

# WASHOE COUNTY HEALTH DISTRICT

ENHANCING QUALITY OF LIFE

## 2013-22 Washoe County, Nevada Air Quality Trends Report

June 22, 2023



**Public Health**  
Prevent. Promote. Protect.



## **VISION**

**A healthy community**

## **MISSION**

**To improve and protect our community's quality of life and increase equitable opportunities for better health.**

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## Acronyms and Abbreviations

AQI	Air Quality Index
AQMD	Washoe County Health District - Air Quality Management Division
AQS	Air Quality System
BAM	Beta Attenuation Monitor
CFR	Code of Federal Regulations
CBSA	Core-Based Statistical Area
CO	Carbon Monoxide
EPA	U.S. Environmental Protection Agency
GAL	Galletti
HA 87	Hydrographic Area 87
HC	Hydrocarbons
HNO <sub>2</sub>	Nitrous Acid
HNO <sub>3</sub>	Nitric Acid
INC	Incline
LEM	Lemmon Valley
µg/m <sup>3</sup>	Micrograms per cubic meter
NAAQS	National Ambient Air Quality Standards
NCore	National Core Multi-Pollutant Monitoring Station
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Oxides of Nitrogen
NO <sub>y</sub>	Reactive Oxides of Nitrogen
O <sub>3</sub>	Ozone
PLM	Plumb-Kit
PM	Particulate Matter
PM <sub>2.5</sub>	Particulate Matter less than or equal to 2.5 microns in aerodynamic diameter
PM <sub>10</sub>	Particulate Matter less than or equal to 10 microns in aerodynamic diameter
PM <sub>coarse</sub>	PM <sub>10</sub> minus PM <sub>2.5</sub>
ppb	Parts per billion
ppm	Parts per million
REN	Reno4
RNO	Reno3
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Station
SO <sub>2</sub>	Sulfur Dioxide
SO <sub>3</sub>	Sulfur Trioxide
SO <sub>x</sub>	Oxides of Sulfur
SPK	Sparks
SPM	Special Purpose Monitoring
SPS	Spanish Springs
SRN	South Reno
STN	Speciation Trends Network
TOL	Toll
USG	Unhealthy for Sensitive Groups
VOC	Volatile Organic Compounds

## Introduction

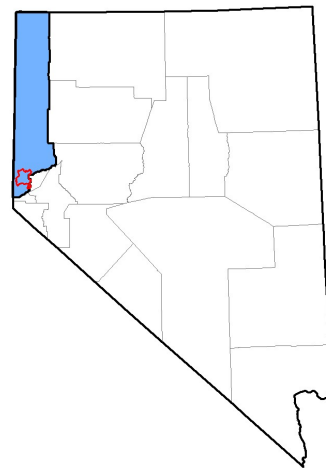
Washoe County is in the northwest portion of Nevada and bounded by California, Oregon, and the Nevada counties of Humboldt, Pershing, Storey, Churchill, Lyon, and Carson City (Figure 1). The Truckee Meadows is approximately 200 square miles in size and situated in the southern portion of Washoe County. It is geographically identified as Hydrographic Area 87 (HA 87) as defined by the State of Nevada Division of Water Resources. Most of Washoe County's urban population lives in the Truckee Meadows. Anthropogenic activities, such as automobile use and residential wood combustion, are also concentrated here.

The U.S. Environmental Protection Agency (EPA) has set health and welfare based National Ambient Air Quality Standards (NAAQS) for the following pollutants: ozone ( $O_3$ ), particulate matter less than or equal to 2.5 microns in aerodynamic diameter ( $PM_{2.5}$ ), particulate matter less than or equal to 10 microns in aerodynamic diameter ( $PM_{10}$ ), carbon monoxide (CO), nitrogen dioxide ( $NO_2$ ), sulfur dioxide ( $SO_2$ ), and lead (Pb).

The mission of the Washoe County Health District, Air Quality Management Division (AQMD) Monitoring Program is "To monitor and assure the scientific accuracy of the ambient air quality data collected for the determination of compliance with the National Ambient Air Quality Standards (NAAQS) as defined by the EPA". The AQMD has established a monitoring network throughout Washoe County to collect ambient air data. The network is reviewed annually to ensure it reflects the actual air quality of the county and that it is measuring for the pollutants of highest concern.

This document summarizes the ambient air data collected between 2013 and 2022 from the AQMD's monitoring network. These data were submitted to the EPA's Air Quality System (AQS) and are available for public review on EPA's AirData website. Long-term monitoring data can reveal trends in ambient air pollution and the subsequent need for control strategies.

Figure 1  
Washoe County, Nevada



## Pollutants

The following describes the six NAAQS criteria pollutants, their primary sources, and associated health effects.

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

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Ozone is a gas composed of three oxygen atoms. It is not usually emitted directly into the air, but, at ground-level, it is created by a chemical reaction between oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOC) in the presence of sunlight. Ozone has the same chemical structure whether it occurs miles above the earth or at ground-level and can be “good” or “bad”, depending on its location in the atmosphere. “Good” O<sub>3</sub> occurs naturally in the stratosphere approximately 10 to 30 miles above the earth and forms a layer that protects life on earth from the sun’s harmful rays.

In the lower atmosphere, ground-level O<sub>3</sub> is considered “bad”. Breathing ground-level O<sub>3</sub> can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. It can worsen bronchitis, emphysema, and asthma. Ground-level O<sub>3</sub> can also reduce lung function and inflame the linings of the lungs. Repeated exposure may permanently scar lung tissue. People with lung disease, children, older adults, and physically active people may be affected when O<sub>3</sub> levels are unhealthy. Numerous scientific studies have linked ground-level O<sub>3</sub> exposure to a variety of problems including airway irritation, coughing, and pain when taking a deep breath; wheezing and breathing difficulties during exercise or outdoor activities; inflammation, which is much like a sunburn on the skin; aggravation of asthma and increased susceptibility to respiratory illnesses like pneumonia and bronchitis; and permanent lung damage with repeated exposures.

Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources emit NO<sub>x</sub> and VOC that help form O<sub>3</sub>. Ground-level O<sub>3</sub> is the primary constituent of smog. Sunlight and hot weather cause ground-level O<sub>3</sub> to form in harmful concentrations. As a result, it is known as a summertime air pollutant. Many urban areas tend to have high levels of “bad” O<sub>3</sub>, but even rural areas are also subject to increased O<sub>3</sub> levels because wind carries O<sub>3</sub> and pollutants that form it hundreds of miles away from their original sources.

### Particulate Matter (PM<sub>10</sub>, PM<sub>2.5</sub>, and PM<sub>coarse</sub>)

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Particulate matter, also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of several components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

The size of particles is directly linked to their potential for causing health problems. Of concern are particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. EPA groups particle pollution into two categories:

- “Inhalable coarse particles” (PM<sub>10</sub> and PM<sub>coarse</sub>), such as those found near roadways and dusty industries, are between 2.5 and 10 micrometers in diameter.
- “Fine particles” (PM<sub>2.5</sub>), such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries, and automobiles react in the air.

Particle pollution, especially fine particles, contains microscopic solids or liquid droplets that are so small that they can get deep into the lungs and cause serious health problems. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including irritation of the airways, coughing, difficulty breathing, decreased lung function, aggravated asthma, development of chronic bronchitis, irregular heartbeat, nonfatal heart attacks, and premature death in people with heart or lung disease.

People with heart or lung diseases, children and older adults are the most likely to be affected by particle pollution exposure. However, even healthy people may experience temporary symptoms from exposure to elevated levels of particle pollution.

### **Carbon Monoxide (CO)**

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Carbon monoxide is a colorless, odorless gas that is formed when carbon in fuel is not burned completely. It is a byproduct of incomplete combustion found in exhaust of on-road vehicles, non-road engines and vehicles (such as construction equipment and boats) and in industrial processes, residential wood burning, and natural sources such as wildfires. Higher concentrations generally occur in areas with heavy traffic congestion. Typically, the highest ambient levels of CO typically occur during the colder months of the year when temperature inversions are more frequent. The air pollution becomes trapped near the ground beneath a layer of warm air.

Carbon monoxide can cause harmful health effects by reducing oxygen delivery to the body’s organs (i.e., heart and brain) and tissues. The health threat from lower levels of CO is most serious for those who suffer from heart disease, like angina, clogged arteries, or congestive heart failure. For a person with heart disease, a single exposure to low levels of CO may cause chest pain and a reduced ability to exercise. Repeated exposure may contribute to other cardiovascular effects. Even healthy people can be affected by high levels of CO. Exposure to high levels can result in vision problems, reduced ability to work or learn, reduced manual dexterity, and difficulty performing complex tasks. At extremely high levels, CO is poisonous and can cause death.



## Nitrogen Dioxide (NO<sub>2</sub>)

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Nitrogen dioxide is one of a group of highly reactive gasses known as “oxides of nitrogen”, or “nitrogen oxides (NO<sub>x</sub>)”. Other nitrogen oxides include nitrous acid (HNO<sub>2</sub>) and nitric acid (HNO<sub>3</sub>). While EPA’s NAAQS covers this entire group of NO<sub>x</sub>, NO<sub>2</sub> is the component of greatest interest and the indicator for the larger group of NO<sub>x</sub>. Nitrogen dioxide forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level O<sub>3</sub> and fine particle pollution, NO<sub>2</sub> is linked with several adverse effects on the respiratory system.

Current scientific evidence links short-term NO<sub>2</sub> exposures, ranging from 30 minutes to 24 hours, with adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma. Also, studies show a connection between breathing elevated short-term NO<sub>2</sub> concentrations and increased visits to emergency rooms and hospital admissions for respiratory issues, especially asthma.

NO<sub>2</sub> concentrations in vehicles and near roadways are appreciably higher than those measured at monitors in the current network. In fact, in-vehicle concentrations can be 2 to 3 times higher than measured at nearby area-wide monitors. Near-roadway (within about 50 meters) concentrations of NO<sub>2</sub> have been measured to be approximately 30 to 100% higher than concentrations away from roadways.

Individuals who spend time on or near major roadways can experience short-term NO<sub>2</sub> exposures considerably higher than measured by the current network. Approximately 16% of US housing units (approximately 48 million people) are located within 300 feet of a major highway, railroad, or airport. NO<sub>2</sub> exposure concentrations near roadways are of particular concern for susceptible individuals, including people with asthma, children, and the elderly.

NO<sub>x</sub> reacts with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. Ozone is formed when NO<sub>x</sub> and VOC react in the presence of heat and sunlight. Children, the elderly, people with lung diseases such as asthma, and people who work or exercise outdoors are at risk for adverse effects from O<sub>3</sub>. These include reduction in lung function and increased respiratory symptoms as well as respiratory-related emergency room visits, hospital admissions, and possibly premature deaths.

