



**COLO R A D O**

**Air Pollution Control Division**

Department of Public Health & Environment

Technical Services Program

# 2023 Ambient Air Monitoring Network Plan





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**COLORADO  
AMBIENT AIR MONITORING  
NETWORK PLAN  
2023**

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## Glossary of Terms

APCD	Air Pollution Control Division
AQS	Air Quality System (EPA database)
CAMP	Continuous Air Monitoring Program
CBSA	Core-Based Statistical Area
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CMZ	Community Monitoring Zone
CO	Carbon monoxide
CSN	Carbon Speciation Network
EPA	U.S. Environmental Protection Agency
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standards
NATTS	National Air Toxics Trends Stations
NO	Nitric oxide
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Reactive nitrogen oxides
NO <sub>y</sub>	Total reactive nitrogen
NPS	National Park Service
O <sub>3</sub>	Ozone
Pb	Lead
PM <sub>2.5</sub>	Particulate matter with an equivalent diameter less than or equal to 2.5 μm
PM <sub>10</sub>	Particulate matter with an equivalent diameter less than or equal to 10 μm
ppb	Parts per billion (one part in 10 <sup>9</sup> )
ppm	Parts per million (one part in 10 <sup>6</sup> )
PMSA	Primary Metropolitan Statistical Area
PSD	Prevention of Significant Deterioration
PWEI	Population Weighted Emissions Index
QA/QC	Quality Assurance/Quality Control
SIP	State Implementation Plan
SLAMS	State or Local Air Monitoring Stations
SO <sub>2</sub>	Sulfur dioxide
SPM	Special Purpose Monitor
TSP	Total Suspended Particulates
μg	Microgram (10 <sup>-6</sup> grams)
VOC	Volatile Organic Compound

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## Introduction

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The Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division's (APCD) 2023 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) and provides the general reasoning for the APCD's ambient air monitoring strategy, the location of each monitor, the highest pollutant concentrations, and the type and frequency of measurements taken at each location. The Network Plan is also a simple accounting of monitoring site changes that have taken place over the past year and changes that are expected for the year ahead. It is due on or before July 1<sup>st</sup> of each year to the U.S. Environmental Protection Agency (EPA) after a 30-day public comment period.

This plan was made available for public comment from 5/25/2023 to 6/26/2023.

### 1.1 Overview of the Colorado Air Monitoring Network

The APCD currently conducts air quality and meteorological monitoring operations at 43 locations statewide. Ozone (O<sub>3</sub>) and particulate matter (PM) monitors, including those for particulate matter less than 10 µm in diameter (PM<sub>10</sub>) and particulate matter less than 2.5 µm in diameter (PM<sub>2.5</sub>), are the most abundant and widespread monitors in the network. Currently, there are PM<sub>10</sub> monitors at 15 separate locations, PM<sub>2.5</sub> monitors at 16 locations, O<sub>3</sub> monitors at 23 locations, carbon monoxide (CO) monitors at seven locations, nitrogen dioxide (NO<sub>2</sub>) monitors at seven locations, and sulfur dioxide (SO<sub>2</sub>) monitors at four locations. The APCD also operates 19 meteorological sites statewide for the continuous measurement of wind speed, wind direction, resultant speed, resultant direction, standard deviation of horizontal wind direction, and temperature. Additionally, relative humidity is also monitored at seven of these locations. Total solar radiation is also currently monitored at two sites and precipitation and barometric pressure are monitored at one location.

A majority of the gaseous monitoring conducted by the APCD occurs in the Front Range region, with a particular focus on the Denver Metro area. Three of the O<sub>3</sub> monitoring sites that are located on the Western Slope and have data included in this report are operated and maintained by a third party contractor, Air Resource Specialists (ARS). These are the Rifle, Palisade, and Cortez monitoring sites. ARS keeps the sites in proper working order and performs calibrations, data retrieval, and data validation, while the APCD uploads data to the EPA's Air Quality System (AQS) database and conducts independent audits of the sites for Quality Assurance (QA) purposes.

Within the particulate sampling network, the APCD operates both continuous and filter-based sampling methods for PM<sub>2.5</sub> and PM<sub>10</sub>. Continuous monitors sample without the need for subsequent filter retrieval and laboratory analysis, which is required for filter based equipment. Thus, these monitors can continuously record concentrations and send the results back to APCD headquarters on a nearly instantaneous basis. Currently, thirteen sites are equipped to measure continuous PM<sub>10</sub> and, of those thirteen sites, six are located at sites also having filter based PM<sub>10</sub> monitors. Of the 16 PM<sub>2.5</sub> monitoring sites, 12 measure PM<sub>2.5</sub> on a continuous basis, 6 of these sites also having filter based samplers. All real-time continuous PM<sub>2.5</sub> and PM<sub>10</sub> data is reported on the CDPHE website.<sup>1</sup>

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<sup>1</sup><https://www.colorado.gov/airquality/report.aspx>

### 1.1.1 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 state of the art for defining the magnitude and extent of the very visible air pollution problem. Monitoring for gaseous pollutants (CO, SO<sub>2</sub>, NO<sub>2</sub>, and O<sub>3</sub>) began in 1965 when the federal government established the CAMP monitoring station in downtown Denver at the intersection of 21<sup>st</sup> Street and Broadway, which was the area that was thought at the time to represent the best site for detecting maximum levels of most of the pollutants of concern. Instruments were primitive by comparison with those of today and were frequently out of service.

Under provisions of the original Federal Clean Air Act of 1970, the Administrator of the U.S. EPA established National Ambient Air Quality Standards (NAAQS) designed to protect the public's health and welfare. Standards were set for total suspended particulates (TSP), CO, SO<sub>2</sub>, NO<sub>2</sub>, and O<sub>3</sub>. In 1972, the first State Implementation Plan (SIP) was submitted 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 system 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 SIPs 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 modification to the network. These and subsequent modifications were made to ensure consistency and compliance with Federal monitoring requirements. Station location, probe siting, sampling methodology, QA practices, and data handling procedures are all maintained throughout any changes made to the network.

Historically, 34 of the 42 current APCD monitoring locations have been in operation for 10 or more years, 21 of these sites have been in operation for 20 or more years, and 12 of the monitoring locations have been in operation for more than 30 years. Conversely, 8 of the 42 current monitoring locations have been in operation for less than 10 years.

### 1.1.2 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 perceived risk. Building roof remodeling and demolition projects can also lead to a loss of sampling time and access to locations.

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

### 1.1.3 Network Modification Procedures

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

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 current example of this is the Tri-County Health Department site, which was relocated to the Birch Street location nearby due to a roofing project and some access issues at the property during 2020. Monitors are also removed from the network after review of the data shows that the levels have dropped to the point where it is no longer necessary to continue monitoring at that location or if the data obtained from a site is redundant with another monitoring site or if access to the site becomes

too restrictive. For example, the Welch site was closed in 2020 and relocated to Evergreen because this monitor was redundant with other ozone monitoring sites in the Denver Metro/North Front Range Region.

Finally, all monitors are reviewed on a regular basis to determine if they are continuing to meet their monitoring objectives. If the population, land use, or vegetation around the monitor has changed significantly since the monitor was established, a more suitable location for the monitor may be examined. An example of this is the O<sub>3</sub> monitor previously located at the Aspen Park monitoring site, which was shut down on September 16, 2019 and relocated to the Black Hawk monitoring station. A detailed scientific evaluation of the present monitoring network configuration can be found in the APCD’s 2020 Ambient Air Monitoring Network Assessment.<sup>2</sup>

### 1.1.4 Description of Monitoring Regions 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 1.1 shows the approximate boundaries of these regions.

A map of APCD air quality monitoring stations is shown in Figure 1.3 and the parameters monitored at each location are given in Table 1.2. Detailed site descriptions can be found in Appendix A.

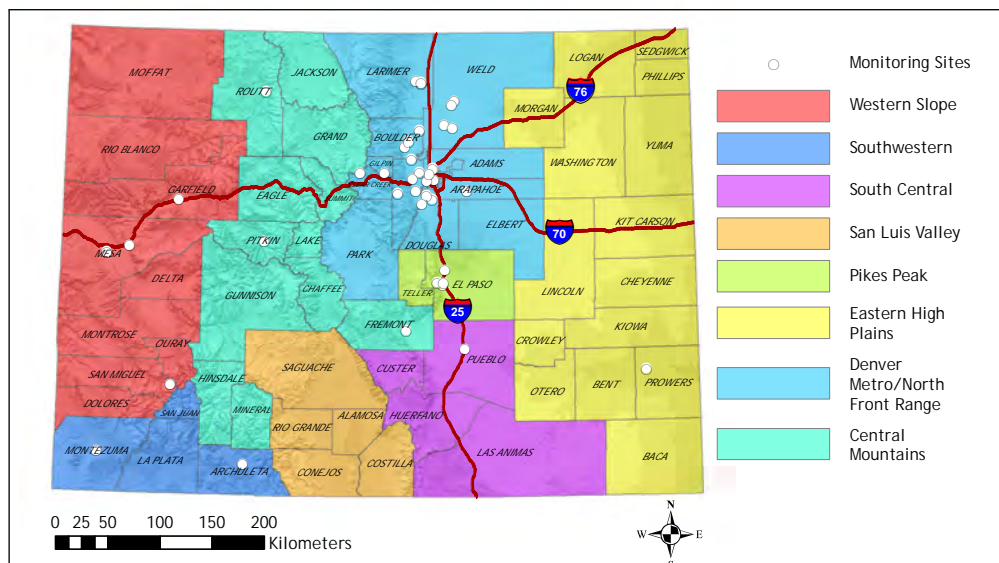


Figure 1.1: Counties and multi-county monitoring regions discussed in this report.

#### 1.1.4.1 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 features. Leadville, Steamboat Springs, Cañon City, Salida, Buena Vista, and Aspen represent the larger communities. The population of this region is approximately 242,137, according to the 2020 U.S. Census. Skiing, tourism, ranching, mining, and correctional facilities are the primary industries. The 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 in this region is centered around particulate pollution from wood burning and road dust. During 2022, there were three particulate monitoring sites operated by the APCD in the Central Mountains region (Aspen, Steamboat Springs, and Cañon City). APCD does not currently operate any gaseous monitors in this region.

<sup>2</sup>[https://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx?action=open&file=2020\\_CO\\_5yr\\_Network\\_Assessment.pdf](https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=2020_CO_5yr_Network_Assessment.pdf)

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

The Denver Metro/North Front Range region includes Adams, Arapahoe, Boulder, Broomfield, Clear Creek, Denver, Douglas, Elbert, Gilpin, Jefferson, Larimer, Park, and Weld counties. This 13 county region comprises the largest population base in the state of Colorado with approximately 4,016,921 people living in the area, according to the 2020 U.S. Census. This region includes Rocky Mountain National Park and several other wilderness areas.

Since 2002, the region complied with all NAAQS, except for ozone. The area has been exceeding the EPA's current ozone standards since the early 2000s, and in 2007 was formally designated as a "nonattainment" area. This designation was re-affirmed in 2012 when the EPA designated the region as a "marginal" nonattainment area after a more stringent ozone standard was adopted in 2008. The Denver Metro / North Front Range region failed to attain the 2008 ozone standard and was moved up to the next level of classification, a "moderate" area in May of 2016. The EPA released a more stringent eight-hour ozone standard on October 1, 2015. Colorado submitted area designation recommendations for the eight-hour 2015 ozone standard in 2016, based on the data from the 2013-2015 monitoring period. The EPA finalized area designations for the 2015 eight-hour ozone standard of 0.070 ppm (70 ppb) nationwide in April of 2018, designating the Denver Metro/Northern Front Range region as nonattainment with a marginal area classification. In January 2020, EPA designated the Denver Metro/Northern Front Range area as a "serious" nonattainment area under the 2008 ozone standard. Due to high ozone levels recorded during July and August 2020, the area may be reclassified as "severe" under the 2008 standard and "moderate" under the 2015 standard.

In the past, the Denver-metropolitan area has violated health-based air quality standards for carbon monoxide and fine particles. In response, RAQC, CAQCC, and the APCD developed, adopted, and implemented air quality improvement plans to reduce each of these 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.

There are currently 50 air quality and meteorological monitors at 25 individual sites in the Northern Front Range Region. There are six CO monitors, 15 O<sub>3</sub> monitors, seven NO<sub>2</sub> monitors, three SO<sub>2</sub> monitors, as well as six PM<sub>10</sub> monitors, 13 PM<sub>2.5</sub> monitors, and 14 meteorological towers. There are also two air toxics monitoring sites, one located at CAMP, and one at Platteville. The CAMP site monitors urban air toxics, while the Platteville site monitors air toxics and ozone precursors in a region of oil and gas development. In addition, there is one site (DESCI) that measures visual range by use of a nephelometer and a transmissometer.

#### 1.1.4.3 Eastern High Plains Region

The Eastern High Plains region encompasses the fifteen counties on the plains of eastern Colorado. The area is semiarid and often windy. The area's population is approximately 133,477, according to the 2020 U.S. Census. Its major population 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 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 in the Eastern High Plains Region 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. Along the I-70 corridor, only the community of Limon has been monitored for particulates. Along the US-50/Arkansas River corridor, the Division has monitored for particulates in the communities of La Junta and Rocky Ford. These monitoring sites were all discontinued in the late 1970s through early 1990s after a review showed that the concentrations were well below the standards and trending downward.

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

## 1.1. OVERVIEW OF THE COLORADO AIR MONITORING NETWORK

### 1.1.4.4 Pikes Peak Region

The Pikes Peak region includes El Paso and Teller counties. The area has a population of approximately 756,489, according to the 2020 U.S. Census. Eastern El Paso County is rural prairie, while the western part of the region is mountainous. 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, which are both military installations. Aerospace and technology are also large employers in the area. All of the area is currently in compliance with federal air quality standards. Two exceedances of the SO<sub>2</sub> standard were observed at the Highway 24 site during 2014-2015; however, these elevated values have not yet resulted in a violation of the NAAQS and SO<sub>2</sub> concentrations have been trending downward at the Highway 24 site since 2016.

Currently, there is one CO monitor, one SO<sub>2</sub> monitor, and two O<sub>3</sub> monitors in the Pikes Peak region, as well as one PM<sub>10</sub> monitor, one PM<sub>2.5</sub> monitor, and one meteorological site. Most of these monitors are located in the populous city of Colorado Springs.

### 1.1.4.5 San Luis Valley Region

Colorado's San Luis Valley region is located in the south central portion of Colorado and is comprised of 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 114 km wide and 196 km long, extending south into New Mexico. The average elevation is 2290 km. Principal towns include Alamosa, Monte Vista, and Del Norte. The population of this area is approximately 46,150, according to the 2020 U.S. Census. 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.

There are currently no APCD air monitoring operations active in this region. PM monitoring in the city of Alamosa was discontinued at the end of 2018 due to the low concentrations observed there.

### 1.1.4.6 South Central Region

The South Central region is comprised of Pueblo, Huerfano, Las Animas, and Custer counties. Its population is approximately 194,758, according to the 2020 U.S. Census. Population 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.

There are currently two particulate monitors (one PM<sub>10</sub> monitor and one PM<sub>2.5</sub> monitor) operated in the South Central Region, both at a site located in the city of Pueblo. A new O<sub>3</sub> monitoring site was established at Pueblo West in early 2023.

### 1.1.4.7 Southwestern 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 98,122, according to the 2020 U.S. Census. 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, although the oil and gas industry is becoming increasingly important. All of the area complies with federal air quality standards.

There are currently two monitoring stations in the Southwestern region, one O<sub>3</sub> site in Cortez and one PM<sub>10</sub> site located in Pagosa Springs. PM monitoring in the city of Durango was discontinued at the end of 2018.

