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Memorandum

April 21, 2020

TO: Interested Persons

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SUBJECT: Air Pollution Regulation in Colorado

Summary

This memorandum provides an overview of the history of the Clean Air Act, describes common air pollutants and their health impacts, describes Colorado's air quality concerns and state programs, and lists recently proposed legislation, which aims to improve air quality.

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The Clean Air Act

In the beginning of the 20th century, concerns about the quality of outdoor air, or ambient air, increased as the potential impact of air pollutants on human health and the environment became more evident. In response to growing health concerns, the federal government began to implement new programs to improve the nation's ambient air. The Clean Air Act (CCA) of 1963 requires the federal government to reduce air pollution to improve the quality of the nation's air.¹ The act also directs the U.S. Public Health Service to research techniques to monitor and eventually control air pollution. In 1970, the CCA was amended to authorize the federal and state governments to limit emissions from stationary sources of pollution, such as power plants, and mobile sources of pollution, such as vehicles. The 1970 amendments also require the U.S. Environmental Protection Agency (EPA) to set national standards for air pollutants that can endanger public health or welfare.²

¹42 U.S.C. § 7401

²42 U.S.C. § 7401(a)(1)

National Ambient Air Quality Standards. In 1971, the EPA established the national ambient air quality standards (NAAQS) for six criteria pollutants considered harmful to public health and the environment. The CAA identifies both primary and secondary standards. Primary standards protect public health, including for sensitive populations such as persons with asthma, and secondary standards protect public welfare, including mitigating decreased visibility and damage to animals and crops. These standards are updated as deemed necessary by the EPA. Table 1 lists the current standards set for the six criteria air pollutants measured in parts per million (ppm), parts per billion (ppb), and micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$).

Table 1
National Ambient Air Quality Standards

Pollutant	Standard	Time	Concentration	Concentration Limit
Carbon monoxide	Primary	8 Hours	9 ppm	Cannot be exceeded more than once per year
Lead	Primary and Secondary	Rolling three-month average	0.15 $\mu\text{g}/\text{m}^3$	Cannot be exceeded
Nitrogen dioxide	Primary	1 Hour	100 ppb	Cannot exceed one-hour maximum daily concentrations averaged over three years
	Primary and Secondary	1 Year	53 ppb	Cannot exceed the concentration averaged annually
Ozone	Primary and Secondary	8 Hours	0.070 ppm	Annual fourth-highest daily maximum eight-hour concentration, averaged over three years cannot be exceeded
Particulates ($\text{PM}_{2.5}$)*	Primary and Secondary	24 Hours	35 $\mu\text{g}/\text{m}^3$	Annual mean averaged over three years cannot be exceeded
	Primary	1 Year	120 $\mu\text{g}/\text{m}^3$	Annual mean averaged over three years cannot be exceeded
	Secondary	1 Year	15.0 $\mu\text{g}/\text{m}^3$	Annual mean averaged over three years cannot be exceeded
Particulates (PM_{10})*	Primary and Secondary	24 Hours	150 $\mu\text{g}/\text{m}^3$	Cannot be exceeded more than once per year on average over three years
Sulfur Dioxide	Primary	1 Hour	75 ppb	One-hour daily maximum concentration averaged over three years cannot to be exceeded
	Secondary	3 Hours	0.5ppm	Cannot be exceeded more than once per year

Source: U.S. Environmental Protection Agency.

* $\text{PM}_{2.5}$ includes particulates smaller than 2.5 micrometers. PM_{10} includes particulates smaller than 10 micrometers.

Hazardous air pollutants. The EPA is also required to regulate the emissions of hazardous air pollutants (HAPs) under the CAA. HAPs are pollutants that are known or suspected to cause cancer or other serious health and environmental effects, and include toxins such as asbestos, benzene, and mercury. According to the EPA, most of the 187 regulated HAPs are emitted from man-made sources, such as cars, factories, and building materials. The EPA works with state and local governments to reduce the emission of HAPs from major industrial sources and from other non-point sources.³

³<https://www.epa.gov/haps/reducing-emissions-hazardous-air-pollutants#stat>

Health and Environmental Impacts

Potential impacts for the six NAAQS pollutants are listed below, according to the EPA.

Carbon monoxide. Carbon monoxide is a colorless, odorless gas that is released when fossil fuels are burned. It is also released from volcanos and wildfires. The largest sources of pollution are vehicles and industrial operations. High concentrations can cause dizziness, confusion, headaches, and rapid breathing. High concentrations are more common in enclosed spaces than in ambient air.

Lead. Lead is a naturally occurring metal found throughout the environment. Lead is mined and used in a variety of industrial products including wires, cables, and batteries. When a product with lead is released into the environment, it can accumulate in the air, soil, or water. The health effects of large concentrations of lead are most concerning for children under the age of six and include: anemia, kidney and brain damage, central nervous system damage, and in extreme cases, even death.

