COLORADO
ANNUAL MONITORING NETWORK PLAN
2017

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) 2017 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)].[1] 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 1st of each year.

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. This is the tenth year that this review has been released to the general public for comment prior to its submittal to the U. S. Environmental Protection Agency (EPA) for final approval. This change was initiated due to a change in the Federal Regulations implemented in December 2006. The Colorado APCD currently operates monitors at 53 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. Relative humidity is monitored at seven of these locations and total solar radiation is monitored at one.

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. Eleven sites are equipped to measure continuous PM_{10} and of those eleven 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,

[1] "Annual Monitoring Network Plan and Periodic Network Assessment," 40 Federal Regulations 58.10 (26 Oct. 2015).

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Carbon Speciation Network (CSN) monitors and at the Powell Grand Junction site by APCD.

The APCD's gaseous monitoring network consists of continuous Carbon Monoxide (CO), Ozone (O_3), Nitrogen Dioxide/Oxides of Nitrogen (NO_2/NO_y), and Sulfur Dioxide (SO_2). 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_3 monitoring occurs statewide. Currently, the APCD reports data from eight CO monitoring sites, twenty one O_3 monitoring sites, five NO_2/NO_y monitoring sites, and four SO_2 monitoring sites. Five of the ozone (O_3) 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 monitoring sites. 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. APCD does perform the data retrieval and validation for the Elk Springs and Paradox sites. 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 (carbon monoxide, sulfur dioxide, oxides of nitrogen and ozone) began in 1965 when the Federal Government established the CAMP station in downtown Denver at the intersection of 21st 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 U.S. Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) designed to protect the public's health and welfare. Standards were set for total suspended particulate matter (TSP), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2) and sulfur dioxide (SO_2). 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 53 current APCD monitoring locations have been in operation for 10 or more years, 23 of these sites have been in operation for 20 or more years, and 14 of the

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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 System (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_3 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 examples of this are the South Boulder Creek monitoring station and the relocation of the Denver Municipal Animal Shelter (DMAS) NCore 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 DMAS NCore site was relocated to the La Casa site due to a change in use of 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.

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_3 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

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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.

Orientation	**Scale (Area Represented)**[2]
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**	**Pollutant Started**	**Orient/Scale**	**Monitor**	**Type**	**Sample**
Adams							
08 001 0008	*Tri County Health*	*4201 E 72nd Ave.*		*07/2016*	*1,574*	*39.82835*	*-104.93836*
	PM_{10}	1	07/ 2016	P.O. Neigh	Partisol 2025	SLAMS	1 in 1
	$PM_{2.5}$	2	07/ 2016	P.O. Neigh	Partisol 2025	SLAMS	1 in 6
	$PM_{2.5}$	3	07/ 2016	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
	$PM_{2.5}$ Speciation	5	07/ 2016	P.O. Neigh	SASS	Trends Spec	1 in 6
	$PM_{2.5}$ Carbon	5	07/ 2016	P.O. Neigh	URG 3000N	Trends Spec	1 in 6
08 001 3001	*Welby*	*3174 E. 78th Ave.*		*07/1973*	*1,554*	*39.838119*	*-104.94984*
	CO (Trace)	1	07/1973	P.O. Neigh	Thermo 48i-TLE	SLAMS	Continuous
	SO_2	2	07/1973	P.O. Neigh	TAPI 100E	SLAMS	Continuous
	NO/NO_x	2	01/1976	P.O. Urban	TAPI 200UP	SPM	Continuous
	NO_2	1	01/1976	P.O. Urban	TAPI 200UP	SLAMS	Continuous
	O_3	2	07/1973	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	01/1975	P.O. Neigh	Met - One	SPM	Continuous
	PM_{10}	1	02/1992	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 6
	PM_{10}	3	06/1990	P.O. Neigh	TEOM-1400ab	SLAMS	Continuous
Alamosa							
08 003 0003	*Alamosa – Municipal Bldg.*	*425 4th St.*		*04/2002*	*2,301*	*37.469584*	*-105.863175*
	PM_{10}	1	05/2002	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 1
Arapahoe							
08 005 0002	*Highland Reservoir*	*8100 S. University Blvd*		*06/1978*	*1,747*	*39.567887*	*-104.957193*
	O_3	1	06/1978	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	07/1978	P.O. Neigh	Met - One	SPM	Continuous
08 005 0005	*Arapaho Community College (ACC)*	*6190 S. Santa Fe Dr.*		*12/1998*	*1,636*	*39.604399*	*-105.019526*

[2] "Appendix D to Part 58 – Network Design Criteria for Ambient Air Quality Monitoring," 40 Federal Register 58 (15 January 2015).

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AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	**POC**	**Pollutant Started**	**Orient/Scale**	**Monitor**	**Type**	**Sample**
	$PM_{2.5}$	1	03/1999	P.O. Neigh	Partisol 2025	SLAMS	1 in 3
08 005 0006	*Aurora - East*	*36001 E. Quincy Ave.*		*04/2011*	*1,552*	*39.63854*	*-104.56913*
	O_3	1	04/2011	P.O. Region	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	06/2011	P.O. Neigh	Met - One	SPM	Continuous
Archuleta							
08 007 0001	*Pagosa Springs School*	*309 Lewis St.*		*08/1975*	*2,165*	*37.26842*	*-107.009659*
	PM_{10}	3	09/1990	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 1
Boulder							
08 013 0003	*Longmont-Municipal Bldg.*	*350 Kimbark St.*		*06/1985*	*1,520*	*40.164576*	*-105.100856*
	PM_{10}	2	09/1985	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 6
	PM_{10} Collocated	2	09/2014	P.O. Micro[2]	SA/GMW-1200	SLAMS	1 in 6
	$PM_{2.5}$	1	01/1999	P.O. Neigh	Partisol 2025	SLAMS	1 in 3
	$PM_{2.5}$	3	11/2005	P.O. Neigh	TEOM 1400ab	SPM	Continuous
08 013 0014	*Boulder Reservoir*	*5565 N. 51st*		*09/2016*	*1,586*	*40.070016*	*-105.220238*
	O_3	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_{10}	1	10/1994	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 6
	$PM_{2.5}$	1	01/1999	P.O. Middle[3]	Partisol 2025	SLAMS	1 in 3
08 013 1001	*Boulder – CU – Athens*	*2102 Athens St.*		*12/1980*	*1,622*	*40.012969*	*-105.264212*
	$PM_{2.5}$	3	02/2004	P.O. Neigh	TEOM FDMS	SPM	Continuous
Delta							
08 029 0004	*Delta Health Dept*	*560 Dodge St.*		*08/1993*	*1,511*	*38.739213*	*-108.073118*
	PM_{10}	1	05/1993	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
Denver							
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_2	1	01/1967	P.O. Neigh	TAPI 100E	SLAMS	Continuous
	O_3	6	03/2012	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	NO/NO_x	1	01/1973	Other	TAPI 200E	Other	Continuous
	NO_2	1	01/1973	P.O. Neigh	TAPI 200E	SLAMS	Continuous
	WS/WD/Temp	1	01/1965	P.O. Neigh	Met - One	SPM	Continuous
	PM_{10}	1	08/1986	P.O. Micro[3]	SA/GMW-1200	SLAMS	1 in 6
	PM_{10} Collocated	2	12/1987	P.O. Micro[3]	SA/GMW-1200	SLAMS	1 in 6
	PM_{10}	3	04/2013	P.O. Micro[3]	GRIMM EDM 180	SLAMS	Continuous

[3] The CAMP $PM_{2.5}$ 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 $PM_{2.5}$ concentrations. The same is true for the Boulder Chamber of Commerce $PM_{2.5}$ site, which is technically a middle scale site.

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AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	**POC**	**Pollutant Started**	**Orient/Scale**	**Monitor**	**Type**	**Sample**
	$PM_{2.5}$	1	01/1999	P.O. Micro[3]	Partisol 2025	SLAMS	1 in 1
	$PM_{2.5}$ Collocated	2	09/2001	P.O. Micro[3]	Partisol 2025	SLAMS	1 in 6
	$PM_{2.5}$	3	04/2013	P.O. Micro[3]	GRIMM EDM 180	SPM	Continuous
08 031 0013	*NJH-E*	*14th Ave. & Albion St.*		*01/1983*	*1,620*	*39.738578*	*-104.939925*
	$PM_{2.5}$	3	10/2003	P.O. Neigh	TEOM FDMS	SPM	Continuous
08 031 0016	*DESCI*	*1901 E. 13th 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.*		*01/2013*	*1,594*	*39.779429*	*-105.005174*
	CO (Trace)	1	10/2012	P.O. Neigh	Thermo 48i-TLE	NCore	Continuous
	SO_2 (Trace)	1	10/2012	P.O. Neigh	TAPI 100EU	NCore	Continuous
	NO_Y	1	10/2012	P.O. Neigh	TAPI 200EU	NCore	Continuous
	CAPS NO_2	1	07/2014	P.O. Neigh	TAPI 500U	NCore	Continuous
	O_3	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
	Temp (Lower)	2	10/2012	P.O. Neigh	Met - One	NCore	Continuous
	PM_{10}	1	10/2012	P.O. Neigh	Partisol 2025	SLAMS	1 in 3
	PM_{10} Collocated	2	10/2012	P.O. Neigh	Partisol 2025	SLAMS	1 in 6
	PM_{10}	3	02/2014	P.O. Neigh	GRIMM EDM 180	SLAMS	Continuous
	$PM_{2.5}$	1	10/2012	P.O. Neigh	Partisol 2025	NCore	1 in 3
	$PM_{2.5}$	3	02/2014	P.O. Neigh	GRIMM EDM 180	SLAMS	Continuous
	$PM_{2.5}$ Speciation	5	10/2012	P.O. Neigh	SASS	Supplem. Speciation	1 in 3
	$PM_{2.5}$ Carbon	5	10/2012	P.O. Neigh	URG 3000N	Supplem. Speciation	1 in 3
08 031 0027	*I-25 Denver*	*971 Yuma Street*		*06/2013*	*1,586*	*39.732146*	*-105.015317*
	CO (Trace)	1	06/2013	Near Road	Thermo 48i-TLE	SLAMS	Continuous
	NO_2	1	06/2013	Near Road	TAPI 200E	NAMS	Continuous
	NO/NO_x	1	06/2013	Near Road	TAPI 200E	SPM	Continuous
	WS/WD/Temp	1	06/2013	Near Road	Met - One	SPM	Continuous
	PM_{10}	3	12/2013	Near Road	GRIMM EDM 180	SLAMS	Continuous
	$PM_{2.5}$	1	01/2014	Near Road	R & P 2025	SLAMS	1 in 6
	$PM_{2.5}$	3	12/2013	Near Road	GRIMM EDM 180	SLAMS	Continuous
	$PM_{2.5}$ Carbon	5	10/2013	Near Road	API 633	Supplem. Speciation	Continuous
08 031 0028	*I-25 Globeville*	*4905 Acoma Street*		*10/1/2015*	*1,587*	*39.785823*	*-104.988857*
	$NO/NO_2/NO_x$	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_{10}	3	10/1/2015	Near Road	GRIMM EDM 180	SLAMS	Continuous
	$PM_{2.5}$	3	10/1/2015	Near Road	GRIMM EDM 180	SLAMS	Continuous

AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	POC	Pollutant Started	Orient/Scale	Monitor	Type	Sample
Douglas							
08 035 0004	*Chatfield State Park*	*11500 N. Roxborough Pk. Rd*		*04/2004*	*1,676*	*39.534488*	*-105.070358*
	O_3	1	05/2005	H.C. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	04/2004	P.O. Neigh	Met - One	SPM	Continuous
	$PM_{2.5}$	1	07/2005	P.O. Neigh	Partisol 2025	SPM	1 in 3
	$PM_{2.5}$	3	05/2004	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_3	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_2	1	01/2013	P.O. Micro	TAPI 100EU	SLAMS	Continuous
	WS/WD/Temp	1	08/2014	P.O. Micro	RM Young	SPM	Continuous
	Relative Humidity	1	08/2014	P.O. Micro	RM Young	SPM	Continuous
08 041 0016	*Manitou Springs*	*101 Banks Pl.*		*04/2004*	*1,955*	*38.853097*	*-104.901289*
	O_3	1	04/2004	H.C. Neigh	TAPI 400E	SLAMS	Continuous
08 041 0017	*Colorado College*	*130 W. Cache La Poudre*		*12/2007*	*1,832*	*38.848014*	*-104.828564*
	PM_{10}	1	12/2007	P.O. Neigh	Partisol 2025	SLAMS	1 in 6
	PM_{10}	3	06/2016	P.O. Neigh	GRIMM EDM 180	SLAMS	Continuous
	$PM_{2.5}$	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_{10}	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_{10}	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_{10}	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_3	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*
	PM_{10}	2	03/1997	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
	PM_{10} Collocated	3	10/2008	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 6
08 051 0007	*Mt. Crested Butte - Realty*	*19 Emmons Rd.*		*07/2005*	*2,866*	*38.900392*	*-106.966104*
	PM_{10}	1	07/2005	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 1
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

AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	**POC**	**Pollutant Started**	**Orient/Scale**	**Monitor**	**Type**	**Sample**
08 059 0005	*Welch*	*12400 W. Hwy. 285*		*08/1991*	*1,742*	*39.638781*	*-105.13948*
	O_3	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_3	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_3	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_3	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_{10}	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_{10}	1	07/1999	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
	PM_{10}	3	06/2015	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
	$PM_{2.5}$	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_3	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_3	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_{10} & NATTS Toxic Metals	3	01/2005	P.O. Neigh	Partisol 2025	SLAMS	1 in 3
	PM_{10} Collocated & NATTS	4	03/2005	P.O. Neigh	Partisol 2025	SLAMS	1 in 6
	PM_{10}	3	01/2014	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
	$PM_{2.5}$	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	MetOne/RM Young	SPM	Continuous
	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_3	1	04/2008	P.O. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	04/2008	P.O. Neigh	RM Young	SPM	Continuous

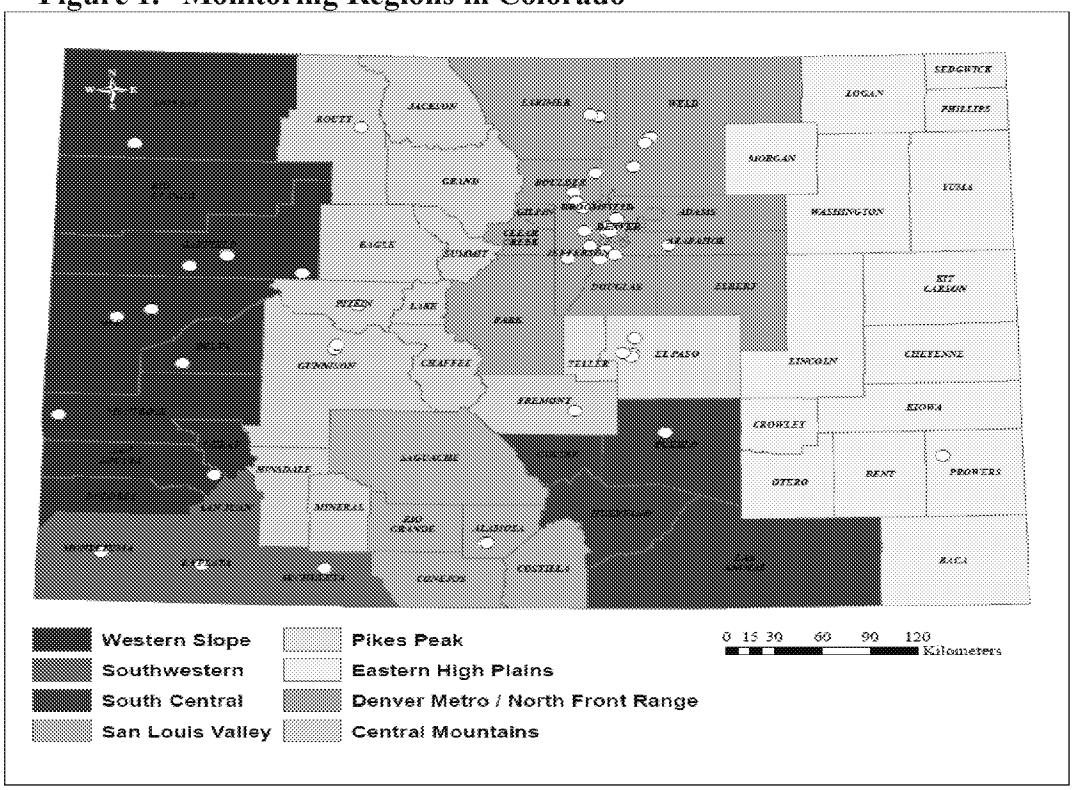
AQS #	Site Name	Address		Site Started	Elevation (m)	Latitude	Longitude
	Parameter	**POC**	**Pollutant Started**	**Orient/Scale**	**Monitor**	**Type**	**Sample**
Moffat							
08 081 0003	*Elk Springs*	*33902 Old US Hwy. 40*		*08/2015*	*1,902*	*40.329253*	*-108.494240*
	O_3	1	08/2015	BG Regional	TAPI 400E	SPM	Continuous
	WS/WD/Temp/RH	1	08/2015	BG Regional	RM Young	SPM	Continuous
Montezuma							
08 083 0006	*Cortez – Health Dept.*	*106 W. North St.*		*06/2006*	*1,890*	*37.350054*	*-108.592337*
	O_3	1	06/2008	P.O. Urban	TAPI 400E	SLAMS	Continuous
Montrose							
08 085 0005	*Paradox*	*7250 County Rd. 5*		*03/2016*	*1,582*	*38.342743*	*-108.944950*
	O_3	1	03/2016	BG Regional	Thermo 49C	SPM	Continuous
	WS/WD/Temp/RH	1	03/2016	BG Regional	RM Young	SPM	Continuous
Pitkin							
08 097 0006	*Aspen – Yellow Brick*	*215 N. Garmisch St.*		*01/2015*	*2,408*	*39.192958*	*-106.823257*
	PM_{10}	1	02/2015	P.O. Neigh	SA/GWM 1200	SLAMS	1 in 3
Prowers							
08 099 0002	*Lamar Municipal*	*104 E. Parmenter St.*		*12/1976*	*1,107*	*38.084688*	*-102.618641*
	PM_{10}	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
Pueblo							
08 101 0015	*Pueblo – Fountain School*	*925 N. Glendale Ave.*		*06/2011*	*1,433*	*38.276099*	*-104.597613*
	PM_{10}	1	04/2011	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
	$PM_{2.5}$	1	04/2011	P.O. Neigh	Partisol 2025	SLAMS	1 in 3
Routt							
08 107 0003	*Steamboat Springs*	*136 6th St.*		*09/1975*	*2,054*	*40.485201*	*-106.831625*
	PM_{10}	2	03/1987	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 1
San Miguel							
08 113 0004	*Telluride*	*333 W. Colorado Ave.*		*03/1990*	*2,684*	*37.937872*	*-107.813061*
	PM_{10}	1	03/1990	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
Weld							
08 123 0006	*Greeley-Hospital*	*1516 Hospital Rd.*		*04/1967*	*1,441*	*40.414877*	*-104.70693*
	PM_{10}	2	03/1987	P.O. Neigh	SA/GMW-1200	SLAMS	1 in 3
	$PM_{2.5}$	3	02/1999	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
08 123 0008	*Platteville Middle School*	*1004 Main St.*		*12/1998*	*1,469*	*40.209387*	*-104.82405*
	$PM_{2.5}$	1	08/1999	P.O. Region	Partisol 2025	SLAMS	1 in 3
	$PM_{2.5}$ Speciation	5	08/1999	P.O. Region	SASS	Spec Trends	1 in 6
	$PM_{2.5}$ 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*

AQS #	*Site Name*	*Address*		*Site Started*	*Elevation (m)*	*Latitude*	*Longitude*
	Parameter	**POC**	**Pollutant Started**	**Orient/Scale**	**Monitor**	**Type**	**Sample**
	O_3	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.

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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 ozone. 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. This nonattainment designation was re-affirmed in 2012 when the EPA classified the region as a "marginal" nonattainment area for the 2008 ozone standard. The region recently failed to attain the 2008 ozone standard and has been moved up to the next level of classification, a "moderate" area designation. A moderate area ozone implementation plan has been developed by the APCD and will be submitted to the EPA in 2017.

The EPA released a more stringent ozone standard on October 1, 2015. Colorado has submitted a "Marginal" area designation recommendation, based on the 2013-2015 monitoring data period. The EPA will finalize area designations in 2017. Depending on the monitoring data levels and the associated nonattainment area classification a State Implementation Plan might be due three years from the promulgation date of the standard.

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 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 six CO, fourteen O_3, five NO_2, one NOy, and three SO_2 monitoring sites. There are sixteen PM_{10} monitors at 10 sites and twenty-three $PM_{2.5}$ monitors at twelve sites, keeping in mind that the GRIMM's monitor continuously for both $PM_{2.5}$ and PM_{10} and co-located samplers are also included in the total number of samplers operated by the APCD. There are two air toxics 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, Limon, La Junta, and Lamar. The agricultural base includes both irrigated and dry land farming. With concurrences by EPA on the

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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_{10} monitoring site in Lamar, no gaseous pollutant monitoring sites and one meteorological site in the area. A replacement site for the Elbert $PM_{2.5}$ background site was installed at Castlewood Canyon in Douglas County in 2014. This site was in the Denver Metro/Northern Front Range region, but was discontinued as of 12/31/2014 due to APCD finding a more cost effective way to monitor background $PM_{2.5}$ concentrations through IMPROVE monitors. The IMPROVE monitors are a 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_2, and two O_3 gaseous monitors in this region, as well as one PM_{10} and one $PM_{2.5}$ 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.

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Currently, there are no gaseous pollutant monitoring sites and one PM_{10} 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. There is one site in Pueblo that monitors for both filter based PM_{10} and $PM_{2.5}$.

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. The $PM_{2.5}$ monitor in Cortez Colorado was decommissioned in July of 2015. The monitor recorded low concentrations and had met its monitoring objectives.

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 location, four O_3 monitoring sites, five PM_{10}, and one $PM_{2.5}$ 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 monitoring network.

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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
COLORADO	***5,029,196***	***5,474,968***	***5,999,989***	***1.8%***	***1.9%***
CENTRAL MOUNTAINS	**225,907**	**255,043**	**288,527**	**2.6%**	**2.8%**
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%
DENVER METRO / NORTH FRONT RANGE	**3,390,504**	**3,679,013**	**4,023,313**	**1.6%**	**1.7%**
BOULDER MSA / BOULDER	***294,567***	***312,668***	***332,107***	***1.2%***	***1.3%***
DENVER-AURORA-LAKEWWOD MSA	***2,543,482***	***2,755,356***	***2,999,591***	***1.7%***	***1.8%***
Adams	441,603	491,263	544,258	2.2%	2.3%
Arapahoe	572,003	619,762	673,230	1.7%	1.8%
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%
FORT COLLINS MSA / LARIMER	***299,630***	***325,776***	***360,274***	***1.7%***	***2.0%***

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REGION / MSA / COUNTY	Actual Population	Projected Population		Avg. Annual % Change	
	July 2010	July 2015	July 2020	2010 -15	2010 -20
GREELEY MSA / WELD	*252,825*	*285,216*	*331,341*	*2.6%*	*3.1%*
EASTERN HIGH PLAINS	**137,009**	**143,588**	**151,837**	**1.0%**	**1.1%**
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%
PIKES PEAK	**645,613**	**702,925**	**763,004**	**1.8%**	**1.8%**
COLORADO SPRINGS MSA	**645,613**	**702,925**	**763,004**	**1.8%**	**1.8%**
El Paso	622,263	677,353	734,862	1.8%	1.8%
Teller	23,350	25,572	28,142	1.9%	2.1%
SAN LUIS VALLEY	**45,315**	**48,303**	**51,972**	**1.3%**	**1.5%**
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%
SOUTH CENTRAL	**185,536**	**201,360**	**763,004**	**1.7%**	**1.8%**
Custer	4,255	4,991	5,866	3.5%	3.8%
Huerfano	6,711	6,996	7,527	0.8%	1.2%
Las Animas	15,507	19,346	19,217	5.0%	2.4%
PUEBLO MSA / PUEBLO	**159,063**	**170,027**	**185,227**	**1.4%**	**1.6%**
SOUTHWEST	**89,652**	**101,670**	**115,796**	**2.7%**	**2.9%**
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%
WESTERN SLOPE	**309,660**	**345,062**	**387,704**	**2.3%**	**2.5%**

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REGION / MSA / COUNTY	Actual Population	Projected Population		Avg. Annual % Change	
	July 2010	July 2015	July 2020	2010 -15	2010 -20
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%
Grand Junction MSA / Mesa	**146,723**	**157,878**	**171,581**	**1.5%**	**1.7%**
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 2017, 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 2.4 ppm in 2016. 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_2 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 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 2016 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 Region

Site ID	Site Name	Eight-Hour Max (ppm)	One-Hour Max (ppm)
08 069 1004	Fort Collins-Mason	1.4	2.60
08 123 0009	Weld County Tower	1.1	1.80

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Table 4. Maximum CO Concentrations for the Denver Metro Area

Site ID	Site Name	Eight-Hour Max (ppm)	One-Hour Max (ppm)
08 001 3001	Welby	1.6	3.00
08 031 0002	CAMP	1.8	3.20
08 031 0026	La Casa	1.8	2.98
08 031 0027	I-25 Denver	2.4	3.38

The monitor located at the Welby site is an EPA Regional Administrator Required Monitor.

Pikes Peak Region

The Pikes Peak Region is a very popular tourist area with rapid urban growth. In 2016, the highest eight-hour CO concentration recorded at the Colorado Springs-Hwy 24 monitor was 1.4 ppm with a maximum one-hour concentration of 2.62 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 2016, the highest eight-hour CO concentration recorded at the Grand Junction – Pitkin monitor was 1.3 ppm with a one-hour maximum concentration of 2.3 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 2017, there are no major planned changes for the CO monitoring network operated by APCD. All of APCD's carbon monoxide monitors have been upgraded to a Thermo 48iTLE trace level instrument. 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. There are no additional changes scheduled for the CO monitoring network at this time.

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 violate the standard.