### 1.1.4.8 Western Slope Region

The Western Slope region includes nine counties on the far western border of Colorado. A mix of mountains on the east, and 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 325,155, according to the 2020 U.S. Census. Primary industries

include ranching, agriculture, mining, energy development, and tourism. Dinosaur and Colorado National Monuments are located in this region. The Western Slope, along with the Central Mountains, are projected to be the fastest growing areas of Colorado through 2020 with greater than two percent annual population increases, according to the Colorado Department of Local Affairs. All of the area complied with federal air quality standards during 2022.

Currently, there are two ozone monitoring sites and two particulate monitoring sites in the Western Slope region operated by the APCD. The APCD also works with the EPA to monitor air toxics at the Grand Junction - Pitkin site as part of the EPA's National Air Toxics Trends Stations (NATTS) monitoring network.

### 1.1.5 Statewide Population Statistics

Table 1.1 is a listing of the projected population statistics by county based on the 2020 U.S. Census. Counties have been grouped by Metropolitan Statistical Area (MSA) and by the multi-county monitoring regions described above.

Population growth in Colorado over time is plotted in Figure 1.2, which shows actual population values in each multi-county monitoring region for the period 1970-2020 and U.S. Census Bureau projections for the period 2021-2030.

Table 1.1: Population estimates and projections by county and Metropolitan Statistical Area (MSA).

Region/MSA/County	Actual Population		Projected Population		Avg. Annual Change (%)	
	2020	2025	2030	2020-25	2020-30	
<b>COLORADO</b>	<b>5,813,209</b>	<b>6,120,735</b>	<b>6,544,591</b>	<b>1.1</b>	<b>1.3</b>	
<b>CENTRAL MOUNTAINS</b>	<b>242,137</b>	<b>249,943</b>	<b>263,801</b>	<b>0.6</b>	<b>0.9</b>	
Chaffee	20,397	21,099	22,295	0.7	0.9	
Eagle	55,390	57,953	61,862	0.9	1.2	
Fremont	47,413	47,369	48,246	-0.0	0.2	
Grand	15,719	16,545	17,675	1.1	1.2	
Gunnison	17,522	17,988	18,703	0.5	0.7	
Hinsdale	827	868	914	1.0	1.1	
Jackson	1,367	1,307	1,272	-0.9	-0.7	
Lake	8,095	8,358	8,799	0.6	0.9	
Mineral	764	805	828	1.1	0.8	
Pitkin	17,591	17,614	17,909	0.0	0.2	
Routt	25,929	27,845	30,882	1.5	1.9	
Summit	31,123	32,192	34,416	0.7	1.1	
<b>DENVER METRO/NORTH FRONT RANGE</b>	<b>4,016,921</b>	<b>4,242,183</b>	<b>4,543,600</b>	<b>1.1</b>	<b>1.3</b>	
<b>BOULDER</b>	<b>328,006</b>	<b>334,735</b>	<b>351,743</b>	<b>0.4</b>	<b>0.7</b>	
Boulder	328,006	334,735	351,743	0.4	0.7	
<b>DENVER-AURORA-LAKEWOOD</b>	<b>2,996,432</b>	<b>3,153,963</b>	<b>3,351,783</b>	<b>1.1</b>	<b>1.2</b>	
Adams	523,709	558,063	612,890	1.3	1.7	
Arapahoe	661,363	695,723	733,504	1.0	1.1	
Broomfield	71,803	81,029	91,058	2.6	2.7	
Clear Creek	9,750	9,971	10,518	0.5	0.8	
Denver	735,822	773,264	818,733	1.0	1.1	
Douglas	356,811	381,544	408,671	1.4	1.5	
Elbert	27,286	31,130	35,970	2.8	3.2	
Gilpin	6,185	6,141	6,091	-0.1	-0.2	
Jefferson	584,725	597,384	613,270	0.4	0.5	
Park	18,978	19,714	21,078	0.8	1.1	
<b>FORT COLLINS</b>	<b>360,937</b>	<b>384,222</b>	<b>415,248</b>	<b>1.3</b>	<b>1.5</b>	
Larimer	360,937	384,222	415,248	1.3	1.5	
<b>GREELEY</b>	<b>331,546</b>	<b>369,263</b>	<b>424,826</b>	<b>2.3</b>	<b>2.8</b>	
Weld	331,546	369,263	424,826	2.3	2.8	
<b>EASTERN HIGH PLAINS</b>	<b>133,477</b>	<b>136,040</b>	<b>138,920</b>	<b>0.4</b>	<b>0.4</b>	
Baca	3,517	3,374	3,235	-0.8	-0.8	
Bent	5,368	5,204	5,079	-0.6	-0.5	
Cheyenne	1,819	1,813	1,801	-0.1	-0.1	
Crowley	6,049	6,131	6,262	0.3	0.4	

Table 1.1: Population estimates and projections by county and Metropolitan Statistical Area (MSA).

Region/MSA/County	Actual Population			Projected Population		Avg. Annual Change (%)	
	2020	2025	2030	2020-25	2020-30		
Kiowa	1,390	1,356	1,304	-0.5	-0.6		
Kit Carson	7,131	7,337	7,623	0.6	0.7		
Lincoln	5,717	6,093	6,457	1.3	1.3		
Logan	22,061	23,249	24,327	1.1	1.0		
Morgan	28,900	30,256	31,994	0.9	1.1		
Otero	18,151	17,801	17,290	-0.4	-0.5		
Phillips	4,248	4,176	4,120	-0.3	-0.3		
Prowers	12,084	11,881	11,764	-0.3	-0.3		
Sedgwick	2,217	2,234	2,208	0.2	-0.0		
Washington	4,721	4,851	4,916	0.6	0.4		
Yuma	10,104	10,284	10,540	0.4	0.4		
<b>PIKES PEAK</b>	<b>756,489</b>	<b>803,270</b>	<b>863,281</b>	<b>1.2</b>	<b>1.4</b>		
<i>COLORADO SPRINGS</i>	<i>756,489</i>	<i>803,270</i>	<i>863,281</i>	<i>1.2</i>	<i>1.4</i>		
El Paso	731,032	776,678	835,835	1.2	1.4		
Teller	25,457	26,592	27,446	0.9	0.8		
<b>SAN LOUIS VALLEY</b>	<b>46,150</b>	<b>46,912</b>	<b>47,832</b>	<b>0.3</b>	<b>0.4</b>		
Alamosa	16,223	17,139	18,044	1.1	1.1		
Conejos	8,136	8,059	8,113	-0.2	-0.0		
Costilla	3,847	3,790	3,744	-0.3	-0.3		
Rio Grande	11,138	11,106	11,099	-0.1	-0.0		
Saguache	6,806	6,818	6,832	0.0	0.0		
<b>SOUTH CENTRAL</b>	<b>194,758</b>	<b>198,081</b>	<b>206,613</b>	<b>0.3</b>	<b>0.6</b>		
Custer	5,053	4,946	5,028	-0.4	-0.0		
Huerfano	6,776	6,642	6,538	-0.4	-0.4		
Las Animas	14,386	14,110	13,869	-0.4	-0.4		
<i>PUEBLO</i>	<i>168,543</i>	<i>172,383</i>	<i>181,178</i>	<i>0.5</i>	<i>0.7</i>		
Pueblo	168,543	172,383	181,178	0.5	0.7		
<b>SOUTHWESTERN</b>	<b>98,122</b>	<b>104,556</b>	<b>113,027</b>	<b>1.3</b>	<b>1.5</b>		
Archuleta	14,137	14,856	16,242	1.0	1.5		
La Plata	56,970	61,520	66,972	1.6	1.8		
Montezuma	26,294	27,461	29,097	0.9	1.1		
San Juan	721	719	716	-0.1	-0.1		
<b>WESTERN SLOPE</b>	<b>325,155</b>	<b>339,750</b>	<b>367,517</b>	<b>0.9</b>	<b>1.3</b>		
Delta	31,108	31,497	32,952	0.3	0.6		
Dolores	2,017	1,934	1,880	-0.8	-0.7		
Garfield	60,795	64,517	70,422	1.2	1.6		
<i>GRAND JUNCTION</i>	<i>155,574</i>	<i>163,040</i>	<i>177,574</i>	<i>1.0</i>	<i>1.4</i>		
Mesa	155,574	163,040	177,574	1.0	1.4		
Moffat	13,181	13,039	13,032	-0.2	-0.1		
Montrose	42,999	45,558	50,355	1.2	1.7		
Ouray	4,931	5,028	5,204	0.4	0.6		
Rio Blanco	6,260	6,176	6,120	-0.3	-0.2		
San Miguel	8,290	8,961	9,978	1.6	2.0		



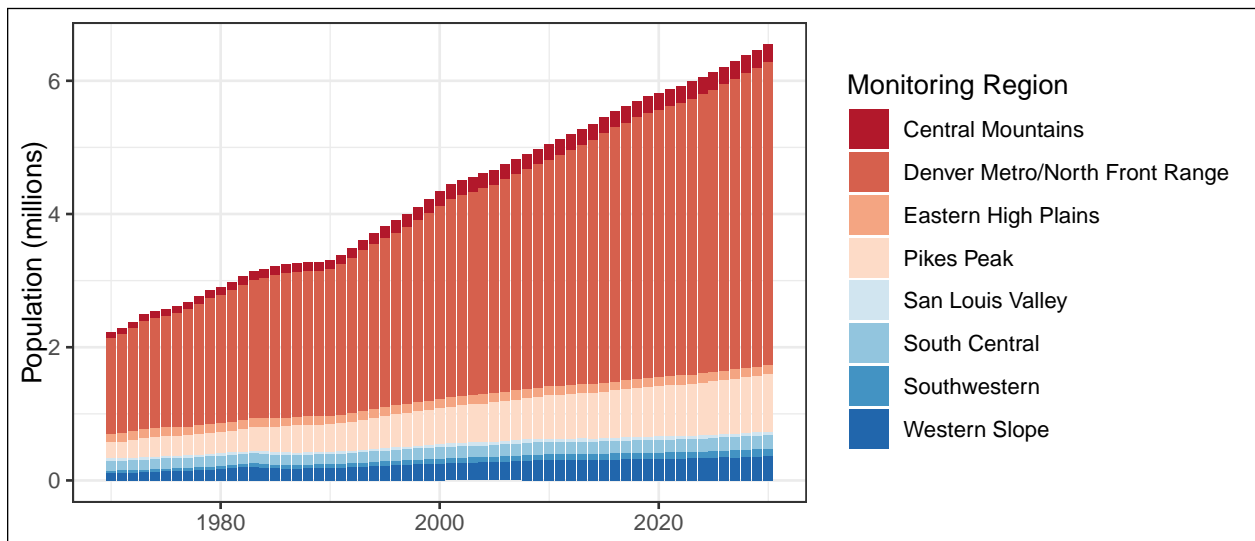


Figure 1.2: Population in Colorado from 1970 to 2030.

### 1.1.6 Monitoring Site Locations and Parameters Monitored

Table 1.2: Summary of parameters monitored at APCD monitoring sites discussed in this report.

AQS Site Number	Site Name	County	Parameters Monitored						
			O <sub>3</sub>	CO	NO <sub>2</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	Met
08-001-0010	Birch Street	Adams					X	X	
08-001-3001	Welby	Adams	X	X	X	X	X		X
08-005-0002	Highland Reservoir	Arapahoe	X						X
08-005-0005	Arapaho Community College (ACC)	Arapahoe						X	
08-005-0006	Aurora - East	Arapahoe	X						X
08-007-0001	Pagosa Springs School	Archuleta					X		
08-013-0003	Longmont - Municipal Bldg.	Boulder					X	X	
08-013-0012	Boulder Chamber of Commerce (CC)	Boulder					X	X	
08-013-0014	Boulder Reservoir	Boulder	X						X
08-019-0006	Mines Peak	Clear Creek	X						
08-031-0002	CAMP	Denver	X	X	X	X	X	X	X
08-031-0013	National Jewish Health (NJH)	Denver						X	
08-031-0026	La Casa	Denver	X	X	X	X	X	X	X
08-031-0027	I-25: Denver	Denver		X	X			X	X
08-031-0028	I-25: Globeville	Denver			X			X	X
08-035-0004	Chatfield State Park	Douglas	X					X	X
08-041-0013	U.S. Air Force Academy (USAFA)	El Paso	X						
08-041-0015	Highway 24	El Paso		X		X			X
08-041-0016	Manitou Springs	El Paso	X						
08-041-0017	Colorado College	El Paso					X	X	
08-043-0003	Cañon City - City Hall	Fremont					X		
08-045-0012	Rifle - Health Dept.	Garfield	X						
08-047-0003	Black Hawk	Gilpin	X						
08-059-0006	Rocky Flats - N.	Jefferson	X		X				X
08-059-0011	NREL	Jefferson	X						
08-059-0014	Evergreen	Jefferson	X						X
08-069-0009	Fort Collins - CSU	Larimer						X	
08-069-0011	Fort Collins - West	Larimer	X						X
08-069-1004	Fort Collins - Mason	Larimer	X	X					X
08-077-0017	Grand Junction - Powell Bldg.	Mesa					X	X	
08-077-0018	Grand Junction - Pitkin	Mesa							X
08-077-0020	Palisade Water Treatment	Mesa	X						X
08-083-0006	Cortez - Health Dept.	Montezuma	X						
08-097-0008	Aspen	Pitkin					X		
08-099-0002	Lamar - Municipal Bldg.	Prowers					X		
08-101-0015	Pueblo - Fountain School	Pueblo					X	X	
08-101-0016	Pueblo West	Pueblo	X						X
08-107-0003	Steamboat Springs	Routt					X		
08-113-0004	Telluride	San Miguel					X		
08-123-0006	Greeley - Hospital	Weld						X	
08-123-0008	Platteville - Middle School	Weld						X	
08-123-0009	Greeley - Weld County Tower	Weld	X	X					X
08-123-0013	Platteville Atmospheric Observatory (PAO)	Weld	X		X				X

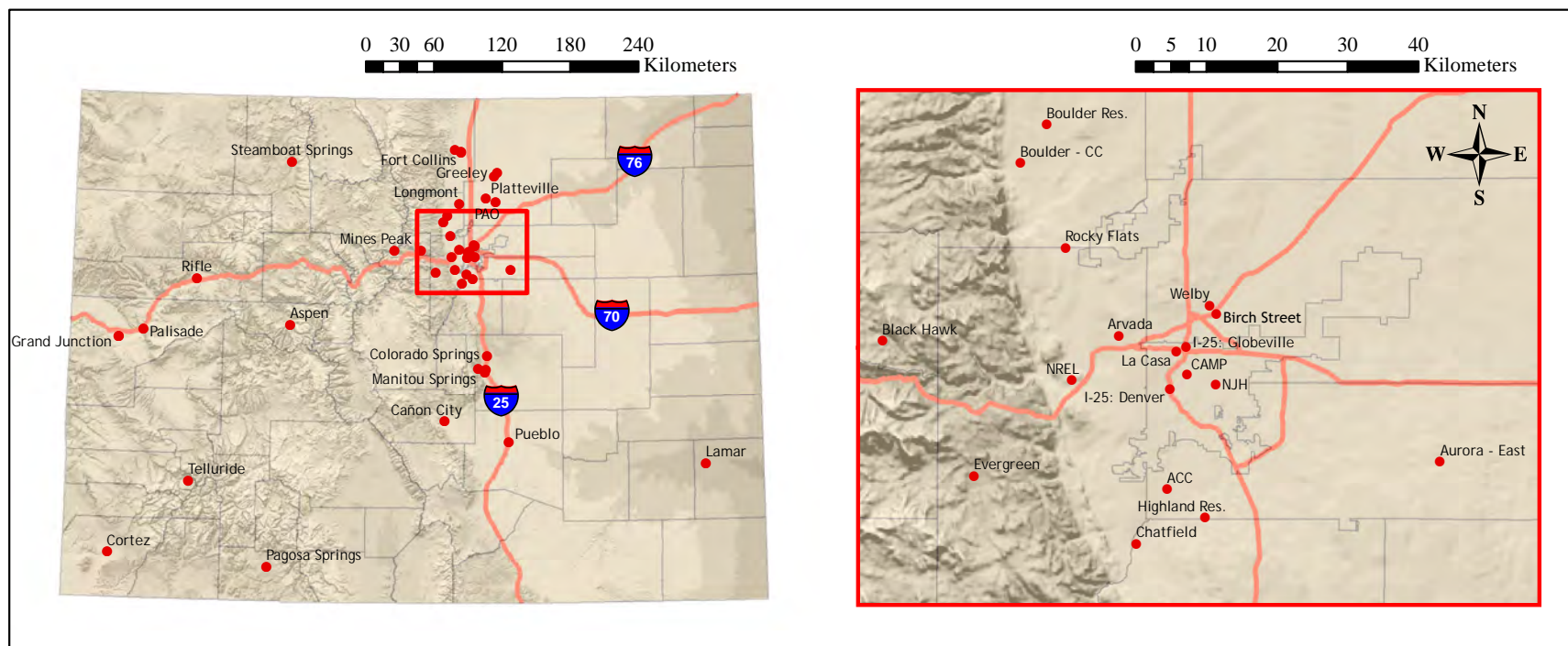


Figure 1.3: Map of Colorado with an inset map of the Denver metropolitan area showing the location of all monitoring sites operated by the APCD and listed in Table 1.2. For the purpose of improving the readability of the map, labels for monitoring sites in Fort Collins, Grand Junction, Pueblo, and Colorado Springs have been combined under a single label. Detailed site information, including AQS identification numbers, site descriptions and histories, addresses and coordinates, monitoring start dates, site elevations, site orientation/scale designations, etc., can be found in Appendix A of this document.

