainment” area for the 1997 ozone standard of 85 ppb. This nonattainment designation was re-affirmed in 2012 when the EPA classified the region as a “marginal” nonattainment area for the 2008 ozone standard of 75 ppb. The Denver Metro / North Front Range region failed to attain the 2008 ozone standard and was moved up to the next level of classification, a “moderate” area in May of 2016. A moderate area ozone state implementation plan (SIP) was developed by the Regional Air Quality Control Council with support from APCD and was approved by the Air Quality Control Commission in 2016. The EPA has recently proposed portions of the Denver Metro / North Front Range region ozone SIP for approval. The EPA released a more stringent 8-hour ozone standard on October 1, 2015. Colorado submitted area designation recommendations for the 8-hour 2015 ozone standard in 2016, based on the data from the 2013-2015 monitoring period. The EPA finalized area designations for the 2015 8-hour ozone standard of 70 ppb nationwide in April of 2018. The EPA designated the Denver Metro / Northern Front Range region as nonattainment with a marginal area classification.

In the past, the Denver-metropolitan area violated health-based air quality standards for carbon monoxide and fine particles. In response, the Regional Air Quality Council, the Colorado Air Quality Control Commission and the Air Pollution Control Division developed, adopted and implemented air quality improvement plans to successfully reduce each of the pollutants.

For the rest of the Northern Front Range, Fort Collins, Longmont, and Greeley were nonattainment areas for carbon monoxide in the 1980s and early 1990s, but have met the federal standards since 1995. Air quality improvement plans have been implemented for each of these communities.

Currently, there are twenty-nine gaseous pollutant monitors at sixteen sites and thirty-three

particulate monitors at sixteen sites in the Northern Front Range Region. There are seven CO, fourteen O<sub>3</sub>, five NO<sub>2</sub>, one NOy, and three SO<sub>2</sub> monitoring sites. There are seventeen PM<sub>10</sub> monitors at 12 sites and twenty-three PM<sub>2.5</sub> monitors at twelve sites, keeping in mind that the GRIMM's and T640's monitor continuously for both PM<sub>2.5</sub> and PM<sub>10</sub> and co-located samplers are also included in the total number of samplers operated by the APCD. There are two ozone precursor monitoring sites, one located at CAMP, and one at Platteville. In addition, there is one site that measures visual range by use of a nephelometer and a transmissometer.

### **Eastern High Plains Region**

The Eastern High Plains region encompasses the counties on the plains of eastern Colorado. The area is semiarid and often windy. The area's population is approximately 143,588 according to 2015 U.S. Census Bureau estimates. Its major urban centers have developed around farming, ranching and trade centers such as Sterling, Fort Morgan, Brush, Limon, La Junta, and Lamar. The agricultural base includes both irrigated and dry land farming. With concurrences by EPA on the Exceptional Event Reports for high wind dust events submitted by the APCD, all of the Eastern High Plains Region complies with federal air quality standards.

Historically, there have been a number of communities that were monitored for particulates and meteorology but not for any of the gaseous pollutants. In the northeast along the I-76 corridor, the communities of Sterling, Brush, and Fort Morgan have been monitored in the past for particulates. Along the I-70 corridor only the community of Limon has been monitored for particulates. Along the US-50/Arkansas River corridor the APCD has monitored for particulates in the communities of La Junta and Rocky Ford. These monitoring sites were all discontinued in the late 1970s and early 1990s after a review showed that the concentrations were well below the standard and trending downward.

For the Eastern High Plains Region there is currently one PM<sub>10</sub> monitoring site in Lamar, no gaseous pollutant monitoring sites and one meteorological site in the area. As of 2015, with EPA concurrence, the APCD no longer operates a stand-alone background PM<sub>2.5</sub> monitoring site, but relies on data from the IMPROVE monitoring network. The IMPROVE monitors are an EPA/National Park Service network that operates in park and wilderness areas, with a focus on monitoring visual air quality (visibility).

### **Pikes Peak Region**

The Pikes Peak Region includes El Paso and Teller counties. The area has a population of approximately 702,925 according to 2015 U.S. Census Bureau estimates. Eastern El Paso County is rural prairie, while the western part of the region is mountainous. All of the area complies with federal air quality standards.

The U.S. Government is the largest employer in the area, and major industries include Fort Carson and the U.S. Air Force Academy in Colorado Springs, both military installations. Aerospace and technology are also large employers in the area.

Currently, there are four gaseous instruments at three sites and one particulate monitoring site in the Pikes Peak Region. There are one CO, one SO<sub>2</sub>, and two O<sub>3</sub> gaseous monitors in this region, as well as one PM<sub>10</sub> and one PM<sub>2.5</sub> monitor in the region. There is also one meteorological monitoring site in the region operated by the APCD.

## **San Luis Valley Region**

Colorado's San Luis Valley Region is in the south central portion of Colorado and includes a broad alpine valley situated between the Sangre de Cristo Mountains on the northeast and the San Juan Mountains of the Continental Divide to the west. The valley is some 71 miles wide and 122 miles long, extending south into New Mexico. The average elevation is 7,500 feet. Principal towns include Alamosa, Monte Vista and Del Norte. The population is approximately 48,303 according to 2015 U.S. Census Bureau estimates. Agriculture and tourism are the primary industries. The valley is semiarid and croplands of potatoes, head lettuce, and barley are typically irrigated. The valley is home to Great Sand Dunes National Park.

The air quality planning region consists of Saguache, Rio Grande, Alamosa, Conejos and Costilla counties. With concurrences by EPA on the Exceptional Event Reports submitted by the APCD, all of the San Luis Valley Region complies with federal air quality standards.

Currently, there are no gaseous and one PM<sub>10</sub> monitoring site in the area.

## **South Central Region**

The South Central Region is comprised of Pueblo, Huerfano, Las Animas and Custer counties. Its population is approximately 201,360 according to 2015 U.S. Census Bureau estimates. Urban centers include Pueblo, Trinidad and Walsenburg. The region has rolling semiarid plains to the east and is mountainous to the west. All of the area complies with federal air quality standards.

In the past the APCD has conducted particulate monitoring in both Walsenburg and Trinidad but that monitoring was discontinued in 1979 and 1985 respectively, due to low concentrations.

Currently, there are no gaseous pollutant monitoring sites and one particulate monitoring site in the South Central Region. That site is located in Pueblo and monitors for both filter based PM<sub>10</sub> and PM<sub>2.5</sub>.

## **Southwest Region**

The Southwestern Region includes the Four Corners area counties of Montezuma, La Plata, Archuleta and San Juan. The population of this region is approximately 101,670 according to 2015 U.S. Census Bureau estimates. The landscape includes mountains, plateaus, high valleys and canyons. Durango and Cortez are the largest towns, while lands of the Southern Ute and Ute Mountain Ute tribes make up large parts of this region. The region is home to Mesa Verde National Park. Tourism and agriculture are the dominant industries. Though the oil and gas industry is growing in this area, all of the area complies with federal air quality standards.

Currently there are one ozone and two particulate monitoring stations in the region operated by APCD.

## **Western Slope Region**

The Western Slope Region includes nine counties on the far western border of Colorado. A mix of mountains on the east, with mesas, plateaus, valleys and canyons to the west form the landscape of this region. Grand Junction is the largest urban area, and other cities include Telluride, Montrose, Delta, Rifle, Glenwood Springs, Meeker, Rangely, and Craig. The population of this region is approximately 345,062 according to 2015 U.S. Census Bureau estimates. Primary industries include ranching, agriculture, mining, energy development and

tourism. Dinosaur and Colorado National Monuments are located in this region.

The Western Slope, and the central mountains, are projected to have the fastest growing populations of Colorado through 2020 with greater than two percent annual population increases, according to the Colorado Department of Local Affairs. All of the area complies with federal air quality standards.

Currently, there are five gaseous pollutant monitoring sites and five particulate monitoring sites in the Western Slope region operated by the APCD. There is one CO monitoring site, four O<sub>3</sub> monitoring sites, five PM<sub>10</sub>, and one PM<sub>2.5</sub> monitoring site operated by APCD in this region. The APCD also works with the EPA to monitor air toxics at the Grand Junction Pitkin site as part of the EPA's National Air Toxics Trends Stations (NATTS) monitoring network.

### **State-wide Population Statistics**

**Table 2** is a listing of the projected population statistics by county based on 2015 estimates. The counties have been grouped into Planning and Management Regions (per Colorado Executive Orders of November 1972, 1973, 1986, and October 1998), Metropolitan Statistical Areas (per the US Office of Management and Budget, February 28, 2013), and Sub-state Regions. The Sub-state Regional grouping typically varies from data user to data user. For the purposes of this assessment, the groupings used were as similar to the State's monitoring regions as possible.

**Table 2. Population Statistics by County and Metropolitan Statistical Area**

REGION / MSA / COUNTY	Actual Population	Projected Population		Avg. Annual % Change	
	July 2010	July 2015	July 2020	2010 -15	2010 -20
<b>COLORADO</b>	<b>5,029,196</b>	<b>5,474,968</b>	<b>5,999,989</b>	<b>1.8%</b>	<b>1.9%</b>
<b>CENTRAL MOUNTAINS</b>	<b>225,907</b>	<b>255,043</b>	<b>288,527</b>	<b>2.6%</b>	<b>2.8%</b>
Chaffee	17,809	19,862	23,052	2.3%	2.9%
Eagle	52,197	61,846	71,076	3.7%	3.6%
Fremont	46,824	50,456	54,217	1.6%	1.6%
Grand	14,843	16,989	20,090	2.9%	3.5%
Gunnison	15,324	16,457	17,895	1.5%	1.7%
Hinsdale	843	928	1,027	2.0%	2.2%
Jackson	1,394	1,507	1,598	1.6%	1.5%
Lake	7,310	8,424	9,642	3.0%	3.2%
Mineral	712	804	870	2.6%	2.2%
Pitkin	17,148	19,394	21,929	2.6%	2.8%
Routt	23,509	25,706	28,563	1.9%	2.1%
Summit	27,994	32,670	38,568	3.3%	3.8%
<b>DENVER METRO / NORTH FRONT RANGE</b>	<b>3,390,504</b>	<b>3,679,013</b>	<b>4,023,313</b>	<b>1.6%</b>	<b>1.7%</b>
<b>BOULDER MSA / BOULDER</b>	<b>294,567</b>	<b>312,668</b>	<b>332,107</b>	<b>1.2%</b>	<b>1.3%</b>
<b>DENVER-AURORA-LAKEWOOD MSA</b>	<b>2,543,482</b>	<b>2,755,356</b>	<b>2,999,591</b>	<b>1.7%</b>	<b>1.8%</b>
Adams	441,603	491,263	544,258	2.2%	2.3%
Arapahoe	572,003	619,762	673,230	1.7%	1.8%

REGION / MSA / COUNTY	Actual Population	Projected Population		Avg. Annual % Change	
	July 2010	July 2015	July 2020	2010 -15	2010 -20
Broomfield	55,889	63,926	71,211	2.9%	2.7%
Clear Creek	9,088	9,757	10,710	1.5%	1.8%
Denver	600,158	645,364	686,613	1.5%	1.4%
Douglas	285,465	322,985	373,308	2.6%	3.1%
Elbert	23,086	28,266	38,173	4.5%	6.5%
Gilpin	5,441	5,972	6,519	2.0%	2.0%
Jefferson	534,543	548,447	571,753	0.5%	0.7%
Park County	16,206	19,614	23,816	4.2%	4.7%
<b>FORT COLLINS MSA / LARIMER</b>	<b>299,630</b>	<b>325,776</b>	<b>360,274</b>	<b>1.7%</b>	<b>2.0%</b>
<b>GREELEY MSA / WELD</b>	<b>252,825</b>	<b>285,216</b>	<b>331,341</b>	<b>2.6%</b>	<b>3.1%</b>
<b>EASTERN HIGH PLAINS</b>	<b>137,009</b>	<b>143,588</b>	<b>151,837</b>	<b>1.0%</b>	<b>1.1%</b>
Baca	3,788	3,822	3,893	0.2%	0.3%
Bent	6,499	6,657	6,832	0.5%	0.5%
Cheyenne	1,836	1,940	2,082	1.1%	1.3%
Crowley	5,823	6,234	6,643	1.4%	1.4%
Kiowa	1,398	1,458	1,509	0.9%	0.8%
Kit Carson	8,270	8,643	8,893	0.9%	0.8%
Lincoln	5,467	5,787	6,193	1.2%	1.3%
Logan	22,709	23,873	25,734	1.0%	1.3%
Morgan	28,159	29,772	32,209	1.1%	1.4%
Otero	18,831	19,813	20,802	1.0%	1.0%
Phillips	4,442	4,540	4,670	0.4%	0.5%
Prowers	12,551	13,065	13,633	0.8%	0.9%
Sedgwick	2,379	2,542	2,689	1.4%	1.3%
Washington	4,814	4,948	5,054	0.6%	0.5%
Yuma	10,043	10,494	11,001	0.9%	1.0%
<b>PIKES PEAK</b>	<b>645,613</b>	<b>702,925</b>	<b>763,004</b>	<b>1.8%</b>	<b>1.8%</b>
<b>COLORADO SPRINGS MSA</b>	<b>645,613</b>	<b>702,925</b>	<b>763,004</b>	<b>1.8%</b>	<b>1.8%</b>
El Paso	622,263	677,353	734,862	1.8%	1.8%
Teller	23,350	25,572	28,142	1.9%	2.1%
<b>SAN LUIS VALLEY</b>	<b>45,315</b>	<b>48,303</b>	<b>51,972</b>	<b>1.3%</b>	<b>1.5%</b>
Alamosa	15,445	16,505	17,860	1.4%	1.6%
Conejos	8,256	8,773	9,253	1.3%	1.2%
Costilla	3,524	3,726	3,871	1.1%	1.0%
Rio Grande	11,982	12,812	13,887	1.4%	1.6%
Saguache	6,108	6,487	7,101	1.2%	1.6%
<b>SOUTH CENTRAL</b>	<b>185,536</b>	<b>201,360</b>	<b>763,004</b>	<b>1.7%</b>	<b>1.8%</b>
Custer	4,255	4,991	5,866	3.5%	3.8%

REGION / MSA / COUNTY	Actual Population July 2010	Projected Population		Avg. Annual % Change	
		July 2015	July 2020	2010 -15	2010 -20
Huerfano	6,711	6,996	7,527	0.8%	1.2%
Las Animas	15,507	19,346	19,217	5.0%	2.4%
<b>PUEBLO MSA / PUEBLO</b>	<b>159,063</b>	<b>170,027</b>	<b>185,227</b>	<b>1.4%</b>	<b>1.6%</b>
<b>SOUTHWEST</b>	<b>89,652</b>	<b>101,670</b>	<b>115,796</b>	<b>2.7%</b>	<b>2.9%</b>
Archuleta	12,084	14,348	17,127	3.7%	4.2%
La Plata	51,334	58,404	66,714	2.8%	3.0%
Montezuma	25,535	28,160	31,171	2.1%	2.2%
San Juan	699	758	784	1.7%	1.2%
<b>WESTERN SLOPE</b>	<b>309,660</b>	<b>345,062</b>	<b>387,704</b>	<b>2.3%</b>	<b>2.5%</b>
Delta	30,952	35,724	41,311	3.1%	3.3%
Dolores	2,064	2,247	2,436	1.8%	1.8%
Garfield	56,389	65,124	76,939	3.1%	3.6%
<b>Grand Junction MSA / Mesa</b>	<b>146,723</b>	<b>157,878</b>	<b>171,581</b>	<b>1.5%</b>	<b>1.7%</b>
Moffat	13,795	14,672	15,464	1.3%	1.2%
Montrose	41,276	47,541	54,718	3.0%	3.3%
Ouray	4,436	5,220	5,832	3.5%	3.1%
Rio Blanco	6,666	7,827	9,056	3.5%	3.6%
San Miguel	7,359	8,829	10,367	4.0%	4.1%

## II. Carbon Monoxide (CO)

In 2018, the APCD will operate eight CO monitors. Currently, the NAAQS for CO are primary standards, with a concentration level not to exceed 9 parts per million (ppm) in an eight-hour time period, or 35 ppm in a one-hour period. There is no secondary standard for CO. CO levels have declined from a statewide maximum eight-hour value of 48.1 ppm in 1973 to a value of 1.8 ppm in 2017. The level of the standard has not been exceeded since 1999. The CO monitors currently operated by the APCD are associated both with State Maintenance Plan requirements and EPA requirements under the Code of Federal Regulations (CFR). However, the EPA has revised the minimum requirements for CO monitoring by requiring CO monitors to be sited near roads in certain urban areas. They are requiring a CO monitor to be located at one near-roadway NO<sub>2</sub> monitoring site. EPA is also specifying that monitors required in metropolitan areas (Core Based Statistical Area—CBSAs) of 2.5 million or more persons are to be operational by January 1, 2015, and that monitors required in CBSAs of one million or more persons are required to be operational by January 1, 2017. Currently, a CO monitor is located at the I-25 Denver near roadway NO<sub>2</sub> site to satisfy these requirements.

### Denver Metro/Northern Front Range Region

The three major urban centers in the Northern Front Range Region include the greater Denver Metro area, and the Fort Collins and Greeley areas located in Larimer and Weld counties respectively. Mobile sources are the main contributor to elevated CO in the Front Range region. However, controlled burns/wild fires and biogenic influences, including oil and gas

development, may also contribute to elevated CO levels. Weld County is also located in an area of significant oil and gas development.

**Table 3** lists the maximum eight-hour and one-hour concentrations recorded in 2017 for the Northern Front Range region while, **Table 4** lists the same values for monitoring stations in the Denver Metro area for the same time period.

**Table 3. Maximum CO Concentrations in Northern Front Range**

Site ID	Site Name	Eight-Hour Max (ppm)	One-Hour Max (ppm)
08 069 1004	Fort Collins-Mason	1.2	2.09
08 123 0009	Weld County Tower	1.0	1.45

**Table 4. Maximum CO Concentrations in Denver Area**

Site ID	Site Name	Eight-Hour Max (ppm)	One-Hour Max (ppm)
08 001 3001	Welby	1.5	2.16
08 031 0002	CAMP	1.8	4.10
08 031 0026	La Casa	1.5	2.86
08 031 0027	I-25 Denver	1.7	2.66

### Pikes Peak Region

The Pikes Peak Region is a very popular tourist area with rapid urban growth. In 2017, the highest eight-hour CO concentration recorded at the Colorado Springs-Hwy 24 monitor was 1.3 ppm with a maximum one-hour concentration of 2.68 ppm.