Emissions that lead to the formation of NO<sub>2</sub> generally also lead to the formation of other NO<sub>x</sub>. Emissions control measures leading to reductions in NO<sub>2</sub> can generally be expected to reduce population exposures to all gaseous NO<sub>x</sub>. This may have the important co-benefit of reducing the formation of O<sub>3</sub> and fine particles, both of which pose significant public health threats.

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

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Sulfur dioxide is one of a group of highly reactive gases known as “oxides of sulfur”. The largest sources of SO<sub>2</sub> emissions are from fossil fuel combustion at power plants (66%) and other industrial facilities (29%). Smaller sources of SO<sub>2</sub> emissions include industrial processes such as extracting metal from ore, and the burning of high sulfur-containing fuels by locomotives, large ships, and non-road equipment. SO<sub>2</sub> is linked with a number of adverse effects on the respiratory system.

Current scientific evidence links short-term exposures to SO<sub>2</sub>, ranging from 5 minutes to 24 hours, with an array of adverse respiratory effects including bronchoconstriction and increased asthma symptoms. These effects are particularly important for asthmatics at elevated ventilation rates (i.e., while exercising or playing). Studies also show a connection between short-term exposure and increased visits to emergency rooms and hospital admissions for respiratory illnesses, particularly in at-risk populations including children, the elderly, and asthmatics.

EPA’s SO<sub>2</sub> NAAQS is designed to protect against exposure to the entire group of sulfur oxides (SO<sub>x</sub>). SO<sub>2</sub> is the component of greatest concern and is used as the indicator for the larger group of SO<sub>x</sub>. Other gaseous sulfur oxides (i.e., sulfur trioxide (SO<sub>3</sub>)) are found in the atmosphere at concentrations much lower than SO<sub>2</sub>.

Emissions leading to high concentrations of SO<sub>2</sub> generally also lead to the formation of other SO<sub>x</sub>. Control measures that reduce SO<sub>2</sub> can generally be expected to reduce people’s exposures to all gaseous SO<sub>x</sub>. This may have the important co-benefit of reducing the formation of fine sulfate particles, which pose significant public health threats.

SO<sub>x</sub> can react with other compounds in the atmosphere to form small particles. These particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death. EPA’s PM NAAQS are designed to provide protection against these health effects.

## **Lead (Pb)**

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Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of Pb emissions have historically been motor vehicles (such as cars and trucks) and industrial sources. As a result of EPA’s efforts to remove Pb from gasoline, ambient Pb levels decreased 99% between 1980 and 2017. Today, elevated levels of Pb in air are usually found near lead smelters, waste incinerators, utilities, lead-acid battery manufacturers, and can be found in emissions of non-road mobile sources such as piston-propelled aircraft.

In addition to exposure to Pb in air, other major exposure pathways include ingestion of Pb in drinking water and lead-contaminated food as well as incidental ingestion of lead-contaminated soil and dust. Lead-based paint remains a major exposure pathway in older homes.

Once taken into the body, Pb distributes throughout the body in the blood and is accumulated in the bones. Depending on the level of exposure, Pb can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems, and the cardiovascular system. Lead exposure also affects the oxygen carrying capacity of the blood. The effects most encountered in current populations are neurological effects in children and cardiovascular effects (i.e., high blood pressure and heart disease) in adults. Infants and young children are especially sensitive to even low levels of Pb, which may contribute to behavioral problems, learning deficits, and lowered IQ.

## National Ambient Air Quality Standards

The Clean Air Act requires the EPA to establish NAAQS for pollutants considered harmful to public health and the environment. Two types of NAAQS have been established: primary and secondary standards. Primary standards set limits to protect public health, especially that of sensitive populations such as asthmatics, children, and seniors. Secondary standards set limits to protect public welfare, including protections against decreased visibility, damage to animals, crops, and buildings.

The EPA has set NAAQS for seven principal pollutants, which are called “criteria” pollutants. They are listed in Title 40 of the Code of Federal Regulations (CFR) Part 50 and summarized in Table 1 below. The units of measure for the standards are parts per million (ppm), part per billion (ppb), or micrograms per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ).

Table 1  
National Ambient Air Quality Standards (as of December 31, 2022)

Pollutant	Primary Standard		Secondary Standard		Form
	Averaging Time	Level	Averaging Time	Level	
O <sub>3</sub>	8-hour	0.070 ppm	Same as primary		Fourth highest daily maximum concentration, averaged over 3 years
PM <sub>2.5</sub>	24-hour	35 $\mu\text{g}/\text{m}^3$	Same as primary		98 <sup>th</sup> percentile of daily max, averaged over 3 years
	Annual	12.0 $\mu\text{g}/\text{m}^3$	Annual	15.0 $\mu\text{g}/\text{m}^3$	Annual mean, averaged over 3 years
PM <sub>10</sub>	24-hour	150 $\mu\text{g}/\text{m}^3$	Same as primary		Not to be exceeded more than once per year on average over 3 years
CO	1-hour	35 ppm	None		Not to be exceeded more than once per year
	8-hour	9 ppm	None		
NO <sub>2</sub>	1-hour	100 ppb	None		98 <sup>th</sup> percentile, averaged over 3 years
	Annual	53 ppb	Same as primary		Annual Mean
SO <sub>2</sub>	1-hour	75 ppb	3-hour	0.5 ppm	1 <sup>st</sup> : 99 <sup>th</sup> percentile of daily maximum concentration, averaged over 3 years
					2 <sup>nd</sup> : not to be exceeded more than once per year
Pb	Rolling 3-month average	0.15 $\mu\text{g}/\text{m}^3$	Same as primary		Not to be exceeded

## Current Design Values and Attainment Status

Table 2 summarizes Washoe County's current design values. Design values are the statistic used to compare ambient air monitoring data against the NAAQS to determine designations for each NAAQS. Designations are also codified in [40 CFR 81.329](#).

Table 2  
Design Values and Attainment Status (as of December 31, 2022)

NAAQS		Design Value	Designations	
Pollutant (Averaging Time)	Level		Unclassifiable/ Attainment, or Maintenance	Non-Attainment (classification)
O <sub>3</sub> (8-hour)	0.070 ppm	0.073 ppm	All HA's	---
PM <sub>2.5</sub> (24-hour)	35 µg/m <sup>3</sup>	78 µg/m <sup>3</sup>	All HA's	---
PM <sub>2.5</sub> (Annual)	12.0 µg/m <sup>3</sup>	11.0 µg/m <sup>3</sup>	All HA's	---
PM <sub>10</sub> (24-hour)	150 µg/m <sup>3</sup>	5.3 Expected Exceedances	All HA's <sup>1</sup>	---
CO (1-hour)	35 ppm	2.6 ppm	All HA's	---
CO (8-hour)	9 ppm	2.1 ppm	All HA's <sup>2</sup>	---
NO <sub>2</sub> (1-hour)	100 ppb	47 ppb	All HA's	---
NO <sub>2</sub> (Annual Mean)	53 ppb	12 ppb	All HA's	---
SO <sub>2</sub> (1-hour)	75 ppb	3 ppb	All HA's	---
Pb (Rolling 3-month average)	0.15 µg/m <sup>3</sup>	n/a	All HA's	---

<sup>1</sup> Maintenance Area for PM<sub>10</sub> (1<sup>st</sup> 10-year maintenance plan expires January 6, 2026) [80 FR 76232](#)

<sup>2</sup> Maintenance Area for CO (2<sup>nd</sup> 10 year maintenance plan expires October 31, 2026) [81 FR 59490](#)

## Ambient Air Monitoring Network

The AQMD began monitoring ambient air quality in Washoe County in the 1960's, and the monitoring network has grown and evolved since that time. This trends report provides a summary of data collected from ambient air monitoring sites in Washoe County that the AQMD operated and maintained between 2013 and 2022 to measure O<sub>3</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>, CO, NO<sub>2</sub>, and SO<sub>2</sub>. Due to not exceeding airport and non-airport emissions limits in 40 CFR 58, Appendix D, Section 4.5(a), there is no Pb monitoring in Washoe County.

Each monitoring site is classified into one of two major categories, SLAMS (State and Local Air Monitoring Station) and SPM (Special Purpose Monitoring). SLAMS consist of a network of monitoring stations, the size and distribution of which is largely determined by the monitoring requirements for NAAQS comparison. SLAMS in the AQMD's network can be further classified as NCore (National Core monitoring network) or STN (Speciation Trends Network).

The AQMD's monitoring stations are sited in accordance with 40 CFR 58 and utilize equipment designated as reference or equivalent methods.<sup>1</sup> In addition, the network is reviewed annually<sup>2</sup> to ensure it meets the monitoring objectives defined in 40 CFR 58, Appendix D. Ambient air monitoring data are collected, quality assured,<sup>3</sup> and recorded in AQS. Appendix A of this document provides a detailed summary of the ambient air monitoring data for 2022. All data summarized in Appendix A has been provided by reports retrieved from AQS. The data provided by AQS reports were certified on April 18, 2023. Figure 2 displays the ambient air monitoring sites operated between 2013 and 2022. For specific details regarding the ambient air monitoring network, refer to the AQMD's "2022 Ambient Air Monitoring Network Plan" and "2020 Ambient Air Monitoring Network Assessment".

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<sup>1</sup> 40 CFR 53.

<sup>2</sup> 40 CFR 58.10.

<sup>3</sup> 40 CFR 58.



Figure 2  
 Washoe County Ambient Air Monitoring Sites (2013-2022)