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## Carbon Monoxide (CO)

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In 2023, the APCD will operate seven 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 2.1 ppm in 2022. The level of the standard has not been exceeded since 1999. The CO monitors currently operated by the APCD are associated both with State Maintenance Plan requirements and EPA requirements under the Code of Federal Regulations (CFR). However, the EPA has revised the minimum requirements for CO monitoring by requiring CO monitors to be sited near roads in certain urban areas. They are requiring a CO monitor to be located at one near-roadway NO<sub>2</sub> monitoring site. EPA is also specifying that monitors required in metropolitan areas of 2.5 million or more persons are to be operational by January 1, 2015, and that monitors required in Core-Based Statistical Areas (CBSAs) of one million or more persons are required to be operational by January 1, 2017. Currently, a CO monitor is located at the I-25 Denver near roadway NO<sub>2</sub> site to satisfy these requirements.

### 2.1 Denver Metro/North Front Range Region

The three major urban centers in the North 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 2.1 lists the first and second maximum one-hour and eight-hour CO concentrations recorded in 2022 for the Denver Metro/North Front Range region.

Table 2.1: Summary of CO values recorded at monitoring stations in the Denver Metro / Northern Front Range region during 2022.

Site Name	County	CO 1-Hour Average (ppm)		CO 8-Hour Average (ppm)	
		1 <sup>st</sup> Max.	2 <sup>nd</sup> Max.	1 <sup>st</sup> Max.	2 <sup>nd</sup> Max.
Welby	Adams	2.0	1.6	1.1	1.1
CAMP	Denver	2.5	2.3	2.1	1.6
La Casa	Denver	1.5	1.4	1.2	1.2
I-25 Denver	Denver	2.5	2.4	2.1	1.6
Fort Collins - Mason	Larimer	2.3	1.6	1.2	1.1
Greeley - County Tower	Weld	1.3	1.2	0.8	0.7

## 2.2 Pikes Peak Region

The Pikes Peak Region is a very popular tourist area with rapid urban growth. The first and second maximum one-hour and eight-hour CO concentrations recorded in 2022 at the Highway 24 site are shown in Table 2.2.

Table 2.2: Summary of CO values recorded at the Highway 24 (Colorado Springs) station during 2022.

Site Name	County	CO 1-Hour		CO 8-Hour	
		Average (ppm)		Average (ppm)	
		1 <sup>st</sup> Max.	2 <sup>nd</sup> Max.	1 <sup>st</sup> Max.	2 <sup>nd</sup> Max.
Highway 24	El Paso	1.9	1.8	1.0	0.9

## 2.3 Recent and Planned Changes in CO Monitoring

State Maintenance Plan requirements will soon be satisfied for the Fort Collins - Mason, Greeley - County Tower, CAMP, Welby, and Highway 24 CO monitoring programs. The APCD will discontinue CO monitoring at these sites in early 2024. However, the La Casa and I-25: Denver sites will continue to have CO monitoring as they are required by the NCore and near-road monitoring programs. When CO monitoring comes to an end at Fort Collins - Mason, the shelter will be removed, which will also lead to the termination of ozone and meteorological measurements.

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## Ozone (O<sub>3</sub>)

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In March 2008, the U.S. EPA promulgated a new level of the NAAQS for O<sub>3</sub> of 0.075 ppm (75 ppb) as an annual fourth-highest daily maximum eight-hour concentration, averaged over three years. This made a significant change in the number of O<sub>3</sub> monitors that violated the standard at the time. On October 2015, the EPA again strengthened the NAAQS for ground level ozone to 70 ppb (effective December 28<sup>th</sup>, 2015). The APCD currently operates 16 sites that have three-year design values (2020-2022) in excess of the current eight-hour O<sub>3</sub> NAAQS standard of 70 ppb. These sites are all located in the Front Range region and are: Welby (77), Highlands (80), Aurora East (74), Boulder Reservoir (76), Camp (74), La Casa (77), Chatfield (83), Manitou Springs (74), Air Force Academy (74), Blackhawk (76), Rocky Flats - North (83), NREL (84), Fort Collins West (77), Fort Collins - Mason (71), Greeley (72), and PAO (77).

EPA's monitoring requirements for O<sub>3</sub> 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<sub>3</sub> 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 3.1 below lists EPA's O<sub>3</sub> monitoring requirements. Each MSA is discussed further in the following subsections.

Table 3.1: EPA's minimum ozone monitoring requirements.

MSA Population	Most recent 3-year design value concentrations > 85% of any O <sub>3</sub> NAAQS	Most recent 3-year design value concentrations < 85% of any O <sub>3</sub> NAAQS
>10 million	4	2
4 - 10 million	3	1
350,000 - 4 million	2	1
50,000 - 350,000	1	0

### 3.1 Denver Metro/North Front Range Region

Emissions from industrial facilities and electric utilities, oil and gas development, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NO<sub>x</sub> and Volatile Organic Compounds (VOCs) in the atmosphere. In the presence of sunlight, NO<sub>x</sub> and VOCs chemically react to form ground level ozone. Table 3.2 lists the first and fourth maximum eight-hour O<sub>3</sub> concentrations recorded in 2022 for the Denver Metro/North Front Range region. Also listed are the current three-year design values for each site with enough data available to calculate them.

In the Denver Metro area, Adams, Arapahoe, Boulder, Denver, Douglas, and Jefferson counties have O<sub>3</sub> monitors.

Table 3.2: Summary of O<sub>3</sub> values recorded at monitoring stations in the Denver Metro / Northern Front Range region during 2022. Sites having three-year NAAQS values in excess of 70 ppb are indicated by asterisks.

Site Name	County	Ozone 8-Hour Average (ppb)		
		1 <sup>st</sup> Max.	4 <sup>th</sup> Max.	3-Year Ave. of 4 <sup>th</sup> Max. 8-Hr
Welby	Adams	78	75	77*
Highlands	Arapahoe	79	73	80*
Aurora East	Arapahoe	77	70	74*
Boulder Reservoir	Boulder	79	72	76*
CAMP	Denver	73	71	74*
La Casa	Denver	74	72	77*
Chatfield State Park	Douglas	93	78	83*
Black Hawk	Gilpin	74	71	76*
Rocky Flats - N.	Jefferson	85	78	83*
NREL	Jefferson	86	77	84*
Evergreen	Jefferson	92	74	-
Fort Collins - West	Larimer	78	73	77*
Fort Collins - Mason	Larimer	73	70	71*
Greeley - County Tower	Weld	76	70	72*
PAO	Weld	80	73	77*

There are 15 monitors currently in operation in this area. There are two MSAs located in the Metropolitan Denver area. These are the Boulder MSA and the Denver-Aurora-Lakewood MSA, with populations of 328,006 and 2,996,432 respectively, according to the 2020 U.S. Census. 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, and this requirement is satisfied by the monitor at Boulder Reservoir, which became operational in August of 2016. By EPA rules, the Denver-Aurora-Lakewood MSA requires at least two monitors. This requirement is satisfied by the remaining ten monitors that are placed throughout the Denver-Aurora-Lakewood MSA. The monitors located at Chatfield State Park, Rocky Flats - North, and NREL are the highest concentration monitors in the state.

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, with populations of 360,937 and 331,546 respectively, according to the 2020 U.S. Census. Per EPA monitoring requirements, the Greeley MSA falls in the 50,000 to 350,000 population range and the Fort Collins MSA falls in the 350,000 to 4,000,000 range. The Greeley MSA therefore requires at least one monitor and the Fort Collins MSA requires at least two monitors. These requirements are satisfied by the monitors listed in Table 3.2. The monitor located at the Fort Collins West site is a highest concentration monitor for the Fort Collins MSA, while the Greeley - County Tower monitor serves the same purpose for the Greeley MSA.

Fourteen of the O<sub>3</sub> monitors shown in Table 3.2 have three-year design values above the current eight-hour ozone NAAQS of 70 ppb: Welby, Highlands, Aurora East, Boulder Reservoir, CAMP, La Casa, Chatfield State Park, Black Hawk, Rocky Flats N., NREL, Fort Collins West, Fort Collins - Mason, Greeley - County Tower, and PAO.

## 3.2 Pikes Peak Region

The first and fourth maximum eight-hour concentrations recorded in 2022 for each O<sub>3</sub> monitoring site in the Pikes Peak region are listed in Table 3.3 below. Also listed are the three year design values for each site.

The Colorado Springs MSA is the only MSA located in the Pikes Peak region. According to the 2020 U.S. Census, this MSA has a population of 756,489. 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 requirement is satisfied by the monitors at the

Table 3.3: Summary of O<sub>3</sub> values recorded at monitoring stations in the Pikes Peak region during 2022.

Site Name	County	Ozone 8-Hour Average (ppm)		
		1 <sup>st</sup> Max.	4 <sup>th</sup> Max.	3-Year Ave. of 4 <sup>th</sup> Max.
U.S. Air Force Academy	El Paso	73	69	74*
Manitou Springs	El Paso	73	68	74*

U.S. Air Force Academy and at Manitou Springs.

### 3.3 Western Slope Region

The first and fourth maximum eight-hour O<sub>3</sub> concentrations recorded in 2022 in the Western Slope region are listed in Table 3.4 below.

Table 3.4: Summary of O<sub>3</sub> values recorded at monitoring stations in the Western Slope region during 2022.

Site Name	County	Ozone 8-Hour Average (ppm)		
		1 <sup>st</sup> Max.	4 <sup>th</sup> Max.	3-Year Ave. of 4 <sup>th</sup> Max.
Rifle - Health Dept.	Garfield	65	59	62
Palisade Water Treatment	Mesa	65	62	65

The Grand Junction MSA is the only MSA located on the Western Slope. The Grand Junction MSA includes all of Mesa County and has a population of 155,574 according to the 2020 U.S. Census. Per EPA monitoring requirements, this MSA falls in the 50,000 to 350,000 population range, and thus requires one O<sub>3</sub> monitor. The monitor at the Palisade site satisfies this requirement, as well as the highest concentration monitor requirement.

### 3.4 Southwestern Region

The first and fourth maximum eight-hour concentrations recorded in 2022 at the Cortez - Health Dept. O<sub>3</sub> monitoring site are listed in Table 3.5 below. This is the only O<sub>3</sub> monitor located in the Southwestern Region.

Table 3.5: Summary of O<sub>3</sub> values recorded at the monitoring station in the Southwest region during 2022.

Site Name	County	Ozone 8-Hour Average (ppm)		
		1 <sup>st</sup> Max.	4 <sup>th</sup> Max.	3-Year Ave. of 4 <sup>th</sup> Max.
Cortez - Health Dept.	Montezuma	64	62	63

### 3.5 Recent and Planned Changes in O<sub>3</sub> Monitoring

In early 2023, the Pueblo West site was established for the purpose of monitoring O<sub>3</sub>, wind speed, wind direction, and temperature.

Planned changes include collaborating with the City of Fort Collins to install a monitoring shelter at Fossil Creek Reservoir. This shelter will measure O<sub>3</sub>, NO<sub>x</sub>, wind speed, wind direction, temperature, barometric pressure, and total solar radiation. The APCD has determined that the Fossil Creek Reservoir site is an ideal location for monitoring



### 3.5. *RECENT AND PLANNED CHANGES IN O<sub>3</sub> MONITORING*

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maximum O<sub>3</sub> concentrations in an exploratory monitoring effort conducted in the Fort Collins region during the summer of 2021.

Additionally, APCD is partnering with Larimer County to establish a site in Timnath that will measure O<sub>3</sub> and NO<sub>x</sub>. Another O<sub>3</sub> monitoring site will be installed in Loveland, also in cooperation with Larimer County. Timnath and Loveland have been identified by the APCD as presently unmonitored regions. The decision to include Timnath was partly motivated by the outcomes of the exploratory O<sub>3</sub> monitoring that has been conducted in the vicinity, as well as its geographical proximity to both oil and gas development and population expansion. Loveland, on the other hand, has long been recognized as a gap in ozone monitoring endeavors. The selection of these sites was made in collaboration with Larimer County, which successfully secured funding from the county council.

O<sub>3</sub> monitoring will be discontinued at Fort Collins - Mason in early 2024 due to the closure of that monitoring site (see section 2.3). The EPA monitoring requirement for two O<sub>3</sub> monitors in the Fort Collins MSA will be satisfied by the installation of the new Fossil Creek Reservoir site.

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## Nitrogen Dioxide/Reactive Oxides of Nitrogen (NO<sub>2</sub>/NO<sub>y</sub>)

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Currently, there are seven NO<sub>2</sub>/NO<sub>x</sub>/NO<sub>y</sub> monitoring locations in operation in the Denver Metro/North Front Range Region, three of which are relatively new sites. The Denver CAMP monitor exceeded the annual average NO<sub>2</sub> standard (53 ppb) in 1977 and the Welby monitor has never exceeded the standard. 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 one-hour NO<sub>2</sub> NAAQS that is in addition to the annual standard. The new standard, both primary and secondary, of 100 ppb is based on the three-year average of the 98<sup>th</sup> percentile of the yearly distribution of daily maximum one-hour concentrations.

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

### 4.1 Denver Metro/North Front Range Region

The annual mean and 98<sup>th</sup> percentile one-hour concentrations recorded in 2022 for each NO<sub>2</sub> monitoring site in the Denver Metro/North Front Range region are listed in Table 4.1 below. Also listed are the three year design values for each site. The APCD currently monitors NO<sub>2</sub> only in this region. All of these monitors show values that are well below both the annual average NAAQS of 53 ppb and the one-hour NAAQS of 100 ppb.