The CO monitor in this area is located at:

08-041-0015 Colorado Springs – Hwy. 24, 690 W. Highway 24

### Western Slope Region

Population in the Western Slope region is not evenly distributed among the counties and ranges from 157,878 people in Mesa County to 8,829 in San Miguel County, according to the 2015 census data. Grand Junction is the largest city on the western slope with an estimated 2014 population of 60,210 (April 2014). This is due in large part to the transient oil/gas working population associated with the boom in drilling in this area.

In 2017, the highest eight-hour CO concentration recorded at the Grand Junction – Pitkin monitor was 0.9 ppm with a one-hour maximum concentration of 1.39 ppm.

The CO monitor in this area is located at:

08-077-0018 Grand Junction - Pitkin, 645 ¼ Pitkin Ave.

### Planned Changes in CO Monitoring

In 2018, there are no planned changes for the CO monitoring network operated by APCD. All of APCD's carbon monoxide monitors have been upgraded to 48i-TLE trace level instruments. The CAMP monitor was converted to a trace level in late April of 2017, which was the last site in the network to make the conversion. The TLE indicates the analyzer is capable of

trace-level CO detection, which increases the resolution of low concentrations detected by an order of magnitude.

### **III. Ozone ( $O_3$ )**

On March 12, 2008, the U.S. Environmental Protection Agency promulgated a new level of the NAAQS for  $O_3$  of 0.075 ppm as an annual fourth-highest daily maximum eight-hour concentration, averaged over three years. This made a significant change in the number of  $O_3$  monitors that violated the standard.

On October 1<sup>st</sup>, 2015, the EPA again strengthened the NAAQS for ground level ozone to 0.070 ppm (effective Dec. 28<sup>th</sup>, 2015). The APCD currently operates five sites out of twenty two in the state that have three-year design values (2015 – 2017) in excess of the current eight-hour  $O_3$  NAAQS standard of 0.070 ppm. These sites are all located in the Denver Metro / Northern Front Range region and are: Chatfield State Park (0.077 ppm), Welch (0.075 ppm), Rocky Flats North (0.077 ppm), Fort Collins West (0.075 ppm) and National Renewable Energy Laboratory or NREL (0.080 ppm).

EPA's monitoring requirements for  $O_3$  include placing a certain number of monitors in areas with high populations. For example, in Metropolitan Statistical Areas (MSAs) with a population greater than ten million people, EPA recommends the placement of at least four monitors in areas with design value concentrations that are greater than or equal to 85% of the  $O_3$  standard. The largest MSA in Colorado is the Denver-Aurora-Lakewood Primary Metropolitan Statistical Area (PMSA). This PMSA includes the counties of Adams, Arapahoe, Broomfield, Clear Creek, Denver, Douglas, Elbert, Gilpin, Jefferson, and Park. There are seven different MSAs in Colorado. **Table 5** below lists EPAs  $O_3$  monitoring requirements. Each MSA is discussed further in the following subsections.

**Table 5. EPAs Minimum Ozone Monitoring Requirements**

<b>MSA population<sup>1,2</sup></b>	<b>Most recent 3-year design value concentrations <math>\geq 85\%</math> of any <math>O_3</math> NAAQS<sup>3</sup></b>	<b>Most recent 3-year design value concentrations <math>&lt; 85\%</math> of any <math>O_3</math> NAAQS<sup>3,4</sup></b>
>10 million	4	2
4–10 million	3	1
350,000–<4 million	2	1
50,000–<350,000 <sup>5</sup>	1	0

<sup>1</sup>Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).

<sup>2</sup>Population based on latest available census figures.

<sup>3</sup>The ozone ( $O_3$ ) National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR Part 50.

<sup>4</sup>These minimum monitoring requirements apply in the absence of a design value.

<sup>5</sup>Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

## Denver Metro/Northern Front Range

Emissions from industrial facilities and electric utilities, oil and gas development, motor vehicle exhaust, gasoline vapors and chemical solvents are some of the major sources of NOx and Volatile Organic Compounds (VOCs) in the atmosphere. In the presence of sunlight, NOx and VOCs chemically react to form ground level ozone.

In the Northern Front Range, the first and fourth maximum eight-hour concentrations recorded in 2017 for each O<sub>3</sub> monitoring site in Larimer and Weld Counties are listed in the **Table 6**. Also listed in the table below are the three-year design values (2015-2017) for each site with enough data available to calculate them. Weld County is an area of significant oil and gas development which potentially contributes to ozone forming compounds or “precursors” in the lower atmosphere. There are two MSAs located in Larimer and Weld counties. These are the Fort Collins MSA, and the Greeley MSA. According to the 2010 Census for projected populations for 2015, their populations in 2015 are projected to be 325,776 and 285,216 respectively. Per EPA monitoring requirements, these MSAs fall in the 50,000 to 350,000 population range and each area requires at least one highest concentration O<sub>3</sub> monitor. These requirements are satisfied by the monitors listed below. The monitor located at the Fort Collins – West site is a highest concentration monitor for the Fort Collins MSA, and the Greeley – Tower monitor serves the same purpose for the Greeley MSA.

**Table 6. Maximum O<sub>3</sub> Concentrations in Northern Front Range Region**

Site ID	Site Name	1 <sup>st</sup> eight-hour Max (ppm)	4 <sup>th</sup> eight-hour Max (ppm)	2015 - 2017 Design Value (ppm)
08 069 0011	Fort Collins – West	0.078	0.075	<b>0.075</b>
08 069 1004	Fort Collins – Mason	0.070	0.066	0.068
08 123 0009	Greeley – Tower	0.076	0.072	0.070

Fort Collins West in the table above shows a 2015-2017 Design Value above the current 2015 8-hour ozone NAAQS standard of .070 ppm. That value is bolded and italicized to highlight that it is above the current standard.

In the Denver Metro area, only Adams, Arapahoe, Boulder, Denver, Douglas, and Jefferson counties have O<sub>3</sub> monitors. There are 11 monitors currently in operation in this area. The first and fourth maximum eight-hour concentrations recorded in 2017 for each O<sub>3</sub> monitoring site in the metropolitan Denver area are listed in **Table 7** below. Also listed are the three-year design values (2015-2017) for each site with enough data available to calculate them. Design values that are **bold** and *italicized* exceed the NAAQS. The 2015 standard of 0.070 ppm will be used to compare to data sets that have three years of data beginning in 2015 or 2015-2017 data.

There are two MSAs located in the Metropolitan Denver area. These are the Boulder MSA, and the Denver-Aurora-Lakewood MSA. According to the 2010 Census for 2015 population projections, their populations are projected to be 312,668 and 2,755,356 respectively. Per EPA monitoring requirements, the Boulder MSA falls in the 50,000 to 350,000 population range, and the Denver-Aurora-Lakewood MSA falls in the 350,000 to 4,000,000 range. The Boulder MSA therefore requires at least one monitor, which is satisfied by the monitor at Boulder Reservoir, which became operational in August of 2016. By EPA rules, the Denver-Aurora-Lakewood

MSA requires at least two monitors. This requirement is satisfied by the remaining ten monitors that are placed throughout the Denver-Aurora-Lakewood MSA. The monitors located at Chatfield, Rocky Flats – North, and NREL are all highest concentration monitors for the Denver-Aurora-Lakewood MSA.

**Table 7. Maximum O<sub>3</sub> Concentrations in the Denver Metro Area**

Site ID	Site Name	1 <sup>st</sup> Eight-hour Max (ppm)	4 <sup>th</sup> Eight-hour Max (ppm)	2015-2017 Design Value (ppm)
08 001 3001	Welby	0.071	0.068	0.067
08 005 0002	Highland	0.076	0.072	----*
08 005 0006	Aurora – East	0.076	0.069	0.067
08 013 0014	Boulder Reservoir	0.078	0.073	----*
08 031 0002	CAMP	0.069	0.067	0.068
08 031 0026	La Casa	0.069	0.068	0.069
08 035 0004	Chatfield State Park	0.078	0.074	<b>0.077</b>
08 059 0005	Welch	0.075	0.075	<b>0.075</b>
08 059 0006	Rocky Flats – N	0.078	0.075	<b>0.077</b>
08 059 0011	NREL	0.081	0.076	<b>0.080</b>
08 059 0013	Aspen Park	0.072	0.068	0.070

\*Highland re-commenced monitoring in Oct. 2015. The Boulder Reservoir site started monitoring in Aug. 2016.

Four of the eleven monitors have concentrations greater than the level of the 2015 8-hour NAAQS standard for ozone of 70 ppb. Their values are bolded and italicized to highlight them.

### Pikes Peak Region

The first and fourth maximum eight-hour concentrations recorded in 2017 for each O<sub>3</sub> monitoring site in the Pikes Peak Region are listed in **Table 8** below. Also listed are the three year design values (2015-2017) for each site.

There is one MSA located in the Pikes Peak Region, the Colorado Springs MSA. According to the 2010 Census data, the projected 2015 population is 702,925. Per EPA monitoring requirements the Colorado Springs MSA falls in the 350,000 to 4,000,000 range and therefore requires at least two monitors. This is satisfied by the monitors at the Air Force Academy and Manitou Springs.

**Table 8. Maximum O<sub>3</sub> Concentrations in Pikes Peak Region**

Site ID	Site Name	1 <sup>st</sup> Eight-hour Max (ppm)	4 <sup>th</sup> Eight-hour Max (ppm)	2015-2017 Design Value (ppm)
08 041 0013	U.S. Air Force Academy	0.073	0.069	0.068
08 041 0016	Manitou Springs	0.074	0.070	0.067

### Western Slope Region

The first and fourth maximum eight-hour concentrations recorded in 2017 for each O<sub>3</sub> monitoring site in the Western Slope Region are listed in **Table 9** below. Also listed are the three year design values (2015-2017) for each site. None of these sites recorded ozone concentrations that exceeded the 8-hour ozone standard. One of the recommendations of the 3-

State Study/Intermountain West Data Warehouse Network Assessment was to locate the former Lay Peak site further to the west. So in response to that recommendation, APCD shut down the Lay Peak site and moved it to Elk Springs. The Elk Springs Site started monitoring for ozone and meteorology on Aug. 1<sup>st</sup>, 2015. The Paradox site was also established due to recommendations of the 3-State Study network assessment.

There is one MSA located on the Western Slope. It is the Grand Junction MSA, which includes all of Mesa County. Per EPA monitoring requirements, this MSA falls in the 50,000 to 350,000 population range, and requires one O<sub>3</sub> monitor. The monitor at the Palisade Water Treatment Plant satisfies this requirement, as well as the highest concentration monitor requirement.

**Table 9. Maximum O<sub>3</sub> Concentrations in the Western Slope Region**

Site ID	Site Name	1 <sup>st</sup> Eight-hour Max (ppm)	4 <sup>th</sup> Eight-hour Max (ppm)	2014-2016 Design Value (ppm)
08 045 0012	Rifle – Health	0.064	0.059	0.062
08 077 0020	Palisade Water Treatment	0.068	0.064	0.064
08 081 0003	Elk Springs	0.065	0.063	-----*
08 085 0005	Paradox	0.062	0.058	-----*

\*The Elk Springs site began monitoring on August 1<sup>st</sup>, 2015. The Paradox site began monitoring on March 1<sup>st</sup>, 2016.

## **Southwest Region**

There is a single O<sub>3</sub> monitor in the Southwest Region in Cortez. The first and fourth eight-hour maximum concentrations in 2017 were 0.068 and 0.064 ppm respectively, and the 2015-2017 design value is 0.061 ppm.

The O<sub>3</sub> monitor in Cortez is:

08 083 0006 – Cortez, 106 W. North Street

## **Planned Changes in O<sub>3</sub> Monitoring**

APCD is in the process of working with the Air Force Academy in Colorado Springs to move the Academy site to a nearby location due to site access issues in its current location. APCD is also currently considering moving the Aspen Park site due to siting criteria concerns that have been identified by EPA. APCD is also considering relocating the Welch monitor due to redundancy findings identified in the monitor-to-monitor correlation analysis performed in the 2015 Network Assessment. There are currently no other planned changes to CDPHE's ozone monitoring network for 2018.

## **IV. Nitrogen Dioxide/Reactive Oxides of Nitrogen (NO<sub>2</sub>/NOy)**

Currently, there are five NO<sub>2</sub>/NOx/NOy monitoring locations in operation, three of which are relatively new sites. The Denver CAMP monitor exceeded the annual average NO<sub>2</sub> standard in 1977 and the Welby monitor has never exceeded the standard of 53 ppb. Concentrations have shown a gradual decline over the past 20 years and during the last decade the trend has been nearly flat, averaging between 20 and 30 ppb.

In January 2010, the EPA set a new primary 1-hour NO<sub>2</sub> NAAQS that is in addition to the

annual standard. The new standard, both primary and secondary, of 100 ppb is based on the three-year average of the 98<sup>th</sup> percentile of the yearly distribution of daily maximum one-hour concentrations.

The APCD began monitoring for NO<sub>y</sub> at the La Casa NCore site in January 2013. NCore sites are part of a national EPA network that monitors multiple pollutants at certain “core” sites around the country. NO<sub>y</sub> monitoring is a requirement for an NCore station, but there are no standards for NO<sub>y</sub>. The EPA has also established requirements for an NO<sub>2</sub> monitoring network that will include monitors at locations where maximum NO<sub>2</sub> concentrations are expected to occur, including within 50 meters of major roadways, as well as monitors sited to measure the area-wide NO<sub>2</sub> concentrations that occur more broadly across communities. Per the requirements, at least one monitor must be located near a major road in any urban area with a population greater than or equal to 500,000 people. A second monitor is required near another major road in areas with either: (1) population greater than or equal to 2.5 million people, or (2) one or more road segments with an annual average daily traffic count greater than or equal to 250,000 vehicles. A second near roadway site was installed and began NO<sub>2</sub> sampling on Oct. 1<sup>st</sup> 2015 at 4905 Acoma St. to satisfy the requirement for a second near-roadway site. In addition to the near roadway monitoring, there must be one monitoring station in each CBSA with a population of 1 million or more persons to monitor a location of expected highest NO<sub>2</sub> concentrations representing the neighborhood or larger spatial scales. The CAMP site satisfies the requirement for the neighborhood highest representative concentration site.

### **Denver Metro/Northern Front Range Region**

The 2017 annual average NO<sub>2</sub> concentrations and one hour design value NAAQS in the Denver Metro/Northern Front Range Region are listed in the table below. The APCD currently only monitors for NO<sub>2</sub> in this region.

**Table 10      Maximum NO<sub>2</sub> Concentrations in the Denver Metro/Northern Front Range**

Site ID	Site Name	Annual Average (ppb)	One Hour Standard Design Value (ppb)
08 001 3001	Welby	14.5	60
08 031 0002	CAMP	19.2	71
08 031 0026	LaCasa	18.4	62
08 031 0027	I25 Denver	24.5	64
08 031 0028	I25 Globeville	27.4	---*

\*A 3-year design value cannot be calculated for the I-25 Globeville site as the site began monitoring in Oct. of 2015.

All the monitors show values that are well below both the Annual Average of 53 ppb and the One Hour Standard Design NAAQS Value of 100 ppb.

The NO<sub>2</sub>/NOx monitors in this area are:

08 001 3001 Welby, 3174 E. 78<sup>th</sup> Avenue  
 08 031 0002 CAMP, 2105 Broadway  
 08 031 0026 La Casa, 4545 Navajo Street  
 08 031 0027 I-25 Denver, 917 Yuma Street

08 031 0028 I-25 Globeville, 4905 Acoma Street

The NO<sub>y</sub> monitor is at 08 031 0026 La Casa, 4545 Navajo Street.

The CAMP monitor serves as an area-wide NO<sub>2</sub> monitor. The I-25 Denver site and the I-25 Globeville sites house the required near-roadway monitors. APCD's most recent near-roadway air monitoring station is called I-25 Globeville and is located at 4905 N. Acoma Street in Denver, on the City and County of Denver right-of-way island between Acoma St. and I-25. The Welby monitor is an EPA Regional Administration Required Monitor for additional NO<sub>2</sub> monitoring in environmental justice areas as defined in the 2010 NO<sub>2</sub> Rule. The monitor at the La Casa site serves as the NCORE monitor.

### **Planned Changes in NO<sub>2</sub>/NO<sub>y</sub> Monitoring**

The APCD is currently outfitting the Rocky Flats North site to accommodate a NO<sub>y</sub> analyzer and a Cavity Attenuated Phase Shift Spectroscopy (CAPS) NO<sub>2</sub> analyzer. These instruments should begin collecting data by the end of 2018. Both of these samplers are part of the Photochemical Assessment Monitoring Station (PAMS) installation at the site.

There are no other planned changes to APCD's NO<sub>2</sub> monitoring network at this time.

## **V. Sulfur Dioxide (SO<sub>2</sub>)**

Currently, there are four monitoring locations within APCD's network. A new one-hour primary standard was finalized in June 2010. To attain that standard, the three-year average of the 99<sup>th</sup> percentile of the daily maximum one-hour average at each monitor within an area must not exceed 75 ppb. The secondary NAAQS is a three-hour average not to exceed 500 ppb more than once per year. In the past, SO<sub>2</sub> had never approached the level of any of the standards until an SO<sub>2</sub> analyzer was added at Highway 24 in Colorado Springs on 1/10/2013; this site exceeded the level of the one-hour standard in 2013 on 3/22/13 and 4/16/13 (1hr = 99 ppb and 1hr = 81 ppb respectively), again on 7/3/2014 (1hr = 82 ppb), and once again on 3/29/2015 (1hr = 87 ppb). Each exceedance of the standard was a single occurrence of a concentration above the specified NAAQS concentration and did not take into account the three-year averaging period necessary to determine an actual violation of the standard.