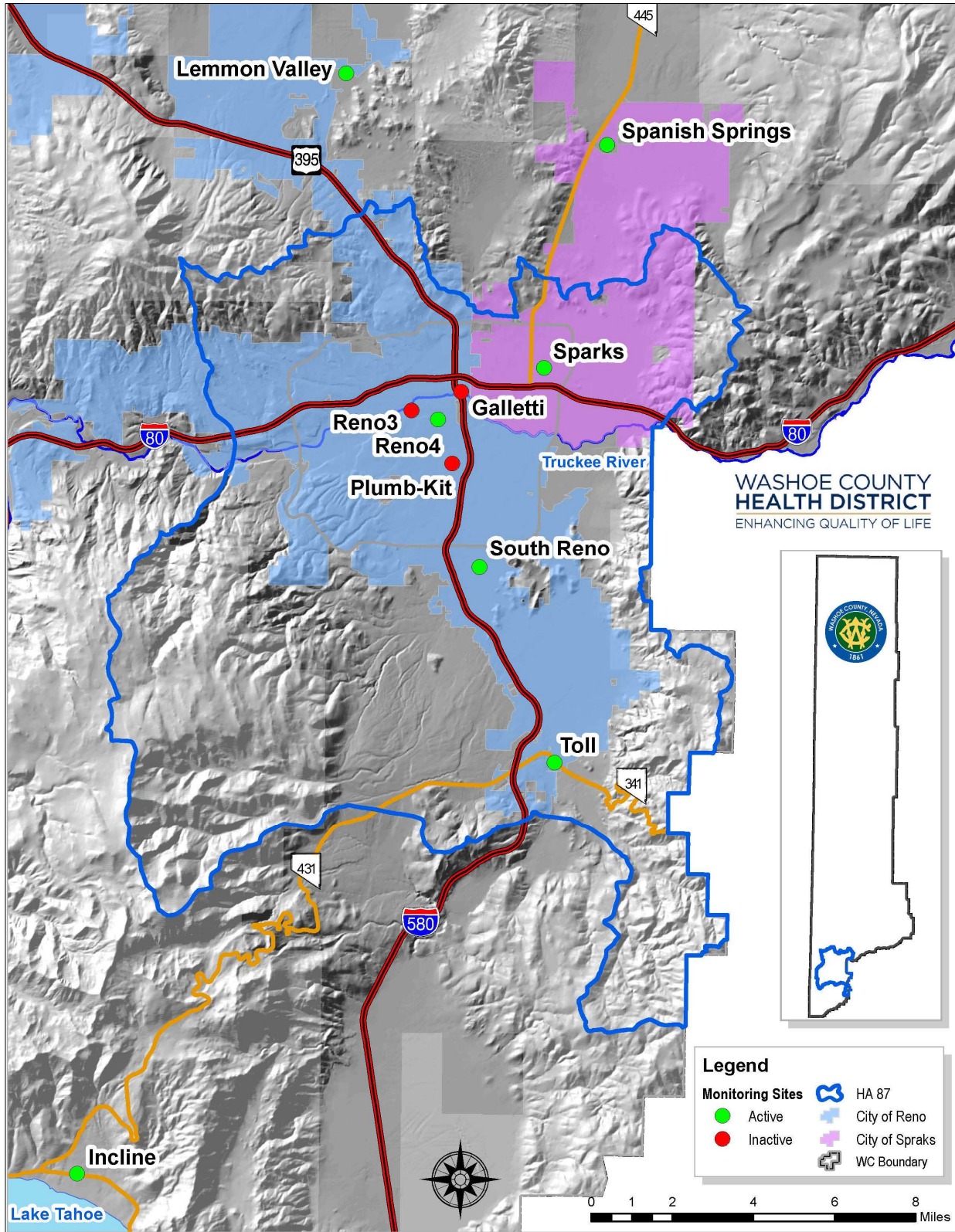


Table 3 Monitoring Stations in Operation and Pollutants Monitored in 2022

Network Type Site	O <sub>3</sub>	CO	Trace CO	Trace NO	NO <sub>2</sub>	NO <sub>x</sub>	Trace NOy	Trace SO <sub>2</sub>	PM <sub>10</sub> (manual)	PM <sub>10</sub> (continuous)	PM <sub>2.5</sub> (manual)	PM <sub>2.5</sub> (continuous)	PM <sub>coarse</sub> (manual)	PM <sub>coarse</sub> (continuous)	PM <sub>2.5</sub> Speciation	Meteorology
SLAMS																
Incline	✓															
Lemmon Valley	✓															
South Reno	✓															✓
Spanish Springs	✓									✓		✓		✓		✓
Sparks	✓	✓								✓		✓		✓		
Toll	✓									✓		✓		✓		✓
NCore																
Reno4	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Speciation Trends																
Reno4															✓	

**Monitoring Stations in Operation and Pollutants Monitored Prior to 2022**

Ambient air monitoring data have been collected in Washoe County since 1963. A complete historical list of monitoring stations and pollutants monitored is included in Appendix B.



## A Review of 2022

January and February continued the green burn code streak from 2021. The 2021-22 burn code season ended with 119 green burn codes and one yellow. The highest 24-hour average for  $PM_{2.5}$  during the 2021-2022 burn code season was  $20.7 \mu\text{g}/\text{m}^3$  on January 24 at Sparks. By the end of winter, high temperatures and below average precipitation led to Washoe County being an area of moderate to extreme drought according to the U.S. Drought Monitor. This led to heightened concern of wildfire smoke impacts in the area.

In the end of April 2022, large wildfires in Siberia and dust storms in the Gobi Desert brought dust and smoke across the Atlantic. Elevated  $PM_{2.5}$  and ozone concentrations were noted at all monitors between April 25 and April 27.

NWS Image of Regional Haze During Siberian Fires and Gobi Dust April 27



The first fire to impact Washoe County was a prescribed fire near Verdi on May 17. The first wildfire effected day was on May 26. Wildfire in Mexico and potentially California's Central Valley contributed to elevated ozone concentrations in the area. The next set of wildfires that brought smoke impacts to the area included the Rices Fire (June 28), Electra Fire (July 4), and the Washburn Fire (July 7). The Oak Fire started on July 22 and elevated the AQI to Unhealthy for Sensitive Groups (USG) throughout the area. The largest fire of the season was the Mosquito Fire. The Mosquito Fire started on September 6 and impacted the area for about 2 weeks. This fire caused the fifth highest monitored 24-hr  $PM_{2.5}$  concentration on record. On September 14<sup>th</sup> at Spanish Springs, a concentration of  $184 \mu\text{g}/\text{m}^3$  and an AQI of 234 was recorded.

Satellite Image of the Mosquito Fire on September 14



The 2022-2023 Burn Code season started with 2 yellow burn codes on November 22 and 23, respectively. December saw a total of 3 yellow burn code days.

Table 4 summarizes NAAQS exceedances in 2022 by pollutant, averaging period, and dates.

Table 4  
2022 NAAQS Exceedances Summary

Pollutant	Averaging Period	Exceedance Dates
O <sub>3</sub>	8-hour	Jul: 22
PM <sub>2.5</sub>	24-hour	Sep: 10-17
PM <sub>10</sub>	24-hour	Sep: 11, 13-16
CO	1-hour	None
	8-hour	None
NO <sub>2</sub>	1-hour	None
SO <sub>2</sub>	1-hour	None
	3-hour	None
Pb	Rolling 3-month	Not required to monitor based on population size and lack of significant Pb sources.

## 2022 Air Quality Index Summaries

The Air Quality Index (AQI) is an index for reporting daily air quality that has been established by the EPA. It informs the public how clean or polluted the air is, and what associated health effects might be a concern. The AQI is reported to the public via EnviroFlash, social media (Facebook and Twitter), AirNow.gov, and the AQMD's air quality hotline ((775) 785-4110). The email, social media, and hotline are updated daily, and more often during air pollution episodes. The next six figures are pollutant-specific and summarize Washoe County's air quality for the previous year by pollutant, month, and AQI categories. The highest NAAQS average pollutant throughout our network is the AQI for that day. Months with less AQIs than days for NO<sub>2</sub> are due to not meeting data completeness requirements for the AQI averaging time due to invalid data.

Figure 5  
Monthly AQI Summary for All Pollutants (2022)

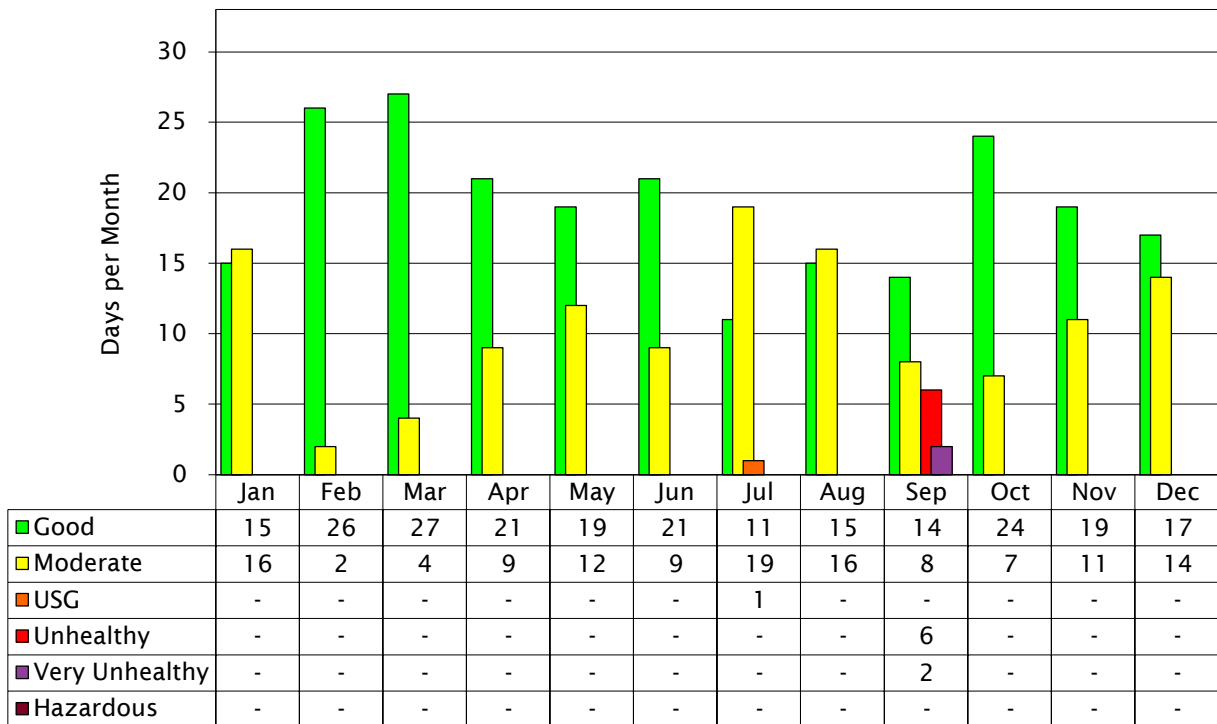


Figure 6  
Monthly AQI Summary of O<sub>3</sub> (2022)

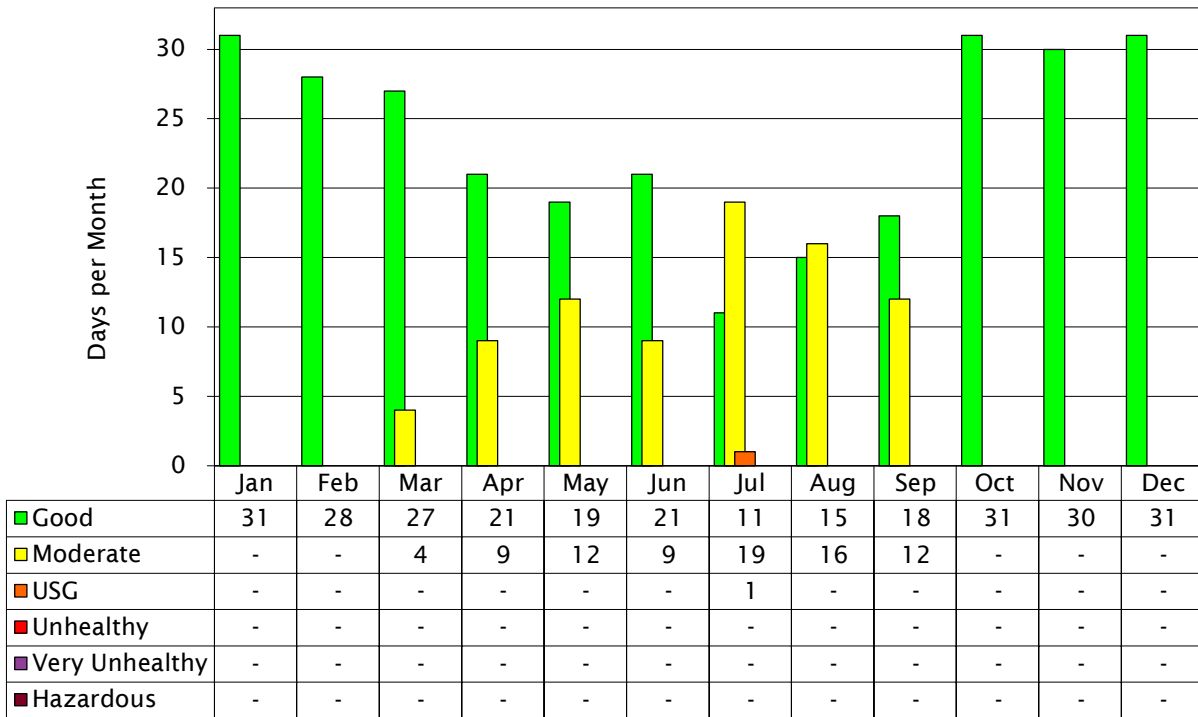


Figure 7  
Monthly AQI Summary of PM<sub>2.5</sub> (2022)