The APCD commenced NO<sub>2</sub> monitoring at the PAO site on 6/12/2020 per PAMS monitoring requirements, so the three-year design value is not currently valid for this site.

### 4.2 Recent and Planned Changes in NO<sub>2</sub>/NO<sub>y</sub> Monitoring

The APCD plans to begin NO<sub>2</sub> monitoring at new sites to be established during 2023-2024 at Fossil Creek Reservoir and Timnath (see section 3.5).

Table 4.1: Summary of NO<sub>2</sub> values recorded at monitoring stations in the Denver Metro / Northern Front Range region during 2022.

Site Name	County	NO <sub>2</sub> (ppb)		
		Annual Mean	98 <sup>th</sup> Percentile	3-Year Ave. of 98 <sup>th</sup> Percentile
Welby	Adams	16.7	57.3	56
CAMP	Denver	15.2	58.1	62
La Casa	Denver	15.9	54.1	57
I-25 Denver	Denver	21.3	60.4	61
I-25 Globeville	Denver	24.4	63.4	68
Rocky Flats - N.	Jefferson	2.8	25.7	25
PAO	Weld	7.9	47.3	-

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## Sulfur Dioxide (SO<sub>2</sub>)

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Currently, there are four SO<sub>2</sub> monitoring locations within the APCD's network. A new one-hour primary standard was finalized in June 2010. To attain that standard, the three-year average of the 99<sup>th</sup> percentile of daily maximum one-hour averages at each monitor within an area must not exceed 75 ppb. The secondary NAAQS is a three-hour average not to exceed 500 ppb more than once per year. In the past, SO<sub>2</sub> had never approached the level of any of the standards until an SO<sub>2</sub> analyzer was added at the Highway 24 site in Colorado Springs in 2013; this site exceeded the level of the one-hour standard in 2013 on 3/22/13 and 4/16/13 (one-hour concentrations of 99 ppb and 81 ppb, respectively), again on 7/3/2014 (82 ppb), and once again on 3/29/2015 (87 ppb). Each exceedance of the standard was a single occurrence of a concentration above the specified NAAQS concentration and did not take into account the three-year averaging period necessary to determine compliance with the standard. Since the installation in 2013, the Highway 24 site has not had an actual violation of the SO<sub>2</sub> standard when calculating the 99<sup>th</sup> percentile across the three-year window. The 2013-2015 three-year design value was 56 ppb at this location, which is below the 75 ppb standard level. Examination of wind direction and speed in combination with higher concentrations of SO<sub>2</sub> at the site indicated the Martin Drake Power Plant as one potential source. Working with the APCD, Colorado Springs Utilities (CSU) completed meteorological monitoring at its Martin Drake Power Plant from October 2015 through January 2017. The division coordinated with CSU to conduct SO<sub>2</sub> modeling using this validated on-site meteorological data. CSU submitted modeling that followed an approved Division and EPA modeling protocol. This protocol process included Division and EPA review as well as public comment. Results from this study, which considered a number of different scenarios, demonstrated current compliance with the one-hour SO<sub>2</sub> NAAQS. The Martin Drake Power Plant ceased operation in August of 2021 and will be demolished beginning in the summer of 2023. In its place, six modular natural gas generators will be installed which will provide power with less maintenance and operating costs and with less emissions than coal. The gas generators will operate until 2027 and will then be moved to another location to continue to generate power.<sup>1</sup> The current three-year SO<sub>2</sub> design value (2020-2022) for the Highway 24 site in Colorado Springs is 8 ppb, well below the 75 ppb standard.

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

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<sub>2</sub> monitor in this MSA. The monitors listed in the sections below meet these requirements.

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<sup>1</sup><https://www.csu.org/Pages/MartinDrakePowerPlant.aspx>

## 5.1 Denver Metro/North Front Range Region

The annual mean and 99<sup>th</sup> percentile one-hour daily maximum concentrations recorded in 2022 for each SO<sub>2</sub> monitoring site in the Denver Metro/North Front Range region are listed in Table 5.1 below. Also listed are the three year design values for each site.

Table 5.1: Summary of SO<sub>2</sub> values recorded at monitoring stations in the Denver Metro/Northern Front Range region during 2022.

Site Name	County	SO <sub>2</sub> (ppb)		
		Annual Mean	99 <sup>th</sup> Percentile	3-Year Ave. of 99 <sup>th</sup> Percentile
Welby	Adams	0.75	6	6
CAMP	Denver	0.33	4	6
La Casa	Denver	0.35	5	6

## 5.2 Pikes Peak Region

In January of 2013 an SO<sub>2</sub> monitor was added to the Highway 24 monitoring station in Colorado Springs.

Table 5.2: Summary of SO<sub>2</sub> values recorded at the Highway 24 monitoring site in Colorado Springs during 2022.

Site Name	County	SO <sub>2</sub> (ppb)		
		Annual Mean	99 <sup>th</sup> Percentile	3-Year Ave. of 99 <sup>th</sup> Percentile
Highway 24	El Paso	0.70	5	8

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

There are no planned changes in 2023 for the SO<sub>2</sub> monitoring network at this time.

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## Particulate Matter (PM)

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Sources of suspended particulate matter in 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. There are also a variety of agricultural sources of PM including feed lots, grazing, tilling, etc. Suspended particulates in the atmosphere vary widely in their chemical and physical composition. Particulate matter can be directly emitted or can be formed in the atmosphere when gaseous pollutants react to form particles.

Particle size is the factor most directly linked to the health impacts of atmospheric PM. Particles of less than 10 micrometers ( $\mu\text{m}$ ) in aerodynamic diameter ( $\text{PM}_{10}$ ) are inhalable and thus pose a health threat. Particles less than 2.5  $\mu\text{m}$  in aerodynamic diameter ( $\text{PM}_{2.5}$ ) can penetrate deeply into the alveoli, while the smallest particles, such as those less than 0.1  $\mu\text{m}$  in aerodynamic diameter (ultrafine particles), can penetrate all the way into the bloodstream. Exposure to such particles can affect the lungs, the heart, and the cardiovascular system. Particles with diameters between 2.5  $\mu\text{m}$  and 10  $\mu\text{m}$  ( $\text{PM}_{10-2.5}$ ) represent less of a health concern, although they can irritate the eyes, nose, and throat, and cause serious harm due to inflammation in the airways of people with respiratory diseases such as asthma, chronic obstructive pulmonary disease, and pneumonia. Note that  $\text{PM}_{10}$  encompasses all particles smaller than 10  $\mu\text{m}$ , including the  $\text{PM}_{2.5}$  and ultrafine fractions.

Currently the APCD operates  $\text{PM}_{10}$  monitors at 15 different locations. Eleven of these sites use high-volume filter-based instruments, four sites use low-volume filter-based instruments, and six sites have continuous monitors collocated with filter-based instruments. There are an additional seven sites that have continuous  $\text{PM}_{10}$  but no filter-based FRM (see section 6.1). There are two sites with collocated high-volume samplers (CAMP and Longmont) and two sites with collocated low volume  $\text{PM}_{10}$  samplers (La Casa and Grand Junction - Powell). The  $\text{PM}_{10}$  NAAQS is a 24-hour average of  $150 \mu\text{g m}^{-3}$  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.

$\text{PM}_{2.5}$  concentration values are reported in four different categories 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 the APCD operates  $\text{PM}_{2.5}$  monitors at 16 different sites. Of the 16 sites, ten have filter-based samplers, six of these being collocated with a continuous instrument and two collocated with another filter-based FRM; six sites have continuous  $\text{PM}_{2.5}$  but no filter-based FRM (see section 6.1). Speciation analysis (laboratory analysis of  $\text{PM}_{2.5}$  samples to characterize the different components of  $\text{PM}_{2.5}$  in the atmosphere) is conducted at three sites: La Casa, Platteville, and Birch Street. All three speciation sites are collocated with a low-volume filter-based FRM.

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

## 6.1 Continuous PM Monitoring

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

The APCD currently employs two (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 monitors that are not intended for comparison with the NAAQS: Boulder - CU Athens (08-013-1001), and Welby (08-001-3001).

## 6.2 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 employ this technique anywhere in the state.

The definition of community monitoring zone (CMZ) in 40 CFR Part 58.1 is as follows: “Community monitoring zone (CMZ) means an optional averaging area with established, well defined boundaries, such as county or census block, within a Monitoring Planning Area (MPA) that has relatively uniform concentrations of annual  $PM_{2.5}$  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 24-hour  $PM_{2.5}$  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 website. A public comment period will be open for thirty days prior to the APCD selecting a new site.

### 6.3 Denver Metro/North Front Range Region

There were no violations of the PM<sub>10</sub> or PM<sub>2.5</sub> NAAQS in the Denver Metro/North Front Range region during 2022; however, the three-year average 24-hour PM<sub>2.5</sub> design value at the Longmont site is currently exceeding the standard of 35  $\mu\text{g m}^{-3}$  due to high values in 2021 and 2022. Table 6.1 and Table 6.2 below list the PM<sub>10</sub> and PM<sub>2.5</sub> annual averages and design values recorded at each site in this region in 2022. The Birch Street monitor has only been in operation since March 2021, so the design values for this site are not valid for NAAQS comparison.

Table 6.1: Summary of PM<sub>10</sub> values recorded at monitoring stations in the Denver Metro/Northern Front Range region during 2022.

Site Name	County	PM <sub>10</sub> ( $\mu\text{g m}^{-3}$ )		
		Annual Average	24-Hr Max	3-Year Exceedances
Birch Street	Adams	31.5	114	-
Welby	Adams	36.1	100	0
Longmont	Boulder	22.2	55	0
Boulder Chamber of Comm.	Boulder	17.6	44	0
CAMP	Denver	28.5	64	0
La Casa	Denver	22.6	51	0

Table 6.2: Summary of PM<sub>2.5</sub> values recorded at monitoring stations in the Denver Metro/Northern Front Range region during 2022.

Site Name	County	PM <sub>2.5</sub> ( $\mu\text{g m}^{-3}$ )		
		Annual Average	Annual 98 <sup>th</sup> Percentile	3-Year Ave. of 98 <sup>th</sup> Percentile
Birch Street	Adams	6.9	16.4	23
Arapaho Comm. College	Arapahoe	5.1	11.0	20
Longmont	Boulder	6.6	24.2	44
Boulder Chamber of Comm.	Boulder	4.8	14.2	23
CAMP	Denver	6.3	15.7	23
National Jewish Health	Denver	6.7	15.6	31
La Casa	Denver	6.6	15.8	26
I-25 Denver	Denver	5.7	12.6	21
I-25 Globeville	Denver	7.4	17.2	26
Chatfield State Park	Douglas	5.3	18.4	34
Fort Collins - CSU	Larimer	6.5	17.4	31
Greeley - Hospital	Weld	6.8	22.1	30
Platteville	Weld	6.7	20.4	26



## 6.4 Eastern High Plains

There were two violations of the PM<sub>10</sub> NAAQS in the Eastern High Plains region during 2022. The maximum 24-hour concentration of 451  $\mu\text{g m}^{-3}$  was recorded at the Lamar site on December 2. The second highest 24-hour average PM<sub>10</sub> concentration recorded at this site in 2022 was 270  $\mu\text{g m}^{-3}$ . Table 6.3 below lists the PM<sub>10</sub> annual average and design value recorded at the Lamar site in 2022.

Table 6.3: Summary of PM<sub>10</sub> values recorded at monitoring stations in the Eastern High Plains region during 2022, with proposed exceptional events included.

Site Name	County	PM <sub>10</sub> ( $\mu\text{g m}^{-3}$ )		
		Annual Average	24-Hr Max	3-Year Exceedances
Lamar - Mun. Bldg.	Prowers	25.7	451	2.8

## 6.5 Pikes Peak Region

There were no violations of the PM<sub>10</sub> or PM<sub>2.5</sub> NAAQS in the Pikes Peak region during 2022. Table 6.4 and Table 6.5 below list the PM<sub>10</sub> and PM<sub>2.5</sub> annual averages and design values recorded at the Colorado College monitoring site in 2022.

Table 6.4: Summary of PM<sub>10</sub> values recorded at the Colorado College station during 2022.

Site Name	County	PM <sub>10</sub> ( $\mu\text{g m}^{-3}$ )		
		Annual Average	24-Hr Max	3-Year Exceedances
Colorado College	El Paso	19.1	60	0

Table 6.5: Summary of PM<sub>2.5</sub> values recorded at the Colorado College station during 2022.

Site Name	County	PM <sub>2.5</sub> ( $\mu\text{g m}^{-3}$ )		
		Annual Average	Annual 98 <sup>th</sup> Percentile	3-Year Ave. of 98 <sup>th</sup> Percentile
Colorado College	El Paso	4.5	12	18

## 6.6 South Central Region

There were three violations of the PM<sub>10</sub> NAAQS in the South Central region during 2022. The maximum 24-hour concentration of 195  $\mu\text{g m}^{-3}$  was recorded at the Pueblo site on May 9. The second and highest 24-hour average PM<sub>10</sub> concentration recorded at this site in 2022 was 180  $\mu\text{g m}^{-3}$ . There were no violations of the PM<sub>2.5</sub> NAAQS in the South Central region during 2022. Table 6.6 and Table 6.7 below list the PM<sub>10</sub> and PM<sub>2.5</sub> annual averages and design values recorded at the Pueblo site in 2022.

Table 6.6: Summary of PM<sub>10</sub> values recorded at the Pueblo monitoring station during 2022, with proposed exceptional events included.

Site Name	County	PM <sub>10</sub> ( $\mu\text{g m}^{-3}$ )		
		Annual Average	24-Hr Max	3-Year Exceedances
Pueblo	Pueblo	23.7	195	1.1

Table 6.7: Summary of PM<sub>2.5</sub> values recorded at the Pueblo monitoring station during 2022.

Site Name	County	PM <sub>2.5</sub> ( $\mu\text{g m}^{-3}$ )		
		Annual Average	Annual 98 <sup>th</sup> Percentile	3-Year Ave. of 98 <sup>th</sup> Percentile
Pueblo	Pueblo	6.4	16.2	18

## 6.7 Central Mountain Region

There were no violations of the PM<sub>10</sub> NAAQS in the Central Mountain region during 2022. Table 6.8 below lists the PM<sub>10</sub> 2022 annual average and design value recorded at each site in this region. The Cañon City PM<sub>10</sub> monitor did not meet completeness requirements during 2019-2020 and so does not have a valid three-year design value.

Table 6.8: Summary of PM<sub>10</sub> values recorded at monitoring stations in the Central Mountains region during 2022.

Site Name	County	PM <sub>10</sub> (µg m <sup>-3</sup> )		
		Annual Average	24-Hr Max	3-Year Exceedances
Cañon City	Fremont	17.6	108	0
Aspen	Pitkin	15.6	70	0
Steamboat Springs	Routt	15.3	46	0

## 6.8 Western Slope Region

There were no violations of the PM<sub>10</sub> or PM<sub>2.5</sub> NAAQS in the Western Slope region during 2022. Table 6.9 and Table 6.10 below list the PM<sub>10</sub> and PM<sub>2.5</sub> annual averages and design values recorded at each site in this region in 2022.

Table 6.9: Summary of PM<sub>10</sub> values recorded at monitoring sites in the Western Slope region during 2022.

Site Name	County	PM <sub>10</sub> (µg m <sup>-3</sup> )		
		Annual Average	24-Hr Max	3-Year Exceedances
Grand Junction - Powell Bldg.	Mesa	18.7	73	0
Telluride	San Miguel	17.4	89	0

Table 6.10: Summary of PM<sub>2.5</sub> values recorded at the Grand Junction - Powell Bldg. monitoring site during 2022.