Since the installation in 2013, the Highway 24 site has not had an actual violation of the SO<sub>2</sub> standard, when calculating the 99<sup>th</sup> percentile across the 3-year window. The 2013-2015 three year design value was 56 ppb at this location, below the 75 ppb standard level. Examination of wind direction and speed in combination with higher concentrations of SO<sub>2</sub> at the site indicated the Martin Drake Power Plant as one potential source. Roadway emissions from diesel vehicles are another potential source. Working with the APCD, Colorado Springs Utilities (CSU) completed meteorological monitoring at its Martin Drake Power Plant from October 2015 through January 2017. The division coordinated with CSU to conduct SO<sub>2</sub> modeling using this validated on-site meteorological data. CSU submitted modeling that followed an approved Division and EPA modeling protocol. This protocol process included Division and EPA review as well as public comment. This modeling, which analyzed a number of scenarios, demonstrated current compliance with the 1-hour SO<sub>2</sub> NAAQS. APCD also monitors meteorology at the Highway 24 site. The current three year design value (2015-2017) for the Highway 24 site in

Colorado Springs is 40 ppb, well below the 75 ppb standard.

SO<sub>2</sub> monitoring requirements include the need for calculating a Population Weighted Emissions Index (PWEI). This figure is calculated for each MSA by multiplying the population of the MSA by the SO<sub>2</sub> emissions for that MSA and dividing by 1 million. This PWEI value is then used to determine areas in need of SO<sub>2</sub> monitoring. A sum of the most recent emissions data by county (2008) give a total for SO<sub>2</sub> emissions of 15,235 tons per year for the Denver PMSA. The calculated PWEI for this region is 37,930 million persons-ton per year. This indicates the need for one SO<sub>2</sub> monitor in the Denver-Aurora-Lakewood MSA according to the EPAs monitoring rules for SO<sub>2</sub>.

Using the same calculation for the Colorado Springs MSA, the calculated PWEI is 8,207 million persons-ton per year. Because of the increase in population in Colorado Springs, there is a need for one SO<sub>2</sub> monitor in this MSA. The monitors listed in the sections below meet these requirements.

### **Metropolitan Denver Counties**

The concentration values are listed in ppb in accordance with the EPA's data reporting rules for this pollutant. **Table 11** below lists the Maximum SO<sub>2</sub> concentrations in the Denver Metro Region.

**Table 11. Maximum SO<sub>2</sub> Concentrations for the Denver Metro Region**

Site ID	Site Name	2017 99 <sup>th</sup> percentile 1-Hour Daily Maximum Concentration (ppb)	2015 – 2017 Design Value (ppb) <sup>4</sup>
08 001 3001	Welby	15.1	17.0
08 031 0002	CAMP	10.0	11.0
08 031 0026	La Casa	16.4	15.0

### **Pikes Peak Region**

In January of 2013 an SO<sub>2</sub> monitor was added to the Highway 24 monitoring station in Colorado Springs. The 99<sup>th</sup> percentile value of the one-hour daily maximum concentration for 2017 was 21.8 ppb. The three year average design value (2015-2017) for the site is 40 ppb.

The SO<sub>2</sub> monitor in this area is:

08 041 0015, Highway 24, 690 W. Highway 24

### **Planned Changes in SO<sub>2</sub> Monitoring**

There are no planned changes in 2018 for the SO<sub>2</sub> monitoring network at this time. Future changes to SO<sub>2</sub> monitoring in Colorado Springs may occur if warranted based on ongoing analyses of emissions from the Drake Power Plant.

## **VI. PM<sub>10</sub>**

Sources of suspended particulate matter in the ambient air include mobile and stationary

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<sup>4</sup>The one-hour SO<sub>2</sub> design value is calculated by taking the three year average of the 99<sup>th</sup> percentile of the daily maximum one-hour averages.

sources (i.e. diesel trucks, wood burning stoves, power plants, etc). Several industrial and manufacturing processes also contribute to elevated particulate levels. There are also a variety of agricultural sources of PM<sub>10</sub> including feed lots, grazing, tilling, etc. Suspended particulates in the atmosphere vary widely in their chemical and physical composition. Particulate matter can be directly emitted or can be formed in the atmosphere when gaseous pollutants react to form fine particles.

Currently the APCD operates PM<sub>10</sub> monitors at 26 different locations. Nineteen of these sites use high volume filter based instruments, 4 sites use low volume filter based instruments, and 9 sites have continuous monitors collocated with FRM (filter based) instruments. There are three sites with collocated high volume samplers (CAMP, Crested Butte and Longmont), and two sites with collocated low volume PM<sub>10</sub> samplers (La Casa and Grand Junction – Powell). The PM<sub>10</sub> NAAQS is a 24-hour average of 150 µg/m<sup>3</sup> not to be exceeded more than once per year on average over a three year period.

This average is also based on the monitoring frequency and the percent of valid data collected at a site.

### **Denver Metro/Northern Front Range Counties**

Neither the monitor at the Fort Collins – CSU site nor the Greeley monitor had any PM<sub>10</sub> exceedances in 2017. The maximum 24 hour averaged concentrations recorded were 99 µg/m<sup>3</sup> at Fort Collins – CSU, and 105 µg/m<sup>3</sup> at Greeley.

The PM<sub>10</sub> monitoring sites in this area are:

08 069 0009 Fort Collins-CSU, 251 Edison Drive  
08 123 0006 Greeley-Hospital, 1516 Hospital Road

There were no PM<sub>10</sub> exceedances by any of the monitors in the Denver Metro area. The

**Table 12** below lists the maximum concentrations recorded at each of the sites in 2017. Site ID numbers that include an asterisk (\*) indicate a low volume sampler, while no asterisk indicates high volume samplers.

**Table 12. Maximum PM<sub>10</sub> Concentrations for the Denver Metro Area**

Site ID	Site Name	Max. 24-Hour Concentration (µg/m <sup>3</sup> )
08 001 0008	Tri County Health Dept.	124*
08 001 3001	Welby	82
08 013 0003	Longmont-Municipal	97
08 013 0012	Boulder Chamber Bldg.	79
08 031 0002	CAMP	90
08 031 0026	La Casa	81*

\*Indicates Low Volume sampler.

### **Eastern High Plains Region**

The sources of PM<sub>10</sub> in the eastern plains are mainly agricultural with some mobile sources near cities and towns. There is a flour mill which may contribute to elevated PM<sub>10</sub> in Lamar.

There were no PM<sub>10</sub> exceedances at the Lamar Municipal site in 2017 with the highest concentration recorded at this site being 87 µg/m<sup>3</sup>.

The PM<sub>10</sub> monitoring site in this area is:

08 099 0002 Lamar Municipal, 104 E. Parmenter Street

### Pikes Peak Region

There were no exceedances of the PM<sub>10</sub> NAAQS in this region for 2017. The highest concentration recorded at the Colorado College site was 83 µg/m<sup>3</sup>. This monitor is a low-volume filter-based sampler.

The PM<sub>10</sub> monitoring site in this area is:

08 041 0017 Colorado College, 130 West Cache la Poudre

### San Luis Valley Region

There were no exceedances in this region in 2017. The maximum concentration at Alamosa Municipal was 60 µg/m<sup>3</sup>. This site houses high volume filter-based samplers.

The PM<sub>10</sub> monitoring site in this area is:

08 003 0003 Alamosa-Municipal, 425 4<sup>th</sup> Street

### South Central Region

There was one PM<sub>10</sub> exceedance in this region in 2017. The maximum concentration found at the Pueblo – Fountain School in 2017 was 168 µg/m<sup>3</sup>. This site houses high volume filter-based samplers.

The PM<sub>10</sub> monitoring site in this area is:

08 101 0015 Pueblo – Fountain School, 925 North Glendale Avenue

### Central Mountain Region

There were no PM<sub>10</sub> exceedances in the Central Mountain region during 2017. The table below lists the maximum concentrations recorded at each of the sites.

**Table 13. Maximum PM<sub>10</sub> Concentrations for Mountain Counties**

Site ID	Site Name	Max. 24-Hour Concentration (µg/m <sup>3</sup> )
08 043 0003	Cañon City – City Hall	48
08 051 0004	Crested Butte	98
08 051 0007	Mount Crested Butte	59
08 097 0008	Aspen – Yellow Brick	52
08 107 0003	Steamboat Springs	77

### Southwestern Region

There were no exceedances of the PM<sub>10</sub> standard in 2017 for this area. The maximum concentration at Pagosa Springs was 72 µg/m<sup>3</sup>, and the maximum concentration at Durango – River City Hall was 38 µg/m<sup>3</sup>. These sites house high volume filter-based samplers.

The PM<sub>10</sub> monitoring sites in this area are:

08 007 0001 Pagosa Springs, 309 Lewis Street

08 067 0004 Durango – River City Hall, 1235 Camino Del Rio

## **Western Slope Region**

There were no PM<sub>10</sub> exceedances in the Western Slope region in 2017. Sources of PM<sub>10</sub> in the Western region include motor vehicle activity, industries and manufacturing processes, which include lumber processing, mining, gravel pits, and rock quarries. There are also a variety of agricultural sources of PM<sub>10</sub> including feed lots, grazing, tilling, and other dry land agricultural activities. The Rifle Henry Building site was dismantled on 12/31/16 due to building use issues. It has been moved and reassembled on the Garfield County Library building just down the street from the Henry Building at 207 East Avenue, Rifle, Colorado 81550 with the first sample being collected in February of 2017. The table below lists the maximum concentrations recorded at the monitoring sites in this area. Site ID numbers that include a star (\*) indicate a low volume sampler, while no star indicates a high volume sampler.

**Table 14. Maximum PM<sub>10</sub> Concentrations in Western Slope Counties**

<b>Site ID</b>	<b>Site Name</b>	<b>Max. 24-Hour Concentration (<math>\mu\text{g}/\text{m}^3</math>)</b>
08 029 0004	Delta	58
08 045 0005	Parachute	47
08 045 0023	Rifle – Library	45
08 077 0017	Grand Junction – Powell	51*
08 113 0004	Telluride	75

\*Indicates a Low Volume sampler.

## **Planned Changes in PM<sub>10</sub> Monitoring**

APCD plans to discontinue PM<sub>10</sub> monitoring at the end of 2018 at the following sites due to all of them meeting their sampling objectives and all of them showing low PM<sub>10</sub> concentrations:

- Alamosa Municipal (08-003-0003)
- Mt. Crested Butte (08-051-0007 dismantled March of 2018 due to building demolition)
- Town of Crested Butte (08-051-0004)
- Delta (08-029-0004)
- Durango (08-067-0004)
- Fort Collins CSU (08-069-0009 PM<sub>10</sub> monitoring will continue with GRIMM EDM 180)
- Greeley Hospital (08-123-0006 PM<sub>10</sub> monitoring will continue with GRIMM EDM 180)
- Parachute (08-045-0005)
- Rifle Library (08-045-0023)

APCD added more continuous PM<sub>10</sub> monitoring to its' network on the front-range in 2017/2018 by installing three Teledyne T640 PM mass monitors. Currently, the Chatfield (08-035-0004) and the National Jewish Health sites (08-031-0012) are measuring and reporting continuous PM<sub>10</sub> with the T640 instruments. The Longmont site will have the TEOM removed and be outfitted with a T640 sometime early summer 2018, giving it continuous PM<sub>10</sub> as well as PM<sub>2.5</sub> readings. All of these new Teledyne monitors will report PM<sub>10</sub> under the 85101 parameter code. There are no additional planned changes to the PM<sub>10</sub> monitoring network for 2018.

## VII. PM<sub>2.5</sub>

Sources of fine particulate matter in the atmosphere include all types of combustion activities (motor vehicle, power plants, wood burning stoves, forest fires, etc.) and certain types of industrial activities. Oil and gas development may also contribute to elevated suspended fine and coarse particulate matter.

The annual PM<sub>2.5</sub> standard of 12 µg/m<sup>3</sup> is compared to the three-year average annual mean PM<sub>2.5</sub> concentration. The 24-hour PM<sub>2.5</sub> standard of 35 µg/m<sup>3</sup> is compared to the three-year average of the annual 98<sup>th</sup> percentile value.

PM<sub>2.5</sub> concentration values are reported in four different groups of readings by the APCD. Data from instruments sampling according to the Federal Reference Method (FRM) are reported with an 88101 parameter code, data from continuous samplers that reasonably compare to the FRM are reported with the 88500 parameter code, data from continuous samplers that don't compare reasonably to the FRM are reported with the 88501 parameter code, and speciation data is reported with the 88502 parameter code. Currently, there are 11 filter-based PM<sub>2.5</sub> FRM instruments at 10 sites. Of the 10 sites, 6 are collocated with a continuous instrument and one is collocated with another filter-based FRM; 7 sites (National Jewish Hospital, Boulder Marine St., I-25 Globeville, Fort Collins CSU, Grand Junction Powell, Greeley Hospital, Colorado College) have continuous PM<sub>2.5</sub> but no filter-based FRM. Speciation samplers, (laboratory analysis of PM<sub>2.5</sub> samples to characterize the different components of PM<sub>2.5</sub> in the atmosphere) take samples at 3 sites; La Casa, Platteville and Tri County Health Dept. All three speciation sites are collocated with a low volume filter based FRM.

### Denver Metro/Northern Front Range Region

The PM<sub>2.5</sub> sites listed below are sites in the APCD network that are suitable for comparisons to the annual PM<sub>2.5</sub> NAAQS.

There were no PM<sub>2.5</sub> violations in 2017 in the Larimer and Weld County area. The table below lists the 24-hour Design Value (98<sup>th</sup> percentile averaged over 3 years) recorded at each of the sites in Larimer and Weld Counties as well as the Annual Design Values (annual mean averaged over 3 years).

**Table 15. Maximum PM<sub>2.5</sub> Concentrations in Northern Front Range Counties**

Site ID	Site Name	24-Hour Design Value (µg/m <sup>3</sup> )	Annual Design Value (µg/m <sup>3</sup> )
08 069 0009	Fort Collins – CSU	21	7.1
08 123 0006	Greeley – Hospital	25	8.3
08 123 0008	Platteville	26	7.6

There were no violations of the PM<sub>2.5</sub> standard in the Denver Metro area in 2017. The table below lists the 24-hour and Annual Design Values (2015-2017) recorded in 2017 for each site in the Denver Metro area.

**Table 16. Maximum PM<sub>2.5</sub> Concentrations in the Denver Metro Area**

<b>Site ID</b>	<b>Site Name</b>	<b>24-Hour Design Value (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>Annual Design Value (<math>\mu\text{g}/\text{m}^3</math>)</b>
08 001 0008	Commerce City (Tri County Health Department)	23*	9.9*
08 005 0005	Arapahoe Community College	18	5.9
08 013 0003	Longmont – Municipal	23	6.7
	Boulder Chamber of Commerce		5.5
08 013 0012	CAMP	17	
08 031 0002	La Casa	20	7.1
08 031 0026	I-25 Denver	19	7.0
08 031 0027	I-25 Globeville	23	8.5
08 031 0028	Chatfield Reservoir	27*	10.8*
08 035 0004		19	5.4

\*Data set does not meet completeness criteria. The Tri County Health Department site began monitoring in August of 2016. The I-25 Globeville site began monitoring in October of 2015. The above data is based on concentrations looking 3 years back.

CAMP and La Casa are technically micro-scale sites but are EPA approved as neighborhood scale. Based on ongoing data collection and analysis, CAMP can be shown to be analogous with sites ranging from Commerce City to La Casa, and is well correlated with sites within the Platte Valley from Greeley and Platteville in the north to Chatfield in the south, and is thus approved as neighborhood scale.

08 031 0002-1 Denver CAMP, 2105 Broadway

08 031 0026-1 La Casa, 4587 Navajo Street

08 035 0004-1 Chatfield Reservoir, 11500 N. Roxborough Park Road

The Boulder Chamber of Commerce building site is considered a middle scale site, but it has been approved by the EPA as representative of a neighborhood scale site. The APCD performed a “land use and gridded emissions inventory analysis” to demonstrate to EPA that the area surrounding the Boulder Chamber of Commerce building has many contiguous middle scale sites with similar emissions densities, meteorology and land uses.

### Pikes Peak Region

There were no violations of the PM<sub>2.5</sub> standard in 2017 in the Pikes Peak Region. The 24-Hour Design Value at the Colorado College site was 17  $\mu\text{g}/\text{m}^3$ , and the Annual Design Value was 5.7  $\mu\text{g}/\text{m}^3$ .

The PM<sub>2.5</sub> monitoring site in this area is:

08 041 0017 Colorado College, 130 West Cache la Poudre

## **South Central Region**

There were no violations of the PM<sub>2.5</sub> NAAQS standard in the South Central region in 2017. The 24-Hour Design Value at the Pueblo – Fountain School was 16 µg/m<sup>3</sup> and the Annual Design Value was 5.2 µg/m<sup>3</sup>.

The PM<sub>2.5</sub> monitoring site in this area is:

08 101 0015 Pueblo – Fountain School, 925 North Glendale Avenue

## **Western Slope Region**

There were no PM<sub>2.5</sub> violations recorded in the Western Slope region in 2017. The 24-Hour Design Value at the Grand Junction Powell building was 19 µg/m<sup>3</sup>, and the Annual Design Value was 6.1 µg/m<sup>3</sup>.

The PM<sub>2.5</sub> monitoring site in this area is:

08 077 0017 Grand Junction – Powell, 650 South Avenue

## **PM<sub>2.5</sub>, GRIMM, TAPI T640 and TEOM Continuous Monitors**

All Federal Reference Method (FRM) monitors in the Colorado PM<sub>2.5</sub> network were in the past compared to the NAAQS. The FRM monitors are all filter based 24-hour composite samples. Due to advances in continuous particulate monitoring technology the APCD now uses continuous PM monitors to compare to the PM<sub>2.5</sub> NAAQS. The GRIMM EDM 180 and the Teledyne T640 have received Federal Equivalent Method (FEM) designation for PM<sub>2.5</sub> from the EPA. The sites that use these instruments to compare to the PM<sub>2.5</sub> NAAQS are: I-25 Denver (08 031 0027), Colorado College (08-041-0017), Fort Collins (08-069-0009), Grand Junction Powell (08-077-0017), I-25 Globeville (08-031-0028), National Jewish Health Center (08-031-0013) and Greeley Hospital (08-123-0006). APCD replaced the first TEOM at CAMP in April of 2013 with a GRIMM EDM 180. APCD has determined the GRIMM EDM 180 and the T640 to be a very reliable cost effective way to monitor ambient continuous particulate concentrations.