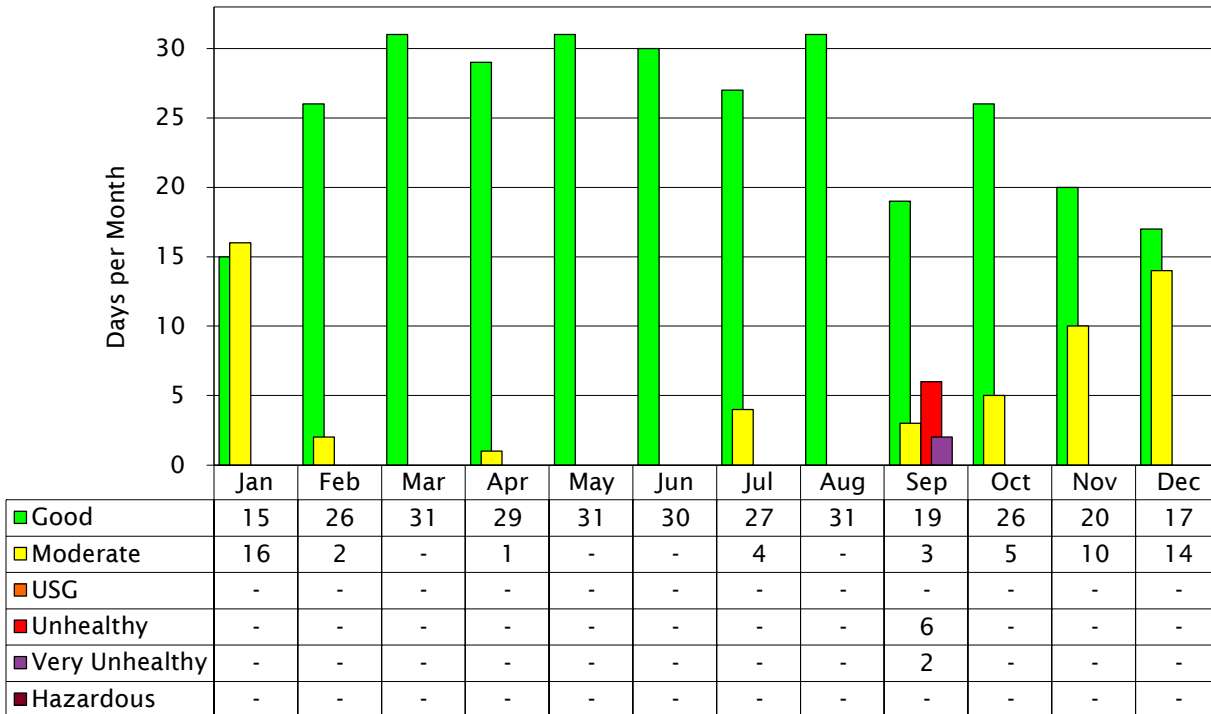


Figure 8  
Monthly AQI Summary of PM<sub>10</sub> (2022)

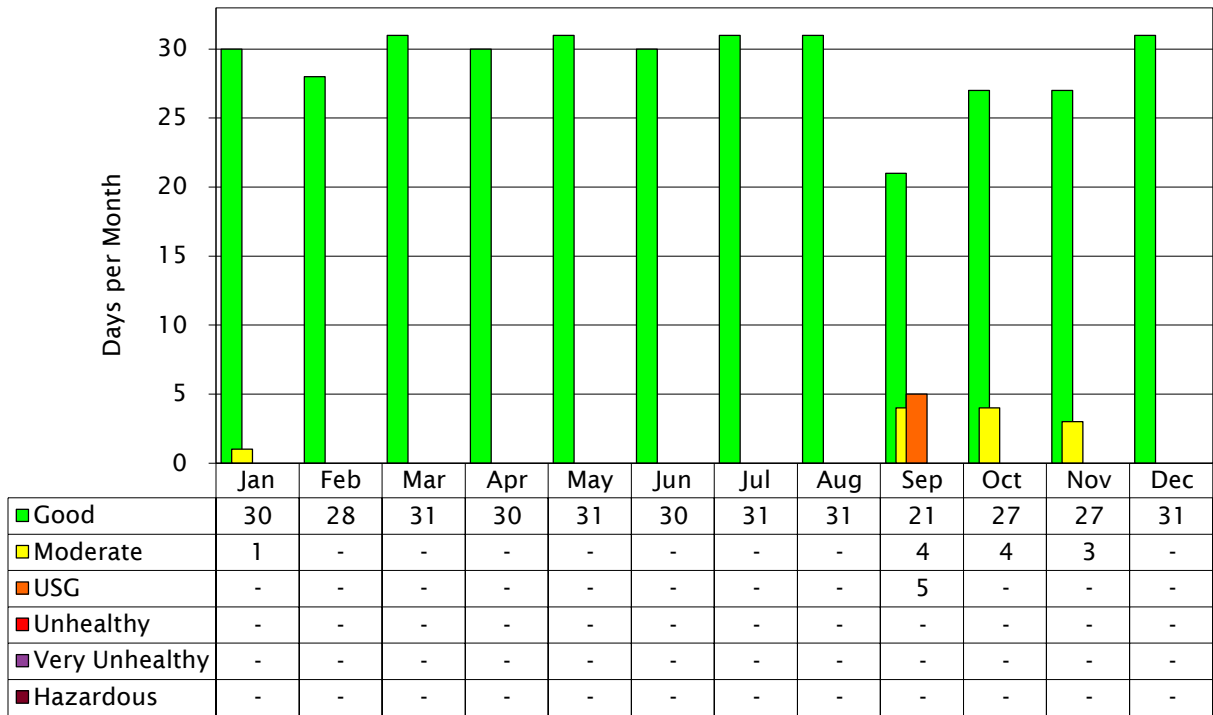


Figure 9  
Monthly AQI Summary of CO (2022)

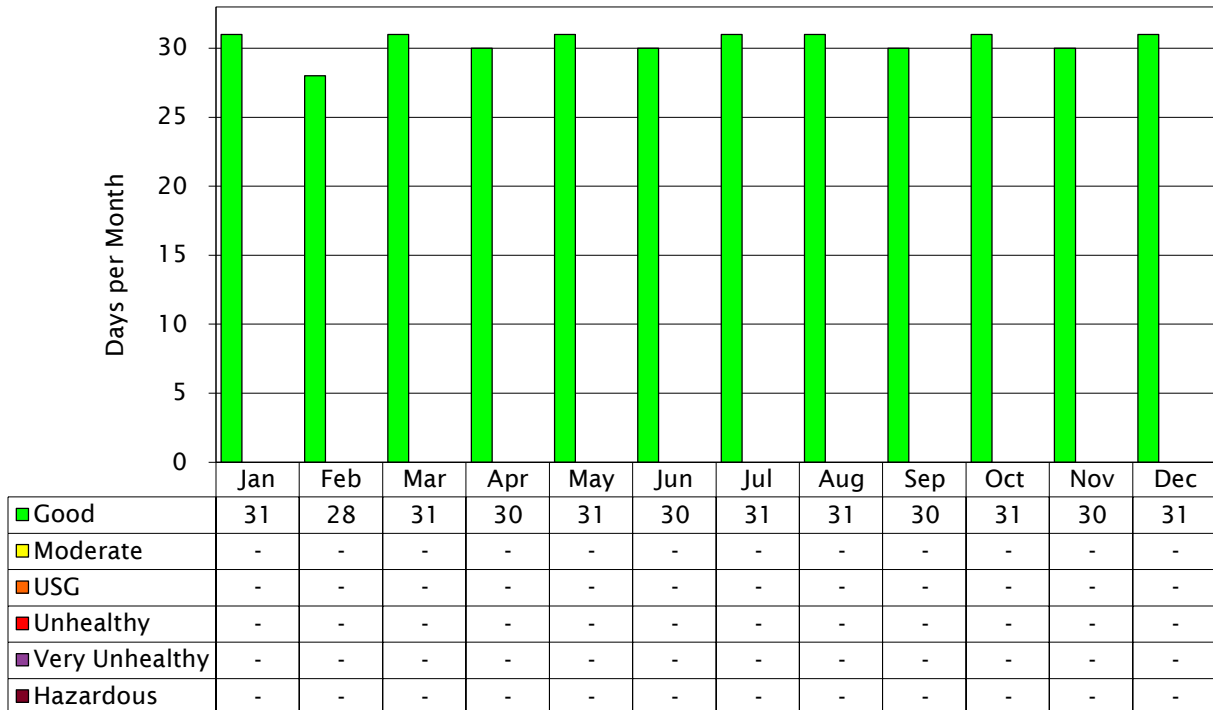


Figure 10  
Monthly AQI Summary of NO<sub>2</sub> (2022)