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On October 1st, 2015, the EPA strengthened the NAAQS for ground level ozone to 0.070 ppm (effective Dec. 28th, 2015). The APCD operates three sites out of 17 that have three-year design values (2014 – 2016) in excess of the current eight-hour O_3 NAAQS standard of 0.075 ppm (note that because the 8 hour ozone standard is calculated based on looking back on three years of data, the calculations for 2016 will be based on the 0.075 ppm value). These sites are: Chatfield State Park (0.077 ppm), Rocky Flats North (0.077 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

MSA population[1,2]	Most recent 3-year design value concentrations ≥ 85% of any O_3 NAAQS[3]	Most recent 3-year design value concentrations < 85% of any O_3 NAAQS[3,4]
>10 million	4	2
4–10 million	3	1
350,000–<4 million	2	1
50,000–<350,000[5]	1	0

[1]Minimum monitoring requirements apply to the Metropolitan statistical area (MSA).
[2]Population based on latest available census figures.
[3]The ozone (O_3) National Ambient Air Quality Standards (NAAQS) levels and forms are defined in 40 CFR Part 50.
[4]These minimum monitoring requirements apply in the absence of a design value.
[5]Metropolitan statistical areas (MSA) must contain an urbanized area of 50,000 or more population.

In addition to the above mentioned O_3 monitoring requirements, EPA rules also state that there must be at least one monitoring site per MSA that monitors for the highest concentrations. There are seven MSA areas in Colorado. They are the Denver-Aurora-Lakewood, Boulder, Fort Collins, Greeley, Colorado Springs, Grand Junction, and Pueblo MSAs. There is no current federal requirement to monitor ozone in the Pueblo MSA but APCD is considering it.

Denver Metro/Northern Front Range

Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors and chemical solvents are some of the major sources of NOx and Volatile Organic

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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 2016 for each O_3 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 (2014-2016) 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_3 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_3 Concentrations in Northern Front Range Region

Site ID	Site Name	1st eight-hour Max (ppm)	4th eight-hour Max (ppm)	2014 - 2016 Design Value (ppm)
08 069 0011	Fort Collins – West	0.086	0.076	0.075
08 069 1004	Fort Collins – Mason	0.074	0.070	0.070
08 123 0009	Greeley – Tower	0.079	0.067	0.070

In the Denver Metro area, only Adams, Arapahoe, Boulder, Denver, Douglas, and Jefferson counties have O_3 monitors. There are 10 monitors currently in operation in this area. The first and fourth maximum eight-hour concentrations recorded in 2016 for each O_3 monitoring site in the metropolitan Denver area are listed in **Table 7** below. Also listed are the three-year design values (2014-2016) for each site with enough data available to calculate them. Design values that are **bold** and *italicized* exceed the NAAQS.

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 was satisfied by the monitor at South Boulder Creek. The South Boulder Creek monitor was shut down Jan. 1st 2016 because it did not meet siting requirements due to large trees that have become overgrown and cannot be removed. A new Boulder ozone site has been established at the Boulder Reservoir and it 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 nine 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.

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Table 7. Maximum O_3 Concentrations for the Denver Metro Area

Site ID	Site Name	1st Eight-hour Max (ppm)	4th Eight-hour Max (ppm)	2014-2016 Design Value (ppm)
08 001 3001	Welby	0.072	0.066	0.067
08 005 0006	Aurora – East	0.070	0.066	0.067
08 013 0014	Boulder Reservoir	*0.066	*0.053	----*
08 031 0002	CAMP	0.074	0.070	0.066
08 031 0026	La Casa	0.073	0.069	0.068
08 035 0004	Chatfield State Park	0.086	0.078	***0.077***
08 059 0005	Welch	0.082	0.075	0.072
08 059 0006	Rocky Flats – N	0.089	0.079	***0.077***
08 059 0011	NREL	0.088	0.083	***0.080***
08 059 0013	Aspen Park	0.081	0.073	0.070

*The Boulder Reservoir site started monitoring in August of 2016.

Three of the above ten monitors have concentrations greater than the level of the 2008 8-hour NAAQS standard for ozone. Their values are bolded and italicized to highlight them.

Pikes Peak Region

The first and fourth maximum eight-hour concentrations recorded in 2016 for each O_3 monitoring site in the Pikes Peak Region are listed in **Table 8** below. Also listed are the three year design values (2014-2016) 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_3 Concentrations in Pikes Peak Region

Site ID	Site Name	1st Eight-hour Max (ppm)	4th Eight-hour Max (ppm)	2014-2016 Design Value (ppm)
08 041 0013	U.S. Air Force Academy	0.072	0.067	0.069
08 041 0016	Manitou Springs	0.070	0.065	0.066

Western Slope Region

The first and fourth maximum eight-hour concentrations recorded in 2016 for each O_3 monitoring site in the Western Slope Region are listed in **Table 9** below. Also listed are the three year design values (2014-2016) for each site. None of these sites recorded ozone concentrations that exceeded the 8-hour ozone standard. The Lay Peak site was established in August of 2011 and was removed from the network at the end of 2014 due to the site meeting its' monitoring objectives. The data for Lay Peak is not listed below, because the APCD no longer collects data from this site as of Jan. 1st, 2015. One of the recommendations of the 3-State Study Network Assessment was to locate the Lay Peak site further to the west and to the North. So in response to that recommendation, APCD shut down the Lay Peak site and moved it to Elk

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Springs. The Elk Springs Site started monitoring for ozone and meteorology on Aug. 1st, 2015.

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_3 monitor. The monitor at the Palisade Water Treatment Plant satisfies this requirement, as well as the highest concentration monitor requirement.

Table 9. Maximum O_3 Concentrations in the Western Slope Region

Site ID	Site Name	1st Eight-hour Max (ppm)	4th Eight-hour Max (ppm)	2014-2016 Design Value (ppm)
08 045 0012	Rifle – Health	0.065	0.060	0.063
08 077 0020	Palisade Water Treatment	0.066	0.063	0.063
08 081 0003	Elk Springs	0.060	0.059	-----*
08 085 0005	Paradox	0.065	0.062	-----*

*The Elk Springs site began monitoring for ozone August 1st, 2015. The Paradox site began monitoring for ozone March 1st 2016.

Southwest Region

There is a single O_3 monitor in the Southwest Region in Cortez. The first and fourth eight-hour maximum concentrations in 2016 were 0.066 and 0.064 ppm respectively, and the 2014-2016 design value is 0.062.

The O3 monitor in Cortez is:

08 083 0006 – Cortez 106 W. North Street

Planned Changes in O_3 Monitoring

There are currently no planned changes to CDPHE's ozone monitoring network for 2017.

IV. NITROGEN DIOXIDE/REACTIVE OXIDES OF NITROGEN (NO_2/NOy)

Historically, the APCD has monitored NO_2 at eight locations in Colorado, two of which are still in operation. Currently, there are five NO_2/NOy monitoring locations in operation, three of which are relatively new sites. The Denver CAMP monitor exceeded the NO_2 standard in 1977 and the Welby monitor has never exceeded the average annual 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_2 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 98th percentile of the yearly distribution of daily maximum one-hour concentrations.

The APCD began monitoring for NO_y 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_y monitoring is a requirement for an NCore station, but there are no standards for NO_y. The EPA has established requirements for an NO_2 monitoring network that will include monitors at locations where maximum NO_2 concentrations are expected to occur,

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including within 50 meters of major roadways, as well as monitors sited to measure the area-wide NO_2 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. 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_2 concentrations representing the neighborhood or larger spatial scales. A second near roadway site was installed and began NO_2 sampling on Oct. 1st 2015 at 4905 Acoma St. to satisfy the requirement for a second near-roadway site. The CAMP site satisfies the requirement for the neighborhood highest representative concentration site.

Denver Metro/Northern Front Range Counties

There are five NO_2 sites operated by APCD in this region (the La Casa site houses a direct NO_2 monitor and a NO_y instrument). The Annual Average and 2014-2016 one-hour Standard Design values are listed below in **Table 10**.

Table 10. Maximum NO_2 Concentrations for the Denver Metro Area

Site ID	Site Name	Annual Average (ppb)	2014-2016 one-hour Design Value (ppb)
08-001-0003	Welby	16.02	62.0
08-031-0002	CAMP	21.23	74.0
08-031-0026	La Casa	19.13	63.0
08-031-0027	I-25 Denver	25.75	66.0
08-031-0028	I-25 Globeville	29.28	-----*

*The I-25 Globeville site began monitoring for NO_2 on Oct. 1st, 2015.

The NO_2/NOy monitors in this area are:

08 001 3001 Welby, 3174 E. 78th 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 CAMP monitor serves as an area-wide monitor. The I-25 Denver site (08-031-0027) and the I-25 Globeville (08-031-0028) sites house the required near-roadway monitors. APCD's most recent near-roadway air monitoring station installed is I-25 Globeville. It is currently set up to monitor for $NO/NO_2/NO_x$, meteorological parameters, and continuous $PM_{2.5}$ and PM_{10} with a GRIMM. It began monitoring on Oct. 1st, 2015. This site will have the capacity to expand monitoring capabilities if needed in the future. The I-25 Globeville near-roadway monitor 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, and the monitor at the La Casa site serves as the NCore monitor.

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Planned Changes in NO_2/NOy Monitoring

EPA's past regulatory requirements included the establishment of an NO_2 near-road site in CBSA's of populations between 500 thousand and 1 million by January of 2017. The Colorado Springs CBSA falls into this population range as of the Census Bureau's 2015 estimates. On December 22nd, 2016 the EPA removed this requirement. Current near road monitoring shows that air quality levels, in urban areas with larger populations, are well below the National Ambient Air Quality Standards for NO_2 issued in 2010. Based on these data, EPA does not anticipate near road NO_2 concentrations to be above the health-based national air quality standards in smaller urban areas. This action would not change the requirements for near road NO_2 monitors in more populated areas, area wide NO_2 monitoring, or monitoring of NO_2 in areas with susceptible and vulnerable populations. The rule summary of the notice can be found at: https://www.epa.gov/no2-pollution/ambient-nitrogen-dioxide-monitoring-requirements (Ambient Nitrogen Dioxide Monitoring Requirements). Accordingly, and with the concurrence of EPA Region 8, APCD has placed a hold on the planning activities for this site. There are no other planned changes to APCD's NO_2 monitoring network at this time.

V. SULFUR DIOXIDE (SO_2)

The Air Pollution Control Division has monitored SO_2 at eight locations in Colorado in the past. 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 99th 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_2 had never approached the level of any of the standards until an SO_2 analyzer was added at Highway 24 in Colorado Springs on 1/10/2013; this site exceeded the level of the 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 = 87ppb). 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. Between 2013 and 2015, the Highway 24 site did not have a violation of the standard. The 2013-2015 three year design value was 56 ppb at the Highway 24 site. Examination of wind direction and speed in combination with higher concentrations of SO_2 at the site indicated the Martin Drake Power Plant as a potential source. Working with the APCD, the Colorado Springs Department of Utilities has completed a year of monitoring meteorology at its Martin Drake Power Plant and is in the process of modeling impacts on the community with that data. APCD is also monitoring meteorology at the Highway 24 site. The current three year design value (2014-2016) for the Highway 24 site in Colorado Springs is 52 ppb, below the 75 ppb standard.

SO_2 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_2 emissions for that MSA and dividing by 1 million. This PWEI value is then used to determine areas in need of SO_2 monitoring. A sum of the most recent emissions data by county (2008) give a total for SO_2 emissions of 15,235 tons per year for the Denver PMSA. The calculated PWEI for this region is 37,930 million persons-tons per year. This indicates the need for one SO_2 monitor in the Denver-Aurora-Lakewood MSA according to the

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EPAs monitoring rules for SO_2.

Using the same calculation for the Colorado Springs MSA, the calculated PWEI is 8,207 million persons-tons per year. Because of the increase in population in Colorado Springs, there is a need for one SO_2 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. The monitor located at the Welby site is an EPA Regional Administrator Required Monitor.

Table 11. Maximum SO_2 Concentrations for the Denver Metro Area

Site ID	Site Name	2016 99th percentile 1-Hour Daily Maximum Concentration (ppb)	2014 – 2016 Design Value (ppb)[4]
08 001 3001	Welby	20.0	18.0
08 031 0002	CAMP	9.0	12.0
08 031 0026	La Casa	12.0	14.0

Pikes Peak Region

In January of 2013 an SO_2 monitor was added to the Highway 24 monitoring station in Colorado Springs. The 99th percentile value of the one-hour daily maximum concentration for 2016 was 45 ppb. The three year average design value (2014-2016) for the site is 52 ppb.

The SO_2 monitor in this area is:

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

Planned Changes in SO_2 Monitoring

There are no 2017 planned changes for the SO_2 monitoring network at this time.

VI. PM_{10}

Sources of suspended particulate matter in the ambient air include mobile and stationary sources (i.e. diesel trucks, wood burning stoves, power plants, etc). Several industrial and manufacturing processes also contribute to elevated particulate levels. 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. There are also a variety of agricultural sources of PM_{10} including feed lots, grazing, tilling, etc.

Currently the APCD operates PM_{10} monitors at 27 different locations. Twenty 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 also currently 10 sites that have dichot particulate monitors, which continuously monitor for both

[4] The one-hour SO_2 design value is calculated by taking the three year average of the 99th percentile of the daily maximum one-hour averages.