Site Name	County	PM <sub>2.5</sub> (µg m <sup>-3</sup> )		
		Annual Average	Annual 98 <sup>th</sup> Percentile	3-Year Ave. of 98 <sup>th</sup> Percentile
Grand Junction - Powell Bldg.	Mesa	5.2	14.8	18

## 6.9 Southwestern Region

There were four violations of the PM<sub>10</sub> NAAQS in the Southwestern region during 2022. The maximum 24-hour concentration of 373  $\mu\text{g m}^{-3}$  was recorded at the Pagosa Springs site on May 9. The second and highest 24-hour average PM<sub>10</sub> concentration recorded at this site in 2022 was 241  $\mu\text{g m}^{-3}$ . Table 6.11 below lists the PM<sub>10</sub> annual average and design value recorded at each site in this region in 2022.

Table 6.11: Summary of PM<sub>10</sub> values recorded at monitoring sites in the Southwestern region during 2022, with proposed exceptional events included.

Site Name	County	PM <sub>10</sub> ( $\mu\text{g m}^{-3}$ )		
		Annual Average	24-Hr Max	3-Year Exceedances
Pagosa Springs School	Archuleta	25.0	373	1.3

## 6.10 Planned Changes in PM Monitoring

The APCD will begin in 2023-2024 to replace several filter-based PM monitors in various areas around the state with continuous monitors as part of an ongoing effort to modernize the PM network.

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## Lead

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Lead sampling at the La Casa NCore site was discontinued in December 31 of 2015 due to low concentrations. The maximum quarterly lead concentration has generally been less than a tenth of the current 2008 standard. Additionally, Colorado has not recorded an exceedance of the previous lead standard ( $1.5 \mu\text{g m}^{-3}$  averaged over a calendar quarter) since the first quarter of 1980. The 2008 lead standard, which is  $0.15 \mu\text{g m}^{-3}$  averaged over any three rolling consecutive three-month periods, has not been exceeded using data from 2013 - 2015.

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

Lead monitoring is required by EPA at one source-oriented SLAMS site located to measure the maximum lead concentration in ambient air resulting from each non-airport lead source which emits 0.50 or more tpy based on either the most recent National Emission Inventory (NEI) or other scientifically justifiable methods and data (such as improved emissions factors or site-specific data) taking into account logistics and the potential for population exposure. Based on the 2014 NEI, there are no non-airport sources in Colorado that are over the 0.5 tpy threshold. There have been questions regarding the U.S. Army Fort Carson facility in Colorado Springs, which has at times reported potential emissions over 0.5 tpy in the Toxics Release Inventory (TRI). It is noted that the 2014 NEI reports 0.029 tpy for Fort Carson and both the 2014 and 2016 TRI report 0 tpy for fugitive and stack air emissions. Based on the APCD inventories, these emissions are actually from their Piñon Canyon training area in Las Animas County. This area is remote with only scattered ranches, approximately 25 miles to the northeast of the town of Trinidad and thus would not warrant monitoring due to a low potential for public exposure.

### 7.1 Planned Changes in Lead Monitoring

No changes in lead monitoring are planned for 2023. Ambient lead concentrations will still be measured at the  $\text{PM}_{2.5}$  speciation and IMPROVE sites throughout the state, as well as on the  $\text{PM}_{10}$  sampler at Grand Junction Powell (08-077-0017) as part of the NATTS project.

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## Meteorological Measurements

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Meteorological measurements taken by the APCD consist of wind speed, wind direction, and temperature; six sites are also equipped to measure relative humidity. Two sites also record temperature differential and total solar radiation, and the APCD is presently enhancing the meteorological network with barometric pressure and precipitation measurements at select sites. Sites equipped with meteorological monitoring equipment are indicated in Table 1.2.

### **8.1 Recent and Planned Changes in Meteorological Monitoring**

Meteorological monitoring has been initiated at Fort Collins West. Meteorological monitoring will continue at the Fort Collins - Mason site until the carbon monoxide maintenance plan is satisfied in early 2024 and the site is decommissioned. Meteorological monitoring also began at the Pueblo West site in early 2023.

The APCD plans to begin meteorological monitoring at a new site to be established during 2023-2024 at Fossil Creek Reservoir (see section 3.5).

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

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In accordance with the EPA's 2015 revised ozone monitoring rule (80 CFR 65292), 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 CBSAs with populations of 1,000,000 or more. The CDPHE operates the NAAQS air monitoring compliance network in Colorado and will be responsible for implementing these new monitoring requirements. Colorado's Rocky Flats - North PAMS site will measure, at a minimum, volatile organic compounds (VOCs), carbonyls, ozone, total reactive nitrogen (NO<sub>y</sub>), nitrogen dioxide (NO<sub>2</sub>), mixing layer height, wind speed, wind direction, relative humidity, temperature, atmospheric pressure, precipitation, total solar radiation, and ultraviolet radiation. All measurements will be collected and reported in hourly averages.

Based on 40 CFR part 58, Appendix D, State air monitoring agencies are required to begin making PAMS measurements at their NCore location(s) by June 1, 2019. EPA is to provide the equipment and operational funding in support of PAMS monitoring. To date, the EPA has provided funding for the purchase of an auto-gas chromatograph, ceilometer, and true nitrogen dioxide analyzer. This equipment has been subsequently purchased and installed at the Rocky Flats - North air monitoring site. The EPA has announced that funding for additional equipment and operations will not be available in time to begin making PAMS measurements by June 1, 2019. Because of this, the EPA has proposed an extension of the PAMS start date from June 1, 2019 to June 1, 2021. This extension was published as a final rule in the Federal Register on January 8, 2020. Despite a continued lack of funding from the EPA for operations of the PAMS shelter at Rocky Flats - North, as part of the State Implementation Plan's enhanced monitoring for ozone precursors, the APCD will begin operations of VOC and carbonyl measurements mid-summer of 2023. The APCD is also planning to open three additional VOC monitoring shelters in Platteville, Elyria-Swansea, and Sheridan. Measurements are expected to begin in mid-summer 2023.

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## Quality Assurance

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### 10.1 Continuous Monitors

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

### 10.2 Particulate Monitors

The audit checks performed on the particulate monitors consist of calibrated flow rate checks, as well as temperature and pressure sensor checks. The precision checks that are made on filter based particulate monitors consist of collocated samplers that operate side-by-side and collect a sample from both samplers once every sixth day. The precision checks for continuous particulate monitors consist of monthly temperature, pressure, leak rate and flow rate verification checks. EPA requires a minimum of 15% of the FRM network to be collocated. By the end of 2022, Colorado maintained 19 filter based particulate monitoring sites (low-volume and high-volume), five of which had collocated instruments (CAMP, Adams County, Longmont, La Casa, and Grand Junction - Powell). The EPA also has a performance evaluation program (PEP), which checks the national network for bias by having a private contractor set up an independent filter based low-volume FRM sampler next to the APCD's PM<sub>2.5</sub> sampler. All of the samples are then compared to ensure that the data are within federal limits and meet pre-established data quality objectives.

### 10.3 Meteorological Monitors

Annual calibrations and audits are performed on all APCD 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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## Summary of Network Changes

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

### 11.1 Completed Changes

- Meteorological monitoring began at the Fort Collins West and Pueblo West sites.
- O<sub>3</sub> monitoring began at the Pueblo West site.

### 11.2 Planned Changes

- The APCD will discontinue carbon monoxide monitoring at the Fort Collins - Mason, Greeley - County Tower, CAMP, Welby, and Highway 24 sites in early 2024.
- O<sub>3</sub> and meteorological monitoring will be discontinued at the Fort Collins - Mason station when this site is closed in early 2024.
- The APCD will be collaborating with the City of Fort Collins to install a monitoring shelter at Fossil Creek Reservoir with O<sub>3</sub>, NO<sub>2</sub>, and meteorological monitoring.
- The APCD is partnering with Larimer County to establish a site in Timnath that will measure O<sub>3</sub> and NO<sub>2</sub> and another O<sub>3</sub> monitoring site in Loveland.
- The APCD will begin in 2023-2024 to replace several filter-based PM monitors with continuous monitors.
- VOC and carbonyl measurements will begin at the Rocky Flats - North site in the summer of 2023.
- VOC monitoring shelters in Platteville, Elyria-Swansea, and Sheridan will be installed during 2023.

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## CFR Requirements Summary

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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, SPM, 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 gaseous analyzers are audited twice annually. 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 weekly 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. Monitor types, sampling frequencies, and station descriptions are listed in Appendix A.

Appendix D of 40 CFR 58 specifies the network design criteria for ambient air quality monitoring. It covers monitoring objectives and spatial scales, general monitoring requirements, design criteria for NCore sites, pollutant specific design criteria for SLAMS sites, and 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 are tracked in a database at the CDPHE and are available upon request.

## APPENDIX A: MONITORING SITE DESCRIPTIONS

This appendix provides detailed information for all monitoring sites considered in this Data Report. **Table A-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 AQS identification numbers, address, site start-up date, elevation, and longitude and latitude coordinates. Beneath each site description the table lists each monitoring parameter in operation at that site, the orientation and spatial scale, which national monitoring network it belongs to, the type of monitor in use, and the sampling frequency. The parameter date is the date when valid data were first collected.

The following abbreviations are used in **Table A-1** below, with orientation (Orient) referring to the monitoring objective and scale referring to the size of the area that concentrations from the monitor represent.

### Orientation

P.O. - Population oriented

Back - Background orientation

SPM - Special Purpose Monitor

H.C. - Highest Concentration

POC - Parameter Occurrence Code

SLAMS - State or Local Air Monitoring Stations

### Scale (Area Represented)<sup>1</sup>

Micro - Micro-scale (several m - 100 m)

Middle - Middle Scale (100 - 500 m)

Neigh - Neighborhood Scale (0.5 - 4 km)

Urban - Urban Scale (4 - 50 km)

Region - Regional Scale (50 - hundreds of km)

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

AQS #	Site Name	Address		Site Start	Elevation (m)	Latitude	Longitude
	Parameter	POC	Start	Orient/Scale	Monitor	Type	Sample
<b>Adams</b>							
08 001 0010	<i>Adams County Birch Street</i>	<i>7275 Birch Street</i>		<i>Mar-21</i>	<i>1,565</i>	<i>39.8281</i>	<i>-104.93646</i>
	PM <sub>10</sub>	1	Mar-21	P.O. Neigh	R&P PARTISOL 2025	SLAMS	1 in 1
	PM <sub>10</sub>	3	Apr-13	P.O. Micro	GRIMM EDM 180	SPM	Continuous
	PM <sub>2.5</sub>	2	Mar-21	P.O. Neigh	R&P PARTISOL 2025	SLAMS	1 in 6
	PM <sub>2.5</sub>	3	Mar-21	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
	PM <sub>2.5</sub> Speciation	5	Mar-21	P.O. Neigh	SASS	Trends Spec.	1 in 6
	PM <sub>2.5</sub> Carbon	5	Mar-21	P.O. Neigh	URG 3000N	Trends Spec.	1 in 6
08 001 3001	<i>Welby</i>	<i>3174 E. 78<sup>th</sup> Ave.</i>		<i>Jul-73</i>	<i>1,554</i>	<i>39.838119</i>	<i>-104.94984</i>
	CO (Trace)	1	Jul-73	P.O. Neigh	THERMO 48i-TLE	SLAMS	Continuous
	SO <sub>2</sub>	2	Jul-73	P.O. Neigh	TAPI 100E	SLAMS	Continuous

<sup>1</sup> "Appendix D to Part 58 – Network Design Criteria for Ambient Air Quality Monitoring," 40 Federal Register 58 (15 January 2015).

AQS #	Site Name	Address		Site Start	Elevation (m)	Latitude	Longitude
	Parameter	POC	Start	Orient/Scale	Monitor	Type	Sample
	NO/NO <sub>x</sub>	2	Jan-76	P.O. Urban	TAPI 200UP	SPM	Continuous
	NO <sub>2</sub>	1	Jan-76	P.O. Urban	TAPI 200EU	SLAMS	Continuous
	O <sub>3</sub>	2	Jul-73	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	Jan-75	P.O. Neigh	MET-ONE	SPM	Continuous
	PM <sub>10</sub>	1	Feb-92	P.O. Neigh	SA/GMW 1200	SLAMS	1 in 6
	PM <sub>10</sub>	3	Jun-90	P.O. Neigh	TEOM 1400AB	SLAMS	Continuous
	<b>Arapahoe</b>						
08 005 0002	Highland Reservoir	8100 S. University Blvd		Jun-78	1,747	39.567887	-104.957193
	O <sub>3</sub>	1	Jun-78	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	Jul-78	P.O. Neigh	MET-ONE	SPM	Continuous
08 005 0005	Arapahoe Community College (ACC)	6190 S. Santa Fe Dr.		Dec-98	1,636	39.604399	-105.019526
	PM <sub>2.5</sub>	1	Mar-99	P.O. Neigh	R&P PARTISOL 2025	SLAMS	1 in 3
08 005 0006	Aurora - East	36001 E. Quincy Ave.		Apr-11	1,552	39.63854	-104.56913
	O <sub>3</sub>	1	Apr-09	P.O. Region	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	Jun-09	P.O. Neigh	MET-ONE	SPM	Continuous
<b>Archuleta</b>							
08 007 0001	Pagosa Springs School	309 Lewis St.		Aug-75	2,165	37.26842	-107.009659
	PM <sub>10</sub>	3	Sep-90	P.O. Neigh	SA/GMW 1200	SLAMS	1 in 1
<b>Boulder</b>							
08 013 0003	Longmont - Municipal Bldg.	350 Kimbark St.		Jun-85	1,520	40.164576	-105.100856
	PM <sub>10</sub>	2	Sep-85	P.O. Neigh	SA/GMW 1200	SLAMS	1 in 6
	PM <sub>10</sub> Collocated	2	Sep-14	P.O. Micro	SA/GMW 1200	SLAMS	1 in 6
	PM <sub>2.5</sub>	1	Jan-99	P.O. Neigh	R&P PARTISOL 2025	SLAMS	1 in 3
	PM <sub>2.5</sub>	3	Nov-05	P.O. Neigh	TAPI T640	SPM	Continuous

AQS #	Site Name	Address		Site Start	Elevation (m)	Latitude	Longitude
	Parameter	POC	Start	Orient/Scale	Monitor	Type	Sample
08 013 0012	<i>Boulder Chamber of Commerce</i>	2440 Pearl St.		Dec-94	1,619	40.021097	-105.263382
	PM <sub>10</sub>	1	Oct-94	P.O. Neigh	SA/GMW 1200	SLAMS	1 in 6
	PM <sub>2.5</sub>	1	Jan-99	P.O. Middle	R&P PARTISOL 2025	SLAMS	1 in 3
08 013 0014	<i>Boulder Reservoir</i>	5565 N. 51 <sup>st</sup>		Sep-16	1,586	40.070016	-105.220238
	O <sub>3</sub>	1	Sep-16	H.C. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp/RH	1	Sep-16	H.C. Urban	RM YOUNG	SPM	Continuous
08 013 1001	<i>Boulder - CU Athens</i>	2102 Athens St.		Dec-80	1,622	40.012969	-105.264212
	PM <sub>2.5</sub>	3	Feb-04	P.O. Neigh	TEOM FDMS	SPM	Continuous
<b>Denver</b>							
08 031 0002	<i>CAMP</i>	2105 Broadway		Jan-65	1,593	39.751184	-104.987625
	CO (Trace)	2	Jan-71	P.O. Micro	THERMO 48i-TLE	SLAMS	Continuous
	SO <sub>2</sub>	1	Jan-67	P.O. Neigh	TAPI 100E	SLAMS	Continuous
	O <sub>3</sub>	6	Mar-12	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	NO/NO <sub>x</sub>	1	Jan-73	Other	TAPI 200EU	Other	Continuous
	NO <sub>2</sub>	1	Jan-73	P.O. Neigh	TAPI 200EU	SLAMS	Continuous
	WS/WD/Temp	1	Jan-65	P.O. Neigh	MET-ONE	SPM	Continuous
	PM <sub>10</sub>	1	Aug-86	P.O. Micro	SA/GMW 1200	SLAMS	1 in 6
	PM <sub>10</sub> Collocated	2	Dec-87	P.O. Micro	SA/GMW 1200	SLAMS	1 in 6
	PM <sub>10</sub>	3	Apr-13	P.O. Micro	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub>	1	Jan-99	P.O. Micro	R&P PARTISOL 2025	SLAMS	1 in 1
	PM <sub>2.5</sub> Collocated	2	Sep-01	P.O. Micro	R&P PARTISOL 2025	SLAMS	1 in 6
	PM <sub>2.5</sub>	3	Apr-13	P.O. Micro	GRIMM EDM 180	SPM	Continuous
08 031 0013	<i>National Jewish Health</i>	14 <sup>th</sup> Ave. & Albion St.		Jan-83	1,620	39.738578	-104.939925
	PM <sub>2.5</sub>	3	Oct-03	P.O. Neigh	TAPI T640	SPM	Continuous