Nitrogen dioxide. Nitrogen dioxide is released when fossil fuels are burned. The largest sources of emissions are vehicles, power plants, and off-road equipment. High concentrations can aggravate respiratory diseases and cause asthma and other respiratory infections. High concentrations can also cause environmental effects, including ground-level ozone, increased haze, and water pollution.

Ozone. Ozone is a naturally occurring gas that is found in the Earth's upper atmosphere, where it protects the Earth's surface from radiation. At ground-level, however, ozone can cause health and environmental impacts. Harmful ozone is formed by sunlight, nitrogen oxides, and volatile organic compounds. Ozone is most likely to reach unhealthy levels on hot sunny days in urban areas and can be transported by wind. High concentrations of ozone can cause chest pain, throat irritation, and other respiratory issues. High levels can also increase haze and harm vegetation.

Particulates. Particulates are small particles found in the air and includes both liquid droplets and solid particles. Some particulates, like soot, smoke, and dirt, are large enough to be visible, while others cannot be seen. Most particulates are emitted directly from a source, such as construction sites and fires. They can be easily inhaled and cause severe lung and heart damage. Smaller particulates can also cause harmful chemicals to be absorbed into a person's bloodstream. Particulates can also increase haze, make water more acidic, and impact crop growth.

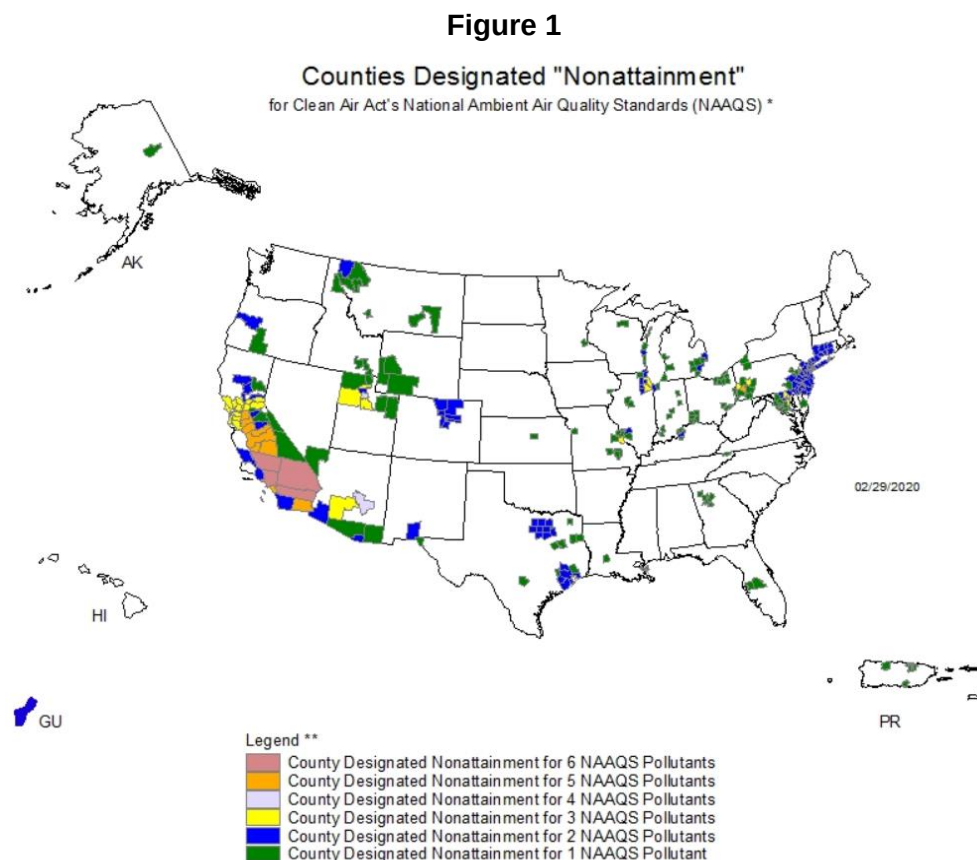
Sulfur dioxide. Sulfur dioxide (SO₂) is a colorless gas with a distinct odor. SO₂ is released into the air when compounds that contain sulfur are burned, which includes burning coal, refining petroleum products, manufacturing cement, or refining and processing a variety of mineral ores such as aluminum, iron, and zinc. High levels of SO₂ can cause a burning sensation when breathing, shortness of breath, and decreases in lung functionality. SO₂ can also dissolve into water when released into the environment, which causes acid rain. Acid rain can damage forests, crops, and cause bodies of water to become too acidic to support wildlife.