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$PM_{2.5}$ and PM_{10}. There are three sites with collocated high volume samplers (CAMP, Crested Butte and Longmont), and two sites with collocated low volume PM_{10} samplers (La Casa and Grand Junction – Powell). The PM_{10} NAAQS is a 24-hour average of 150 $\mu g/m^3$ 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_{10} exceedances in 2016. The maximum concentrations recorded were 74 $\mu g/m^3$ at Fort Collins – CSU, and 53 $\mu g/m^3$ at Greeley.

The PM_{10} 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_{10} exceedances by any of the monitors in the Denver Metro area. The table below lists the maximum concentrations recorded at each of the sites in 2016. Site ID numbers that include an asterisk (*) indicate a low volume sampler, while no asterisk indicates high volume samplers. The Commerce City particulate site (Alsup Elementary School 08-001-0006) was dismantled due to a reroofing project in June of 2015. APCD relocated the site to the Tri County Health Department (08-001-0008) building across the street from the old Alsup site at 4201 E. 72nd Avenue, Commerce City Colorado. Sampling began in July of 2016 at the new site.

Table 12. Maximum PM_{10} Concentrations for the Denver Metro Area

Site ID	Site Name	Max. 24-Hour Concentration ($\mu g/m^3$)
08 001 0008	Tri County Health Dept.	123*
08 001 3001	Welby	110
08 013 0003	Longmont-Municipal	46
08 013 0012	Boulder Chamber Bldg.	39
08 031 0002	CAMP	71
08 031 0017	Denver Visitor Center	82
08 031 0026	La Casa	41*

The Commerce City – Tri County Health Dept. site is a new site which began sampling in July of 2016. See explanation above. *Indicates Low Volume sampler.

Eastern High Plains Region

The sources of PM_{10} 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_{10} in Lamar.

There was one PM_{10} exceedance at the Lamar Municipal site in 2016 with the highest concentration recorded at this site being 183 $\mu g/m^3$. These events are under consideration as being exceptional events and it is anticipated that the EPA will concur with the determinations and recommendations of the APCD as being exceptional events and therefore not exceeding of the NAAQS.

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The PM_{10} 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_{10} NAAQS in this region for 2016. The highest concentration recorded at the Colorado College site was 39 μg/m^3. This monitor is a low-volume sampler.

The PM_{10} monitoring site in this area is:

08 041 0017 Colorado College, 130 West Cache la Poudre

San Luis Valley Region

There were two exceedances in this region in 2016. The maximum concentration at Alamosa – Adams State College was 355 μg/m^3 and the maximum concentration at Alamosa Municipal was 404 μg/m^3. Both monitors are high volume filter based samplers. These events are under consideration as being exceptional events and it is anticipated that the EPA will concur with the determinations and recommendations of the APCD as being exceptional events and therefore not in exceedance of the NAAQS. Sampling at the Alamosa Adams State College (08-003-0001) site was discontinued on 12/31/2016 due to the site being redundant with the Alamosa Municipal site.

The PM_{10} monitoring site in this area is:

08 003 0003 Alamosa-Municipal, 425 4th Street

South Central Region

There were no exceedances in this region in 2016. The maximum concentration found at the Pueblo – Fountain School in 2016 was 82 μg/m^3.

The PM_{10} monitoring site in this area is:

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

Central Mountain Region

There were no PM_{10} exceedances in the Central Mountain region during 2016. The table below lists the maximum concentrations recorded at each of the sites.

Table 13. Maximum PM_{10} Concentrations for Mountain Counties

Site ID	Site Name	Max. 24-Hour Concentration (μg/m^3)
08 043 0003	Cañon City – City Hall	54
08 051 0004	Crested Butte	76
08 051 0007	Mount Crested Butte	46
08 097 0008	Aspen – Yellow Brick	47
08 107 0003	Steamboat Springs	73

Southwestern Region

There were no exceedances of the PM_{10} standard in 2016 for this area. The maximum

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concentration at Pagosa Springs was 117 μg/m^3, and the maximum concentration at Durango – River City Hall was 104 μg/m^3.

The PM_{10} 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_{10} exceedances in the Western Slope region in 2016. 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. Sources of PM_{10} 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_{10} including feed lots, grazing, tilling, and other dry land agricultural activities. The Carbondale site was decommissioned on 12/31/2016 due to low concentrations found and the site meeting its' monitoring objectives. The Rifle Henry Building site was dismantled on 12/31/2016 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 64255 with the first sample being collected in February of 2017.

Table 14. Maximum PM_{10} Concentrations in Western Slope Counties

Site ID	Site Name	Max. 24-Hour Concentration (μg/m^3)
08 029 0004	Delta	82
08 045 0005	Parachute	33
08 045 0007	Rifle – Henry Building	37
08 045 0018	Carbondale	36
08 077 0017	Grand Junction – Powell	38*
08 113 0004	Telluride	79

*Indicates a Low Volume sampler.

Planned Changes in PM_{10} Monitoring

The Alsup Elementary site in Commerce City (08-001-0006) was removed from the building in late May of 2015 due to a reroofing project. During that time APCD decided to relocate the Alsup site to the Tri County Health Department building (08-001-0008) at 4201 E. 72nd Avenue, Commerce City Colorado. The new Tri County Health Department site began sampling in August of 2016. A reconfiguration of the sequential low volume $PM_{2.5}$ sampler at Colorado College (08-041-0017) to a PM_{10} sampler occurred in 2016. This removed the only 126 method code (low volume PM_{10} R&P 2000) from APCD's network. APCD discontinued three Hi Volume PM_{10} sites from its network at the end of 2016. The Denver Visitor's Center site (08-031-0017) was dismantled due to building use issues on December 31st, 2016. The Carbondale Boat House site (08-045-0018) was dismantled due to low concentrations being found and the site meeting its monitoring objectives on December 31st, 2016. The Alamosa Adams State College site (08-003-0001) was dismantled due to redundancy with the Alamosa Municipal site on December 31st, 2016. The Rifle Henry Building site (08-045-0007) was dismantled in January of 2017 due to building use issues, and relocated to the Garfield County Public Library

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building (08-045-0023). The Garfield County Library site commenced sampling PM_{10} in February of 2017. There are currently no additional planned changes to the PM_{10} monitoring network for 2017.

VII. $PM_{2.5}$

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 $PM_{2.5}$ standard of 12 $\mu g/m^3$ is compared to the three-year average annual mean $PM_{2.5}$ concentration. The 24-hour $PM_{2.5}$ standard of 35 $\mu g/m^3$ is compared to the three-year average of the annual 98th percentile value.

$PM_{2.5}$ 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 FRM instruments at 10 sites, of the 10 sites 7 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 $PM_{2.5}$ but no filter-based FRM. Speciation samples (laboratory analysis of $PM_{2.5}$ samples to characterize the different components of $PM_{2.5}$ in the atmosphere) are taken at 3 sites; La Casa, Platteville and Tri County Health Dept. with all three being collocated with a low volume filter based FRM.

Denver Metro/Northern Front Range Region

The $PM_{2.5}$ sites listed below are filter-based FRM sites in the APCD network and are suitable for comparisons to the annual $PM_{2.5}$ NAAQS as of December 31, 2011.

There were no $PM_{2.5}$ exceedances in 2016 in the Larimer and Weld County area. The table below lists the 24-hour Design Value (98th 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 $PM_{2.5}$ Concentrations in Northern Front Range Counties

Site ID	Site Name	24-Hour Design Value ($\mu g/m^3$)	Annual Design Value ($\mu g/m^3$)
08 069 0009	Fort Collins – CSU	22	6.5
08 123 0006	Greeley – Hospital	28	7.9
08 123 0008	Platteville	31	7.8

There were no exceedances of the $PM_{2.5}$ standard in the Denver Metro area in 2016. The table below lists the 24-hour and Annual Design Values recorded in 2016 for each site in the Denver Metro area.

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Table 16. Maximum $PM_{2.5}$ Concentrations in the Denver Metro Area

Site ID	Site Name	24-Hour Design Value (µg/m³)	Annual Design Value (µg/m³)
08 001 0008	Commerce City (Tri County Health Department)	22*	10.2*
08 005 0005	Arapahoe Community College	17	5.9
08 013 0003	Longmont – Municipal	25	6.9
08 013 0012	Boulder Chamber of Commerce	17	5.6
08 031 0002	CAMP	21	7.2
08 031 0026	La Casa	21	7.2
08 031 0027	I-25 Denver	25	9.2
08 031 0028	I-25 Globeville	29*	11.8*
08 035 0004	Chatfield Reservoir	15	5.2

*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.

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, 4545 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 exceedances of the $PM_{2.5}$ standard in 2016 in the Pikes Peak Region. The 24-Hour Design Value at the Colorado College site was 15 µg/m³, and the Annual Design Value was 5.5 µg/m³.

The $PM_{2.5}$ monitoring site in this area is:

08 041 0017 Colorado College, 130 West Cache la Poudre

South Central Region

There were no exceedances of the $PM_{2.5}$ NAAQS standard in the South Central region in 2016. The 24-Hour Design Value at the Pueblo – Fountain School was 14 µg/m³ and the Annual Design Value was 5.2 µg/m³.

The $PM_{2.5}$ monitoring site in this area is:

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

Western Slope Region

There were no $PM_{2.5}$ exceedances recorded in the Western Slope region in 2016. The 24-Hour Design Value at the Grand Junction Powell building was 20 $\mu g/m^3$, and the Annual Design Value was 6.5 $\mu g/m^3$.

The $PM_{2.5}$ monitoring site in this area is:

08 077 0017 Grand Junction – Powell, 650 South Avenue

$PM_{2.5}$ GRIMM and TEOM Continuous Monitors

All Federal Reference Method (FRM) monitors in the Colorado $PM_{2.5}$ network were in the past compared to the NAAQS. The FRM monitors are all filter based 24-hour composite samples. The GRIMM EDM 180 has received Federal Equivalent Method (FEM) designation for $PM_{2.5}$ from the EPA in 2011 and it is the only real-time continuous data that the APCD uses to compare to the NAAQS. The sites that use the GRIMM to compare to the $PM_{2.5}$ NAAQS are: Tri County Health (08-031-0008), I-25 Denver (08 031 0027), I-25 Globeville (08-031-0028), Colorado College (08-041-0017), Fort Collins (08-069-0009), Grand Junction Powell (08-077-0017), and Greeley Hospital (08-123-0006). All of these primary monitor changes occurred in the summer of 2016. The APCD has recently also made the decision to replace most of its aging TEOM fleet with GRIMM EDM 180 continuous particulate monitoring technology. APCD replaced the first TEOM at CAMP in April of 2013 with a GRIMM EDM 180. APCD has determined the GRIMM EDM 180 to be a very reliable cost effective way to monitor ambient continuous particulate concentrations. APCD has also made the decision to purchase a $PM_{2.5}$ FEM approved Teledyne API T640 PM mass monitor. The T640 uses broadband spectroscopy to measure continuous particulate matter in the atmosphere. APCD will install the new T640 at the Chatfield site (08-035-0004) in the spring of 2017, removing the TEOM currently operating at the site.

The APCD currently employs four (one PM_{10}) 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 $PM_{2.5}$ 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.
08 031 0013-3 NJH-E, 14th Avenue and Albion Street

Community Monitoring Zones

Community monitoring zones are an additional method of defining an area for comparison with the $PM_{2.5}$ 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:

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"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 $PM_{2.5}$ 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 $PM_{2.5}$ NAAQS." The CMZ is an optional technique that averages the $PM_{2.5}$ 24-hour concentrations from two or more monitors located in the same community.

If the $PM_{2.5}$ 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 $PM_{2.5}$ Monitoring

Notable changes occurred within APCD's $PM_{2.5}$ network during 2016 including the removal and replacement of five of the primary Federal Reference Method (FRM) filter based monitors with GRIMM 180 EDM continuous instruments for comparison to the NAAQS standards. APCD made these changes because the GRIMM has proven to be a reliable, low cost, low maintenance way to accurately monitor for $PM_{2.5}$ and PM_{10}. APCD has collocated GRIMM instruments with FRM instruments at a number of sites for extended periods of time and the data sets compare well. This will make APCD's $PM_{2.5}$ monitoring more efficient by saving man hours retrieving samples, maintaining aging FRM instruments and will save money over time on laboratory analysis costs. For more detailed changes to the $PM_{2.5}$ monitoring network see "Completed Changes" on page 36 below. The TEOM at the Chatfield site was replaced by a Teledyne API T640 continuous particulate monitor in May of 2017. There are no other planned changes in $PM_{2.5}$ monitoring at this time.

VIII. TSP/Pb

In December 2006 Total Suspended Particulate (TSP) monitoring by the APCD was reduced from six monitoring sites to a single site at DMAS NCore. In 2012 when DMAS was moved to La Casa, TSP sampling for lead was discontinued at the APCD's NCore site and PM_{10} sampling for lead began. Lead sampling at LaCasa was discontinued December 31st, 2015 due to low concentrations being found. Because this is an NCore site, no waiver was required for using PM_{10} sampling in lieu of TSP sampling for lead concentrations. The maximum quarterly lead concentration has generally been less than a tenth of the current standard. In addition, Colorado has not recorded an exceedance of the previous lead standard (1.5 $\mu g/m^3$ averaged over a calendar quarter) since the first quarter of 1980. The new lead standard, which is 0.15 $\mu g/m^3$ averaged over any three rolling consecutive three-month periods, has not been exceeded using data from 2013 - 2015. The new lead standard became effective on December 15, 2008.