AQS #	Site Name	Address		Site Start	Elevation (m)	Latitude	Longitude
	Parameter	POC	Start	Orient/Scale	Monitor	Type	Sample
	PM <sub>10</sub>	3	Mar-18	P.O. Neigh	TAPI T640	SPM	Continuous
08 031 0016	DESCI	1901 E. 13 <sup>th</sup> Ave.		Dec-90	1,623	39.7357	-104.9582
	Transmissometer	1	Dec-89	Other	OPTEC LPV-3	SPM	Continuous
	Nephelometer	1	Dec-00	Other	OPTEC NGN-2	SPM	Continuous
	Relative Humidity	1	Dec-89	Other	RM YOUNG	SPM	Continuous
08 031 0026	La Casa	4587 Navajo St.		Oct-13	1,594	39.779429	-105.005174
	CO (Trace)	1	Oct-12	P.O. Neigh	THERMO 48i-TLE	NCore	Continuous
	SO <sub>2</sub> (Trace)	1	Oct-12	P.O. Neigh	TAPI 100EU	NCore	Continuous
	NO <sub>y</sub>	1	Oct-12	P.O. Neigh	TAPI 200EU	NCore	Continuous
	CAPS NO <sub>2</sub>	1	Jul-14	P.O. Neigh	TAPI 500U	NCore	Continuous
	O <sub>3</sub>	1	Oct-12	Neigh/Urban	TAPI 400E	NCore	Continuous
	WS/WD/Temp	1	Oct-12	P.O. Neigh	MET-ONE	NCore	Continuous
	Relative Humidity	1	Oct-12	P.O. Neigh	MET-ONE	NCore	Continuous
	Total Solar Radiation	1	Apr-18	P.O. Neigh	KIPP & ZONEN	NCore	Continuous
	Temp (Lower)	2	Oct-12	P.O. Neigh	MET-ONE	NCore	Continuous
	PM <sub>10</sub>	1	Oct-12	P.O. Neigh	R&P PARTISOL 2025	SLAMS	1 in 3
	PM <sub>10</sub> Collocated	2	Oct-12	P.O. Neigh	R&P PARTISOL 2025	SLAMS	1 in 6
	PM <sub>10</sub>	3	Feb-14	P.O. Neigh	TAPI T640	SLAMS	Continuous
	PM <sub>2.5</sub>	1	Oct-12	P.O. Neigh	R&P PARTISOL 2025	NCore	1 in 3
	PM <sub>2.5</sub>	3	Feb-14	P.O. Neigh	TAPI T640	SLAMS	Continuous
	PM <sub>2.5</sub> Speciation	5	Oct-12	P.O. Neigh	SASS	Supplem. Speciation	1 in 3
PM <sub>2.5</sub> Carbon	5	Oct-12	P.O. Neigh	URG 3000N	Supplem. Speciation	1 in 3	

AQS #	Site Name	Address		Site Start	Elevation (m)	Latitude	Longitude
	Parameter	POC	Start	Orient/Scale	Monitor	Type	Sample
08 031 0027	<i>I-25: Denver</i>	<i>971 W. Yuma Street</i>		<i>Jun-13</i>	<i>1,586</i>	<i>39.732146</i>	<i>-105.015317</i>
	CO (Trace)	1	Jun-13	Near Road	THERMO 48i-TLE	SLAMS	Continuous
	NO <sub>2</sub>	1	Jun-13	Near Road	TAPI 200E	SLAMS	Continuous
	NO/NO <sub>x</sub>	1	Jun-13	Near Road	TAPI 200E	SPM	Continuous
	WS/WD/Temp	1	Jun-13	Near Road	MET-ONE	SPM	Continuous
	PM <sub>10</sub>	3	Dec-13	Near Road	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub>	1	Jan-14	Near Road	R&P PARTISOL 2025	SLAMS	1 in 6
	PM <sub>2.5</sub>	3	Dec-13	Near Road	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub> Carbon	5	Oct-13	Near Road	API 633	SPM	Continuous
08 031 0028	<i>I-25: Globeville</i>	<i>4905 Acoma Street</i>		<i>10/1/2015</i>	<i>1,587</i>	<i>39.785823</i>	<i>-104.988857</i>
	NO <sub>2</sub>	1	10/1/2015	Near Road	TAPI 200E	SLAMS	Continuous
	NO/NO <sub>x</sub>	1	10/1/2015	Near Road	TAPI 200E	SPM	Continuous
	WS/WD/Temp/RH	1	10/1/2015	Near Road	RM YOUNG	SPM	Continuous
	PM <sub>10</sub>	3	10/1/2015	Near Road	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub>	3	10/1/2015	Near Road	GRIMM EDM 180	SLAMS	Continuous
<b>Douglas</b>							
08 035 0004	<i>Chatfield State Park</i>	<i>11500 N. Roxborough Pk. Rd</i>		<i>Apr-04</i>	<i>1,676</i>	<i>39.534488</i>	<i>-105.070358</i>
	O <sub>3</sub>	1	May-05	H.C. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	Apr-04	P.O. Neigh	MET-ONE	SPM	Continuous
	PM <sub>2.5</sub>	1	Jul-05	P.O. Neigh	R&P PARTISOL 2025	SPM	1 in 3
	PM <sub>2.5</sub>	3	May-04	P.O. Neigh	TAPI T640	SPM	Continuous
	PM <sub>10</sub>	3	Jun-17	P.O. Neigh	TAPI T640	SPM	Continuous

AQS #	Site Name	Address		Site Start	Elevation (m)	Latitude	Longitude
	Parameter	POC	Start	Orient/Scale	Monitor	Type	Sample
<b>El Paso</b>							
08 041 0013	U. S. Air Force Academy	USAFA Rd. 640		May-96	1,971	39.958341	-104.817215
	O <sub>3</sub>	1	Jun-96	H.C. Urban	TAPI 400E	SLAMS	Continuous
08 041 0015	Highway 24	690 W. Hwy. 24		Nov-98	1,824	38.830895	-104.839243
	CO (Trace)	1	Nov-98	P.O. Micro	THERMO 48i-TLE	SLAMS	Continuous
	SO <sub>2</sub>	1	Jan-13	P.O. Micro	TAPI 100EU	SLAMS	Continuous
	WS/WD/Temp	1	Aug-14	P.O. Micro	RM YOUNG	SPM	Continuous
	Relative Humidity	1	Aug-14	P.O. Micro	RM YOUNG	SPM	Continuous
08 041 0016	Manitou Springs	101 Banks Pl.		Apr-04	1,955	38.853097	-104.901289
	O <sub>3</sub>	1	Apr-04	H.C. Neigh	TAPI 400E	SLAMS	Continuous
08 041 0017	Colorado College	130 W. Cache La Poudre		Dec-07	1,832	38.848014	-104.828564
	PM <sub>10</sub>	1	Dec-07	P.O. Neigh	R&P PARTISOL 2025	SLAMS	1 in 6
	PM <sub>10</sub>	3	Jun-16	P.O. Neigh	GRIMM EDM 180	SLAMS	Continuous
	PM <sub>2.5</sub>	3	Dec-07	P.O. Neigh	GRIMM EDM 180	SLAMS	Continuous
<b>Fremont</b>							
08 043 0003	Cañon City - City Hall	128 Main St.		Oct-04	1,626	38.43829	-105.24504
	PM <sub>10</sub>	1	Oct-04	P.O. Neigh	SA/GMW 1200	SLAMS	1 in 3
<b>Garfield</b>							
08 045 0012	Rifle - Health Dept.	195 W. 14th Ave.		Jun-08	1,629	39.54182	-107.784125
	O <sub>3</sub>	1	Jun-08	P.O. Neigh	TAPI 400E	SLAMS	Continuous
<b>Gilpin</b>							
08 047 0003	Black Hawk	831 Miners Mesa Rd.		Jul-19	2,635	39.79251	-105.49133
	O <sub>3</sub>	1	Jul-19	P.O. Neigh	TAPI 400E	SLAMS	Continuous



AQS #	Site Name	Address		Site Start	Elevation (m)	Latitude	Longitude
	Parameter	POC	Start	Orient/Scale	Monitor	Type	Sample
<b>Jefferson</b>							
08 059 0006	Rocky Flats - N.	16600 W. Hwy. 128		Jun-92	1,802	39.912799	-105.188587
	NO <sub>y</sub>	1	Oct-12	P.O. Neigh	TAPI 200EU	PAMS	Continuous
	CAPS NO <sub>2</sub>	1	Jul-14	P.O. Neigh	TAPI 500U	PAMS	Continuous
	O <sub>3</sub>	1	Sep-92	H.C. Urban	TAPI 400E	PAMS	Continuous
	WS/WD/Temp	1	Oct-12	P.O. Neigh	RM YOUNG	PAMS	Continuous
	Relative Humidity	1	Oct-12	P.O. Neigh	RM YOUNG	PAMS	Continuous
	Precipitation	1	Oct-12	P.O. Neigh	RM YOUNG	PAMS	Continuous
	Ultraviolet Radiation	1	Oct-12	P.O. Neigh	KIPP & ZONEN	PAMS	Continuous
	Total Solar Radiation	1	Oct-12	P.O. Neigh	KIPP & ZONEN	PAMS	Continuous
08 059 0011	NREL	2054 Quaker St.		Jun-94	1,832	39.743724	-105.177989
	O <sub>3</sub>	1	Jun-94	H.C. Urban	TAPI 400E	SLAMS	Continuous
08 059 0014	Evergreen	5124 S. Hatch Dr.		Sept-20	2225	39.62047	-105.3382
	O <sub>3</sub>	1	Apr-11	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	Jun-11	P.O. Neigh	RM YOUNG	SPM	Continuous
<b>Larimer</b>							
08 069 0009	Fort Collins - CSU	251 Edison Dr.		Dec-98	1,524	40.571288	-105.079693
	PM <sub>10</sub>	3	Jun-15	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
	PM <sub>2.5</sub>	3	Jun-15	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
08 069 0011	Fort Collins - West	3416 La Porte Ave.		May-06	1,571	40.592543	-105.141122
	O <sub>3</sub>	1	May-06	H.C. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	June-23	P.O. Neigh	RM YOUNG	SPM	Continuous
	Relative Humidity	1	June-23	P.O. Neigh	RM YOUNG	SPM	Continuous
08 069 1004	Fort Collins - Mason	708 S. Mason St.		Dec-80	1,524	40.57747	-105.07892

AQS #	Site Name	Address		Site Start	Elevation (m)	Latitude	Longitude
	Parameter	POC	Start	Orient/Scale	Monitor	Type	Sample
	CO (Trace)	1	Dec-80	P.O. Neigh	THERMO 48i-TLE	SLAMS	Continuous
	O <sub>3</sub>	1	Dec-80	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	Jan-81	P.O. Neigh	MET-ONE	SPM	Continuous
<b>Mesa</b>							
08 077 0017	Grand Junction - Powell Bldg.	650 South Ave.		Feb-02	1,398	39.063798	-108.561173
	PM <sub>10</sub> & NATTS Metals	3	Jan-05	P.O. Neigh	R&P PARTISOL 2025	SLAMS	1 in 3
	PM <sub>10</sub> Collocated & NATTS	4	Mar-05	P.O. Neigh	R&P PARTISOL 2025	SLAMS	1 in 6
	PM <sub>10</sub>	3	Jan-14	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
	PM <sub>2.5</sub>	3	Jan-14	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
08 077 0018	Grand Junction - Pitkin	645 1/4 Pitkin Ave.		Jan-04	1,398	39.064289	-108.56155
	WS/WD/Temp	1	Jan-04	P.O. Neigh	MET-ONE	SPM	Continuous
	Relative Humidity	1	Jan-04	P.O. Neigh	RM YOUNG	SPM	Continuous
08 077 0020	Palisade Water Treatment	Rapid Creek Rd.		May-08	1,512	39.130575	-108.313853
	O <sub>3</sub>	1	Apr-08	P.O. Urban	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	Apr-08	P.O. Neigh	RM YOUNG	SPM	Continuous
<b>Montezuma</b>							
08 083 0006	Cortez - Health Dept.	106 W. North St.		Jun-06	1,890	37.350054	-108.592337
	O <sub>3</sub>	1	Jun-08	P.O. Urban	TAPI 400E	SLAMS	Continuous
<b>Montrose</b>							
<b>Pitkin</b>							
08 097 0006	Aspen	215 N. Garmisch St.		Jan-15	2,408	39.192958	-106.823257
	PM <sub>10</sub>	1	Feb-15	P.O. Neigh	SA/GMW 1200	SLAMS	1 in 3
<b>Prowers</b>							
08 099 0002	Lamar - Municipal Bldg.	104 E. Parmenter St.		Dec-76	1,107	38.084688	-102.618641

AQS #	Site Name	Address		Site Start	Elevation (m)	Latitude	Longitude
	Parameter	POC	Start	Orient/Scale	Monitor	Type	Sample
	PM <sub>10</sub>	2	Mar-87	P.O. Neigh	SA/GMW 1200	SLAMS	1 in 1
<b>Pueblo</b>							
08 101 0015	<i>Pueblo - Fountain School</i>	925 N. Glendale Ave.		Jun-11	1,433	38.276099	-104.597613
	PM <sub>10</sub>	1	Apr-11	P.O. Neigh	SA/GMW 1200	SLAMS	1 in 1
	PM <sub>2.5</sub>	1	Apr-11	P.O. Neigh	R&P PARTISOL 2025	SLAMS	1 in 1
08 101 0016	<i>Pueblo - West</i>	803 S Cellini Cir.		Jun-11	1,564	38.303250	-104.722056
	O <sub>3</sub>	1	Feb-23	P.O. Neigh	TAPI 400E	SLAMS	Continuous
	WS/WD/Temp	1	March-23	P.O. Neigh	RM YOUNG	SPM	Continuous
<b>Routt</b>							
08 107 0003	<i>Steamboat Springs</i>	136 6th St.		Sep-75	2,054	40.485201	-106.831625
	PM <sub>10</sub>	2	Mar-87	P.O. Neigh	SA/GMW 1200	SLAMS	1 in 1
<b>San Miguel</b>							
08 113 0004	<i>Telluride</i>	333 W. Colorado Ave.		Mar-90	2,684	37.937872	-107.813061
	PM <sub>10</sub>	1	Mar-90	P.O. Neigh	SA/GMW 1200	SLAMS	1 in 3
<b>Weld</b>							
08 123 0006	<i>Greeley - Hospital</i>	1516 Hospital Rd.		Apr-67	1,441	40.414877	-104.70693
	PM <sub>10</sub>	2	Mar-87	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
	PM <sub>2.5</sub>	3	Feb-99	P.O. Neigh	GRIMM EDM 180	SPM	Continuous
08 123 0008	<i>Platteville - Middle School</i>	1004 Main St.		Dec-98	1,469	40.209387	-104.82405
	PM <sub>2.5</sub>	1	Aug-99	P.O. Region	R&P PARTISOL 2025	SLAMS	1 in 3
	PM <sub>2.5</sub> Speciation	5	Aug-99	P.O. Region	SASS	Spec. Trends	1 in 6
	PM <sub>2.5</sub> Carbon	5	Apr-11	P.O. Neigh	URG 3000N	Spec. Trends	1 in 6
08 123 0009	<i>Greeley - County Tower</i>	3101 35th Ave.		Jun-02	1,484	40.386368	-104.73744
	O <sub>3</sub>	1	Jun-02	H.C. Neigh	TAPI 400E	SLAMS	Continuous