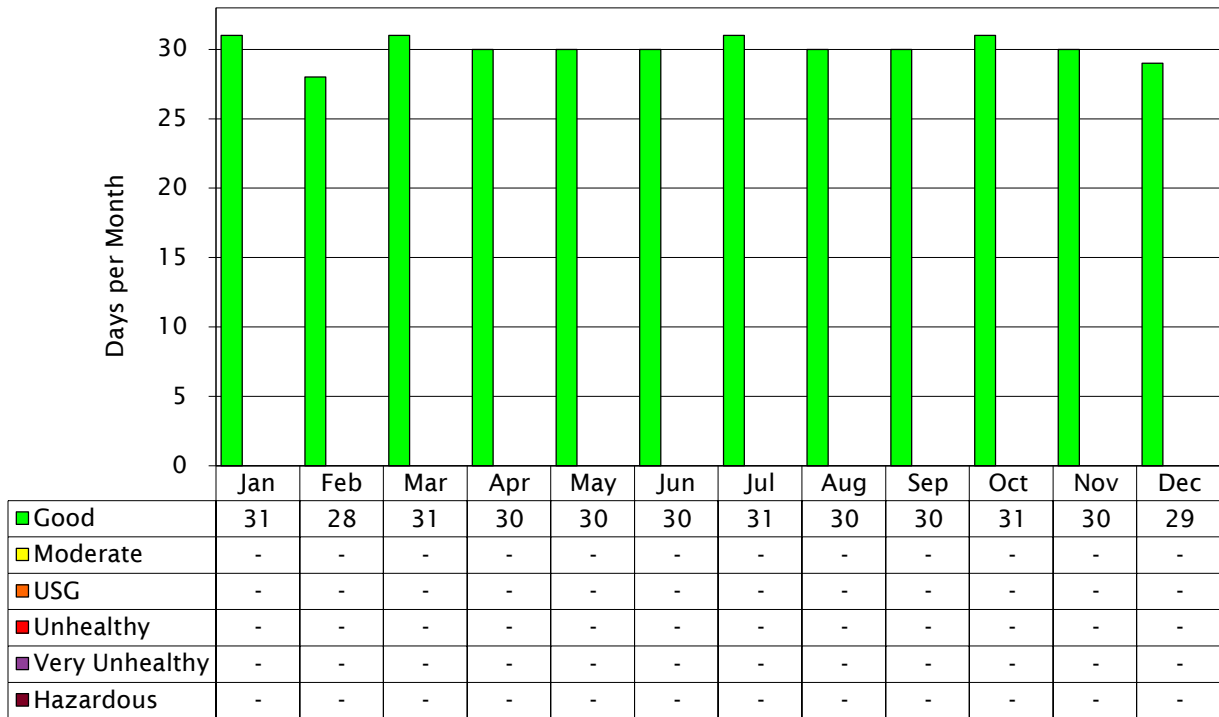
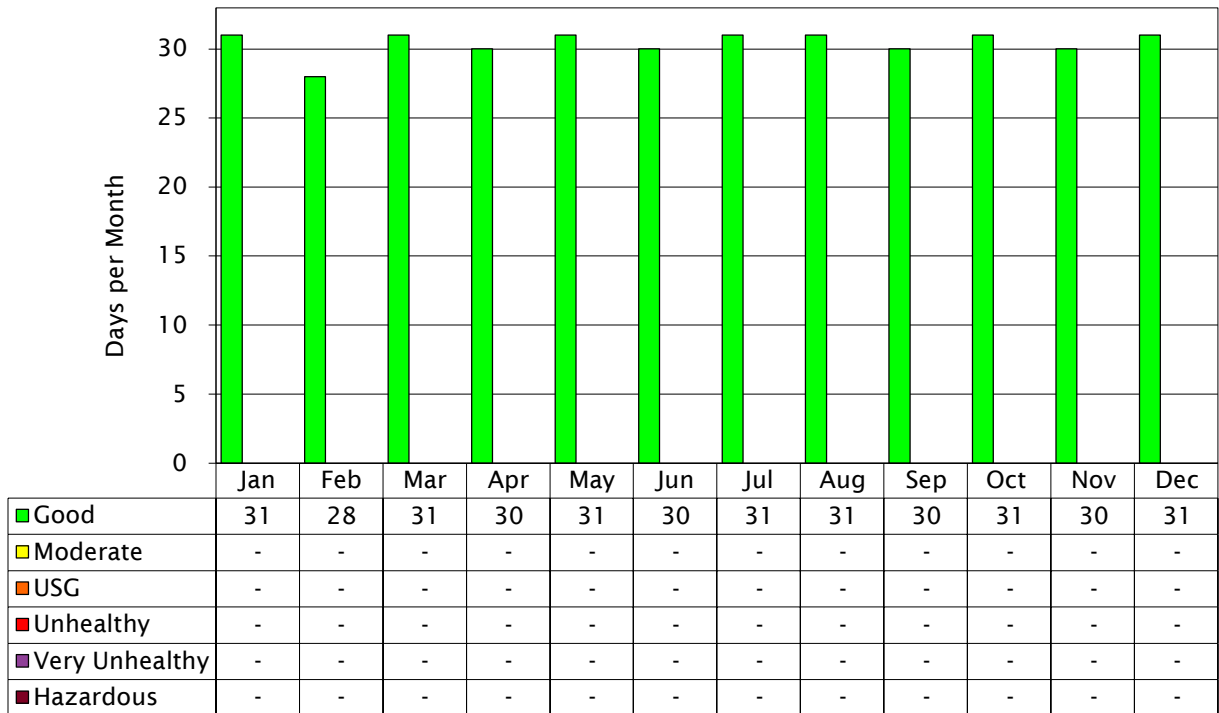


Figure 11  
Monthly AQI Summary of SO<sub>2</sub> (2022)

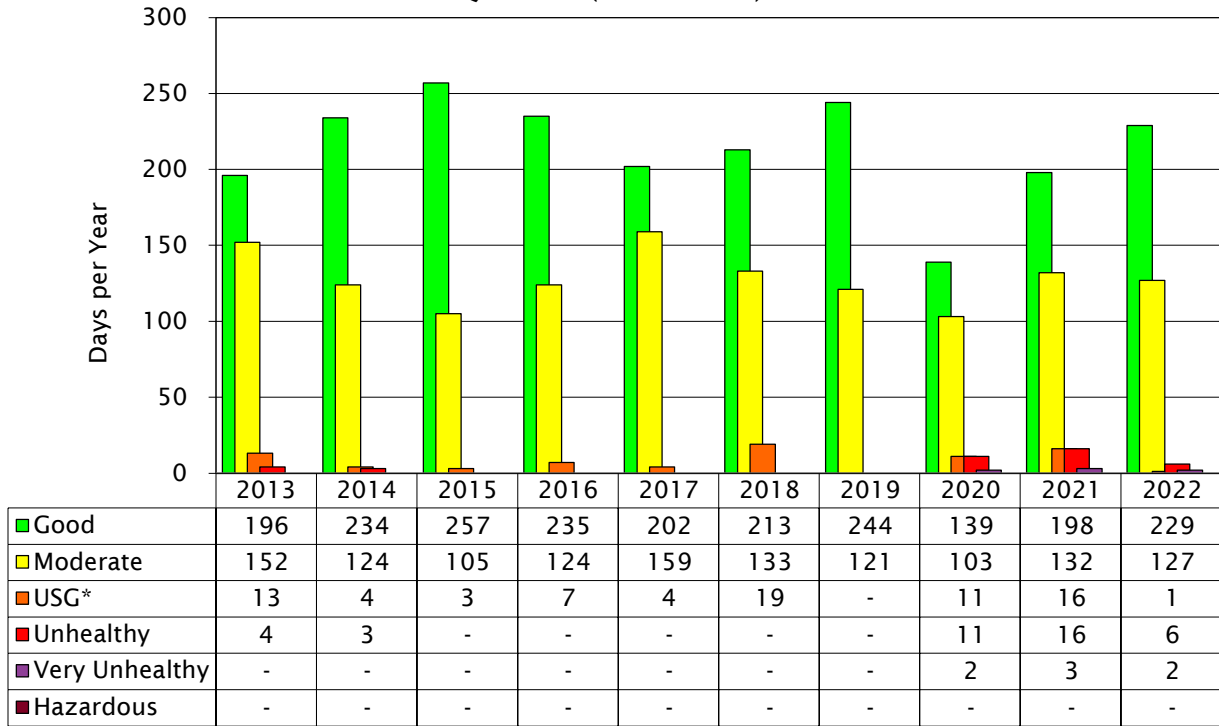


## Ten-Year Air Quality Trend

### Air Quality Index

Figure 12 summarizes the ten-year trend in AQI between 2013 and 2022. A NAAQS revision in 2015 resulted in changes to AQI category ranges and the number of days per year within those ranges.

Figure 12  
AQI Trend (2013-2022)



\* Unhealthy for Sensitive Groups

#### Notes

2015: 8-hour O<sub>3</sub> NAAQS strengthened from 0.075 to 0.070 ppm.

## Burn Code Season

The Burn Code program has been in place since 1987. It begins November 1 and ends on the last day of February. During this wintertime period, the burn code curtails PM<sub>10</sub>, PM<sub>2.5</sub>, and CO emissions from residential and commercial solid fuel burning devices such as wood stoves, pellet stoves, fireplaces, and residential open burning.

**Green:** Issued when PM<sub>2.5</sub> levels are low and are not expected to be approaching the 24-hour PM<sub>2.5</sub> NAAQS. It is legal for residents and businesses to use their solid fuel burning device.

**Yellow:** Issued when PM<sub>2.5</sub> levels are approaching the 24-hour PM<sub>2.5</sub> NAAQS. It is legal for residents and businesses to use their solid fuel burning device, but it is encouraged to reduce or stop burning.

**Red:** Issued when PM<sub>2.5</sub> levels are above or expected to be above the PM<sub>2.5</sub> NAAQS. Under an Emergency Episode Stage 1, it is illegal for residents to use their solid fuel burning device, except residents that have a sole source exemption, and for residents to conduct open burning. Under an Emergency Episode Stage 2, it is illegal for the previously mentioned activities and for businesses to burn solid fuel.