With the revision of the standard in mind, the APCD reviewed its stationary sources database for all point sources that emit lead in Colorado. There were 32 lead sources identified in a database retrieval conducted in November, 2008. None of the sources emit greater than 0.5 ton(s) per year (TPY) of total lead, which includes elemental lead and all lead compounds. Thus, no

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new lead monitors are required at any point source facility in Colorado.

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 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. Subsequently, EPA has updated the lead emissions inventory for airports using 2008 NEI data. They found that Centennial Airport has dropped to the sixth highest lead emissions of any airport in the country at 1.08 TPY. The decrease in general aviation activity was likely due to the economic recession. The Centennial Airport TSP sampler was decommissioned on Dec. 31st, 2014 due to the site meeting its sampling requirements and it regularly showing concentrations well below that of the standard.

Planned Changes in TSP and Lead Monitoring

The EPA proposed the elimination of the requirement to measure lead at NCore sites from Appendix D of 40 CFR Part 58.19 due to the extremely low concentrations being recorded at these sites. Since the requirement to monitor non-point source lead at NCore sites with populations over 500,000 was finalized in 2010, over 50 urban NCore sites have measured lead values ten times below the NAAQS standard of 0.15 micrograms per cubic meter on average. After the removal of this requirement by EPA and the low concentrations recorded at La Casa (NCore 08-031-0026), the APCD decided to eliminate this lead monitor from the network on December 31st, 2015. Ambient lead concentrations will still be measured at the $PM_{2.5}$ speciation and IMPROVE sites throughout the state, as well as on the PM_{10} sampler at Grand Junction Powell (08 077 0017) as part of the National Air Toxics Trends Stations 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. The Paradox site is 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 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. 78th 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, 4545 Navajo Street
08 031 0027 I-25 Denver, 913 Yuma Street
08 031 0028 I-25 Globeville, 4905 Acoma Street

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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. 57th 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 ¼ 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 35th Avenue

Planned Changes in Meteorological Monitoring

There are currently no 2017 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 National 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 (NO2), 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.

<u>Colorado's PAMS Site Planned Milestones</u>

- 7/1/2017 – The CDPHE will submit a draft PAMS Monitoring Implementation Network Plan and any waivers to EPA Region 8 offices as part of its Annual Network Plan by 7/1/2017. Please note that the CDPHE is requesting 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 will have one month to review and provide comments to the waiver (7/31/2017), subsequently, CDPHE will have one month to address all of EPA's concerns, with the final PAMS Monitoring Implementation Network Plan due by 8/31/17. EPA will then have three months to approve the final waivers and implementation plan (11/30/2017).
- 10/31/2018 – 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.

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. These audits/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. 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). 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 flow rate verification checks. EPA requires a minimum of 15% of the FRM network to be collocated. By the end of 2016 Colorado maintained 30 filter based particulate monitoring sites (low-volume and high-volume), 5 of which had collocated instruments (CAMP, Commerce City, Longmont, La Casa 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 $PM_{2.5}$ 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.

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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 2016/2017.

- The removal and replacement of five of the primary $PM_{2.5}$ filter based FRM instruments with continuous GRIMM particulate monitors for comparison to the NAAQS was completed in the summer of 2016. These sites include: the new Adams County site (08-001-0008) with the use of a filter based FRM as collocation with the GRIMM as the primary, I-25 Denver (08-031-0027) $PM_{2.5}$ FRM was moved from a 1 and 3 day to a 1 and 6 day sample schedule and collocated with the GRIMM as the primary, Colorado College (08-041-0017), Ft. Collins (08-069-0009), Grand Junction Powell (08-077-0017) and Greeley Hospital (08-123-0006).
- A new location for South Boulder Creek ozone monitoring station was established because the site no longer met siting criteria due to the presence of large trees near and around the station that could not be removed. The South Boulder Creek site stopped monitoring Dec. 31st, 2015. A new location at the Boulder Reservoir was established and began monitoring for ozone and meteorological parameters in September of 2016.
- Alsup Elementary site (08-001-0006) in Commerce City Colorado (Adams County) was dismantled in May of 2015 due to a reroofing project on the building. During that time APCD decided to relocate the site across the street to the Tri County Health Department building (08-001-0008). Sampling at the new Adams County site began in July of 2016. The meteorological parameters that were monitored at the old Alsup site will not be resumed at the new site.
- All of APCD's carbon monoxide monitors have been upgraded to the Thermo 48iTLE trace level monitor by the beginning of 2017 except for CAMP. The CAMP monitor was upgraded to a trace level monitor in April of 2017. 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 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_{10} sampling in February of 2017.
- APCD removed three High Volume PM_{10} sites from the network in 2016. All three sites completed sampling for the year and were removed December 31st, 2016. The Denver Visitor Center site (08-031-0017) was removed due to building use issues, the Carbondale Boat House site (08-045-0018) was removed due to low concentrations being found and the site meeting its' objectives and the Alamosa Adams State College site (08-003-0001) was removed due to it being redundant with the Alamosa Municipal Building site.

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Planned Changes

APCD plans to begin to install an EPA required Photochemical Monitoring Site (PAMS) in 2017 with an expected completion in the fall of 2018. For more details in regards to this site please see Appendix B and section X of this document. There are no additional planned changes to CDPHE's monitoring network for 2017.

XIII. CFR Part 58, APPENDIX A, C, D, E REQUIRMENTS 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.

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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_3*	*NO*	*NO_2/NOy*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*	*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		NO - trees
08 031 0016	DESCI									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	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
08 051 0007	Mt. Crested Butte - Realty						X			NO - Building
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
08 059 0013	Aspen Park		X						X	NO - trees

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AQS #	*Site Name*	*CO*	*O_3*	*NO*	*NO_2/NO_y*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*	*Met*	*App. A,C,D,E Reqs. Met?*
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	YES
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

Tri County Health Dept. - Commerce City, 4201 E. 72nd 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_{10} and $PM_{2.5}$ monitoring began in August of 2016. There is a collocated $PM_{2.5}$ FRM along with a continuous $PM_{2.5}$ GRIMM EDM dust monitor, a filter based low volume PM_{10} monitor, a trends speciation monitor, and a $PM_{2.5}$ carbon monitor all in operation.

Welby, 3174 E. 78th 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).

O_3 monitoring began at Welby in July of 1973. The Welby monitor has not recorded an exceedance of the old one-hour O_3 standard since 1998. However, the trend in the 3-year average of the 4th maximum eight-hour average has been increasing since 2002.

The Welby NO_2 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_2 monitor began operation in July of 1973.

PM_{10} monitoring began at Welby in June and July of 1990 with a high volume PM_{10} monitor and a PM_{10} continuous TEOM monitor. Meteorological monitoring began in January of 1975.

Alamosa - Municipal, 425 4th Street (08 003 0003):

The Alamosa 425 4th 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_3 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 back up and 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 $PM_{2.5}$ 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 360^0 exposure. Based on the topography and meteorology of the area ACC is in an area where $PM_{2.5}$ 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.

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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_3 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_{10} 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_{10} nonattainment area and a SIP was implemented for this area. PM_{10} 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_{10} followed by $PM_{2.5}$ 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_{10} 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_{10} high volume

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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 $PM_{2.5}$ 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_{10} monitoring began at this site in December of 1994, while the $PM_{2.5}$ 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 1st, 2016 due to large trees that had grown over the years that could not be removed, making the site no longer meet siting criteria.

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_{10} 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 CO monitor was updated to a Thermo 48iTLE trace level monitor in April 2017 to better characterize lower level concentrations seen in recent years.

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_2 monitor began operation in January 1973 at this location.

The SO_2 monitor began operation in January 1967.

O_3 monitoring began originally in 1972 and has been intermittently monitored through January 2008. The current O_3 monitor began operation in February 2012.

The PM_{10} monitoring began in 1986 with the installation of collocated monitors, and was furthered by the addition of a continuous monitor in 1988.

The $PM_{2.5}$ monitoring began in 1999 with a sequential filter based FRM monitor. A continuous TEOM FEM $PM_{2.5}$ 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_{10} and $PM_{2.5}$.

Meteorological monitoring began at this site in January of 1965.

National Jewish Health, 14th 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. 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. Data from this continuous TEOM particulate monitor is not compared with the NAAQS. It is used for short term forecasting and public notifications. The monitor here is a population oriented middle scale special project monitor.

DESCI, 1901 E. 13th Avenue (08 031 0016):

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 to temporarily move to 1255 19th Street in 2010, and quality control measurements showed no meaningful difference between old and new locations. 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, 4545 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_2, O_3, 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_2, CO, and NOy analyzers began operation in January 2013.

The meteorological monitoring began at La Casa in January 2013.

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

$PM_{2.5}$ monitoring began at La Casa in January 2013 with an FRM filter-based monitor, a continuous TEOM/FDMS FEM instrument, a supplemental $PM_{2.5}$ 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_{10} and $PM_{2.5}$.

PM_{10}/lead monitoring began in January 2013. Lead monitoring at La Casa was discontinued December 31st, 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 $PM_{2.5}$ speciation and IMPROVE sites throughout the state, as well as on the PM_{10} sampler at Grand Junction Powell (08 077 0017) as part of the National Air Toxics Trends Stations project.

I-25 Denver, 971 Yuma Street (08 031 0027):

The I-25 Denver site is an EPA-required near roadway NO_2 monitoring site. It was established in June 2013. It is measuring $NO/NO_2/NO_x$ by chemiluminescence. Trace level CO, Teledyne API Model 633 Black Carbon Aethalometer, $PM_{2.5}$ with a filter based sequential FRM on a 1 and 6 day schedule, continuous PM_{10} & $PM_{2.5}$ (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_2 monitoring site. It was established Oct. 1st, 2015. It is measuring $NO/NO_2/NO_x$ by chemiluminescence. The site is also equipped with sensors to measure meteorological parameters and continuous PM_{10} and $PM_{2.5}$ 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_3 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_3 formation in the Denver metro area.

$PM_{2.5}$ monitoring began at this site in 2004 with the installation of a continuous monitor, and was furthered by the addition of an FRM sequential filter based monitor in 2005. Meteorological monitoring began in April of 2004.

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

The United States Air Force Academy site was installed as a replacement maximum concentration O_3 monitor for the Chestnut Street (08 041 0012) site. Modeling in the Colorado Springs area indicates that high O_3 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 8th 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 8th 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_2 monitor was added to Highway 24 to meet monitoring criteria for an increased population found during the 2010 census. To supplement SO_2 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_3 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. It has not recorded any levels greater than the current standard. 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 $PM_{2.5}$ monitor. The APCD elected to collocate the new $PM_{2.5}$ monitor with the corresponding filter-based monitors from the RBD site at the Colorado College location, which included an FRM $PM_{2.5}$ monitor and added a low volume FEM PM_{10} monitor in November, 2007. The continuous monitor began operation in April of 2008. In the summer of 2016 the filter based $PM_{2.5}$ FRM instrument was removed and the GRIMM EDM 180 was designated as the primary sampler used to compare to the $PM_{2.5}$ NAAQS. Currently there is also a low volume filter-based PM_{10} 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_{10} and $PM_{2.5}$).

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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 7th 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_{10} site began operation in December 1987. On May 6, 1988, the Macon Street monitor recorded a PM_{10} concentration of 172 $\mu g/m^3$. This is the only exceedance of either the 24-hour or annual NAAQS since PM_{10} 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. 2nd Street (08 045 0005):

The Parachute site began operation in May 2000 with the installation of a PM_{10} 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 3rd Street (08 045 0023):

The first Rifle site began monitoring for particulates in June 1985 and ended operation in May 1986. The next site began operation in December 1987 and continued until 2001. The levels at that site, with the exception of the March 31, 1999 high wind event, were always less than one half of both the annual and the 24-hour standards. The third location was on the Henry Building downtown and began operation in May of 2005 with the installation of a PM_{10} monitor as a part of the Garfield County study. This site was terminated in January of 2017 due to building use issues. The current site began operation in January of 2017 and is on the Garfield County Public Library down the street from the Henry Building. It includes two population oriented neighborhood scale special purpose, time-integrated, high volume, filter-based PM_{10} monitors on a 1 in 3 day sample schedule. Additionally, this site includes a meteorological tower owned and operated by Garfield County.

Rifle – Health Dept., 195 14th 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_3 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 6th Street (08 051 0004):

The Crested Butte PM_{10} 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_{10}.

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

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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_{10} site that had several high PM_{10} concentrations including five exceedances of the 24-hour standard in 1997 and one in 1998. Mt. Crested Butte also exceeded the PM_{10} annual average standard in 2011. A CMB source apportionment from 10 PM_{10} filters identified a crustal material as the most likely source (91%) of PM_{10}. 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_{10}. This is a population oriented neighborhood scale SLAMS monitor on a daily sample schedule.

Arvada, 9101 57th 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_3 area. As a result, when conditions are proper for daylong O_3 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_3 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_3 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_3 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_3 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_3 monitoring began as a part of the Summer 1993 Ozone Study. The monitor recorded some of the

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highest O_3 levels of any of the sites during that study. Therefore, it was included as a regular part of the APCD O_3 monitoring network. The Rocky Flats – N monitor frequently exceeds the current standard. This is a highest concentration-oriented urban scale SLAMS monitor.