AQS #	Site Name	Address		Site Start	Elevation (m)	Latitude	Longitude
	Parameter	POC	Start	Orient/Scale	Monitor	Type	Sample
	WS/WD/Temp	1	Feb-12	P.O. Neigh	MET-ONE	SPM	Continuous
	CO (Trace)	1	Apr-16	P.O. Neigh	THERMO 48i-TLE	SLAMS	Continuous
08 123 0009	<i>Plattville Atmospheric Obsevatory (PAO)</i>	17065 County Rd 28		Jun-20	1,523	40.18161	-104.72614
	O <sub>3</sub>	1	Jun-20	P.O. Urban	TAPI 400	SLAMS	Continuous
	WS/WD/Temp/RH	1	Jun-20	P.O. Urban	RM YOUNG	SPM	Continuous
	NO/NO <sub>x</sub>	2	Jan-76	P.O. Urban	TAPI 200UP	SPM	Continuous
	NO <sub>2</sub>	1	Jan-76	P.O. Urban	TAPI 200UP	SLAMS	Continuous

**Adams County Birch Street, 7275 Birch Street (08 001 0010):**

The Adams County Birch Street site began operation on 03/01/2021 and 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 Tri County Health Dept. - Commerce City (08-001-0008) site which was dismantled due to a roofing project on the building.

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

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

Located 8 miles north-northeast of the Denver Central Business District (CBD) on the bank of the South Platte River, this site is ideally located to measure nighttime drainage of the air mass from the Denver metropolitan area and the thermally driven, daytime upriver flows. The monitoring shows that high CO levels are associated with winds from the south-southwest. While this is the direction of five of the six major sources in the area, it is also the direction of the primary drainage winds along the South Platte River. This monitor is in the SLAMS network, and is population oriented for a neighborhood scale.

CO monitoring began in 1973 and continued through the spring of 1980. Monitoring was stopped from the spring of 1980 until October 1986 when it began again as a special study. Welby has not recorded an exceedance of either the one-hour or eight-hour CO standard since January 1988. In the last few years, its primary value has been as an indicator of changes in the air quality index (AQI).

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

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

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

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

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

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

Meteorological monitoring began in July of 1978.

In September of 2010 the site and meteorological tower were relocated to the east by approximately 30 meters to allow for the construction of an emergency generator system. This emergency generator system is located approximately 20 meters northwest of the new site location. The Highlands monitoring site had to be shut down from approximately Oct. of 2013 to Sept. of 2015 due to major construction activities on the property. The site is currently 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<sub>2.5</sub> monitor is located on a mobile shelter in the rarely used South parking lot. Located at 6190 S. Santa Fe Drive, this small trailer is close to the Platte River and the monitor has excellent 360° exposure. Based on the topography and meteorology of the area ACC is in an area where PM<sub>2.5</sub> emissions may collect. This location may capture high concentrations during periods of upslope flow and temperature inversion in the valley. However, since it is further south in a more sparsely populated area, the concentrations are usually not as high as other Denver locations.

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

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

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

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

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

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

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

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

The town of Longmont is a growing, medium sized Front Range community. Longmont is located between the Denver/Boulder Metro-area and Fort Collins. Longmont is both suburban and rural in nature. The town of Longmont is located approximately 30 miles north of Denver along the St. Vrain Creek and is about six miles east of the foothills. Longmont is partly a bedroom community for the Denver-Boulder area. The elevation is 4978 feet. The Front Range peaks rise to an elevation of 14,000 feet just to the west of Longmont. In general, the area experiences low relative humidity, light precipitation and abundant sunshine.

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

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

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

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

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

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

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

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

**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<sub>2</sub> monitor began operation in January 1973 at this location.

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

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

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

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

Meteorological monitoring began at this site in January of 1965.

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

This site is located three miles east of the Denver CBD, close to a very busy intersection (Colorado Boulevard and Colfax Avenue). The current site began operations in 1982. 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 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:**

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

The La Casa site was established in January of 2013 as a replacement for the Denver Municipal Animal Shelter (DMAS) site when a land use change forced the relocation of the site. The La Casa location has been established as the NCore site for the Denver Metropolitan area. In late 2012 the DMAS site was decommissioned and moved to the La Casa site in northwest Denver and includes a trace gas/precursor-level CO analyzer, and a NO<sub>y</sub> analyzer, in addition to the trace level SO<sub>2</sub>, O<sub>3</sub>, meteorology, and particulate monitors are located here. La Casa has been certified in 2013 as an NCore-compliant site by the EPA. The site represents a population oriented neighborhood scale monitoring area.

The trace level SO<sub>2</sub>, CO, and NO<sub>y</sub> analyzers began operation in January 2013.

The meteorological monitoring began at La Casa in January 2013.

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

PM<sub>2.5</sub> monitoring began at La Casa in January 2013 with an FRM filter-based monitor, a continuous TEOM/FDMS FEM instrument, a supplemental PM<sub>2.5</sub> speciation monitor, and a carbon speciation monitor. In early 2015, the TEOM/FDMS was replaced with a GRIMM EDM 180 continuous monitor, which concurrently measures both PM<sub>10</sub> and PM<sub>2.5</sub>.

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

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

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

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

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

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

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

PM<sub>2.5</sub> monitoring began at this site in 2004 with the installation of a continuous monitor, and was furthered by the



addition of an FRM sequential filter based monitor in 2005. Meteorological monitoring began in April of 2004.

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

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

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

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

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

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

The Manitou Springs ozone site is located 4 miles west of Colorado Springs. It was established because of concern that the high concentration urban O<sub>3</sub> area was traveling farther up the Fountain Creek drainage and the current monitoring network was not adequate. The Manitou Springs monitor began operations in April 2004. It is located in the foothills above Colorado Springs in the back of the city maintenance facility. 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<sub>2.5</sub> monitor. The APCD elected to collocate the new PM<sub>2.5</sub> monitor with the corresponding filter-based monitors from the RBD site at the Colorado College location, which included an FRM PM<sub>2.5</sub> monitor and added a low volume FEM PM<sub>10</sub> monitor in November, 2007. The continuous monitor began operation in April of 2008. In the summer of 2016 the filter based PM<sub>2.5</sub> FRM instrument was removed and the GRIMM EDM 180 was designated as the primary sampler used to compare to the PM<sub>2.5</sub> NAAQS. Currently there is also a low volume filter-based PM<sub>10</sub> sampler operated on a 1 in 6 day schedule at the site.

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

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

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

relocated to the top of the City Hall building in October of 2004.

The Cañon City PM<sub>10</sub> site began operation in December 1987. On May 6, 1988, the Macon Street monitor recorded a PM<sub>10</sub> concentration of 172 µg/m<sup>3</sup>. This is the only exceedance of either the 24-hour or annual NAAQS since PM<sub>10</sub> monitoring was established at Cañon City. This is a population oriented neighborhood scale SLAMS monitor on a 1 in 6 day sample schedule.

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

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

**Black Hawk, 195 14<sup>th</sup> Ave (08 047 0003):**

The Black Hawk Site was selected to replace the Aspen Park Site that no longer met EPA siting requirements for tree obstruction. The Black Hawk site was chosen because it was found, during a recent Front Range ozone study, to have elevated ozone concentrations as compared to the other sites in the study. The Black Hawk monitoring location sits at an elevation of 2,633 meters and has been in operation since July of 2019.

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

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

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

In accordance with the EPA's 2015 revised ozone monitoring rule (80 CFR 65292), 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 CBSAs with populations of 1,000,000 or more. APCD's Rocky Flats - North PAMS site will measure, at a minimum, volatile organic compounds (VOCs), carbonyls, ozone, total reactive nitrogen (NO<sub>y</sub>), nitrogen dioxide (NO<sub>2</sub>), mixing layer height, wind speed, wind direction, relative humidity, temperature, atmospheric pressure, precipitation, total solar radiation, and ultraviolet radiation. All measurements will be collected and reported in hourly averages. APCD will begin operations of VOC and carbonyl measurements mid-summer of 2023.

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

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

**Evergreen, 5124 S. Hatch Dr. (08 059 0014):**

The Evergreen Site was selected to replace the Welch Site that was closed due to its redundancy with other ozone monitoring sites in the Denver Metro/North Front Range Region. The Evergreen location was selected because it

expanded ozone monitoring into a populous area in the western foothills south of the I-70 corridor, an unmonitored area where special studies have indicated potentially elevated ozone concentrations. The Evergreen monitoring location sits at an elevation of 2,225 meters and has been in operation since September of 2020.

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

Fort Collins does not have the population to require a particulate monitor under Federal regulations. However, it is one of the largest cities along the Front Range. In the summer of 2016 APCD removed the filter based FRM PM<sub>2.5</sub> sampler and designated the GRIMM EDM 180 continuous particulate monitor as the primary method for PM<sub>2.5</sub> NAAQS comparisons. Currently there are filter based high volume PM<sub>10</sub> neighborhood scale SLAMS monitors on a 1 in 3 day schedule and a continuous GRIMM EDM 180 that measures PM<sub>10</sub> and PM<sub>2.5</sub> operated at the site.

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

The Fort Collins-West ozone monitor began operation in May of 2006. The location was established based on modeling and to satisfy permit conditions for a major source in the Fort Collins area. The levels recorded for the first season of operation showed consistently higher concentrations than the 708 S. Mason Street monitor. This is a highest concentration oriented urban scale SLAMS monitor. In mid-2023 the site will also include a meteorological tower which will include wind speed, wind direction, temperature and relative humidity.

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

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

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

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

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

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

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

**Grand Junction - Pitkin, 645¼ Pitkin Avenue (08 077 0018):**

Meteorological monitors were installed in 2004, and include wind speed, wind direction, and temperature sensors. The

meteorological tower was outfitted January 5<sup>th</sup>, 2015 with RM Young meteorological sensors, including a RH sensor. This site is also part of the National Air Toxics Trends Station Network. This network is a national EPA project to assess levels of urban air toxics around the country.

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

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

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

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

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

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

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

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

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

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

**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.

**Pueblo West, 803 S Cellini Cir. (08 101 0016):**

The Pueblo West Sampling Station was established for the purpose of monitoring O<sub>3</sub>, wind speed, wind direction, and Temperature for the Pueblo West Urban Area. It is located just north of the Pueblo Reservoir. This site started sampling in early 2023.

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

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

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

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

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

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

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

Winds in this area are primarily out of the northwest, with dominant wind speeds less than 5 mph. Secondary winds are from the north, north-northwest and east-southeast, with the most frequent wind speeds also being less than 5 mph. The most recent available wind data for this station is for the period December 1986 to November 1987. Predominant residential growth patterns are to the west and north with large industrial growth expected to the west. There are two feedlots located about 11 miles east of the town. There was a closer feedlot on the east edge of town, but it was shut down in early 1999, after the town of Greeley purchased the land in 1997.

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

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

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

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

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

Meteorological monitoring began in February of 2012.

**Plattville Atmospheric Observatory (PAO), 17065 County Rd 28 (08 123 0013):**

The APCD commenced ozone, nitrogen dioxide, and meteorological monitoring at NOAA PAO facility near Platteville, CO on June 12, 2020. The PAO air monitoring site was installed to obtain nitrogen dioxide data in the Denver-Julesberg Basin. The location and need for this site was identified in the 2017 Western Air Quality Study Monitoring Network Assessment, where a key finding was the recommendation for nitrogen dioxide monitoring in the underserved/unmonitored Denver-Julesberg Basin.

## Appendix C - Public Comments and Responses

This appendix includes information regarding the required public comment period, comments received and APCD responses.

Per 40 CFR 58.10, a 30-day public comment period is required before submitting the Annual Network Plan to EPA. APCD posted notice of this Annual Network Plan on May 25, 2023 on the APCD website at: <https://www.colorado.gov/pacific/cdphe/air-division-public-comment> and [https://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx](https://www.colorado.gov/airquality/tech_doc_repository.aspx). The public comment period was open through June 26, 2023.

The APCD received three sets of comments on this Annual Network Plan during the public comment period. The APCD appreciates the time and effort taken to develop these comments. The comments are presented below along with the APCD's responses.

## Public Comments Received and APCD Responses:

### Commenter #1 (Karen Artell):

Hello APCD and EPA Staff Members:

I am grateful for and very much appreciate the APCD efforts installing additional regulatory air quality monitoring units. The APCD staff members were responsive to a community request to install more regulatory monitors in Larimer County. I note from Colorado's 2023 Ambient Air Monitoring Network Plan that meteorological monitoring has started at the Fort Collins West site and ozone and meteorological monitoring has started at the Pueblo West site.

Additionally, the APCD is collaborating with the City of Fort Collins to install a monitoring shelter at Fossil Creek Reservoir with ozone, NO<sub>2</sub>, and meteorological monitoring and is collaborating with Larimer County to establish an ozone and NO<sub>2</sub> monitoring site in Timnath in eastern Larimer County and an ozone monitoring site in west Loveland. The monitor in west Loveland is particularly important to fill in the regulatory monitoring gap between Fort Collins and Longmont.

I note that the APCD will replace several filter-based PM monitors with continuous monitors in 2023-2024. **I request that the PM<sub>2.5</sub> monitor at the Fort Collins CSU site be one of the PM monitors that are replaced with a continuous PM monitor. Alternatively, a continuous PM monitor could be placed at one of the other monitoring sites in Larimer County.**

**I also request that the APCD establish VOC monitoring in Larimer County in 2023.**

I live in Fort Collins which is in Larimer County and due west of Weld County.

Here is an example of what Larimer County residents are dealing with related to our air quality. In December 2022, the Colorado Oil and Gas Conservation Commission permitted the Guanella Comprehensive Area Plan (CAP) which consists of 466 oil and gas wells on 22 locations. The operator, PDC, will develop the CAP over 10 years. The wells have 25-29 year life spans. This CAP will emit GHGs, ozone precursors and toxins until 2059.

The CAP was approved despite:

The Denver and North Front Range ozone nonattainment area is reclassified to severe ozone nonattainment. High ozone levels negatively affect our health, especially young children, the elderly and those with pre existing respiratory conditions.

Oil and gas operations emissions are the predominant contributor to the North Front Range high ozone levels.