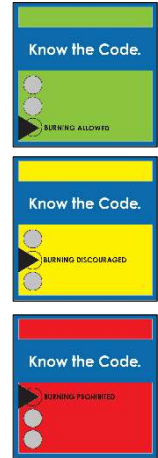
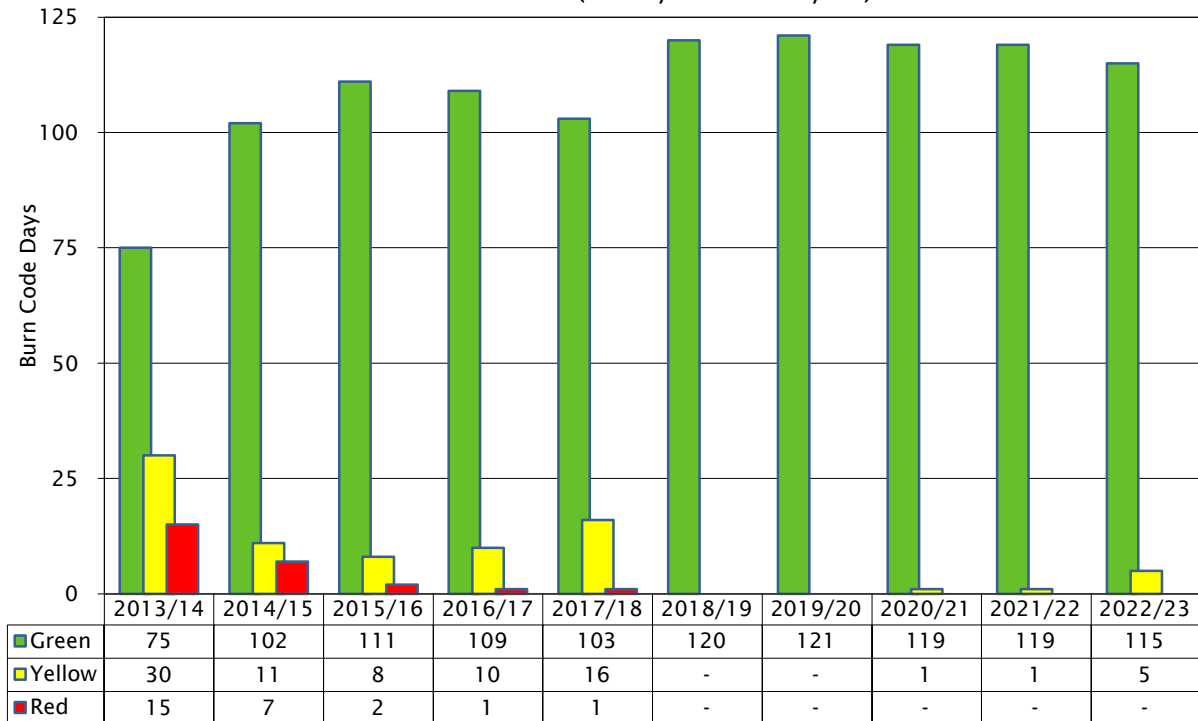


Figure 13  
Burn Code Seasons (2013/14 - 2022/23)





## Design Values

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The following section contains data that the AQMD has flagged as “exceptional” due to events such as wildfires and high winds. The design values will include these “exceptional” data until EPA determines concurrence with AQMD’s exceptional events demonstrations. Ozone exceptional events for the Reno3 monitoring station in 2015 and 2016 were concurred by EPA Region 9 on May 30, 2017.<sup>4</sup>

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<sup>4</sup> “Exceptional Events Document Ozone - Washoe, NV.” ([www.epa.gov/air-quality-analysis/exceptional-events-documents-ozone-washoe-nv](http://www.epa.gov/air-quality-analysis/exceptional-events-documents-ozone-washoe-nv)), EPA.gov. United States Environmental Protection Agency, 9 June 2017. Web. 27 April 2023

## O<sub>3</sub> (8-hour) Design Values

NAAQS Level: 0.070 ppm

Design Value (2020-2022): 0.073 ppm (INC)

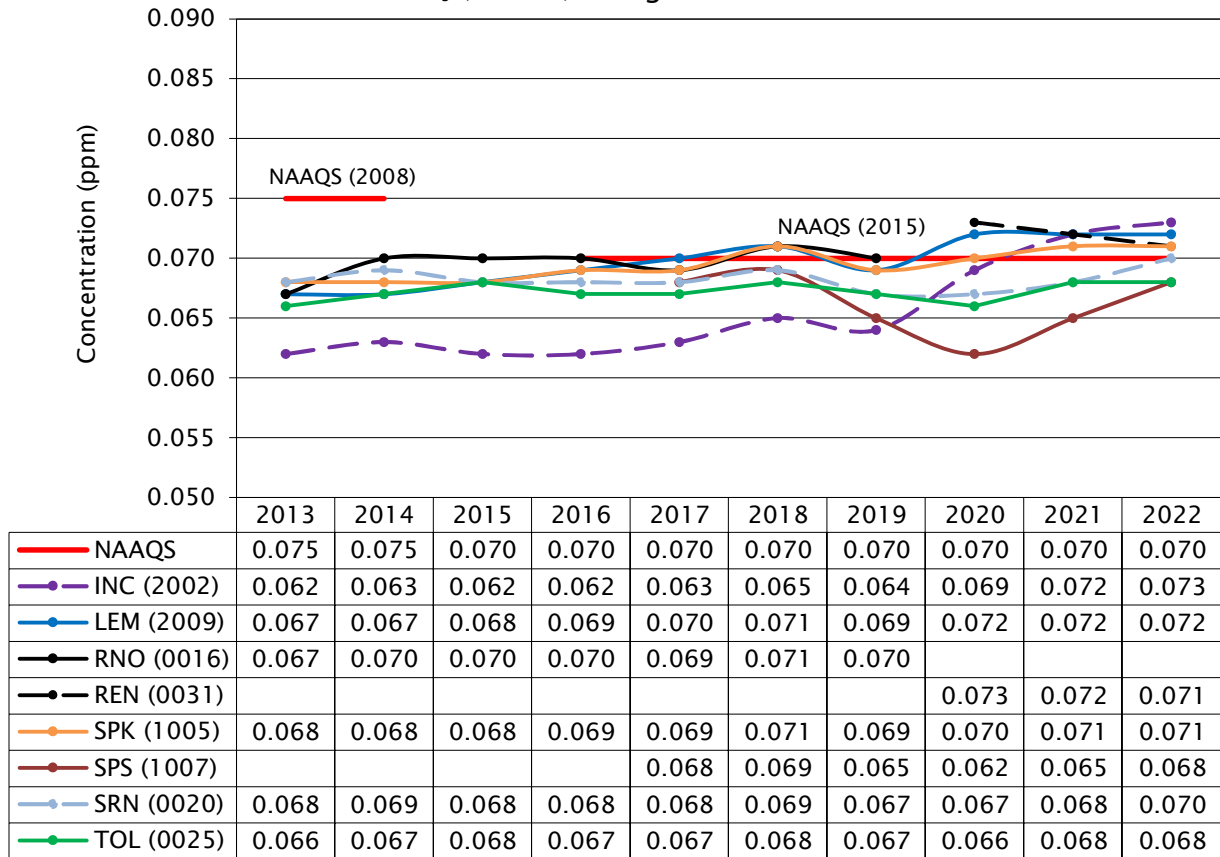
Current Designation: Attainment/Unclassifiable (Entire County)

2022 Exceedances: 1

2022 First High: 0.075 ppm (Jul 22 – SPS & SRN)

2022 Fourth High: 0.066 ppm (Jul 23 – SRN)

Figure 14  
O<sub>3</sub> (8-hour) Design Values



## PM<sub>2.5</sub> (24-hour) Design Values

NAAQS Level: 35 µg/m<sup>3</sup>

Design Value (2020-22): 78 µg/m<sup>3</sup> (REN)

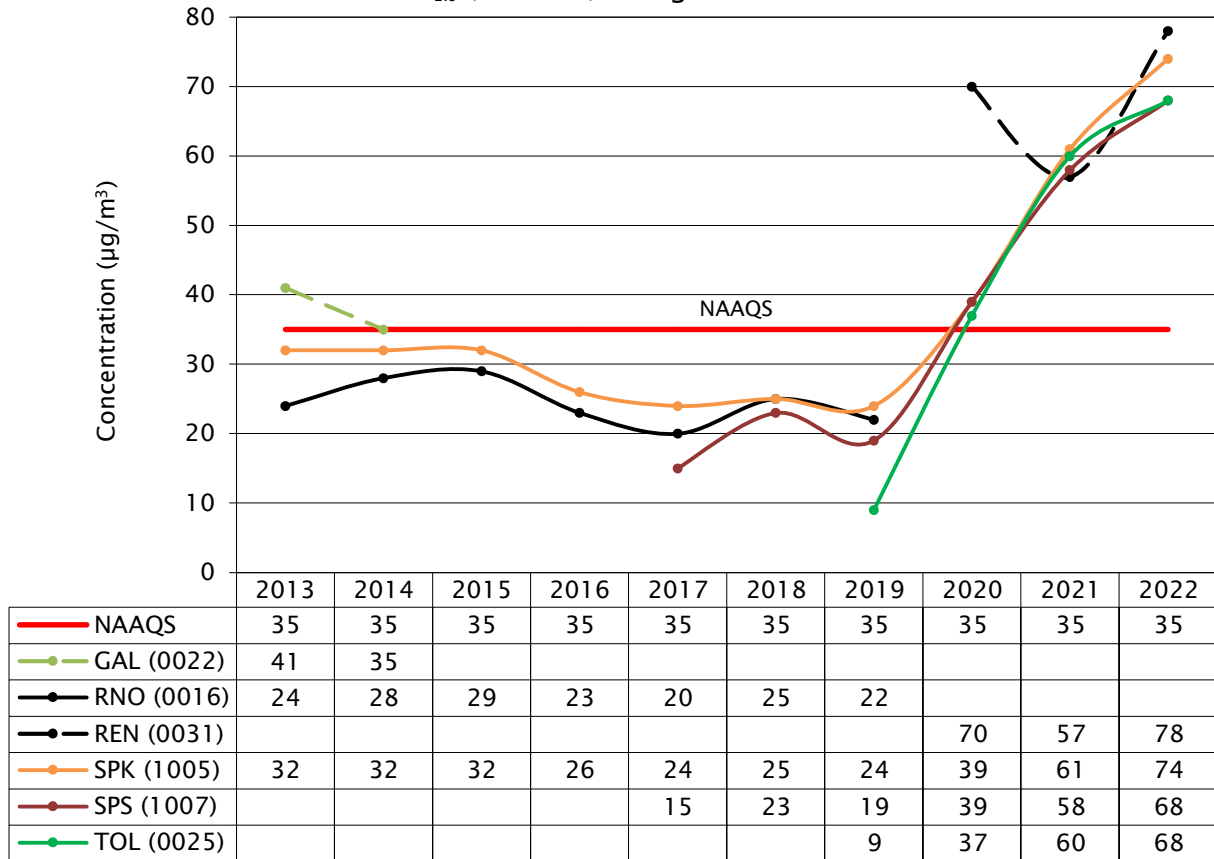
Current Designation: Attainment/Unclassifiable (Entire County)

2022 Exceedances: 8

2022 First High: 184.0 µg/m<sup>3</sup> (Sep 14 - SPS)

2022 98<sup>th</sup> Percentile: 74.1 µg/m<sup>3</sup> (Sep 11 - REN)