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_3 concentrations in the Denver area. It frequently exceeds the current standard.

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_3 levels. In addition, passive O_3 monitors used in the area in a 2007 study indicated the possibility of higher O_3 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_3 levels that are larger than those seen in the metro area, as O_3 concentrations increase with increasing elevation. Whether or not the increased concentrations will be a health concern will be determined with the data gathered from this monitor. 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_{10} 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 $PM_{2.5}$ sampler and designated the GRIMM EDM 180 continuous particulate monitor as the primary method for $PM_{2.5}$ NAAQS comparisons. Currently there are filter based high volume PM_{10} neighborhood scale SLAMS monitors on a 1 in 3 day schedule and a continuous GRIMM EDM 180 that measures PM_{10} and $PM_{2.5}$ 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_3 monitoring began in 1980, and continues today.

Meteorological monitoring began at the site January 1st, 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 $PM_{2.5}$ NAAQS. Currently the GRIMM monitors for continuous $PM_{2.5}$ and PM_{10} and there are also two low volume filter based collocated PM_{10} monitors operated at the site on a 1 in 3 day and 1 in 6 day sample schedule.

Grand Junction - Pitkin, 645¼ 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 Stocker Stadium location had become less than ideal with the growth of the trees surrounding the park and the APCD felt that a location nearer to the CBD would provide a better representation of CO concentration values for the city. The CO concentrations at the Stocker Stadium site had been declining from an eight-hour maximum in 1991 of 7.8 ppm to 3.3 ppm in 2003. 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 5th, 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_3 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.

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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 north and 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 31st, 2014. The Elk Springs site became operational and began monitoring for ozone and meteorological parameters August 1st 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_3 monitor was established to address community concerns of possible high O_3 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 $PM_{2.5}$ filter was sampled June 20th, 2008. $PM_{2.5}$ monitoring was discontinued at the site in July of 2015 due to the site completing sampling requirements and the site returning low $PM_{2.5}$ 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 just 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_{10}, 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_{10} monitor and a continuous $PM_{10}/PM_{2.5}$ GRIMM EDM 180 monitor operated at this site.

The population oriented neighborhood scale SLAMS high volume PM_{10} monitor is operating on a 1 in 3 sample schedule.

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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 $\mu g/m^3$, and both sites regularly record values above 100$\mu g/m^3$ 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_{10} 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 6th 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 6th 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_{10} 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

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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_{10} and $PM_{2.5}$ 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_{10} monitors on a 1 in 3 day sample schedule and a continuous GRIMM instrument that measures $PM_{2.5}$ and PM_{10}. 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 $PM_{2.5}$. 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 $PM_{2.5}$ 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.

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Greeley, Weld County Tower, 3101 35th Avenue (08 123 0009):

The Weld County Tower O_3 monitor began operation in June 2002. The site was established after the 811 15th 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 28th, 2016.

Meteorological monitoring began in February of 2012.

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Appendix B - Colorado's PAMS Implementation Network Plan and Waiver

In accordance with the Environmental Protection Agency's (EPA) 2015 revised ozone monitoring rule (80 FR 65292; October 26, 2015), the state of Colorado is required to install and operate one Photochemical Assessment Monitoring Station (PAMS) site at its La Casa NCore site located at 4545 Navajo St., Denver. 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 Colorado Department of Public Health and Environment (CDPHE) operates the National Ambient Air Quality Standards (NAAQS) air monitoring compliance network in Colorado and proposes to implement PAMS monitoring in accordance with this plan.

Network Decision

☐ The NCore site located at (*Insert Location)* will serve as the location of the required PAMS site and will measure the following parameters described below. An Inventory of equipment used at the site(s) is provided in attachment?

☒ The CDPHE requests a waiver for implementing PAMS at an otherwise required NCore site entirely, or to make PAMS measurements at alternative locations such as existing PAMS sites or existing NATTS sites. Rationale for this waiver is provided in Waiver Request and Rationale (Attachment 1).

Auto GC Decision

Volatile organic compounds (VOCs) – A complete list of the targeted compounds are found in Table 1.

☒ We will measure hourly speciated VOC measurements with an auto-gas chromatograph (GC) using the TO-12 method. Make and Model selection of the auto-gas chromatograph has yet to be determined.

☐ We request a waiver to allow three 8-hour samples every third day as an alternative to daily hourly speciated VOC measurements at locations *(insert locations)*. Rationale for this waiver is provided in Waiver Attachment

Meteorology Measurements Decision – Note: EPA is suggesting the use of ceilometers for determining mixing height, however other types of meteorological equipment that provide for an indication of mixing height can be proposed

☒ Will measure wind direction, wind speed, temperature, humidity, atmospheric pressure, precipitation, solar radiation, ultraviolet radiation, and mixing height.
CDPHE has elected to use the following instrumentation to measure the parameters described above:

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Wind Speed	RMYoung	05305V
Wind Direction	RMYoung	05305V
Relative Humidity	RMYoung	41382VC
Temperature	RMYoung	41342VC
Pressure	RMYoung	61302V
Precipitation (tipping bucket)	RMYoung	52202
Mixing Height (ceilometer)	Vaisala	CL51
Solar Radiation (total)	Kipp&Zonen	CMP11
Ultraviolet Radiation	Kipp&Zonen	CUV5

☐ We request a waiver to allow meteorological measurements to be obtained from other nearby sites. Rationale for this waiver is provided in Waiver attachment

Other Required Measurements

- **Carbonyls -** Carbonyl sampling at a frequency of three 8-hour samples on a one-in-three day basis (~90 samples per PAMS sampling season) using a sequential carbonyl sampler. The sampler that will most likely be used is the ATEC 8000 cartridge sample, however this purchase decision has yet to be finalized. A complete list of the target carbonyl compounds may be found in Table 1. The TO-11A test method, as used in the National Air Toxics Trends (NATTS) program[5] will be used.
- **Nitrogen Oxides** – Will monitor for NO and NO_y (total oxides of nitrogen) in addition to true NO_2. The true NO_2 is required to be measured with a direct reading NO_2 analyzer, cavity attenuated phase shift (CAPS) spectroscopy or photolytic-converter NO_x analyzer. We have elected to use Teledyne T500u analyzer for the true NO2 measurement. NO and NOy will be measured using a Teledyne T200u-NOy analyzer.

5 See NATTS Technical Assistance Document for TO-11A method.

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Table 1 PAMS Target Compound List

Priority Compounds				Optional Compounds			
1	1,2,3-trimethylbenzene [a]	19	n-hexane [b]	1	1,3,5-trimethylbenzene	19	m-diethlybenzene
2	1,2,4-trimethylbenzene [a]	20	n-pentane	2	1-pentene	20	methylcyclohexane
3	1-butene	21	o-ethyltoluene [a]	3	2,2-dimethylbutane	21	methylcyclopentane
4	2,2,4-trimethylpentane [b]	22	o-xylene [a,b]	4	2,3,4-trimethylpentane	22	n-decane
5	acetaldehyde [b,c]	23	p-ethyltoluene [a]	5	2,3-dimethylbutane	23	n-heptane
6	acetone [c,d]	24	Propane	6	2,3-dimethylpentane	24	n-nonane
7	benzene [a,b]	25	propylene	7	2,4-dimethylpentane	25	n-octane
8	c-2-butene	26	styrene [a,b]	8	2-methylheptane	26	n-propylbenzene [a]
9	ethane [d]	27	toluene [a,b]	9	2-methylhexane	27	n-undecane
10	ethylbenzene [a,b]	28	t-2-butene	10	2-methylpentane	28	p-diethylbenzene
11	Ethylene			11	3-methylheptane	29	t-2-pentene
12	formaldehyde [b,c]			12	3-methylhexane	30	α/β-pinene
13	Isobutane			13	3-methylpentane	31	1,3 butadiene [b]
14	Isopentane			14	Acetylene	32	benzaldehyde [c]
15	Isoprene			15	c-2-pentene	33	carbon tetrachloride [b]
16	m&p-xylenes [a,b]			16	cyclohexane	34	Ethanol
17	m-ethyltoluene [a]			17	cyclopentane	35	Tetrachloroethylene [b]
18	n-butane			18	isopropylbenzene [b]		

Source: Revisions to the Photochemical Assessment Monitoring Stations Compound Target List. U.S. EPA, November 20, 2013

[a] Important SOAP (Secondary Organic Aerosols Precursor) Compounds
[b] HAP (Hazardous Air Pollutant) Compounds
[c] Carbonyl compounds
[d] Non-reactive compounds, not considered to be VOC for regulatory purposes

Attachment 1 Waiver Requests and Rationale

Waiver for implementing PAMS at an otherwise required NCore site

The CDPHE requests a waiver to allow PAMS monitoring to be performed at the Rocky Flats North site (08-059-0006), located at 16600 W. Highway 128, in lieu of Colorado's La Casa NCore site (08-031-0026), located at 4545 Navajo St. in Denver.

Rationale for this waiver

As established in the 2015 ozone rule a waiver provision was added in 40CFR 58 Appendix D 5(C) "to allow the collection of required PAMS measurements at an alternative location where the monitoring agency can demonstrate that the alternative location will provide representative data useful for regional or national scale modeling and the tracking of trends in ozone precursors." In late 2016 the CDPHE and EPA Region 8 monitoring and modeling staff established a site selection workgroup to discuss and evaluate the current monitoring network, emission inventories, and current modeling results with a goal of identifying the best location for Colorado's PAMS monitoring site. Ultimately, the workgroup decided that the preferred site location for PAMS monitoring was not at the La Casa NCore site but at the Rocky Flats North site.

The La Casa NCore site is located near downtown Denver just 400m south of 1-70 and 1,300m west of I-25. This location is heavily impacted by mobile emissions and industrial emission originating from the Denver/Commerce City area. This location is representative of maximum precursor emissions from the urban core and would be considered a Type (2) site as described in EPA's Technical Assistance Document for Sampling and Analysis of Ozone Precursors (EPA/600-R-98/161).

The Rocky Flats North site is located approximately 22 km northwest of the downtown Denver area, along State Highway 128. Depending upon meteorological conditions, this site is downwind of either the urban core area located southeast of the site or the oil and gas (O&G) region located northeast of the site. This site is classified as a maximum ozone concentration site for the area, which is verified by analytical measurements. There are no large ozone precursor sources near this site. Ozone precursors affecting this site on high ozone days are transported from regional sources. This site is representative of a Type (3) site as described in EPA's Technical Assistance Document for Sampling and Analysis of Ozone Precursors (EPA/600-R-98/161).

The workgroup identified several preferred attributes for an ideal PAMS site. These are as follows:

1) a site that is capable of monitoring either or both urban and O&G emissions;
2) a site that has a historical ozone and meteorological data record for comparative data evaluations and trend analyses;
3) a site that is not cost prohibitive to install;
4) a site that is downwind of ozone precursor sources on maximum ozone concentration days resulting in the monitoring of a photochemically aged emissions;
5) a downwind site that would result in its location being in a 4km modeling grid cell that has low ozone precursor emissions.

The site that best met the above attributes was Rocky Flats North.

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Attribute 1 – Monitors both urban and O&G emissions

A graphical representation of ozone precursor emission inventories for both volatile organic compounds (VOC) and oxides of nitrogen (NOx) in the Northern Front Range area are given in Figures 1 and 2. As shown in Figures 1 and 2, within the Northern Front Range are two unique areas of VOC and NOx emissions. These areas are the central Denver urban core and the Denver-Julesburg Basin oil and gas area north of the urban core. Both of these areas contribute significantly to ozone production in the western suburbs and foothills. The Rocky Flats North site sits conveniently between these two areas and to the west near the foothills. Figure 3 shows back trajectories for the 10 highest daily 8-hour maximum ozone days at the Rocky Flats North site in 2016. These trajectories show that during the 10 highest concentration days in 2016 the Rocky Flats North site saw approximately equal number of days with short term emissions originating from either the oil and gas area or the urban core area.

Attribute 2 – Historical data record

The Rocky Flats North site is a maximum ozone concentration site that is located along the western foothills. It was established in 1992 and has been in operation for 25 years. It continues to be one of the highest sites in the North Front Range Non-attainment Area. The 25 year ozone and meteorological record will add value to any PAMS measurements occurring at the site.

Attribute 3 – Installation costs

Cost for site installation was considered when determining the PAMS site location. If the decision was to establish a site different than the NCore site then installation costs could be prohibitive. It was determined that the establishment of PAMS monitoring at an existing site would be feasible if the costs were spread out over several years; however, the establishment of a completely new site would be time and cost prohibitive. The Rocky Flats North site is feasible because it is an existing site.

Attribute 4 – Photochemically aged air mass

The workgroup found value in receiving PAMS measurements from both site types: source area (Type 2) or downwind area (Type 3). However, modelers indicated that greater value would be gained by a downwind site, especially if the downwind site had minimal nearby sources. This attribute would allow for greater validation of downwind/max ozone photochemical model projections. Additional value for a downwind PAMS location is gained by existing and continuing NOx/NOy measurements in the urban core at the CAMP and La Casa sites, and VOC summa canister measurements at the CAMP site. Diversifying these measurements into a downwind location, such as Rocky Flats North is of substantial value.