The APCD currently employs three (one PM<sub>10</sub>) TEOM continuous particulate monitors for forecasting and advising the public of air quality alerts. The TEOM 1400ab with 8500 FDMS is a federally equivalent monitor; however frequent monitor problems and APCD concerns regarding equivalency designation have forced the APCD to consider these instruments not suitable for regulatory purposes. The following sites currently have TEOM continuous PM<sub>2.5</sub> monitors that are not intended for comparison with the NAAQS.

08 013 0003-3 Longmont-Municipal, 350 Kimbark Street

08 013 1001-3 Boulder CU/Athens, 2102 Athens St.

08 001 3001-3 Welby, 3174 E. 78<sup>th</sup> Ave. (PM<sub>10</sub>)

## **Community Monitoring Zones**

Community monitoring zones are an additional method of defining an area for comparison with the PM<sub>2.5</sub> NAAQS where data from two or more monitoring sites are averaged together for comparison with the standard. Currently, the APCD does not have any areas where this technique is used.

The definition of community monitoring zone (CMZ) in 40 CFR Part 58.1 is as follows: “Community monitoring zone (CMZ) means an optional averaging area with established, well

defined boundaries, such as county or census block, within a Monitoring Planning Area (MPA) that has relatively uniform concentrations of annual PM<sub>2.5</sub> as defined by appendix N of part 50 of this chapter. Two or more community oriented SLAMS monitors within a CMZ that meet certain requirements as set forth in appendix N of part 50 of this chapter may be averaged for making comparisons to the annual PM<sub>2.5</sub> NAAQS.” The CMZ is an optional technique that averages the PM<sub>2.5</sub> 24-hour concentrations from two or more monitors located in the same community.

If the PM<sub>2.5</sub> monitoring network is changed by the creation/change of a CMZ or changing the location of a violating monitor, then the APCD will ask EPA Region VIII for approval via the current network modification process, and then notify the appropriate governments of affected communities. The APCD will also provide the proposed changes to the affected communities and concerned citizens on our web site. A public comment period will be open for thirty days prior to the APCD selecting a new site.

### **Planned Changes in PM<sub>2.5</sub> Monitoring**

Some notable changes occurred within APCD’s PM<sub>2.5</sub> network during 2017/2018, including the removal and replacement of the TEOM’s at Chatfield and National Jewish Health with Teledyne API T640 Continuous Mass Monitors. These sites will now have continuous PM<sub>2.5</sub> and PM<sub>10</sub> concentrations reported to the division’s website. The PM<sub>2.5</sub> concentrations being generated by these instruments will be used for comparison with the NAAQS but they have not been approved as an FEM for PM<sub>10</sub> by the EPA. For more detailed changes to the PM<sub>2.5</sub> monitoring network see “Completed Changes” in section XII of this plan. APCD also plans to remove and replace the TEOM at the Longmont Municipal site with an API T640 by the end of June 2018. There are no other planned changes in PM<sub>2.5</sub> monitoring in 2018 at this time.

## **VIII. Lead**

Lead sampling at the LaCasa NCore site was discontinued December 31<sup>st</sup>, 2015 due to low concentrations being found. The maximum quarterly lead concentration has generally been less than a tenth of the current 2008 standard. In addition, Colorado has not recorded an exceedance of the previous lead standard (1.5 µg/m<sup>3</sup> averaged over a calendar quarter) since the first quarter of 1980. The 2008 lead standard, which is 0.15 µg/m<sup>3</sup> averaged over any three rolling consecutive three-month periods, has not been exceeded using data from 2013 - 2015.

The U.S. EPA calculated emissions for lead at general aviation airports due to piston engine aircraft, which continue to use leaded aviation fuel. According to EPA, Centennial Airport had the second highest lead emissions of any airport in the country at 1.18 tons per year (TPY) using data from the 2005 National Emissions Inventory (NEI). Since this emissions estimate exceeded the threshold for lead, the APCD located a lead sampling site at the Centennial Airport. This monitoring site was installed in March 2011 and the first sample was collected on April 3, 2011. The Centennial Airport TSP sampler was decommissioned on Dec. 31<sup>st</sup>, 2014 due to the site meeting its sampling requirements and it regularly showing concentrations well below that of the standard. The 2014 NEI reports lead emissions of 0.77 TPY, which is below the 1 TPY threshold for monitoring and corroborates the decision to discontinue monitoring at Centennial Airport.

Lead monitoring is required by EPA at one source-oriented SLAMS site located to measure the maximum lead concentration in ambient air resulting from each non-airport lead source which emits 0.50 or more TPY based on either the most recent National Emission Inventory

(NEI) or other scientifically justifiable methods and data (such as improved emissions factors or site-specific data) taking into account logistics and the potential for population exposure. Based on the 2014 NEI, there are no non-airport sources that are over the 0.5 TPY threshold. There have been questions regarding the U.S. Army Fort Carson facility in Colorado Springs, which has at times reported potential emissions over 0.5 TPY in the Toxics Release Inventory (TRI). It is noted that the 2014 NEI reports 0.029 TPY for Fort Carson and both the 2014 and 2016 TRI report 0 TPY for fugitive and stack air emissions. Based on the APCD inventories, these emissions are actually from their Pinon Canyon training area in Las Animas County. This area is remote with only scattered ranches, approximately 25 miles to the northeast of the town of Trinidad and thus would not warrant monitoring due to a low potential for public exposure.

### **Planned Changes in Lead Monitoring**

No changes in lead monitoring in 2018 are planned. Ambient lead concentrations will still be measured at the PM<sub>2.5</sub> speciation and IMPROVE sites throughout the state, as well as on the PM<sub>10</sub> sampler at Grand Junction Powell (08 077 0017) as part of the NATTS project.

## **IX. METEOROLOGICAL MEASUREMENTS**

Meteorological measurements taken by the APCD consist of Wind Speed, Wind Direction, Temperature, and seven sites are also equipped with Relative Humidity. The La Casa site also records delta temperature and total solar radiation. The Paradox site is currently the only site to record precipitation in APCD's network. The Elk Springs site monitors additional parameters as well, including delta temperature, relative humidity and total solar radiation. The wind speed and direction measurements are made as both scalar and vector averages. A final parameter that is recorded at the meteorological sites is the standard deviation of horizontal wind direction. This is a calculation, not a direct measurement, of the variation of wind direction over time. The meteorological monitoring sites are:

- 08 001 3001 Welby, 3174 E. 78<sup>th</sup> Avenue
- 08 005 0002 Highland Reservoir, 8100 S. University Boulevard
- 08 005 0006 Aurora East, 36001 Quincy Avenue
- 08 013 0014 Boulder Reservoir, 5545 Reservoir Road
- 08 031 0002 Denver-CAMP, 2105 Broadway
- 08 031 0026 La Casa, 4587 Navajo Street
- 08 031 0027 I-25 Denver, 913 Yuma Street
- 08 031 0028 I-25 Globeville, 4905 Acoma Street
- 08 035 0004 Chatfield State Park, 11500 N. Roxborough Park Road
- 08 041 0015 Highway 24, 690 W. Hwy. 24
- 08 059 0002 Arvada, 9101 W. 57<sup>th</sup> Avenue
- 08 059 0005 Welch, 12400 W. Hwy 285
- 08 059 0006 Rocky Flats-N, 16600 W. Hwy 128
- 08 059 0013 Aspen Park, 26137 Conifer Road
- 08 069 1004 Fort Collins-Mason, 708 S. Mason Street
- 08 077 0018 Grand Junction-Pitkin, 645 1/4 Pitkin Avenue
- 08 077 0020 Palisade Water Treatment, Hwy 141 and D Road
- 08 081 0003 Elk Springs, 33902 US Hwy. 40
- 00 085 0005 Paradox, 7250 County Road 5

08 099 0003 Lamar Port of Entry, 7100 US Hwy 50  
08 123 0009 Greeley – Weld County Tower, 3101 35<sup>th</sup> Avenue

### **Planned Changes in Meteorological Monitoring**

APCD will be adding new meteorological monitoring parameters to the Rocky Flats North site in an effort to support the new PAMS monitoring instrumentation being installed there. Those metrological instruments should be fully operational near the end of 2018 and include: wind speed, wind direction, barometric pressure, 10 meter temperature, 2 meter temperature, delta temperature, relative humidity, precipitation, total solar radiation, mixing layer height and ultra violet solar radiation. The APCD will also investigate adding meteorological monitoring to the Fort Collins-West site. There are currently no other 2018 planned changes to APCD's meteorological monitoring network.

### **X. PAMS (Photochemical Assessment Monitoring Station) Monitoring**

In accordance with EPA's 2015 revised ozone monitoring rule (80 CFR 65292; October 26, 2015), the state of Colorado is required to install and operate one Photochemical Assessment Monitoring Station (PAMS) site. The rule states that PAMS monitoring is to occur at all NCore sites from June 1 through August 31 in Core-Based Statistical Areas (CBSAs) with populations of 1,000,000 or more. The CDPHE operates the NAAQS air monitoring compliance network in Colorado and will be responsible for implementing these new monitoring requirements. Colorado's PAMS site will measure, at a minimum, volatile organic compounds (VOCs), carbonyls, ozone, total reactive nitrogen (NOy), true nitrogen dioxide (NO<sub>2</sub>), mixing layer height, wind speed, wind direction, relative humidity, temperature, atmospheric pressure, precipitation, total solar radiation, and ultraviolet radiation. All measurements will be collected and reported in hourly averages.

The implementation will occur in concurrence with EPA's "PAMS Quality Assurance Implementation Plan" document (October 2016). This document sets forth the milestones necessary to ensure a July 1, 2019 implementation date. A list of the more significant milestones are as follows.

#### Colorado's PAMS Site Planned Milestones

- 6/30/2017 – The CDPHE has submitted a draft PAMS Monitoring Implementation Network Plan and a waiver to EPA Region 8 office as part of its Annual Network Plan on 6/30/2017. The CDPHE requested a waiver to relocate Colorado's PAMS site from the La Casa NCore site (08-031-0026) to the Rocky Flats North site (08-059-0006). See Appendix B in this plan for those documents. EPA reviewed and approved the waiver as a part of the 2017 Network Plan on January 17<sup>th</sup>, 2018.
- 12/31/2018 – The CDPHE will have all field equipment installed and operational.
- 3/31/2019 – The CDPHE will have the PAMS quality system documents, such as the Quality Assurance Project Plan and Standard Operating Procedures finalized.
- 3/31/2019 – The CDPHE will have performed readiness reviews in preparation of Performance Test samples and Technical System Audits.
- 6/30/2019 – The CDPHE will have completed at least one EPA Performance Test sample and one Technical System Audit.
- 6/30/2019 – Field implementation of routine monitoring will start by 6/30/2019.

- 10/1/2019 – Develop and submit an Enhanced Monitoring Plan to Regional EPA.

## XI. QUALITY ASSURANCE

### Continuous Monitors

The Technical Services Program (TSP) staff performs three types of gaseous analyzer performance checks: quality control checks, accuracy audits, and calibrations. The audits and calibrations challenge the analyzer with pollutant gases of known concentration within the range of the analyzer. The APCD Quality Assurance (QA) staff conducts independent accuracy audits on all of the instruments at least twice per year. EPA's National Performance Audit Program (NPAP) also conducts independent audits on randomly selected sites within the network. The APCD Gaseous and Meteorology Monitoring (GMM) staff conducts quality control checks nominally once every two weeks, and calibrations once every calendar quarter. The details and minimum standards for this program are set out in the Code of Federal Regulations (Part 58 Ambient Air Quality Surveillance). The APCD always makes an effort to go above and beyond the minimum requirements. A complete description of these procedures is available in the APCD Quality Assurance Project Plan (QAPP) and the results are available from the APCD or through the national EPA AQS database.

### Particulate Monitors

The audit checks performed on the particulate monitors consist of calibrated flow rate checks, as well as temperature and pressure sensor checks. The precision checks that are made on filter based particulate monitors consist of collocated samplers that operate side-by-side and collect a sample from both samplers once every sixth day. The precision checks for continuous particulate monitors consist of monthly temperature, pressure, leak rate and flow rate verification checks. EPA requires a minimum of 15% of the FRM network to be collocated. By the end of 2017 Colorado maintained 30 filter based particulate monitoring sites (low-volume and high-volume), 6 of which had collocated instruments (CAMP, Adams County, Longmont, La Casa, Grand Junction Powell and Crested Butte). The EPA also has a performance evaluation program (PEP), which checks the national network for bias by having a private contractor set up an independent filter based low-volume FRM sampler next to the APCD's PM<sub>2.5</sub> sampler (between 1 – 4 m apart). All of the samples are then compared to ensure that the data are within federal limits and meet pre-established data quality objectives.

### Meteorological Monitors

Annual calibrations and audit checks are performed on the meteorological equipment to determine proper alignment and operation of the sensors. The details and minimum standards for this program are set out in the Code of Federal Regulations (Part 58 Ambient Air Quality Surveillance). A complete description of the procedures and the results are available from the APCD or in the APCD QAPP.

## XII. SUMMARY OF NETWORK CHANGES

Over the past year, several network changes occurred, and during the next year several more changes are planned. The section below summarizes the completed and planned changes.

## **Completed Changes**

The following changes to the CDPHE monitoring network occurred during 2017/2018.

- A ceilometer (Vaisala CL-51) was added to the Rocky Flats North site as a PAMS monitoring requirement for mixing layer height.
- All of APCD's carbon monoxide monitors have been upgraded to the 48iTLE trace level monitors. The TLE indicates the analyzer is capable of trace-level CO detection, which increases the resolution of low level concentrations detected by an order of magnitude.
- The TEOM at the Chatfield site was replaced by a Teledyne API T640 continuous particulate monitor in May of 2017. The TEOM at the National Jewish Health site was also replaced by a Teledyne API T640 continuous particulate monitor in March of 2018.
- The Rifle Henry Building site (08-045-0007) discontinued sampling and was removed due to building use issues in January of 2017. The site was moved down the street to the Garfield County Library (08-045-0023) and recommenced PM<sub>10</sub> sampling in February of 2017.
- Total Solar Radiation monitoring was installed at LaCasa in April of 2018.

## **Planned Changes**

APCD began installing an EPA-required Photochemical Assessment Monitoring Site (PAMS) in 2017, with an expected completion near the end of 2018. This site is at the Rocky Flats North (08-059-0006) site. A waiver to relocate PAMS monitoring to the Rocky Flats North site from the LaCasa NCore site and a PAMS Network Implementation Plan was submitted in APCD's 2017 Network Plan. The waiver and the implementation plan was approved by EPA on January 17<sup>th</sup>, 2018. Additional information regarding these documents can be seen in APCD's 2017 Network Plan.

APCD plans to add meteorological, NOy, NO<sub>2</sub> and VOC parameters to the Rocky Flats North site to meet PAMS monitoring requirements.

APCD will investigate new site locations for the Aspen Park monitor and relocate if an appropriate location is found. Areas around Pine, Conifer and Evergreen are being considered for the relocation.

APCD will investigate new site locations for the Welch monitor and relocate if an appropriate location is found. Areas around Idaho Springs, Black Hawk, Golden Gate Canyon, and Nederland are being considered for the relocation.

APCD will remove the TEOM at the Longmont Municipal site and replace it with a Teledyne API T640 PM mass monitor by the end of June 2018.

APCD plans to discontinue PM<sub>10</sub> monitoring at the end of 2018 at the following sites due to all of them meeting their sampling objectives and all of them showing low PM<sub>10</sub> concentrations:

- Alamosa Municipal (08-003-0003)
- Mt. Crested Butte (08-051-0007 dismantled March of 2018 due to building demolition)
- Town of Crested Butte (08-051-0004)
- Delta (08-029-0004)

- Durango (08-067-0004)
- Fort Collins CSU (08-069-0009 PM<sub>10</sub> monitoring will continue with GRIMM EDM 180)
- Greeley Hospital (08-123-0006 PM<sub>10</sub> monitoring will continue with GRIMM EDM 180)
- Parachute (08-045-0005)
- Rifle Library (08-045-0023)

### **XIII. CFR Part 58, APPENDIX A, C, D, E REQUIREMENTS SUMMARY**

This section summarizes the requirements of 40 CFR 58, Appendices A, C, D, and E, as they pertain to the CDPHE's ambient air monitoring network, as well as how these specific requirements are being met.

Appendix A of 40 CFR 58 covers the data quality assurance requirements for SLAMS, SPMs, and PSD monitors. The requirements state the need for, and frequency of zero, span, and precision processes on the analyzer. It also specifies the auditing requirements for each monitor type. Audits of each particulate analyzer are performed on a quarterly basis and most gaseous analyzers are audited on a twice a year basis. These results are tracked in a database at the CDPHE, and are available upon request. A zero/span, or a zero/precision routine is run on each of the gaseous monitoring instruments in the CDPHE's network on a nightly basis. These results are kept "in-house" at the CDPHE, and are available on request. Manual quality control checks are performed on all gaseous instruments on a two week basis and the results of these quality control tests are uploaded to EPA's national AQS database.

Appendix C of 40 CFR 58 specifies the criteria pollutant monitoring methods (manual analyzers or automated analyzers) which must be used in SLAMS and NCORE stations that are a subset of SLAMS. The monitor types and sampling frequencies are listed in Table 1, as well as in the station summaries found in Appendix A of this document.

Appendix D of 40 CFR 58 specifies the network design criteria for ambient air quality monitoring. It covers the monitoring objectives and spatial scales, the general monitoring requirements, the design criteria for NCORE sites, pollutant specific design criteria for SLAMS sites, and the design criteria for Photochemical Assessment Monitoring Stations (PAMS). These requirements are addressed in the individual pollutant sections.