Oil and gas sector emissions are notoriously under-reported:



[https://earthworks.org/resources/certified\\_disaster/](https://earthworks.org/resources/certified_disaster/)

VOCs and NO<sub>x</sub> are carried on prevailing winds west from Weld County and the DJ Basin up against the foothills (<https://www2.acom.ucar.edu/frappe>) leading to high ozone levels in Larimer County. We not only bear the burden of the number of continued permit approvals in Weld County, but Weld County has more than 10,000 producing wells, 4,104 shut-in wells, 2,070 temporarily abandoned wells, 175 wells waiting on completion and 711 actively drilling (these numbers are from December 2022).

In 2022 we had 46 ozone action alert days and 35 days of ozone levels above the 2015 Standard of 70 ppb and Colorado is not projecting compliance with the 2015 Standard by 2024: <https://raqc.org/streamlined-sip-draft-chapters>.

Oil and gas operators submit Form 2Bs with Oil and Gas Development Plans (OGDP) and CAP applications listing projected emissions. These are additional emissions despite “best management practices” claimed by operators.

In an October 2022 presentation to the COGCC, Alan Fried and others reported that 73% to 83% of methane, a potent GHG, in the DJB is associated with oil & gas operations (Methane, Ethane, & VOC Fluxes in the Denver-Julesburg Basin, Fall 2021: Initial Results Alan Fried (CU), Russell Dickerson (UMD), et. al.)

Weld County residents should know that the Platteville Atmospheric Observatory monitor in Weld County has some of the highest ozone levels in the nonattainment area: <https://raqc.org/current-8-hour-ozone-summary/>.

Oil and gas development in Weld County puts the huge burden of poor air quality on those of us who live Larimer County. We are forced to endure Weld County oil and gas emissions and resulting high ozone levels. Hopefully, the additional regulatory monitors installed will give us a clearer picture of our air quality and lead to reduced ozone precursor emissions, co-pollutants and GHGs.

#### **APCD Responses to Commenter #1:**

*Thank you for taking the time to share your thoughts and concerns regarding the air quality in Larimer County. We appreciate your acknowledgement of the efforts made by the APCD (Air Pollution Control Division) in installing additional regulatory air quality monitoring stations. Your recognition of our responsiveness to the community's request to enhance monitoring in the area is encouraging.*

*We acknowledge your interest in the latest developments mentioned in Colorado's 2023 Ambient Air Monitoring Network Plan. The initiation of meteorological monitoring at the Fort Collins West site and the implementation of ozone and meteorological monitoring at the Pueblo West site are indeed significant steps towards better understanding and managing air quality in those areas.*

*We are pleased to be actively collaborating with the City of Fort Collins and Larimer County to establish various monitoring sites. The installation of a monitoring shelter at Fossil Creek Reservoir, along with the inclusion of ozone, NO<sub>2</sub>, and meteorological monitoring, aims to provide valuable data for assessing air quality in that region. Additionally, we feel that the efforts underway to establish monitoring sites in Timnath and Loveland are essential for filling monitoring gaps and obtaining comprehensive information.*

*Regarding your request for the replacement of filter-based PM monitors with continuous monitors, we appreciate your input. The APCD is planning to replace several filter-based PM monitors with continuous monitoring technology in the upcoming period 2023-2024. While we will consider your suggestion to prioritize the PM<sub>2.5</sub> monitor at the Fort Collins CSU site, we will also evaluate the suitability of other monitoring sites in Larimer County for continuous PM monitoring.*

*Furthermore, we acknowledge your request for VOC monitoring in Larimer County in 2023. VOCs (volatile organic compounds) are important air pollutants, and their monitoring is crucial for assessing overall air quality. We will take your request into consideration as we plan future monitoring efforts in the region.*

*We understand your concerns about the impact of the Guanella Comprehensive Area Plan (CAP) and the emissions associated with oil and gas operations. The issue of ozone nonattainment, especially with its adverse effects on vulnerable populations, is a significant concern for us as well. We recognize the contribution of the oil and gas sector to high ozone levels and understand the importance of accurate reporting of emissions.*

*The prevailing winds from Weld County and the DJ Basin carrying VOCs and NO<sub>x</sub> to Larimer County indeed pose challenges to air quality. The substantial number of active wells in Weld County, as you mentioned, emphasizes the need for comprehensive monitoring and effective measures to mitigate air pollution. We share your desire for improved air quality and reduced emissions.*

*The additional regulatory monitors that have been installed are designed to provide a clearer picture of air quality in Larimer County. We hope that the data obtained from these monitors will contribute to a better understanding of ozone precursors, co-pollutants, and greenhouse gas emissions, ultimately leading to more targeted actions for improvement.*

*We appreciate your engagement and commitment to the well-being of Larimer County residents. Your concerns and suggestions will be taken into account as we continue to work towards ensuring better air quality in the region. If you have any further questions or suggestions, please don't hesitate to reach out to us.*

**Commenter #2 (Darryl Etter):**

More monitors seems like a good idea! Glad that one of them is going to be in Elyria/Swansea. The more data we have, the harder it's going to be for polluters and politicians to dodge the need to rein in emissions.

Appreciate your work to support community and environment health!

**APCD Responses to Commenter #2:**

*Thank you for your positive and supportive comment regarding the installation of additional monitors, particularly in the Elyria/Swansea area. We share your sentiment that increased monitoring capacity is essential for promoting transparency and accountability when it comes to addressing emissions and their impact on the environment and community health.*

*By expanding the monitoring network, we aim to gather more comprehensive and accurate data on air quality. This data plays a crucial role in identifying pollution sources, assessing the effectiveness of emission control measures, and holding polluters accountable for their actions.*

*We appreciate your recognition of our commitment to supporting community and environmental health. It is our primary goal to ensure that the air we breathe is clean and safe for everyone. Your encouragement reinforces our determination to continue working towards this shared objective.*

*Please feel free to reach out to us if you have any further questions or suggestions. Together, we can create a healthier and more sustainable environment for all.*

**Commenter #3 (Annareli Morales, Weld County Department of Public Health and Environment):**

Dear Mr. Vicars,

Weld County appreciates the opportunity to provide comments to the Colorado Department of Public Health and Environment - Air Pollution Control Division (APCD) regarding the report entitled: "2023 Ambient Air Monitoring Network Plan," published on May 25, 2023 ("the draft 2023 Plan"). Weld County has comments related to the 1) new ozone monitoring sites, 2) the ozone monitoring site that is proposed to be decommissioned, 3) air toxics and volatile organic compound (VOC) monitoring, 4) the description of ozone precursor sources, and 5) the siting of fine

particulate matter (PM<sub>2.5</sub>) monitors.

#### *New Ozone Monitoring Sites*

Three new ozone monitoring sites at Fossil Creek Reservoir (Fort Collins), Timnath, and Loveland are proposed in the draft 2023 Plan. Detailed information should be added in the draft 2023 Plan about the rationale for these monitors (e.g., are there specific sources of precursor emissions you plan to monitor?), the basis for selecting these locations, and where exactly the monitors will be located within Fort Collins, Timnath, and Loveland (e.g., how far will they be relative to the rest of the monitoring network?).

#### *Proposed Site Decommissioning*

In Section 2.3 of the draft 2023 Plan, APCD explains that when the carbon monoxide monitor is removed at Fort Collins - Mason site, APCD will also decommission the ozone and meteorological monitors at the site. These changes are not discussed in Section 3.1 “Denver Metro/North Front Range Region”, Section 3.5 “Recent and Planned Changes in O<sub>3</sub> Monitoring”, nor in Section 11.2 “Planned Changes”. Detailed information about the planned site removal should be added to these sections in the draft 2023 Plan, especially on the rationale for removing the ozone and meteorological monitoring equipment at the Fort Collins - Mason site.

#### *Air Toxics and VOC Monitoring*

The draft 2023 Plan includes air toxics monitoring conducted by APCD at CAMP and Platteville in Section 1.1.4.2, and sites that are part of the National Air Toxics Trends Stations Network in Section 1.1.4.8. We suggest Section 1.1.4.2 of the draft 2023 Plan be revised to include air toxics monitoring conducted by the APCD at Missile Site Park monitoring station for transparency and improve the accuracy of information in the draft 2023 Plan related to air toxics monitoring site locations.

Weld County provided comments to APCD on June 29, 2021, for the “2021 Ambient Air Monitoring Network Plan,” requesting that a description of the VOC sampling system at MSP be added to the draft 2021 Plan. APCD responded by saying, “Due to timing, we will plan on including all that information in next year’s report.”<sup>1</sup> There is no such description found in the 2023 Plan. We request that a description of the VOC/air toxics sampling system be added to the 2023 Plan.

#### *Ozone Precursor Sources*

As shown in Table 3.2 of the draft 2023 Plan, eight (8) other counties in the State have higher ozone concentrations than Weld County, yet Weld County is the only county specifically mentioned to have ozone precursor emissions. Why? The top source sectors that contribute to local ozone formation are mobile sources, non-electric generating point sources, construction equipment, and lawn and garden equipment.<sup>2</sup> Yet these source types and the areas with notable emissions of these source types are not mentioned in the draft 2023 Plan. This is an important discrepancy that has the potential to misinform readers. We recommend removal of

the statement “Weld County is an area of significant oil and gas development, which potentially contributes to ozone forming compounds or ‘precursors’ in the lower atmosphere” on page 14 and similar statement on page 11. We ask that Weld County be provided equal treatment as other counties.

### *PM<sub>2.5</sub> Monitor Siting*

Weld County conducted two Greeley-Hospital site visits in early 2023 and identified that the monitored PM<sub>2.5</sub> concentrations may be affected by nearby emission sources: unfiltered HVAC outlets, an elevator shaft exhaust, and a hot water heater exhaust. The hot water heater exhaust is approximately 7 meters from the sample inlet, while the closest HVAC vent is 9 meters away. Motivated by our findings, we urge the APCD to perform source testing at all the PM<sub>2.5</sub> monitors (including, but not limited to the Greeley-Hospital Site) to better understand the near-source PM<sub>2.5</sub> influences and their potential implications on monitored concentrations.

Given the U.S. Environmental Protection Agency’s current reconsideration of the National Ambient Air Quality Standards (NAAQS) for PM,<sup>3</sup> a more robust evaluation of PM monitoring site locations must be conducted by APCD, if it has not already done so. This evaluation is especially prudent as the current monitored PM<sub>2.5</sub> concentrations are near or exceeding the current 24-hour and annual average PM<sub>2.5</sub> NAAQS as shown in Table 6.2 of the draft 2023 Plan. When the annual standard of the PM<sub>2.5</sub> NAAQS is lowered to either 9 or 10 µg/m<sup>3</sup>, several sites in Colorado could be in violation of the NAAQS. Given this high potential for violations of the PM<sub>2.5</sub> NAAQS, it is critical to consider the installation of additional monitors to provide enhanced spatial information. We also request APCD include more information in Section 6.3 about the monitored PM<sub>2.5</sub> exceedances. Specifically, are the concentrations monitored in 2020-2022 used in the three year average design value calculations influenced by exceptional events, such as wildfire smoke? The APCD should conduct an Exceptional Events Demonstration for monitored PM<sub>2.5</sub> concentrations throughout the region.

Thank you for the opportunity to provide these comments and local government perspectives. If you have any questions or wish to schedule a meeting to discuss Weld County’s comments on the draft 2023 Monitoring Plan in greater detail, please contact Dr. Annareli Morales, Environmental Health Specialist with the Weld County Public Health and Environment Department at (970) 400-2222.

<sup>1</sup> CDPHE-APCD. (2021). *2021 Ambient Air Monitoring Network Plan*. p. 70.

[https://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx?action=open&file=2021AnnualNetworkPlan.pdf](https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=2021AnnualNetworkPlan.pdf). Accessed Jun 2023.

<sup>2</sup> See RAQC April 14, 2021, ozone modeling forum “2023 Local Source Modeling” slides 13-15.

[https://raqc.egnyc.com/dl/lJuxGvGWRQ/CAMx\\_APCA\\_Local\\_Source\\_Modeling-Forum\\_2021-04-14v3.pdf](https://raqc.egnyc.com/dl/lJuxGvGWRQ/CAMx_APCA_Local_Source_Modeling-Forum_2021-04-14v3.pdf)

<sup>3</sup> Federal Register Vol. 88 No. 18. Reconsideration of the National Ambient Air Quality Standards for Particulate Matter. p. 5558-5719. Proposed Rule.

### **APCD Responses to Commenter #3:**

*Thank you for providing your detailed comments on the draft 2023 Ambient Air Monitoring Network Plan. We appreciate the input from Weld County and your valuable insights regarding various aspects of the plan. We understand your concerns and would like to address each of the points you raised.*

*Regarding the new ozone monitoring sites at Fossil Creek Reservoir, Timnath, and Loveland, we acknowledge the need for detailed information on the rationale behind these sites and their specific objectives. We will ensure that the final version of the plan includes comprehensive explanations for the selection of these locations.*

*Your feedback on the proposed site decommissioning at Fort Collins - Mason is duly noted. We understand that the information provided in the draft plan may lack the necessary details on the rationale for removing the ozone and meteorological monitoring equipment. We will rectify this by providing explicit explanations in the relevant sections of the final plan.*

*We appreciate your suggestion to revise Section 1.1.4.2 of the plan to include air toxics monitoring conducted by the APCD at the Missile Site Park (MSP) monitoring station. However, the Network Plan is mostly intended to describe and summarize the APCD's criteria pollutant (i.e., NAAQS) monitoring network and therefore does not cover in detail our broad and extensive ozone precursor and air toxics monitoring program (see [https://www.colorado.gov/airquality/air\\_toxics\\_repo.aspx](https://www.colorado.gov/airquality/air_toxics_repo.aspx)). These activities will be described in analogous reports that are currently in development, while the Network Plan will continue to be limited to the criteria pollutant monitoring program required by federal law.*

*You raised an important point about the mention of Weld County as an area of significant oil and gas development contributing to ozone-forming compounds or "precursors" in the lower atmosphere. We apologize for any potential misinterpretation caused by this statement. However, we are confident that this statement is accurate in its current form. Weld county is indeed a significant source of ozone precursor emissions in the Denver Metro/North Front Range ozone nonattainment area. For example, oil and gas activities, mostly in Weld County, account for about 50% of all VOC emissions in this region. Oil and gas sources also amount to the second largest NO<sub>x</sub> source within this region, with most of them attributed to Weld County.<sup>1</sup> The substantial number of active wells in Weld County*

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<sup>1</sup> [https://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx?action=open&file=FRAPPE-NCAR\\_Final\\_Report\\_July2017.pdf](https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=FRAPPE-NCAR_Final_Report_July2017.pdf)

*emphasizes the need for comprehensive monitoring and effective measures to mitigate air pollution throughout the Denver Metro/North Front Range region.*

*Thank you for bringing the concerns regarding PM<sub>2.5</sub> monitor siting to our attention. We acknowledge the potential influence of nearby emission sources on monitored concentrations and the need for source testing. Given the current reconsideration of the National Ambient Air Quality Standards for PM by the U.S. Environmental Protection Agency, we recognize the importance of conducting a robust evaluation of PM monitoring site locations. We will prioritize these evaluations and take your recommendations into account.*

*Your request for additional information in Section 6.3 about the monitored PM<sub>2.5</sub> exceedances and their potential influence by exceptional events, such as wildfire smoke, is valid. Exceptional events demonstrations are typically only pursued when they cause violations of ambient air quality standards that jeopardize attainment status. Therefore, while it is certainly possible that the PM concentrations measured during 2020-2022 were impacted by wildfire smoke, there have been no days formally classified as exceptional events.*

*We appreciate your thoughtful feedback, which will contribute to the improvement of the final 2023 Ambient Air Monitoring Network Plan. If you have any further comments or suggestions, please don't hesitate to reach out to us. Your engagement is essential in our shared goal of ensuring the best possible air quality for all.*