Figure 15  
PM<sub>2.5</sub> (24-hour) Design Values



## PM<sub>2.5</sub> (Annual) Design Values

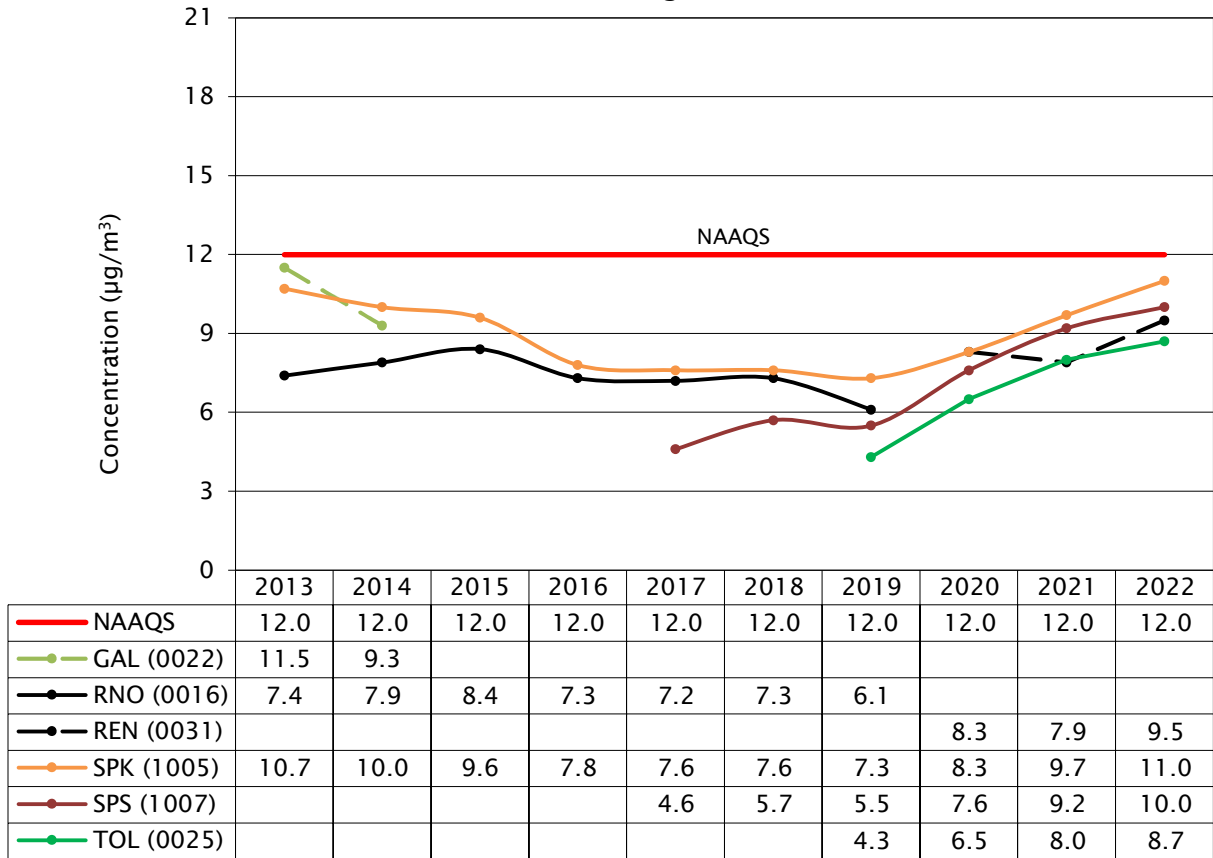
NAAQS Level: 12.0 µg/m<sup>3</sup>

Design Value (2020-22): 11.0 µg/m<sup>3</sup> (SPK)

Current Designation: Attainment/Unclassifiable (Entire County)

2022 Annual Weighted Mean: 10.0 µg/m<sup>3</sup> (SPK)

Figure 16  
PM<sub>2.5</sub> (Annual) Design Values



## PM<sub>10</sub> (24-hour) First Highs

NAAQS Level: 150 µg/m<sup>3</sup>

Design Value (2020-22): 5.3 expected exceedances (TOL)

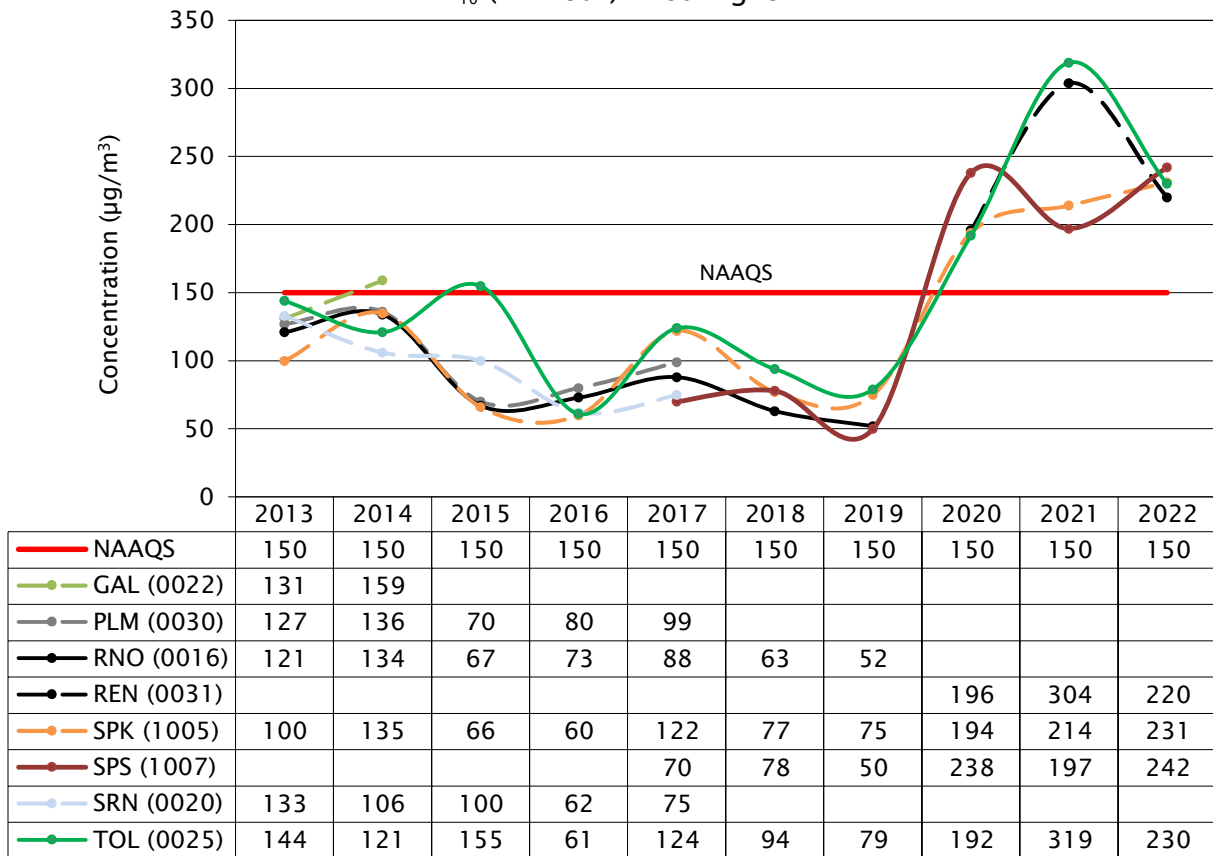
Current Designation: Attainment (HA 87); Attainment/Unclassifiable (Remainder of County)

2022 Exceedances: 4

2022 Expected Exceedances: 4.0 (TOL)

2022 First High: 242 µg/m<sup>3</sup> (Sep 14 - SPS)

Figure 17  
PM<sub>10</sub> (24-hour) First Highs



## CO (8-hour) Design Values

NAAQS Level: 9 ppm

Design Value (2021-22): 2.1 ppm (REN)

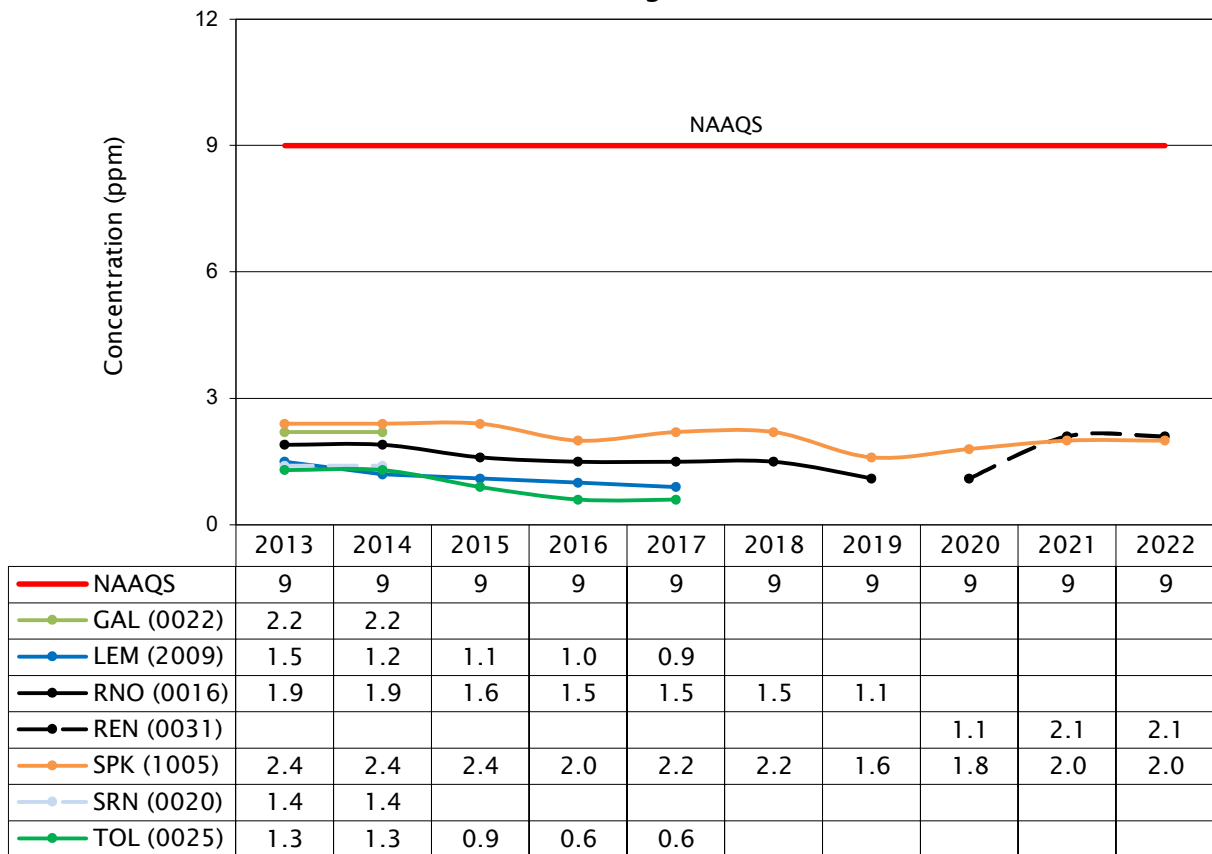
Current Designation: Attainment (HA 87); Attainment/Unclassifiable (Remainder of County)

2022 Exceedances: 0

2022 First High: 2.3 ppm (Sep 14 - SPK)

2022 Second High: 1.8 ppm (Sep 14 - SPK)

Figure 18  
CO (8-hour) Design Values



## CO (1-hour) Design Values

NAAQS Level: 35 ppm

Design Value (2021-22): 2.6 ppm (SPK)