Appendix E of 40 CFR 58 contains the specific location criteria applicable to SLAMS, NCORE, and PAMS ambient air quality monitoring probes, inlets, and optical paths after the general location has been selected based on the monitoring objectives and spatial scale of representation discussed in Appendix D of 40 CFR 58. Adherence to these specific siting criteria is necessary to ensure the uniform collection of compatible and comparable air quality data. To ensure that all sites in the network meet the appropriate criteria, the CDPHE performs thorough site evaluations every two years. These evaluations include measurements of the probe heights and locations, as well as residence time determinations for each gaseous analytical instrument. The results of these site evaluations are available upon request.

## Appendix A - Monitoring Site Descriptions

Appendix A includes site information for all sites containing continuous gaseous monitors, meteorological monitors, or particulate monitors. The data is presented first in a tabular format, and is then followed by site descriptions. It is in the order of EPA AQS Station ID number.

**Table 17. Monitoring Site Locations and Instruments**

AQS #	Site Name	CO	O <sub>3</sub>	NO	NO <sub>2</sub> /NOy	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	Met	App. A,C,D,E Reqs. Met?
08 001 0008	Tri County Health Bldg. - Commerce City						X	X		YES
08 001 3001	Welby	X	X	X	X	X	X		X	NO – trees*
08 003 0003	Alamosa – Municipal Bldg.							X		YES
08 005 0002	Highland Reservoir		X						X	YES
08 005 0005	Arapahoe Comm. Coll.							X		YES
08 005 0006	Aurora – East		X						X	YES
08 007 0001	Pagosa Springs School						X			YES
08 013 0003	Longmont-Municipal Bldg.							X	X	YES
08 013 0012	Boulder Chamber of Commerce							X	X	NO - trees
08 013 0014	Boulder Reservoir		X						X	YES
08 013 1001	Boulder – CU - Athens							X		YES
08 029 0004	Delta Health Dept						X			YES
08 031 0002	Denver – CAMP	X	X	X	X	X	X	X	X	NO – trees*
08 031 0013	Denver - NJH						X	X		NO - trees
08 031 0016	DESCI – Visibility Site									YES
08 031 0026	La Casa	X	X	X	X	X	X	X	X	YES
08 031 0027	I-25 Denver	X		X	X		X	X	X	YES
08 031 0028	I-25 Globeville			X	X		X	X	X	YES
08 035 0004	Chatfield State Park		X				X	X	X	YES
08 041 0013	U. S. Air Force Academy		X							YES
08 041 0015	Colorado Springs Hwy 24	X				X			X	YES
08 041 0016	Manitou Springs		X							YES
08 041 0017	Colorado College						X	X		YES
08 043 0003	Cañon City – City Hall						X			YES
08 045 0005	Parachute – Elem. School						X		X	YES
08 045 0012	Rifle – Health Dept.		X							YES
08 045 0023	Rifle – Garfield County Library							X		YES
08 051 0004	Crested Butte						X			YES
08 059 0002	Arvada								X	YES
08 059 0005	Welch		X						X	YES
08 059 0006	Rocky Flats - N		X						X	YES
08 059 0011	NREL		X							YES

<i>AQS #</i>	<i>Site Name</i>	<i>CO</i>	<i>O<sub>3</sub></i>	<i>NO</i>	<i>NO<sub>2</sub>/NOy</i>	<i>SO<sub>2</sub></i>	<i>PM<sub>10</sub></i>	<i>PM<sub>2.5</sub></i>	<i>Met</i>	<i>App. A,C,D,E Reqs. Met?</i>
08 059 0013	Aspen Park		X						X	NO - trees
08 067 0004	Durango-River City Hall						X			YES
08 069 0009	Fort Collins - CSU - Edison						X	X		NO - trees
08 069 0011	Fort Collins - West		X							YES
08 069 1004	Fort Collins - Mason	X	X						X	NO - trees, met only
08 077 0017	Grand Junction – Powell Bldg						X	X		YES
08 077 0018	Grand Junction - Pitkin	X							X	YES
08 077 0020	Palisade Water Treatment		X						X	YES
08 081 0003	Elk Springs		X						X	YES
08 083 0006	Cortez – Health Dept		X							YES
08 085 0005	Paradox		X						X	YES
08 097 0006	Aspen – Yellow Brick						X	X		YES
08 099 0002	Lamar Municipal						X			YES
08 099 0003	Lamar Port of Entry								X	YES
08 101 0015	Pueblo - Fountain School						X	X		YES
08 107 0003	Steamboat Springs						X			YES
08 113 0004	Telluride						X			YES
08 123 0006	Greeley-Hospital						X	X		YES
08 123 0008	Platteville Middle School							X		YES
08 123 0009	Greeley – County Tower	X	X						X	YES

\*The CAMP and Welby sites were granted waivers by EPA in 2014 for not meeting siting criteria due to tree obstructions. The waivers were granted because they are long term trends site.

#### **Tri County Health Dept. - Commerce City, 4201 E. 72<sup>nd</sup> Ave. (08 001 0008):**

Tri County Health Dept. - Commerce City site is in a predominantly residential area with a large commercial and industrial district. It is located north of the Denver Central Business District (CBD) near the Platte River Valley, downstream from the Denver urban air mass. There are three schools in the immediate vicinity, an elementary school to the south, a middle school to the north, and a high school to the southeast. There is a large industrial area to the south and east, and gravel pits about a kilometer to the west and northwest.

This is a replacement site for the Alsup Elementary school (08-001-0006) site which was dismantled due to a roofing project on the building.

PM<sub>10</sub> and PM<sub>2.5</sub> monitoring began in August of 2016. There is a collocated PM<sub>2.5</sub> FRM along with a continuous PM<sub>2.5</sub> GRIMM EDM dust monitor, a filter based low volume PM<sub>10</sub> monitor, a trends speciation monitor, and a PM<sub>2.5</sub> carbon monitor all in operation.

#### **Welby, 3174 E. 78<sup>th</sup> Avenue (08 001 3001):**

Located 8 miles north-northeast of the Denver Central Business District (CBD) on the bank of the South Platte River, this site is ideally located to measure nighttime drainage of the air mass from the Denver metropolitan area and the thermally driven, daytime upriver flows. The

monitoring shows that high CO levels are associated with winds from the south-southwest. While this is the direction of five of the six major sources in the area, it is also the direction of the primary drainage winds along the South Platte River. This monitor is in the SLAMS network, and is population oriented for a neighborhood scale.

CO monitoring began in 1973 and continued through the spring of 1980. Monitoring was stopped from the spring of 1980 until October 1986 when it began again as a special study. Welby has not recorded an exceedance of either the one-hour or eight-hour CO standard since January 1988. In the last few years, its primary value has been as an indicator of changes in the air quality index (AQI). The site did not meet siting criteria due to large trees near the site but a waiver was submitted to EPA and was approved in 2014 due to it being a long term trends site.

O<sub>3</sub> monitoring began at Welby in July of 1973. The Welby monitor has not recorded an exceedance of the old one-hour O<sub>3</sub> standard since 1998. However, the trend in the 3-year average of the 4<sup>th</sup> maximum eight-hour average has been increasing since 2002.

The Welby NO<sub>2</sub> monitor began operation in July 1976. The site's location provides an indication of possible exceedance events before they hit the Denver-Metro area. The site serves as a good drainage location, but it may be a target for deletion or relocation farther down the South Platte River Valley from Denver due to growth in trees that are not allowed to be removed.

The Welby SO<sub>2</sub> monitor began operation in July of 1973.

PM<sub>10</sub> monitoring began at Welby in June and July of 1990 with a high volume PM<sub>10</sub> monitor and a PM<sub>10</sub> continuous TEOM monitor. Meteorological monitoring began in January of 1975.

#### **Alamosa - Municipal, 425 4<sup>th</sup> Street (08 003 0003):**

The Alamosa 425 4<sup>th</sup> Street was started in May 2002. The site was established to be closer to the center of the city than the former Adams State College site, in order to be more representative of the population exposure in the area. This is a population oriented neighborhood scale SLAMS monitor that is on a daily sample schedule.

#### **Highland Reservoir, 8100 S. University Boulevard (08 005 0002):**

The Highlands site began operation in June of 1978. It was intended to be a background location. However, with urban growth and the construction of C-470, it has become a long-term trend site that monitors changes in the air quality of the area. It is currently believed to be near the southern edge of the high urban O<sub>3</sub> concentrations although it may not be in the area of maximum concentrations. This is a population oriented neighborhood scale SLAMS monitor.

Meteorological monitoring began in July of 1978.

In September of 2010 the site and meteorological tower were relocated to the east by approximately 30 meters to allow for the construction of an emergency generator system. This emergency generator system is located approximately 20 meters northwest of the new site location. The Highlands monitoring site had to be shut down from approximately Oct. of 2013 to Sept. of 2015 due to major construction activities on the property. The site is currently monitoring for ozone and meteorological parameters.

#### **Arapahoe Community College (ACC), 6190 S. Santa Fe Drive (08 005 0005):**

The ACC site is located in south suburban metropolitan Denver. It is located on the south side of the Arapahoe Community College in a distant parking lot. The site is near the bottom of the

Platte River Valley along Santa Fe Drive (Hwy. 85) in the city of Littleton. It is also near the city of Englewood. There is a large residential area located to the east across the railroad and Light Rail tracks. The PM<sub>2.5</sub> monitor is located on a mobile shelter in the rarely used South parking lot. Located at 6190 S. Santa Fe Drive, this small trailer is close to the Platte River and the monitor has excellent 360° exposure. Based on the topography and meteorology of the area ACC is in an area where PM<sub>2.5</sub> emissions may collect. This location may capture high concentrations during periods of upslope flow and temperature inversion in the valley. However, since it is further south in a more sparsely populated area, the concentrations are usually not as high as other Denver locations.

Winds are predominately out of the south-southwest and south, with secondary winds out of the north and north-northeast (upslope). Observed distances and traffic estimates easily fall into the neighborhood scale in accordance with federal guidelines found in the 40 CFR, Part 58, Appendix D. The site meets all other neighborhood scale criteria, making the monitor a population oriented neighborhood scale SLAMS monitor on a 1 in 3 day sample schedule.

**Aurora – East, 36001 Quincy Ave (08 005 0006):**

The Aurora East site began operation in June 2009. It is intended to act as a regional site and aid in the determination of the eastern most extent of the high urban O<sub>3</sub> concentrations. It is located along the eastern edge of the former Lowry bombing range, on a flat, grassy plains area. This site is currently outside of the rapid urban growth area taking place around Aurora Reservoir. This was a special purpose monitor (SPM) for a regional scale, and became a SLAMS monitor in 2013.

**Pagosa Springs School, 309 Lewis Street (08 007 0001):**

The Pagosa Springs site was located on the roof of the Town Hall from April 24, 2000 through May 2001. When the Town Hall building was planned to be demolished, the PM<sub>10</sub> monitor was relocated to the Pagosa Springs Middle School and the first sample was collected on June 7, 2001.

The Pagosa Springs School site is located next to Highway 160 near the center of town. Pagosa Springs is a small town spread over a large area. The San Juan River runs through the south side of town. The town sits in a small bowl like setting with hills all around. A small commercial strip area along Highway 160 and single-family homes surrounds this location. It is representative of residential neighborhood exposure. Pagosa Springs was a PM<sub>10</sub> nonattainment area and a SIP was implemented for this area. PM<sub>10</sub> concentrations were exceeded a few times in the late 1990s.

Winds for this area predominantly blow from the north, with secondary winds from the north-northwest and the south. The predominant wind directions closely follow the valley topography in this rugged terrain. McCabe Creek, which is very near the meteorological station that was on the Town Hall building, runs north-south through this area. However, the highest wind gusts come from the west and southwest during regional dust storms. This is a population oriented neighborhood scale SLAMS monitor on a daily sampling schedule.

**Longmont – Municipal Bldg., 350 Kimbark Street (08 013 0003):**

The town of Longmont is a growing, medium sized Front Range community. Longmont is located between the Denver/Boulder Metro-area and Fort Collins. Longmont is both suburban and rural in nature. The town of Longmont is located approximately 30 miles north of Denver

along the St. Vrain Creek and is about six miles east of the foothills. Longmont is partly a bedroom community for the Denver-Boulder area. The elevation is 4978 feet. The Front Range peaks rise to an elevation of 14,000 feet just to the west of Longmont. In general, the area experiences low relative humidity, light precipitation and abundant sunshine.

The station began operations in 1985 with the installation of PM<sub>10</sub> followed by PM<sub>2.5</sub> monitors in 1999.

Longmont's predominant wind direction is from the north through the west due to winds draining from the St. Vrain Creek Canyon. The PM<sub>10</sub> site is near the center of the city near both commercial and residential areas. This location provides the best available monitoring for population exposure to particulate matter. The distance and traffic estimate for the controlling street easily falls into the neighborhood scale in accordance with federal guidelines found in 40 CFR, Part 58, and Appendix D. This is a population oriented neighborhood scale SLAMS monitor on a 1 in 6 day sample schedule. In September of 2014 APCD installed a collocated sampler at the site to meet EPA PM<sub>10</sub> high volume collocation requirements.

**Boulder Chamber of Commerce, 2440 Pearl Street (08 013 0012):**

The city of Boulder is located on the eastern edge of the Rocky Mountain foothills. Most of the city sits on rolling plains. The Boulder PM<sub>2.5</sub> site is approximately 7,000 feet east of the base of the Front Range foothills and about 50 feet south of a small branch of Boulder Creek, the major creek that runs through Boulder.

PM<sub>10</sub> monitoring began at this site in December of 1994, while the PM<sub>2.5</sub> monitoring did not begin until January of 1999.

The predominant wind direction at the APCD's closest meteorological site (Rocky Flats – North) is from the west with secondary maximum frequencies from the west-northwest and west-southwest. The distance and traffic estimate for Pearl Street and Folsom Street falls into the middle scale, but the site has been justified to represent a neighborhood scale site in accordance with federal guidelines found in 40 CFR, Part 58 and Appendix D. This is a population oriented neighborhood scale SLAMS monitoring site on a 1 in 6 day sample schedule.

**Boulder Reservoir, 5545 Reservoir Road (08 013 0014):**

The city of Boulder is located about 30 miles to the northwest of Denver. The Boulder Reservoir is a 700 acre multi-use recreation and water storage facility owned and managed by the city of Boulder. It is operated as a water supply by the Northern Colorado Water Conservancy District. The Reservoir is located about 5.5 miles to the North East of the city of Boulder. This site is a replacement site for the South Boulder Creek site which was shut down January 1<sup>st</sup>, 2016 due to large trees that had grown over the years that could not be removed, making the site no longer suitable for monitoring ozone.

The Boulder Reservoir is a highest concentration oriented urban scale SLAMS monitor. The site monitors for ozone and meteorological parameters and has been sampling since September of 2016.

**Boulder – CU - Athens, 2102 Athens Street (08 013 1001):**

The Boulder - CU site is located at the edge of a low usage parking lot to the immediate north of the site and south of the University of Colorado football practice fields. This location provides a good neighborhood representation for particulates. The site houses a continuous TEOM

particulate monitor inside the shelter. The site began operation in November 2004. A dome is erected each fall over the practice field and remains inflated until early spring when it is removed for the summer months.

**Delta, 560 Dodge Street (08 029 0004):**

Delta is a small agricultural community midway between Grand Junction and Montrose. The topography in and around Delta is relatively flat as it sits in the broad Uncompaghre River Valley surrounded by high mesas and mountains. Delta sits in a large bowl shaped basin that can effectively trap air pollution, especially during persistent temperature inversions.

The Delta County Health Department site was chosen because it is a one story building near the downtown area. The site began operation in August 1993, and is representative of the large basin with the potential for high PM<sub>10</sub> due to agricultural burning and automobile traffic. This is a population oriented neighborhood scale SLAMS monitor on a 1 in 3 day sample schedule.

**CAMP, 2105 Broadway (08 031 0002):**

The City and County of Denver is located approximately 30 miles east of the foothills of the Rocky Mountains. Denver sits in a basin, and the terrain of the city is characterized as gently rolling hills, with the Platte River running from southwest to northeast, just west of the downtown area. The CAMP site is located in downtown Denver.

CO monitoring began in February 1965 as a part of the Federal Continuous Air Monitoring Program. It was established as a maximum concentration (micro-scale), population-oriented monitor. The CAMP site measures the exposure of the people who work or reside in the central business district (CBD). Its location in a high traffic street canyon causes this site to record most of the high pollution episodes in the metro area. The street canyon effect at CAMP results in variable wind directions for high CO levels and as a result wind direction is less relevant to high concentrations than wind speed. Wind speeds less than 1 mph, especially up-valley, combined with temperature inversions trap the pollution in the area. The site did not meet siting criteria due to large trees near the site but a waiver was submitted to EPA and was approved in 2014 due to it being a long term trends site.

Sampling for all parameters at the site was discontinued from June of 1999 to July of 2000 for the construction of a new building.

The NO<sub>2</sub> monitor began operation in January 1973 at this location.

The SO<sub>2</sub> monitor began operation in January 1967.

O<sub>3</sub> monitoring began originally in 1972 and has been intermittently monitored through January 2008. The current O<sub>3</sub> monitor began operation in February 2012.

The PM<sub>10</sub> monitoring began in 1986 with the installation of collocated monitors, and was furthered by the addition of a continuous monitor in 1988.

The CO monitor was updated to a Thermo 48iTLE trace level monitor in April 2017 to better characterize lower level concentrations seen in recent years.

The PM<sub>2.5</sub> monitoring began in 1999 with a sequential filter based FRM monitor. A continuous TEOM FEM PM<sub>2.5</sub> monitor was installed in February of 2001 and an FDMS was installed on the instrument November 1, 2003. In April 2013, the TEOM/FDMS was replaced with a GRIMM EDM 180 continuous monitor, which concurrently measures both PM<sub>10</sub> and PM<sub>2.5</sub>.

Meteorological monitoring began at this site in January of 1965.