State Implementation Plans. Each state must submit a State Implementation Plan to the EPA for approval that demonstrates how the NAAQS will be achieved and maintained. SIPs must also

address how a state plans on achieving certain NAAQS if they are not currently being met. States are responsible for developing air quality monitoring and data systems.⁴

Colorado Air Quality

In 1977, the CCA was amended to establish new requirements for areas that exceed the established thresholds of air pollutants according to the NAAQS. Any county that exceeds the threshold of any of the six criteria air pollutants is designated as a nonattainment area by the EPA. States that have nonattainment areas must outline how to reduce air pollutant levels in their SIPs. Figure 1 shows the nonattainment areas in the United States.



Source: U.S. Environmental Protection Agency.

Nine counties in Colorado are considered nonattainment zones for ozone and particulate pollution: Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Larimer, and Weld Counties. Colorado has submitted multiple SIP provisions for its nonattainment zones. Contributors to ozone and particulate pollution in Colorado include industrial operations, vehicles, power plants, refineries, and airports. Unique meteorological conditions in Colorado also influence ozone pollution.

⁴<https://www.epa.gov/ground-level-ozone-pollution/basics-sip-requirements>

State Programs

The Air Quality Control Commission (AQCC) within the Colorado Department of Public Health and Environment (CDPHE) develops air pollution control policy, regulates pollution sources, and conducts hearings involving violations of the state's air pollution laws. The AQCC is required to adopt cost-effective and efficient air quality management regulations that promote clean and healthy air and that aim to decrease greenhouse gas pollution in the state. The AQCC also oversees the SIPs for the nonattainment areas in the state.⁵

The Air Pollution Control Division monitors, regulates, and forecasts the state's air quality. The division collects information from monitoring stations to provide real-time information about air quality. The division uses the air quality index (AQI) to rate the expected daily air quality and its associated level of health concerns for locations around the state. Figure 2 summarizes the AQI ratings.

Figure 2
Air Quality Index Values

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
<i>When the AQI is in this range:</i>	<i>..air quality conditions are:</i>	<i>...as symbolized by this color:</i>
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Source: AirNow.gov.

The division posts the AQI for the monitored locations daily on the CDPHE website to provide information about the potential impacts of that day's air quality.⁶ The division also posts air advisories, including those due to wildfires, and burning restrictions to notify the public of any potential health concerns. Table 2 shows the number of days in Colorado counties with monitoring stations at which the AQI was ranked below "Good" due to ozone pollution in 2019.

⁵<https://www.colorado.gov/pacific/cdphe/state-implementation-plans-sips>

⁶https://www.colorado.gov/airquality/colorado_summary.aspx

Table 2
Number of Days Ranked Below “Good” in 2019

County	Number of Days
Adams	32
Arapahoe	130
Archuleta	32
Boulder	94
Clear Creek	85
Delta	25
Denver	70
Douglas	107
El Paso	98
Garfield	57
Gilpin	26
Gunnison	81
Jefferson	127
La Plata	95
Larimer	137
Mesa	61
Montezuma	85
Rio Blanco	52
Weld	46

Source: U.S. Environmental Protection Agency.⁷

Recent Legislation in Colorado

Table 3 includes certain legislation enacted in Colorado since 2018 related to air quality.

Table 3
Enacted Legislation Related to Air Quality

Bill Number	Summary	Link to Bill
House Bill 18-1400 Increase Fees Stationary Sources Air Pollutants	The bill increases the maximum statutory cap on certain fees set by the AQCC and requires it to assess measures to improve billing practices.	https://leg.colorado.gov/bills/hb18-1400
House Bill 19-1261 Climate Action Plan to Reduce Pollution	The bill sets statewide greenhouse gas reduction goals. The goals are to reduce emissions by at least 26 percent by 2025, 50 percent by 2030, and 90 percent by 2050.	https://leg.colorado.gov/bills/hb19-1261

⁷Data available at: https://ags.epa.gov/agsweb/airdata/download_files.html#AQI.

Table 3 (Cont.)
Enacted Legislation Related to Air Quality

Bill Number	Summary	Link to Bill
Senate 19-096 Collect Long-term Climate Change Data	The bill requires the AQCC to collect greenhouse gas data from emitting entities, report on the data, including the forecast of future emissions, and propose rules to address greenhouse gas reduction goals by July 1, 2020.	https://leg.colorado.gov/bills/sb19-096
Senate Bill 19-181 Protect Public Welfare Oil and Gas Operations	The bill allows local governments to regulate the surface impacts of oil and gas operations to protect and minimize adverse impacts to public health, safety, and welfare, and the environment. This authority includes giving local governments the right to further regulate air emissions and air quality concerns.	https://leg.colorado.gov/bills/sb19-181

Source: Legislative Council Staff.