Attribute 5 – Minimal nearby sources

It is beneficial for downwind sites, such as Rocky Flats North site, be removed from any significant ozone precursor sources. Thus, any precursor measurements taken at the site would have originated by transport from source areas and be comprised of photochemically aged emissions. For modeling purposes, it is important that a downwind site be in a grid cell (4km) with minimal ozone precursor emissions so that the photochemical transport projected by the model of emissions to the site be accurately represented and not be confounded by local emissions. The Rocky Flats North site is unique in that it is one of the only sites in the network that has minimal local ozone precursor sources and land use is not expected to change in the near future. CDPHE permit inventory maps show no VOC and NOx sources within 2.5 km of the site, and only 8 VOC and 4 NOx permitted sources within 5 km of the site.

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Request for Concurrence

It is with the consideration of the above listed attributes that the CDPHE requests EPA's concurrence on this waiver request to install PAMS monitoring at the Rocky Flats North site instead of the NCore site.

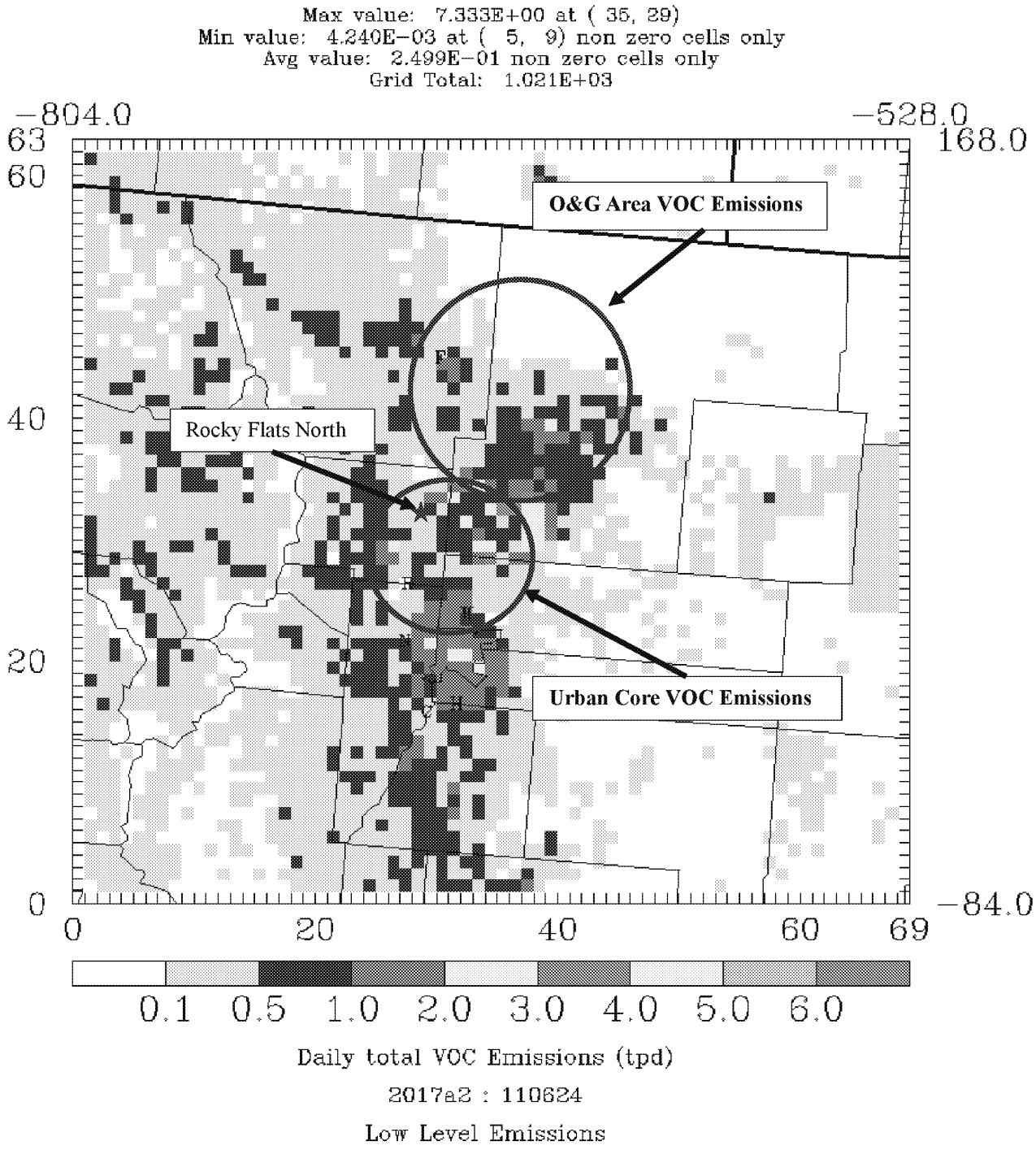

Figure 1. Surface Level VOC Emissions

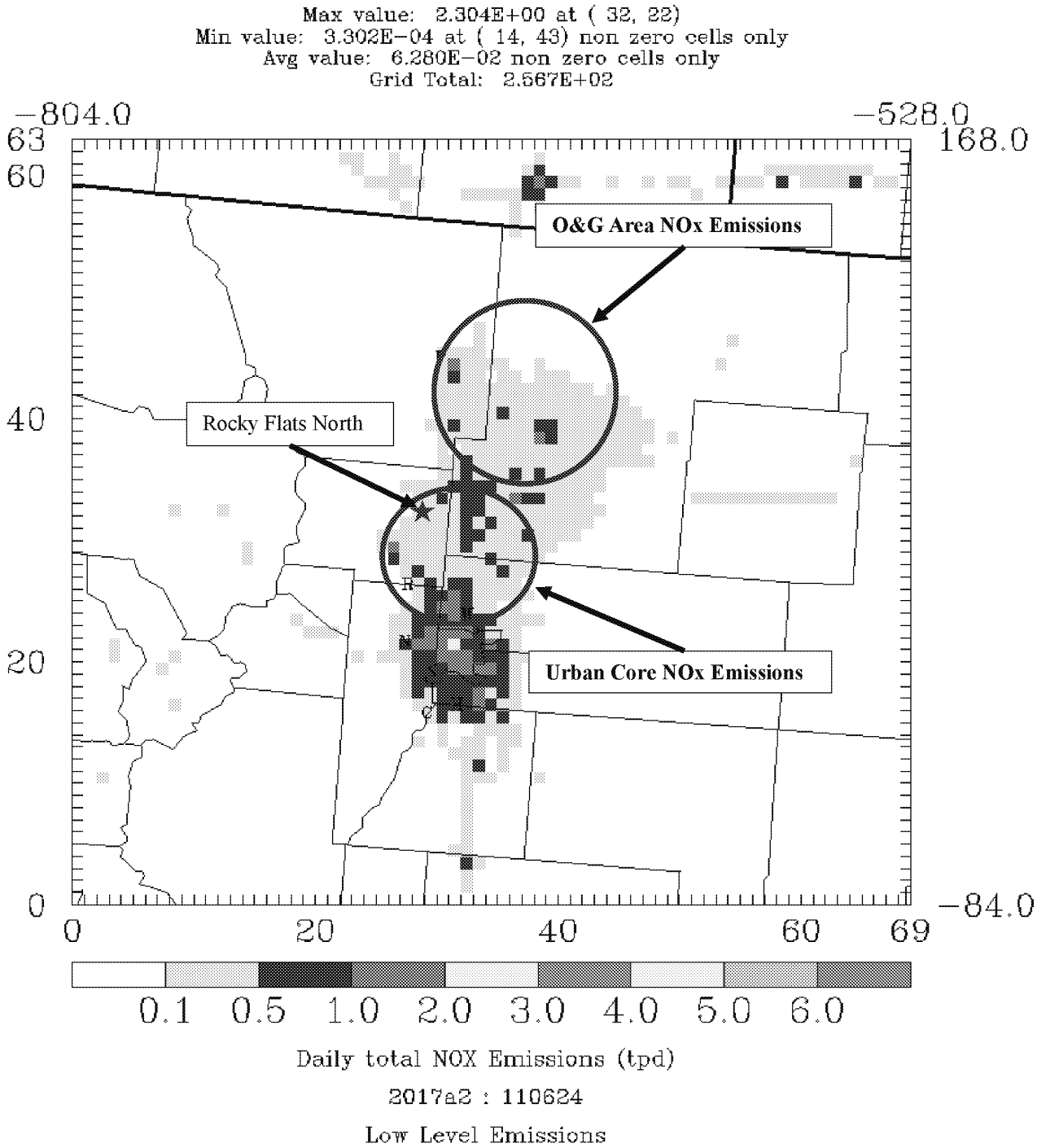

Figure 2. Surface Level NOx Emissions

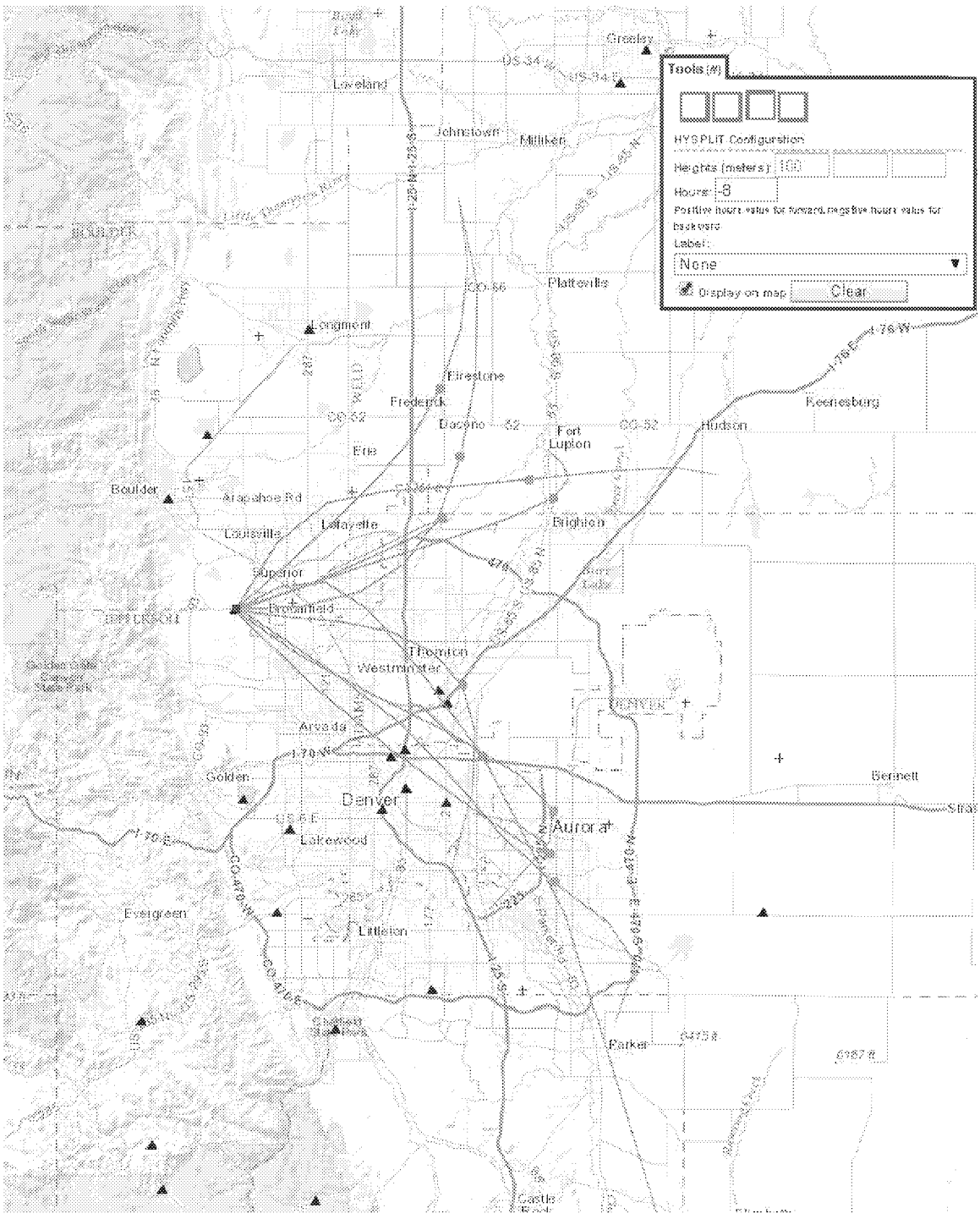

Figure 3. 8 hour Back Trajectories for the 10 Highest Ozone Days in 2016 at Rocky Flats North Beginning at 14:00

Appendix C – Comments and Responses

Manitou Springs Formal Review Comment

Colorado Annual Monitoring Network Plan 2017

Submitted by Manitou Springs City Council

Summary

CDPHE's mission statement is: "To protect and improve the health of Colorado's people and the quality of its environment." To that end, the people of Manitou Springs, represented by their Mayor and City Council, are providing this comment to the 2017 Colorado Annual Monitoring Network Plan, with the aim of locating an SO_2 monitoring station in or near Manitou Springs.

Two options are proposed to achieve our goal.

We respectfully submit this comment, urging CDPHE to amend the 2017 Network Plan accordingly, and to avoid delaying consideration of our request until the 2018 Network Plan.