**National Jewish Health, 14<sup>th</sup> Avenue & Albion Street (08 031 0013):**

This site is located three miles east of the Denver CBD, close to a very busy intersection (Colorado Boulevard and Colfax Avenue). The current site began operations in 1982, as a CO monitoring site. Two previous sites were located just west of the current location. The first operated for only a few months before it was moved to a new site in the corner of the laboratory building at the corner of Colorado Boulevard and Colfax Avenue. In 2001, particulate monitoring began at this location. In 2007, CO was discontinued at the site. This site recently had the TEOM removed and had a Teledyne T640 Continuous Particulate Matter Mass Monitor installed on March 15<sup>th</sup> 2018. This site is now being compared to the NAAQS with continuous PM<sub>2.5</sub> concentrations and is reporting continuous PM<sub>10</sub> concentrations under the 85101 parameter code which is not compared to the PM<sub>10</sub> NAAQS. The monitor here is a population oriented middle scale special project monitor.

**DESCI:**

A visibility site was installed in Denver in late 1990 using a long-path transmissometer. Visibility in the downtown area is monitored using a receiver located near Cheesman Park at 1901 E. 13th Avenue, and a transmitter located on the roof of the Federal Building at 1929 Stout Street. Renovations at the Federal Building forced the transmissometer source to be temporarily moved to the Sakura Building at 1255 19th Street in 2010, and quality control measurements showed no meaningful difference between the Federal Building and the Sakura Building. Visibility monitoring was re-instated at the Federal Building on January 1<sup>st</sup>, 2014. This instrument directly measures light extinction, which is proportional to the ability of atmospheric particles and gases to attenuate image-forming light as it travels from an object to an observer. The station also monitors relative humidity in order to resolve low visibility because of fog or rain.

**La Casa, 4587 Navajo Street (08 031 0026):**

The La Casa site was established in January of 2013 as a replacement for the Denver Municipal Animal Shelter (DMAS) site when a land use change forced the relocation of the site. The La Casa location has been established as the NCore site for the Denver Metropolitan area. In late 2012 the DMAS site was decommissioned and moved to the La Casa site in northwest Denver and includes a trace gas/precursor-level CO analyzer, and a NOy analyzer, in addition to the trace level SO<sub>2</sub>, O<sub>3</sub>, meteorology, and particulate monitors are located here. La Casa has been certified in 2013 as an NCore-compliant site by the EPA. The site represents a population oriented neighborhood scale monitoring area.

The trace level SO<sub>2</sub>, CO, and NOy analyzers began operation in January 2013.

The meteorological monitoring began at La Casa in January 2013. Total Solar Radiation was added to the met parameters in April of 2018.

PM<sub>10</sub> monitoring began at La Casa in January 2013. Currently, there is a pair of collocated low volume PM<sub>10</sub> samplers, and a Lo-Vol PM<sub>2.5</sub> on the shelter roof. The Lo-vol PM<sub>10</sub> concentrations are very useful as they are used in conjunction with the PM<sub>2.5</sub> measurements to calculate PM<sub>10-2.5</sub> or coarse PM.

PM<sub>2.5</sub> monitoring began at La Casa in January 2013 with an FRM filter-based monitor, a

continuous TEOM/FDMS FEM instrument, a supplemental PM<sub>2.5</sub> speciation monitor, and a carbon speciation monitor. In early 2015, the TEOM/FDMS was replaced with a GRIMM EDM 180 continuous monitor, which concurrently measures both PM<sub>10</sub> and PM<sub>2.5</sub>.

PM<sub>10</sub>/lead monitoring began in January 2013. Lead monitoring at La Casa was discontinued December 31<sup>st</sup>, 2015 due to extremely low concentrations measured at the site. EPA has removed the lead monitoring requirement from all NCORE sites due to the low concentrations measured throughout the country. Ambient lead concentrations will still be measured at the PM<sub>2.5</sub> speciation and IMPROVE sites throughout the state, as well as on the PM<sub>10</sub> sampler at Grand Junction Powell (08 077 0017) as part of the National Air Toxics Trends Stations project.

**I-25 Denver, 913 Yuma Street (08 031 0027):**

The I-25 Denver site is an EPA-required near roadway NO<sub>2</sub> monitoring site. It was established in June 2013. It is measuring NO/NO<sub>2</sub>/NO<sub>x</sub> by chemiluminescence. Trace level CO, Teledyne API Model 633 Black Carbon Aethalometer, PM<sub>2.5</sub> with a filter based sequential FRM on a 1 and 6 day schedule, continuous PM<sub>10</sub> & PM<sub>2.5</sub> (with a GRIMM EDM 180), and meteorological parameters are also measured here.

**I-25 Globeville, 4905 Acoma Street (08 031 0028):**

The I-25 Globeville site is a second EPA-required near roadway NO<sub>2</sub> monitoring site. It was established Oct. 1<sup>st</sup>, 2015. It is measuring NO/NO<sub>2</sub>/NO<sub>x</sub> by chemiluminescence. The site is also equipped with sensors to measure meteorological parameters and continuous PM<sub>10</sub> and PM<sub>2.5</sub> with a GRIMM EDM 180 instrument.

**Chatfield State Park, 11500 N. Roxborough Park Road (08 035 0004):**

The Chatfield State Park location was established as the result of the 1993 Summer O<sub>3</sub> Study. The original permanent site was located at the campground office. This site was later relocated on the south side of Chatfield State Park at the park offices. This location was selected over the Corps of Engineers Visitor Center across the reservoir because it was more removed from the influence of traffic along C-470. Located in the South Platte River drainage, this location is well suited for monitoring southwesterly O<sub>3</sub> formation in the Denver metro area.

PM<sub>2.5</sub> monitoring began at this site in 2004 with the installation of a TEOM continuous monitor, and was furthered by the addition of an FRM sequential filter based monitor in 2005. In May of 2017 the TEOM was removed and replaced with a Teledyne T640 PM mass monitor. Meteorological monitoring began in April of 2004.

**Colorado Springs, USAFA Road 640 (08 041 0013):**

The United States Air Force Academy site was installed as a replacement maximum concentration O<sub>3</sub> monitor for the Chestnut Street (08 041 0012) site. Modeling in the Colorado Springs area indicates that high O<sub>3</sub> concentrations should generally be found along either the Monument Creek drainage to the north of the Colorado Springs central business district (CBD), or to a lesser extent along the Fountain Creek drainage to the west of the CBD. The decision was made to locate this site near the Monument Creek drainage, approximately 9 miles north of the CBD. This location is near the south entrance of the Air Force Academy but away from any roads. This is a population oriented urban scale SLAMS monitor.

### **Colorado Springs Hwy-24, 690 W. Highway 24 (08 041 0015):**

The Highway 24 site is located just to the west of I-25 and just to the east of the intersection of U.S. Highway 24 and 8<sup>th</sup> Street, approximately 0.8 miles to the west of the Colorado Springs CBD. Commencing operation in November 1998, this site is a replacement for the Tejon Street (08 041 0004) CO monitor. The site is located in the Fountain Creek drainage and is in one of the busiest traffic areas of Colorado Springs. Additionally, traffic is prone to back-up along Highway 24 due to a traffic light at 8<sup>th</sup> Street. Thus, this site is well suited for the SLAMS network to monitor maximum concentrations of CO in the area both from automotive sources and also from nearby industry, which includes a power plant. It also provides a micro-scale setting for the Colorado Springs area, which has not been possible in the past.

In January of 2013 an SO<sub>2</sub> monitor was added to Highway 24 to meet monitoring criteria for an increased population found during the 2010 census. To supplement SO<sub>2</sub> monitoring at the site, APCD added an RM Young meteorological tower in August of 2014, which also includes an RH sensor.

### **Manitou Springs, 101 Banks Place (08 041 0016):**

The Manitou Springs ozone site is located 4 miles west of Colorado Springs. It was established because of concern that the high concentration urban O<sub>3</sub> area was traveling farther up the Fountain Creek drainage and the current monitoring network was not adequate. The Manitou Springs monitor began operations in April 2004. It is located in the foothills above Colorado Springs in the back of the city maintenance facility. This is a population-oriented neighborhood scale SLAMS monitor.

### **Colorado College, 130 W. Cache la Poudre Street (08 041 0017):**

The Colorado College monitoring site was established in January, 2007 after the revised particulate regulations required that Colorado Springs have a continuous PM<sub>2.5</sub> monitor. The APCD elected to collocate the new PM<sub>2.5</sub> monitor with the corresponding filter-based monitors from the RBD site at the Colorado College location, which included an FRM PM<sub>2.5</sub> monitor and added a low volume FEM PM<sub>10</sub> monitor in November, 2007. The continuous monitor began operation in April of 2008. In the summer of 2016 the filter based PM<sub>2.5</sub> FRM instrument was removed and the GRIMM EDM 180 was designated as the primary sampler used to compare to the PM<sub>2.5</sub> NAAQS. Currently there is also a low volume filter-based PM<sub>10</sub> sampler operated on a 1 in 6 day schedule at the site.

The nearest representative meteorological site is located at the Highway 24 monitoring site. Wind flows at the Colorado College site are affected by its proximity to Fountain Creek, so light drainage winds will follow the creek in a north/south direction. The three monitoring sites here are population-oriented neighborhood scale monitors on the SLAMS network (PM<sub>10</sub> and PM<sub>2.5</sub>).

### **Cañon City - City Hall, 128 Main Street (08 043 0003):**

Cañon City is located 39 miles west of Pueblo. Particulate monitoring began on January 2, 1969 with the operation of a TSP monitor located on the roof of the courthouse building at 7<sup>th</sup> Avenue and Macon Street. The Macon Street site was relocated to the top of the City Hall building in October of 2004.

The Cañon City PM<sub>10</sub> site began operation in December 1987. On May 6, 1988, the Macon Street monitor recorded a PM<sub>10</sub> concentration of 172 µg/m<sup>3</sup>. This is the only exceedance of

either the 24-hour or annual NAAQS since PM<sub>10</sub> monitoring was established at Cañon City. This is a population oriented neighborhood scale SLAMS monitor on a 1 in 6 day sample schedule.

**Parachute Elementary School, 100 E. 2<sup>nd</sup> Street (08 045 0005):**

The Parachute site began operation in May 2000 with the installation of a PM<sub>10</sub> monitor at the local elementary school. This is a population-oriented neighborhood scale SLAMS monitor on a 1 in 3 day sample schedule.

**Rifle – Garfield County Public Library, 144 3<sup>rd</sup> Street (08 045 0023):**

This site began operation in January of 2017 and is on the Garfield County Public Library, down the street from the former monitoring site on the Henry Building. It includes two population oriented neighborhood scale special purpose, time-integrated, high volume, filter-based PM<sub>10</sub> monitors on a 1 in 3 day sample schedule. Additionally, this site includes a meteorological tower and continuous PM<sub>2.5</sub> sampler owned and operated by Garfield County.

**Rifle – Health Dept., 195 14<sup>th</sup> Ave (08 045 0012):**

The Rifle Health site is located at the Garfield County Health Department building. The site is approximately 1 kilometer to the north of the downtown area and next to the Garfield County fairgrounds. The site is uphill from the downtown area. A small residential area is to the north and a commercial area to the east. This site was established to measure O<sub>3</sub> in Rifle, which is the largest population center in the oil and gas impacted area of the Grand Valley. Monitoring commenced in June 2008. This is a SLAMS site with a neighborhood scale.

**Crested Butte, 603 6<sup>th</sup> Street (08 051 0004):**

The Crested Butte PM<sub>10</sub> site began operation in June 1985. Crested Butte is a high mountain ski town located approximately 30 miles north of Gunnison, Colorado. The monitor is at the east end of town near the highway and in the central business district. Any wood burning from the residential area to the west directly affects this location. The physical setting of the town, near the end of a steep mountain valley, makes wood burning, street sanding, and wintertime inversions a major concern. The town is attempting to regulate the number of wood burning appliances, since this is a major source of wintertime PM<sub>10</sub>.

This is a population oriented neighborhood scale SLAMS monitor on a 1 in 3 day sample schedule with a collocated sampler on a 1 in 6 day sample schedule.

**Mt. Crested Butte Realty, 19 Emmons Road (08 051 0007):**

Mount Crested Butte is located at an elevation of 8,940 feet (2,725 m) at the base of the Crested Butte Mountain Resort ski area. Mount Crested Butte is a unique location for high particulate matter concentrations because it is located on the side of a mountain (Crested Butte 12,162 ft. or 3,707 m), not in a bowl, valley, or other topographic feature that would normally trap air pollutants. There is not a representative meteorological station in or near Mt. Crested Butte.

The location for the Mt. Crested Butte site was selected because it had an existing PM<sub>10</sub> site that had several high PM<sub>10</sub> concentrations including five exceedances of the 24-hour standard in 1997 and one in 1998. Mt. Crested Butte also exceeded the PM<sub>10</sub> annual average standard in 2011. A CMB source apportionment from 10 PM<sub>10</sub> filters identified a crustal material as the most likely source (91%) of PM<sub>10</sub>. Carbon, which is most likely from residential wood smoke, made up 8% of the statistically composite sample and secondary species made up the remaining one percent.

The Mt. Crested Butte site was also selected because it is an area representative of the residential impact of PM<sub>10</sub>. This is a population oriented neighborhood scale SLAMS monitor on a daily sample schedule.

This site was closed in March 2018 due to building reconstruction.

**Arvada, 9101 57<sup>th</sup> Avenue (08 059 0002):**

The city of Arvada is located 15 miles west-northwest of the Denver central business district (CBD). The Arvada site began operation before 1973. It is located to the northwest of the Denver CBD near the western end of the diurnal midday wind flow of the high concentration urban O<sub>3</sub> area. As a result, when conditions are proper for daylong O<sub>3</sub> production, this site has received some of the highest levels in the city. In the early and mid-1990s, these wind patterns caused Arvada to have the most exceedances in the metro area. In the 5-Year Network Assessment Plan the Arvada site was deemed to be redundant. The last valid O<sub>3</sub> sample was taken 12/31/2011, and the instrument was removed shortly after that. Meteorological monitoring began in 1975 and continues today.

**Welch, 12400 W. Highway 285 (08 059 0005):**

The APCD conducted a short-term O<sub>3</sub> study on the grounds of Chatfield High School from June 14, 1989 until September 28, 1989. The Chatfield High School location was chosen because it sits on a ridge southwest of the Denver CBD. Wind pattern studies showed a potential for elevated O<sub>3</sub> levels in the area on mid to late afternoon summer days. There were no exceedances of the NAAQS recorded at the Chatfield High School site, but the levels were frequently higher than those recorded at the other monitoring sites south of the metro area.

One finding of the study was the need for a new, permanent site further north of the Chatfield High School location. As with most Denver locations, the predominant wind pattern is north/south. The southern flow occurs during the upslope, daytime warming period. The northern flow occurs during late afternoon and nighttime when drainage is caused by cooling and settling. The major drainages of Bear Creek and Turkey Creek were selected as target downwind transport corridors. These are the first major topographical features north of the Chatfield High School site. A point midway between the valley floor (Englewood site) and the foothill's hogback ridge was modeled to be the best estimate of the maximum downwind daytime transport area. These criteria were used to evaluate available locations. The Welch site best met these conditions. This site is located off State Highway 285 between Kipling Street and C-470. This is a population oriented urban scale SLAMS monitor.

**Rocky Flats North, 16600 W. Highway 128 (08 059 0006):**

The Rocky Flats - N site is located north-northeast of the former plant on the south side of Colorado Highway 128, approximately 1¼ miles to the west of Indiana Street. The site began operation in June of 1992 with the installation of an O<sub>3</sub> monitor and meteorological monitors as a part of the first phase of the APCD's monitoring effort around the Rocky Flats Environmental Technology Site.

O<sub>3</sub> monitoring began as a part of the Summer 1993 Ozone Study. The monitor recorded some of the highest O<sub>3</sub> levels of any of the sites during that study. Therefore, it was included as a regular part of the APCD O<sub>3</sub> monitoring network. The Rocky Flats – N monitor frequently exceeds the current standard. This is a highest concentration-oriented urban scale SLAMS monitor.

The Rocky Flats North site has been chosen as the new location for the EPA required PAMS monitoring. It was chosen with a waiver to monitor PAMS at this location rather than the NCore site due to a number of attributes examined by a division work group. It will be outfitted with PAMS monitoring equipment with the use of an auto-gas chromatograph, and carbonyls sampled using a sequential carbonyl sampler. Total oxides of nitrogen or NO<sub>y</sub> and NO will be measured using a Teledyne T200u-NO<sub>y</sub> analyzer. True NO<sub>2</sub> is also required and will be accomplished with the installation of a Cavity Attenuated Phase Shift Spectroscopy (CAPS) Teledyne T500u instrument. Additional meteorological parameters will also be added to the site. These parameters are relative humidity, upper and lower temperature sensors (10 meters and 2 meters), barometric pressure, total solar radiation, ultra violet radiation, precipitation and mixing height in addition to the meteorological parameters wind speed and wind direction currently operating at the site. All of this additional instrumentation should be fully operational near the end of 2018.

**NREL Solar Radiation Research Laboratory, 2054 Quaker Street (08 059 0011):**

The National Renewable Energy Laboratory (NREL) site is located on the south rim of South Table Mountain, near Golden, and was part of the Summer 1993 Ozone Study. Based on the elevated concentrations found at this location during the study, it was made a permanent monitoring site in 1994. This site typically records some of the higher eight-hour O<sub>3</sub> concentrations in the Denver area.

**Aspen Park, 26137 Conifer Road (08 059 0013):**

The Aspen Park site began operation in May 2009. It is intended to verify/refute model predictions of above normal O<sub>3</sub> levels. In addition, passive O<sub>3</sub> monitors used in the area in a 2007 study indicated the possibility of higher O<sub>3</sub> levels. The monitor is located in an urban setting at a Park and Ride facility off of Highway 285, at an elevation of just over 8,100 feet. Because the site is nearly 3,000 feet higher than the average metro area elevation, it should see O<sub>3</sub> levels that are larger than those seen in the metro area, as O<sub>3</sub> concentrations increase with increasing elevation. This is a SLAMS neighborhood scale monitor.

**Durango River City Hall, 1235 Camino del Rio (08 067 0004):**

Durango is the second largest city on the western slope. The town is situated in the Animas River Valley in southwestern Colorado. Its elevation is approximately 6,500 feet (1,981 meters) above mean sea level. The Animas valley through Durango is steep and narrow. Even though little meteorological information is available for the area, the microclimate of Colorado mountain communities is characterized by cold air subsidence, or drainage flows during the evening and early morning hours and up valley flows during afternoon and early evening hours when solar heating is highest. Temperature inversions that trap air pollutants near the surface are common during night and early morning hours. This site is equipped with a high volume PM<sub>10</sub> sampler and is a population oriented neighborhood scale SLAMS monitor on a 1 in 3 day sample schedule.

**Fort Collins – CSU – Edison, 251 Edison Street (08 069 0009):**

Fort Collins does not have the population to require a particulate monitor under Federal regulations. However, it is one of the largest cities along the Front Range. In the summer of 2016 APCD removed the filter based FRM PM<sub>2.5</sub> sampler and designated the GRIMM EDM 180 continuous particulate monitor as the primary method for PM<sub>2.5</sub> NAAQS comparisons. Currently there are filter based high volume PM<sub>10</sub> neighborhood scale SLAMS monitors on a 1

in 3 day schedule and a continuous GRIMM EDM 180 that measures PM<sub>10</sub> and PM<sub>2.5</sub> operated at the site.

**Fort Collins - West, 3416 W. La Porte Avenue (08 069 0011):**

The Fort Collins-West ozone monitor began operation in May of 2006. The location was established based on modeling and to satisfy permit conditions for a major source in the Fort Collins area. The levels recorded for the first season of operation showed consistently higher concentrations than the 708 S. Mason Street monitor. This is a highest concentration oriented urban scale SLAMS monitor.

**Fort Collins- Mason, 708 S. Mason Street (08 069 1004):**

The 708 S. Mason Street site began operation in December 1980 and is located one block west of College Avenue in the Central Business District. The one-hour CO standard of 35 ppm as a one-hour average has only been exceeded on December 1, 1983, at 4:00 P.M. and again at 5:00 P.M. The values reported were 43.9 ppm and 43.2 ppm respectively. The eight-hour standard of 9 ppm was exceeded one or more times a year from 1980 through 1989. The last exceedances were in 1991 on January 31 and December 6 when values of 9.8 ppm and 10.0 ppm respectively were recorded.

Fort Collins does not have the population to require a CO monitor under Federal regulation. However, it is one of the largest cities along the Front Range and was declared in nonattainment for CO in the mid-1970s after exceeding the eight-hour standard in both 1974 and 1975. In May of 2016 the CO monitor was upgraded to a Thermo 48i-TLE trace level instrument. The current level of monitoring is in part a function of the resulting CO State Maintenance Plan (SMP) for the area. It is a population oriented neighborhood scale SLAMS monitor.

O<sub>3</sub> monitoring began in 1980, and continues today.

Meteorological monitoring began at the site January 1<sup>st</sup>, 1981. In March 2012 the meteorological tower was relocated from a freestanding tower on the west side of the shelter to a shelter mounted tower on the south side of the shelter due to the Mason Street Redevelopment Project.

**Grand Junction - Powell, 650 South Avenue (08 077 0017):**

Grand Junction is the largest city on the western slope. It is located in the broad valley of the Colorado River. The monitors are on county owned buildings in the south side of the city. This site is on the southern end of the central business district and close to the industrial area along the train tracks. It is about a half a mile north of the river and about a quarter mile east of the railroad yard. In the summer of 2016 the primary filter based FRM was removed and the GRIMM EDM 180 continuous particulate monitor was designated as the primary to compare to the PM<sub>2.5</sub> NAAQS. Currently the GRIMM monitors for continuous PM<sub>2.5</sub> and PM<sub>10</sub> and there are also two low volume filter based collocated PM<sub>10</sub> monitors operated at the site on a 1 in 3 day and 1 in 6 day sample schedule.

**Grand Junction - Pitkin, 645½ Pitkin Avenue (08 077 0018):**

The Grand Junction-Pitkin CO monitor began operation in January 2004. This monitor replaced the site at the Stocker Stadium. The CO monitor at the Pitkin site was upgraded to a Thermo 48i-TLE trace level monitor in July of 2016. This is a population oriented, micro-scale SLAMS monitor.

Meteorological monitors were installed in 2004, and include wind speed, wind direction, and temperature sensors. The meteorological tower was outfitted January 5<sup>th</sup>, 2015 with RM Young meteorological sensors, including a RH sensor. This site is also part of the National Air Toxics Trends Station Network. This network is a national EPA project to assess levels of urban air toxics around the country. EPA requires that the site include a carbon monoxide monitor, as an indication of automobile traffic in the area.

**Palisade Water Treatment, Rapid Creek Rd (08 077 0020):**

The Palisade site is located at the Palisade Water Treatment Plant. The site is 4 km to the east-northeast of downtown Palisade, just into the De Beque Canyon area. The site is remote from any significant population and was established to measure maximum concentrations of O<sub>3</sub> that may result from summertime up-flow conditions into a topographical trap. Ozone and meteorological monitoring commenced in May 2008. This is an urban scale special purpose monitor.

**Elk Springs, 33902 US Hwy 40 (08 081 0002):**

One of the recommendations of the 3-State Network Assessment was to move the Lay Peak site further to the west. Elk Springs, 35 miles west was found to be a suitable location. The Lay Peak site completed sampling requirements and all sampling equipment was taken offline as of December 31<sup>st</sup>, 2014. The Elk Springs site became operational and began monitoring for ozone and meteorological parameters August 1<sup>st</sup> 2015. The purpose for this site and other Three State Study sites is for the development of monitoring data sets in geographic areas that have no monitoring data to support modeling efforts in NEPA assessments and in determinations of NAAQS compliance. The surrounding terrain is high desert, dominated by sagebrush, pinion pines, and riparian vegetation. The site is in open terrain with a 360-degree exposure. There are no significant sources nearby, however, the oil and gas development potential is high for lands to the north and east of the site, and development of these resources is expected to increase in the future.

**Cortez, 106 W. North St (08 083 0006):**

The Cortez site is located in downtown Cortez at the Montezuma County Health Department building. Cortez is the largest population center in Montezuma County in the southwest corner of Colorado.

The O<sub>3</sub> monitor was established to address community concerns of possible high O<sub>3</sub> from oil and gas and power plant emissions in the area. Many of these sources are in New Mexico. Ozone monitoring commenced in May 2008 and the first PM<sub>2.5</sub> filter was sampled June 20<sup>th</sup>, 2008. PM<sub>2.5</sub> monitoring was discontinued at the site in July of 2015 due to the site completing sampling requirements and the site returning low PM<sub>2.5</sub> concentrations. This site is an urban scale SLAMS monitor.

**Paradox, 7250 County Road 5, Paradox, CO (08 085 0005):**

One of the recommendations from the 3-State Study Network Assessment, a cooperative study effort involving federal agencies, Colorado, Utah and Wyoming, was the inclusion of a new ozone site in or near the Paradox Valley in southwestern Colorado. As a result of that study, the APCD investigated the area and found a suitable location on a Colorado Department of Transportation property to the south and east of the town of Paradox Colorado near the Utah-Colorado border. The purpose for this site and other Three State Study sites is the development

of monitoring data sets in geographic areas that have no monitoring data to support modeling efforts in NEPA assessments and in determinations of NAAQS compliance. This site began monitoring for ozone and meteorological parameters including precipitation measurements in March of 2016.

**Aspen Yellow Brick School, 215 North Garmisch (08 097 0008):**

Aspen is at the upper end of a steep mountain valley. Aspen does not have an interstate highway running through it. Aspen was classified as nonattainment for PM<sub>10</sub>, but it is now under an attainment/maintenance plan. The valley is more restricted at the lower end, and thus forms a tighter trap for pollutants. The transient population due to winter skiing and summer mountain activities greatly increases the population and traffic during these seasons. There is also a large down valley population that commutes to work each day from as far away as the Glenwood Springs area, which is 41 miles to the northeast. There is currently a high volume filter based PM<sub>10</sub> monitor and a continuous PM<sub>10</sub>/PM<sub>2.5</sub> GRIMM EDM 180 monitor operated at this site.

The population oriented neighborhood scale SLAMS high volume PM<sub>10</sub> monitor is operating on a 1 in 3 sample schedule.

**Lamar Municipal Building, 104 Parmenter Street (08 099 0002):**

The Lamar Municipal site was established in January of 1996 as a more population oriented location than the Power Plant. The Power Plant site was located on the northern edge of town (until it was decommissioned in 2012) while the Municipal site is near the center of the town. Both sites have recorded exceedances of the 24-hour standard of 150 µg/m<sup>3</sup>, and both sites regularly record values above 100µg/m<sup>3</sup> as a 24-hour average. The Power Station site in Lamar has been shut down, because it did not meet siting criteria. The Lamar Municipal Building location houses population oriented neighborhood scale SLAMS high-volume PM<sub>10</sub> monitors on a daily sample schedule.

**Lamar Port of Entry, 7100 US Highway 50, (08 099 0003):**

The particulate monitors in Lamar have recorded some of the highest readings in the state. These readings are primarily associated with east winds in excess of 20 mph. The APCD first established a meteorological monitor in Lamar at the Municipal Building. However, this location was too protected and the meteorological monitor was moved to the Port of Entry location in March of 2005.

**Pueblo Fountain School, 925 N. Glendale Ave (08 101 0015):**

Pueblo is the third largest city in the state, not counting communities that are part of Metropolitan Denver. Pueblo is principally characterized by rolling plains and moderate slopes with elevations ranging from 4,474 feet to 4,814 feet (1,364 to 1,467 m). The Rocky Mountain Front Range is about 25 miles (40 km) west and the sight of Pikes Peak is easily visible on a clear day.

Meteorologically, Pueblo can be described as having mild weather with an average of about 300 days of sunshine per year. Generally, wind blows up valley from the southeast during the day and down valley from the west at night. Pueblo experiences average wind speed ranges from 7 miles per hour in the fall and early winter to 11 miles per hour in the spring.

This site was formerly located on the roof of the Public Works Building at 211 E. D St., in a relatively flat area found two blocks northeast of the Arkansas River. At the end of June in 2011 the Public Works site was shut down and moved to the Magnet School site as the construction of a new multi-story building caused a major change in the flow dynamics of the site. The new site began operations in 2011. The distance and traffic estimate for the surrounding streets falls into the middle scale in accordance with federal guidelines found in 40 CFR, Part 58, and Appendix D.

#### **Steamboat Springs, 136 6<sup>th</sup> Street (08 107 0003):**

Like other ski towns, Steamboat Springs has problems with wintertime inversions, high traffic density, wood smoke, and street sand. These problems are exacerbated by temperature inversions that trap the pollution in the valleys.

The first site began operation in Steamboat Springs in June 1985 at 929 Lincoln Avenue. It was moved to the current location in October 1986. The 136 6<sup>th</sup> Street location not only provides a good indication of population exposure, since it is more centrally located, but it has better accessibility than the previous location. This site monitors for PM<sub>10</sub> with high volume filter based sampling. This is a population oriented neighborhood scale SLAMS monitor on a daily sample schedule.

#### **Telluride, 333 W. Colorado Avenue (08 117 0002):**

Telluride is a high mountain ski town in a narrow box end valley. The San Miguel River runs through the south end of town, which is only about ½ mile wide from north to south. The topography of this mountain valley regime creates temperature inversions that can last for several days during the winter. Temperature inversions can trap air pollution close to the ground. Telluride sits in a valley that trends mainly east to west, which can trap air pollutants more effectively since the prevailing winds in this latitude are westerly and the San Miguel River Valley is closed off on the east end. This is a population oriented neighborhood scale SLAMS monitor on a 1 in 3 day sample schedule.

#### **Greeley Hospital, 1516 Hospital Road (08 123 0006):**

The Greeley PM<sub>10</sub> and PM<sub>2.5</sub> monitors are on the roof of a hospital office building at 1516 Hospital Road. In the summer of 2016 the filter Based FRM was removed from the site and the GRIMM EDM 180 continuous particulate monitor was designated as the primary monitor for NAAQS comparisons. The site currently has Hi Volume filter based PM<sub>10</sub> monitors on a 1 in 3 day sample schedule and a continuous GRIMM instrument that measures PM<sub>2.5</sub> and PM<sub>10</sub>. This is a population-oriented neighborhood scale SLAMS site. Greeley Central High School is located immediately to the east of the monitoring site. Overall, this is in an area of mixed residential and commercial development that makes it a good population-exposure, neighborhood scale monitor. The distance and traffic estimate for the most controlling street easily falls into the neighborhood scale in accordance with federal guidelines found in 40 CFR, Part 58.

Winds in this area are primarily out of the northwest, with dominant wind speeds less than 5 mph. Secondary winds are from the north, north-northwest and east-southeast, with the most frequent wind speeds also being less than 5 mph. The most recent available wind data for this station is for the period December 1986 to November 1987. Predominant residential growth patterns are to the west and north with large industrial growth expected to the west. There are

two feedlots located about 11 miles east of the town. There was a closer feedlot on the east edge of town, but it was shut down in early 1999, after the town of Greeley purchased the land in 1997.

**Platteville, 1004 Main Street (08 123 0008):**

Platteville is located immediately west of Highway 85 along the Platte River valley bottom approximately five miles east of I-25, at an elevation of 4,825 feet. The area is characterized by relatively flat terrain and is located about one mile east of the South Platte. The National Oceanic and Atmospheric Administration operated the Prototype Regional Observational Forecasting System Mesonet network of meteorological monitors from the early 1990s through the mid-1990s in the northern Colorado Front Range area. Based on this data, the area around Platteville is one of the last places in the wintertime that the cold pool of air that is formed by temperature inversions will burn off. This is due to solar heating. The upslope/down slope Platte River Valley drainage and wind flows between Denver and Greeley make Platteville a good place to monitor PM<sub>2.5</sub>. These characteristics also make it an ideal location for chemical speciation sampling, which began at the end of 2001 and is currently still monitoring.

The Platteville site is located at 1004 Main Street at the South Valley Middle School, located on the south side of town on Main Street. The school is a one-story building and it has a roof hatch from a locked interior room providing easy access to its large flat roof. There is a 2-story gym attached to the building approximately 28 meters to the Northwest of the monitor. The location of the Platteville monitor falls into the regional transport scale in accordance with federal guidelines found in 40 CFR, Part 58, and Appendix D. There are three monitors here. Two are population-oriented regional scale monitors, one of which is on the SLAMS network and the other is for supplemental speciation. The PM<sub>2.5</sub> filter based FRM SLAMS monitor is operating on a 1 in 3 day sample schedule, while the speciation monitor is operating on a 1 in 6 day schedule. The remaining monitor is a population oriented neighborhood scale supplemental speciation monitor on a 1 in 6 day sample schedule.

**Greeley, Weld County Tower, 3101 35<sup>th</sup> Avenue (08 123 0009):**

The Weld County Tower O<sub>3</sub> monitor began operation in June 2002. The site was established after the 811 15<sup>th</sup> Street building was sold and was scheduled for conversion to other uses. The Weld County Tower site has generally recorded levels greater than the old site. This is a population-oriented neighborhood scale SLAMS monitor. The Greeley West Annex carbon monoxide monitoring site was dismantled in June of 2015 and moved to the Weld County Tower site. Carbon Monoxide monitoring began at the Weld County Tower site in April of 2015 with a Thermo 48C monitor. The CO monitor at Weld County Tower was upgraded from a Thermo 48C to a Thermo 48iTLE trace level analyzer on April 28<sup>th</sup>, 2016.

Meteorological monitoring began in February of 2012.

## **Appendix B - Public Comments and Responses**

Appendix B includes information regarding the required public comment period, comments received and APCD responses.

Per 40 CFR 58.10, a 30-day public comment period is required before submitting the Annual Network Plan to EPA. APCD posted notice of this Annual Network Plan on May 23, 2018 on the APCD website at: <https://www.colorado.gov/pacific/cdphe/air-division-public-comment> and [https://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx](https://www.colorado.gov/airquality/tech_doc_repository.aspx). The public comment period was open through June 24, 2018. Notification was sent out to interested parties, including the Air Quality Control Commission and the Regional Air Quality Council, as well as to the APCD's permit email lists.

APCD received a total of seven comments on this Annual Network Plan during the public comment period.

### **May 23, 2018 Public Comment Notice Email to the APCD Permit Public Notice:**

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#### **Fwd: 2018 Annual Monitoring Network Plan out for public comment**

1 message

Niebergall - CDPHE, Alexandria <[alexandria.niebergall@state.co.us](mailto:alexandria.niebergall@state.co.us)>  
To: Gordon Pierce - CDPHE <[gordon.pierce@state.co.us](mailto:gordon.pierce@state.co.us)>

Wed, May 23, 2018 at 3:44 PM

----- Forwarded message -----

From: Colorado Air Pollution Control Division <[alexandria.niebergall@state.co.us](mailto:alexandria.niebergall@state.co.us)>  
Date: Wed, May 23, 2018 at 2:50 PM  
Subject: 2018 Annual Monitoring Network Plan out for public comment  
To: [alexandria.niebergall@state.co.us](mailto:alexandria.niebergall@state.co.us)

Hello,

Per federal regulation (40 CFR 58.10), the Colorado Air Pollution Control Division is required to develop and submit to the U.S. EPA an annual monitoring network plan which shall provide for the documentation of the establishment and maintenance of an air quality surveillance system.

This email is to let you know that our Colorado 2018 Annual Monitoring Network Plan is now available for comment until June 24, 2018 at 5:00 p.m. The plan can be found on our website at [https://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx#network\\_plan](https://www.colorado.gov/airquality/tech_doc_repository.aspx#network_plan).

Please send comments to [cdphe.commentsapcd@state.co.us](mailto:cdphe.commentsapcd@state.co.us).

Thank you.

## **Public Comments Received:**

### **Comment #1:**

From: James Rada <[jrada@co.jefferson.co.us](mailto:jrada@co.jefferson.co.us)>  
Date: Fri, May 25, 2018 at 4:47 PM  
Subject: Comment on the 2018 Annual Monitoring Network Plan  
To: "cdphe.commentsapcd@state.co.us" <[cdphe.commentsapcd@state.co.us](mailto:cdphe.commentsapcd@state.co.us)>

Jefferson County is often lumped in with Denver in terms of PM2.5 issues because we have no PM2.5 monitors. We are acutely aware of our ozone issues but would like to have a better sense of our PM2.5 concentrations, particularly on inversion days in some of the more heavily populated parts of the County and some of our lower socioeconomic communities.