General Context

There is one Metropolitan Statistical Area (MSA) located in the Pikes Peak Region, the Colorado Springs MSA. According to the calculated Population Weighted Emissions Index (PWEI) shown in the Network Plan, there is a need for one SO_2 monitor in this MSA. This single SO_2 monitor is currently located near the corner of Highway 24 and 8th Street in Colorado Springs (HWY24 Monitor).

The concentration of SO_2 at the site of the HWY24 Monitor, along with wind direction and speed, have indicated that the Martin Drake Power Plant has the potential to be the source of a plume of high SO_2 concentrations, possibly in excess of the one-hour primary standard adopted by the EPA in June 2010.

There is a process currently underway to model SO_2 impacts from the Martin Drake Power Plant in the region. The results are expected in late summer of 2017. The modeling results will indicate where higher concentrations of SO_2 are likely to occur and the levels of those concentrations. The modeling results will also be a source of information that CDPHE can use to identify the most appropriate locations for the single SO_2 monitor in the Colorado Springs MSA.

Siting of HWY24 Monitor

The siting of the HWY24 Monitor appears to be less than optimal in fulfilling its function. As reported in the Network Plan, the HWY24 Monitor recorded levels of SO_2 exceeding the primary National Ambient Air Quality Standards (NAAQS) only four times between its installation in October 2013 and the end of the last reporting period in December 2016. The SO_2 levels recorded by the HWY24 Monitor have consistently decreased over the years since its installation and are now well below the 75 ppb standard.

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There is a strong possibility that, if the Martin Drake Power Plant is emitting an SO_2 plume with concentrations above the standard, the HWY24 Monitor would be located outside of that plume. Continuing to monitor at the same location is most likely to continue confirming what is already known, rather than producing new data that will answer open questions.

Modeling to inform placement

The USEPA's draft Technical Assistance Document (TAD) on SO_2 evaluation states that "*Air agencies electing to use monitoring as a means of satisfying the DRR [Data Requirement Rule for the 1-hour standard] or other source-oriented monitoring activity are expected to provide adequate reasoning in a monitoring network proposal.*" ... "*Modeling is a powerful tool that should be strongly considered to inform the identification of potential monitoring sites intended to satisfy source-oriented monitoring efforts, such as the DRR.*" ... "In general, the approach of using dispersion modeling to inform monitor placement will likely provide high confidence information to inform the monitor siting process."

To date, the independent AERMOD models of the Martin Drake Power Plant's plume indicate that the location of the HWY24 Monitoring site, less than a mile north-west of the plant, is well outside the plume of highest SO_2 concentrations. This raises the question of whether any modeling data was used in the placement of the HWY24 Monitor and, in the absence of modeling, what other "high confidence information" was used in the siting of this single monitor a short distance from the plant.

Susceptible population

The 40 CFR Chapter I, Subchapter C, Part 58 (40 CFR) states "The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high population of susceptible individuals".

In its network assessment, the Network Plan does not include a description of how the location of the HWY24 Monitor qualifies as an area where susceptible individuals would likely be found. To the contrary, the HWY24 Monitor is located on the side of a busy highway, at a busy intersection, with a high traffic of frequently idling vehicles. The location hosts little to no residential housing or schools where a population of susceptible individuals might be found.

Two Proposed Options

Option 1

Keep the HWY24 Monitor at its current location and install a new SO_2 monitor in a properly sited area in or near Manitou Springs.

- Reclassify the HWY24 Monitor as Special Purpose Monitor (SPM) to remove it from the count of monitors used to meet compliance with the minimum requirement for the Colorado Springs MSA.

- Install a new SO_2 monitor to satisfy the minimum requirement for the Colorado Springs MSA.

Option 2

Relocate the HWY24 Monitor to a properly sited area in or near Manitou Springs.

Monitor Siting

- Use the modeling data to be released this summer to properly site the SO_2 monitor in one of the areas where the model shows some of the highest SO_2 concentration.

- In the siting of the SO_2 monitor, consider the heavy presence in and around Manitou Springs from tourists and nearby residents using the trails and hills around Manitou Springs for regular outdoor activities and exercise. Census data alone is not reflective of the population present in and around Manitou Springs during most months of the year.

- In the siting of the SO_2 monitor, take into account the willingness of Manitou Springs to provide all necessary logistical assistance in the installation and operation of the monitor

Time is of the Essence

The release of the new modeling data regarding the SO_2 impacts from the Martin Drake Power Plant will take place shortly after the closing of the public comment period for the 2017 Network Plan. Short of anticipating and taking into consideration the imminent release of the modeling data in this year's Network Plan, it will be at least another full year before the 2018 Network Plan is released and modeling information can result in a potential change in SO_2 monitoring in the Colorado Springs MSA.

Public concerns regarding the air quality in and near Manitou Springs have recently increased. This is a result of several factors. Among them is the publication of a number of articles in the local and regional press and the broadcast of news pieces on the local television channels, all reporting on the lack of information regarding the SO_2 levels caused by the Martin Drake Power Plant. While the up-coming modeling may ease some of the public's concerns, there is nothing like actual monitoring data captured near where people live, play and their children go to school to bring real answers people can trust.

Glossary

- *AERMOD* means the atmospheric dispersion modeling system
- *HWY24 Monitor* means the SO_2 monitor located at 690 W. Highway 24 in Colorado Springs (site ID 08 041 0015).
- *MSA* means metropolitan statistical area.
- *NAAQS* means National Ambient Air Quality Standards
- *Network Plan* means the Colorado Annual Monitoring Network Plan 2017.
- *SPM* means special purpose monitor as defined in §58.20 of 40 CFR.
- *TAD* means the EPA's SO2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (February 2016, Draft).
- *40 CFR* means 40 CFR Chapter I, Subchapter C, Part 58

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Department of Public Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

Manitou Springs City Council
Attn: Coreen Toll
606 Manitou Avenue,
Manitou Springs, Colorado 80829

June 30, 2017

SUBJECT: Response to public comment - 2017 Network Monitoring Plan

Manitou Springs City Council,

Thank you for the comments you provided for the Colorado Department of Public Health, Air Pollution Control Division's (Division) 2017 Network Monitoring Plan. As required by 40 CFR 58.10, the Division is required to submit an annual network monitoring plan to the U.S. Environmental Protection Agency (EPA) Regional Administrator by July 1, 2017. This plan is to be made available for public comment for 30 days prior to acceptance by the Regional Administrator. The Division's 2017 Network Monitoring Plan was made available for public comment from May 26, 2017 thru June 27, 2017. The Division received two comments.

Your comment is to request locating a sulfur dioxide (SO2) monitoring station in or near Manitou Springs. This is primarily in response to emissions from the Colorado Springs Utilities (CSU) Drake Power Plant, located approximately five miles to the southeast and down-valley from Manitou Springs. The Division does not currently have any SO2 monitoring sites listed for planned addition(s) to the monitoring network.

Based on the population weighted emissions index, EPA required a SO2 monitor in the Colorado Springs Metropolitan Statistical Area as part of the 2010 revisions to the SO2 National Ambient Air Quality Standards. In January 2013, the Division established a SO2 monitor at the existing Highway 24 carbon monoxide monitoring site, located in Fountain Creek to the west of I-25 to meet the requirement. This location meets the criteria for population exposure, highest concentration and source impacts (per 40 CFR Part 58, Appendix D). Historically, modeling has not been widely used to inform monitor placement due to the lack of appropriate data and time needed to perform. Instead, an understanding of weather patterns, topography, location of contributing sources, and site access issues all inform a monitor's location. Only recently has modeling become accurate enough to be used as a tool to inform monitor placement, assuming the appropriate protocols are followed.

As your comment notes, the SO2 monitor has recorded concentrations exceeding the level of the standard that are believed to be due to emissions from the Drake Power Plant. Being located next to a major roadway, concentrations are also expected to be higher due to diesel emissions. Regarding the note that the monitor is not in a location to support air quality characterization for areas with relatively high population(s) of susceptible individuals, according to the CDPHE Community Health Equity Map, the monitor is located at the union of two census tracts with higher than average population density, income/poverty levels, and asthma-related hospitalizations (http://www.cohealthmaps.dphe.state.co.us/cdphe_community_health_equity_map/).

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As you are aware, there has been a lot of interest regarding emissions from the Drake Power Plant. Modeling conducted by the Sierra Club indicated potential high SO2 impacts along the foothills to the west of the plant, including in the Manitou Springs area. The Division performed an analysis of the modeling in 2015 and concluded that there were a number of inputs into the model that were not consistent with EPA recommendations, including non-representative meteorological data and the source characterization (such as stack heights and land use classification). (Please refer to 40 CFR Part 51 Appendix W for details on modeling recommendations.)

To address the non-representative meteorological data, the Division requested that CSU install an on-site meteorological system and collect at least one full year of data to get a representative data set. This has now been completed and validated. A modeling protocol has been submitted to the Division and has been posted for public comment. Once finalized, CSU will complete a final modeling analysis using the representative meteorological data, which will be reviewed by the Division to ensure that it followed the modeling protocol and any other applicable EPA guidelines. These results are expected to be finalized by the late summer of 2017.

Once the modeling is finalized, the Division will review the results to determine if there is a potential for high SO2 impacts in specific regions of the Colorado Springs and Manitou Springs area. If warranted, additional SO2 monitoring will be installed in the indicated areas. The Division will also assess if the Highway 24 monitoring site may need to be relocated. It should be noted that even though new monitoring is not included in the 2017 Network Plan, it does not preclude the addition or relocation of sites prior to next year's plan if appropriate.

We thank Manitou Springs for their comments and appreciate your offer to provide logistical assistance in the installation and operation of a SO2 monitor. The Division agrees that appropriate monitoring is a valuable and reliable source of information for the public.

Sincerely,

Gordon E. Pierce

Gordon Pierce, Program Manager
Technical Services Program
Air Pollution Control Division

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John W. Hickenlooper, Governor | Larry Wolk, MD, MSPH, Executive Director and Chief Medical Officer

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Comment from the City of Aspen:

From: **Jannette Whitcomb** <jannette.whitcomb@cityofaspen.com>
Date: Tue, May 30, 2017 at 5:19 PM
Subject: 2017 Air monitoring network
To: "cdphe.commentsapcd@state.co.us" <cdphe.commentsapcd@state.co.us>

Below are few comments regarding the monitoring plan for 2017.
Section titled:
"Central Mountain Region

There were no PM_{10} exceedances in the Central Mountain region during 2016. The table below lists the maximum concentrations recorded at each of the sites.

Table 12. Maximum PM_{10} Concentrations for Mountain Counties

Site ID	Site Name	Max. 24-Hour Concentration (µg/m3)
08 043 0003	Cañon City – City Hall	54
08 051 0004	Crested Butte	76
08 051 0007	Mount Crested Butte	46
08 097 0008	Aspen – Yellow Brick	47
08 107 0003	Steamboat Springs	73

"

As the Senior Environmental Health Specialist for the City of Aspen, I maintain a GRIMM particulate PM10 and PM2.5 monitor that is collocated with the state's monitor on top of the Yellow Brick. The GRIMM measured many days with 24 hour averages above 47 ug/m3. With our fourth maximum level at 57 ug/m3. I am curious on why such a dramatic difference in results.

I encourage adding to the network Aspen's ozone and particulate monitors air monitors. Aspen has an intergovernmental agreement with APCD to share data and support. We also maintain a AQMP for both monitors. Given our high level of assurance for quality data this site could be used to demonstrate air quality not located near industry yet still impacted by regional population sources as well as natural weather events such as stratospheric intrusions.

Sincerely,

Jannette Whitcomb, REHS
Sr. Environmental Health Specialist
City of Aspen
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Department of Public Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

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City of Aspen
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Aspen, CO 81611

June 30, 2017

SUBJECT: Response to public comment - 2017 Network Monitoring Plan

Dear Ms. Whitcomb,

Thank you for the comments you provided for the Colorado Department of Public Health, Air Pollution Control Division's (Division) 2017 Network Monitoring Plan. As required by 40 CFR 58.10, the Division is required to submit an annual network monitoring plan to the U.S. Environmental Protection Agency (EPA) Regional Administrator by July 1, 2017. This plan is to be made available for public comment for 30 days prior to acceptance by the Regional Administrator. The Division's 2017 Network Monitoring Plan was made available for public comment from May 26, 2017 thru June 27, 2017. The Division received two comments.

To address your concern that the continuous GRIMM sampler has recorded values higher than the hi-vol PM10 sampler, this is plausible. The hi-vol sampler only operates every third day, while the GRIMM provides a 24-hour value for every day of the year. Thus, it is possible that the higher values occurred on days when the hi-vol sampler was not operating.

In regards to your comment encouraging the addition of Aspen's ozone and particulate air monitors to our Network Plan, it is not appropriate to incorporate those monitors at this time. We very much appreciate the City of Aspen funding and operating these monitors, but this Network Plan is specifically for Division-operated monitors under our EPA-approved Quality Assurance Project Plan. For this reason, we do not include monitors operated by other agencies. We do utilize your data on our website and they are very useful for our forecasting efforts and associated air quality health advisories, as well as for public awareness.

We thank Aspen for their comments and look forward to continuing to work with you on air monitoring in the future.

Sincerely,

Gordon Pierce, Program Manager
Technical Services Program
Air Pollution Control Division

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