It appears that the monitoring program is eliminating a number of PM monitoring stations in the more rural areas which makes sense. However, I believe that as the urban population continues to grow, more attention is needed with regard to urban PM levels. Perhaps some of the saved program costs could be shifted to Jefferson County.

Thank you,

**Jim Rada**  
Environmental Health Services Division Director  
Jefferson County Public Health  
645 Parfet St.  
**Lakewood, CO 80215**  
o 303-271-5718  
c 303-547-6434  
[email@jeffco.us](mailto:email@jeffco.us)

### **Comment #2:**

From: **Jan Kerr** <[jbkerr7@gmail.com](mailto:jbkerr7@gmail.com)>  
Date: Tue, Jun 19, 2018 at 11:33 AM  
Subject: Martin Drake monitoring devices  
To: <[cdphe.commentsapcd@state.co.us](mailto:cdphe.commentsapcd@state.co.us)>

As a citizen of the state of Colorado, I have the right to expect my state authorities to be looking out for my health and the health of all its citizens. We all have the right to know what is in the air we breathe so i am asking you to installl proper air quality monitors in the Pikes Peak Region and in the best locations possible to insure accurate pollution readings. As citizens yourselves, you should want the same thing!  
Thank you,  
Janet Kerr  
Parker, CO  
Sent from my iPhone

### **Comment #3:**

From: **Kelsey Brown** <[kelsey.brown502@gmail.com](mailto:kelsey.brown502@gmail.com)>  
Date: Tue, Jun 19, 2018 at 12:56 PM  
Subject: Please take action on Martin Drake Monitor

To: <[cdphe.commentsapcd@state.co.us](mailto:cdphe.commentsapcd@state.co.us)>

Dear Colorado Department of Public Health and Environment,

I'm 28 and have lived in Colorado Springs my whole life. I love this city. As I've gotten older, though, I've become informed about how dangerous the Martin Drake Power Plant is. I can't believe a city that prides itself on natural beauty and Olympic athletics could allow such a dangerous pollutant to exist in the middle of downtown. The plant puts the health of all Colorado Springs residents at risk. Please enforce the hourly standard of the federal air quality regulations and move the monitor to an area that will accurately measure SO2 levels!

As I finish graduate school, I will be looking for where I want to settle down and raise a family. I want to be able to consider Colorado Springs, as it's the place I call home. But I can't raise children in a city that doesn't care about their health and the air we're breathing.

Thank you,  
Kelsey Brown

#### **Comment #4:**

From: **Margaret Rudin** <[margrudin@gmail.com](mailto:margrudin@gmail.com)>

Date: Tue, Jun 19, 2018 at 10:35 AM

Subject: Please consider...

To: <[cdphe.commentsapcd@state.co.us](mailto:cdphe.commentsapcd@state.co.us)>

...all the negatives of our own Martin Drake Power Plant. We could be a leader in our nation with efficient and safe energy.

Thank you,  
Margaret Rudin  
80904

#### **Comment #5:**

From: david rudin <[dbrudin@yahoo.com](mailto:dbrudin@yahoo.com)>

Date: Tue, Jun 19, 2018 at 8:28 AM

Subject: Comments on Martin Drake Power Plant

To: [cdphe.commentsapcd@state.co.us](mailto:cdphe.commentsapcd@state.co.us) <[cdphe.commentsapcd@state.co.us](mailto:cdphe.commentsapcd@state.co.us)>

To Whom it May Concern,

The Martin Drake Power Plant in Colorado Springs continues to be a concern for all of us who live in the community. Public officials have done nothing to put to rest the public's concern about high levels of pollutants, especially SO2!

We demand that the hourly standard detailed in federal air quality standards be enforced and that the monitor be moved from its Highway 24 location so as to better monitor emissions!

Best,

David

Have Binoculars Will Travel  
Naturalist-at-Large

Nature in her green, tranquil woods heals and soothes all afflictions. Earth hath no sorrows that earth cannot heal.

John Muir

### **Comment #6:**

From: **Nicole Rosa** <[nicki@totalmath.net](mailto:nicki@totalmath.net)>  
Date: Thu, Jun 21, 2018 at 5:06 PM  
Subject: Comments: 2018 Network Monitoring Plan  
To: [cdphe.commentsapcd@state.co.us](mailto:cdphe.commentsapcd@state.co.us), Nicki Rosa <[nicki@totalmath.net](mailto:nicki@totalmath.net)>, "CDPHE - AQCC Comments - CDPHE, cdphe" <[cdphe.aqcc-comments@state.co.us](mailto:cdphe.aqcc-comments@state.co.us)>

Dear AQCC,

I would like to submit my comments regarding the 2018 Network Monitoring Plan.

Specifically, I would like to address the HWY 24 monitor in Colorado Springs.

By your own admission, it is not ideally located.

That being the case, I would like to request an additional monitor to the Southwest of the current one, where modeling has shown the pollution plume to travel.

Also, please enforce the One Hour Emissions standard at Drake. Anything less than that would allow dangers SO2 spikes which are harmful to the population.

In addition, our Ozone levels are getting dangerously high. We need a NOx monitor in El Paso County!

Sincerely,  
Nicole Rosa

### **Comment #7:**

From: Leslie Weise <[leslie@weise.us](mailto:leslie@weise.us)>  
Date: Fri, Jun 22, 2018 at 5:08 PM  
Subject: Colorado 2018 Annual Monitoring Network Plan - Public Comment Regarding Colorado Springs Region  
To: [cdphe.commentsapcd@state.co.us](mailto:cdphe.commentsapcd@state.co.us) <[cdphe.commentsapcd@state.co.us](mailto:cdphe.commentsapcd@state.co.us)>, Cdphe CDPHE - AQCC Comments - CDPHE <[cdphe.aqcc-comments@state.co.us](mailto:cdphe.aqcc-comments@state.co.us)>  
Cc: Leslie Weise <[leslie@weise.us](mailto:leslie@weise.us)>

To: CDPHE, Air Pollution Control Division  
Air Quality Control Commission  
From: Leslie Weise  
Subject: Colorado 2018 Network Monitoring Plan, Colorado Springs  
Date: June 22, 2018

My request regarding the Colorado Springs Region under the Colorado 2018 Network Monitoring Plan, is a simple one. It is for CDPHE, Air Pollution Control Division (APCD), to take the necessary step of placing an additional air quality monitor, more optimally sited than the current sole existing SO<sub>2</sub> monitor, to more accurately measure sulfur dioxide emissions from the Martin Drake Power Plant.

CDPHE, APCD, has consistently made regulatory decisions that have been specifically requested by Colorado Springs Utilities (CSU). Yet the decisions made and recommendations offered to the Colorado Air Quality Control Commission (AQCC) and the U.S. Environmental Protection Agency (EPA) have always been counter to the majority of public comment and against the side of public interest on nearly every topic that has surfaced for review and action by APCD over the past decade.

The action for the 2018 Network Monitoring Plan for the Pikes Peak Region is straightforward, and could serve to facilitate a more certain designation of SO<sub>2</sub> NAAQS compliance for the region from its present designation of unclassifiable. Representatives of CDPHE, APCD, including Gordon Pierce, Lisa DeVore, Mike Silverstein, and Chris Coclasure, have all acknowledged that the monitoring data from the current sole SO<sub>2</sub> monitor in the Colorado Springs region, is not optimally sited to measure SO<sub>2</sub> emissions from the Martin Drake Plant. They have also expressed the intention to locate a monitor in a more appropriate location. Now that updated weather data exists from the meteorological station APCD allowed CSU a nearly two year delay to install and from which to collect data, and updated modeling has been conducted in 2017-2018 by Wingra Engineering, Maureen Barrett, and APCD, this is the prime opportunity to add another air quality monitor so that the residents who live, work and recreate in the proximity of the Martin Drake plant and who are exposed to its pollution, can have the best information available regarding air quality to which they are subjected. For example, recent information shows that an SO<sub>2</sub> monitor placed approximately 1.5km southwest of the plant is an optimal location to measure Martin Drake's emissions.

Both the existing monitor and a more optimally placed SO<sub>2</sub> monitor, can be used in combination with professional modeling, to ensure health-based standards are met. Please, for once, demonstrate to the public that CDPHE is willing to take steps to ensure public safety over the convenience of the pollution emitter, Colorado Springs Utilities. There are over 400,000 people who live within a five mile radius of the Martin Drake Plant, the least efficient, oldest, and sole remaining urban coal fired power plant in the state. This makes the Pikes Peak region have the notable distinction of having the highest number of people exposed to the most amount of pollution from two coal-fired power plants. This region deserves action that errs on the side of caution, rather than on the side of the industrial polluter.

Additionally, CSU has submitted comments for this 2018 Network Plan, once again, that this municipally owned utility and CDPHE should not be so concerned about the largest population in the state exposed to pollution from the largest pollution source that is exposed to the largest population, and that CSU need not adhere to the health-based standard for NAAQS. However, the propensity of data and other factors support that **the health-based one-hour standards for criteria pollutant emissions under the National Ambient Air Quality Standards (“NAAQS”), including sulfur dioxide NO<sub>x</sub>, mercury and PM<sub>2.5</sub>**, must be enforced, for at least the following reasons.

- a. The Drake Plant emits thousands of tons of toxic air pollution each year, reaching over 400,000 people in a five-mile radius in the second largest urban area in the State, causing the basis for adherence to, not leniency from, regulatory obligations to address human health.
- b. The Drake Plant is the second oldest, and most inefficient coal plant in the remaining state fleet

of coal plants. It has been proven unsafe for the surrounding community, aside from the thousands of tons of pollutants emitted upon the surrounding community of urban population, in 2014, the Drake Plant suffered a major fire that the Fire Chief on duty noted, it was quite possible an explosion could have been caused by the fire.

c. A sole air quality monitor that is operational for the second most populous urban area of the State of Colorado has been confirmed by APCD and Colorado Springs officials is not optimally sited to measure SO<sub>2</sub> emissions from the Drake Plant. On multiple occasions, commitments were made by Jerry Forte, Lisa Devore, Chris Colclasure and others to the public that a new monitor would be sited for this purpose. Multiple years have passed, resources expended to install a meteorological station on site at the Drake Plant, and modeling conducted that could be used to properly site a new monitor, yet no action has been taken to install a new monitor. Notwithstanding, APCD continually relies on the sole air quality monitor to assert that the Drake Plant is emitting SO<sub>2</sub> within NAAQS standard. APCD cannot accurately or definitively make such conflicting statements, and therefore is negligent in its fiduciary duties to the public in doing so. APCD can now adhere to its duty to site an additional monitor for SO<sub>2</sub> air pollution emissions, to ensure public health is within safe levels.

d. Since 2010 when the Revised Standard for sulfur dioxide (SO<sub>2</sub>) emissions was promulgated for NAAQS to address human health impacts of short term exposure to SO<sub>2</sub>, **all modeling conducted for SO<sub>2</sub> emissions from the Drake Plant**, including modeling conducted by AECOM for the Colorado Springs Utilities, and more recently by the CDPHE Air Pollution Control Division ("APCD"), as reviewed using stricter parameters by Steve Klafka of Wingra Engineering for the Sierra Club, **demonstrate SO<sub>2</sub> emissions from the Drake Plant have been exceeding the NAAQS – even with the new Neuman Systems SO<sub>2</sub> scrubbers installed.**

e. Indeed, data (using actual emissions levels) submitted by Francois Raab to you – shows that when the Neumann SO<sub>2</sub> scrubbers are not operating, SO<sub>2</sub> emitted is in exceedance of the NAAQS. This means unsafe air quality still exists in the vicinity of the Martin Drake Plant, even after the Neumann SO<sub>2</sub> scrubbers were installed.

f. In April, 2018, Moody's bond rating service published their ratings of the largest municipal coal plants in the country and of 113, MD did not just place at the bottom half or even bottom 10%, it came in dead last place for market competitiveness. The pollution from this coal plant affects the greatest number of people in the state, and among the largest population impacted by coal fired power plant in the entire nation.

At this time when the Network Operating Plan for the State is being considered, I urge that CDPHE, APCD and AQCC:

- 1. Require that a new monitor be installed in an optimal measurement location, as previously committed by APCD and CSU, to measure SO<sub>2</sub> and other dangerous pollutants from the Drake Plant.**
- 2. Require the one-hour health-based standard for SO<sub>2</sub>, and other pollutants.**
- 3. Require that when the Neumann Systems SO<sub>2</sub> scrubbers are down, the entire Drake Plant must cease operations to avoid dangerous air quality.**

**4. Require that the other criteria pollutants are regulated at the most stringent level.**

The one-hour health base standard has been required for power plants in other states. As for Colorado, for the reasons and data mentioned above and presented in written and oral comment to APCD and AQCC, it is clear that this is an exceptional plant that should not be permitted more lenient scrutiny than the federal law requires.

Thank you for your consideration of my comments.

Leslie Weise  
17780 Caribou Drive  
Monument, Colorado 80132

**APCD Responses to Public Comments:**

The APCD appreciates the time and effort that each commenter took to develop their comments. Due to the overlap between many of the issues raised in the comments, the Division is providing this consolidated response to address all comments received. This document compiles and summarizes the written comments received during the public notice period and is organized by topic area. The APCD's responses to comments are provided below:

**1. PM<sub>2.5</sub> Monitoring**

***Summary of comments:*** There are no PM<sub>2.5</sub> monitors in Jefferson County and would like some to be installed.

***APCD response:*** The statement is correct. There are currently no PM<sub>2.5</sub> monitors in Jefferson County. It is unknown which lower socioeconomic communities are of concern, but work is currently ongoing in the Globeville-Elyria-Swansea area in Denver, which is an environmental justice area near major highways and industry, that includes PM<sub>2.5</sub>. In general, PM<sub>2.5</sub> does not have strong local gradients and the monitoring we have in the north and central part of Denver where we typically will see higher levels is all quite consistent and below the NAAQS except for some occasional high values during inversions. This includes at APCD's near-roadway sites. As one moves towards Chatfield, to the south, values decrease and are well below the air standards.

Since Jefferson County is not in the core of the South Platte Valley drainage, it is not expected that PM<sub>2.5</sub> levels will be higher, but likely lower. The APCD is amenable to working with agencies on socioeconomic concerns and studies with non-regulatory monitors could be explored as an alternative.

## **2. SO<sub>2</sub> Monitoring in Colorado Springs**

***Summary of comments:*** The existing SO<sub>2</sub> monitor in Colorado Springs is not in the correct location and should be moved to better monitor emissions from the Martin Drake Power Plant. A new SO<sub>2</sub> monitor should be installed to monitor emissions from the Martin Drake Power Plant.

***APCD response:*** The SO<sub>2</sub> monitor was placed in Colorado Springs at the current location to be representative of concentrations to which the general public might be exposed. While the Martin Drake Power Plant was a factor in the decision, it was never intended as a source-specific monitor. There are other sources of SO<sub>2</sub> to which the general public might be exposed. In particular, this location is next to a busy arterial roadway with the potential for significant diesel vehicle emissions that can be a SO<sub>2</sub> source. The APCD feels that this is a representative site for general population exposure and meets EPA requirements.

To satisfy requirements under EPA's SO<sub>2</sub> Data Requirement Rule, the Martin Drake Power plant elected to be permitted at an emissions limit of less than 2,000 tons per year, which negated other requirements to model or monitor. Modeling conducted by the APCD specifically related to the Martin Drake Power Plant shows that the facility does comply with the National Ambient Air Quality Standard (1-hour of 75 ppb as the annual 99<sup>th</sup> percentile averaged over 3 years). The APCD will continue to evaluate emissions from the plant and will perform additional modeling to determine if a new SO<sub>2</sub> monitoring site specifically related to the plant needs to be installed.

## **3. Other Pollutant Monitoring in Colorado Springs**

***Summary of comments:*** Ozone levels are high in Colorado Springs. A NOx monitor is needed. Require that other criteria pollutants are regulated.

***APCD Response:*** Ozone levels in the Colorado Springs region are currently below the level of the 2015 National Ambient Air Quality Standard (8-hour of 70 ppb as the 4<sup>th</sup> annual maximum averaged over 3 years). For 2015-2017, the 3-hour average of the 4<sup>th</sup> maximum 8-hour values were 67 and 68 ppb at the two sites in the area. Since 2000, ozone levels have, on average, decreased.

As part of efforts to investigate moving the US Air Force Academy site due to access issues, the APCD is conducting a special ozone monitoring study in the Colorado Springs area this summer. The results of this study will inform if a better location exists and if additional ozone monitoring may be needed. Since ozone is a secondarily formed pollutant, concentrations will likely be higher outside of the core urban area and any new monitor will likely not be in Colorado Springs itself. The urban area is the source of ozone precursor emissions and ozone will be lower in those areas. From emissions inventories, motor vehicles are the primary source of ozone precursors in El Paso County.

For NOx, the APCD does not foresee the need for the installation of a monitor. There are no Federal requirements for an NO<sub>2</sub> monitor in Colorado Springs. All NO<sub>2</sub> monitors in Colorado are showing compliance with National Ambient Air Quality Standard (1 hour of 100 ppb as the

annual 98<sup>th</sup> percentile averaged over 3 years), including at the two near-roadway sites in Denver. For 2017, the highest 98<sup>th</sup> percentile 1-hour NO<sub>2</sub> value monitored in Colorado was 70 ppb with a 2015-2017 3-year average of 71 ppb. Concentrations are decreasing over time.

For particulates, the APCD monitors for both PM<sub>10</sub> and PM<sub>2.5</sub> at the Colorado College site. Concentrations for both pollutants have been well under the standards. The APCD also has a carbon monoxide monitor at the Highway 24 site, where the SO<sub>2</sub> monitor is located. Concentrations of carbon monoxide are far below the levels of standards, as they are nationwide.

All criteria pollutants are regulated in Colorado. The APCD meets or exceeds all federally required monitoring requirements for all criteria pollutants.

#### **4. Permitting of Martin Drake Power Plant**

***Summary of comments:*** A one-hour emissions standard should be enforced. Require that the plant must shut down if the SO<sub>2</sub> scrubbers are down.

***APCD Response:*** These issues are outside the scope of this Network Monitoring Plan.