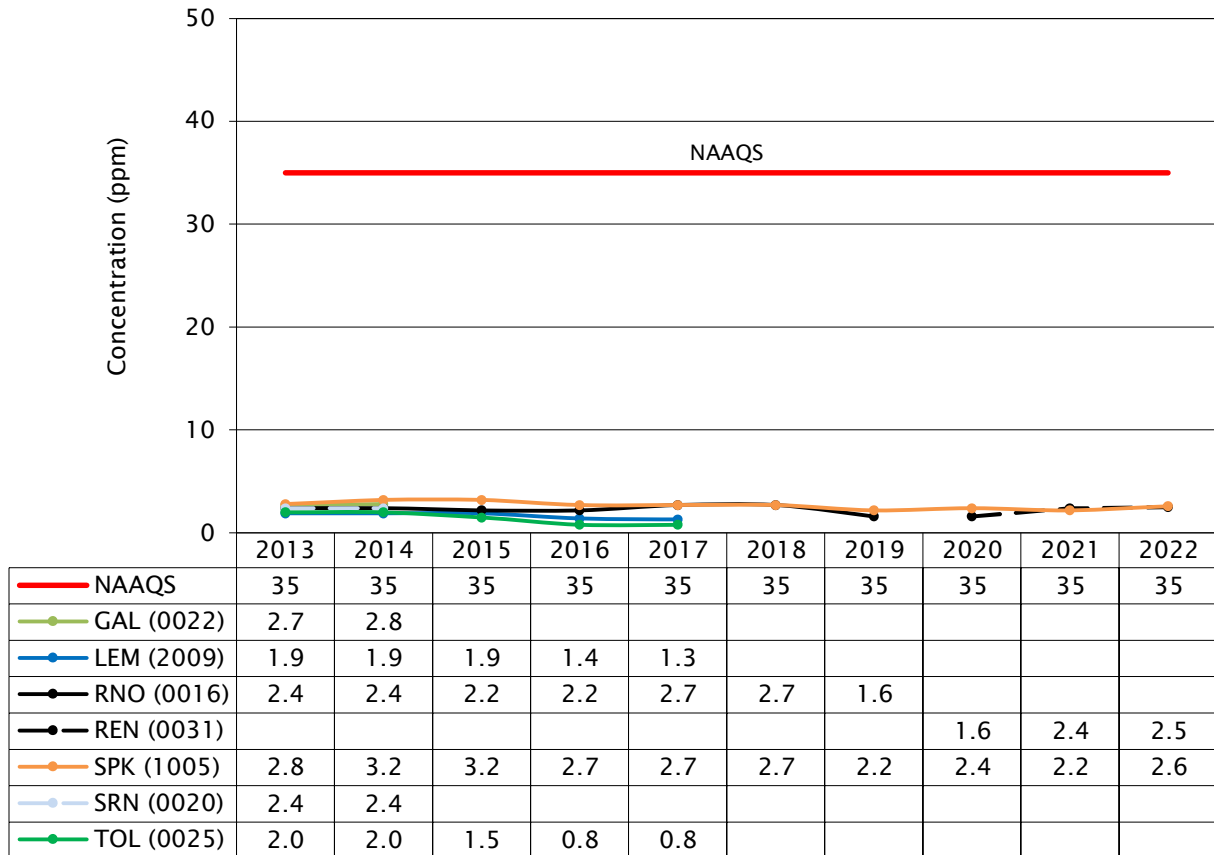
Current Designation: Attainment/Unclassifiable (Entire County)

2022 Exceedances: 0

2022 First High: 3.3 ppm (Sep 12 - REN)

2022 Second High: 2.7 ppm (Sep 12 - SPK)

Figure 19  
CO (1-hour) Design Values



## NO<sub>2</sub> (1-hour) Design Values

NAAQS Level: 100 ppb

Design Value (2020-22): 47 ppb (REN)

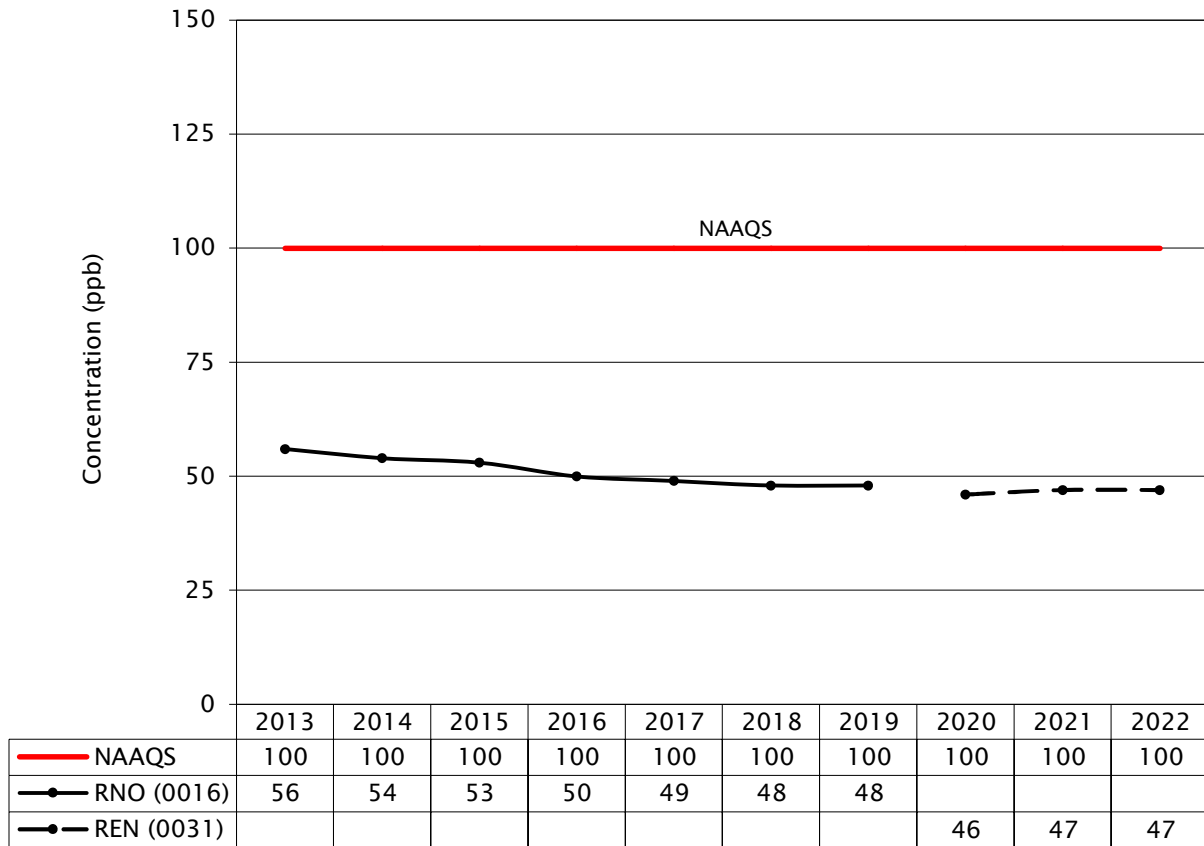
Current Designation: Attainment/Unclassifiable (Entire County)

2022 Exceedances: 0

2022 First High: 51.6 ppb (Feb 14 - REN)

2022 98<sup>th</sup> Percentile: 47.2 ppb (Nov 23 - REN)

Figure 20  
NO<sub>2</sub> (1-hour) Design Values





## NO<sub>2</sub> (Annual) Design Values

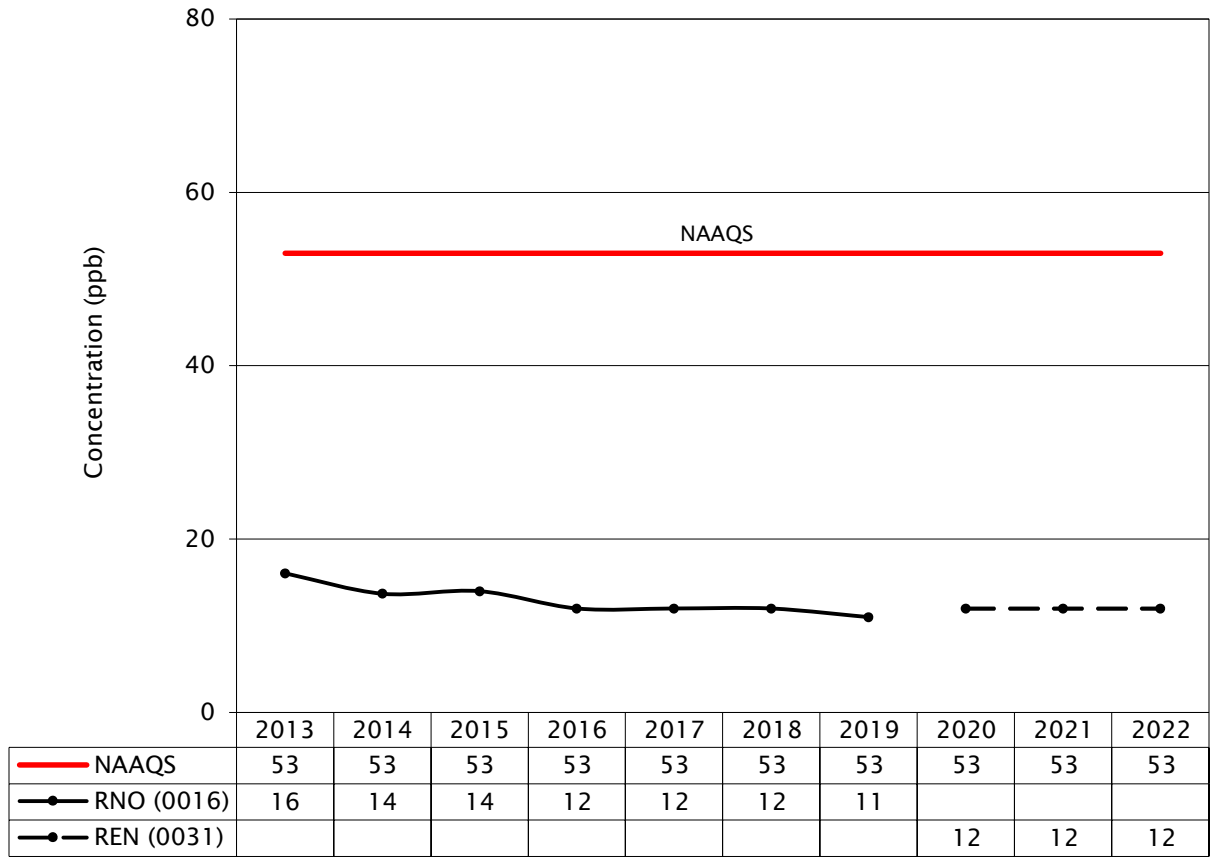
NAAQS Level: 53 ppb

Design Value (2022): 12 ppb (REN)

Current Designation: Attainment/Unclassifiable (Entire County)

2022 Annual Mean: 11.8 ppb (REN)

Figure 21  
NO<sub>2</sub> (Annual) Design Values



## SO<sub>2</sub> (1-hour) Design Values

NAAQS Level: 75 ppb

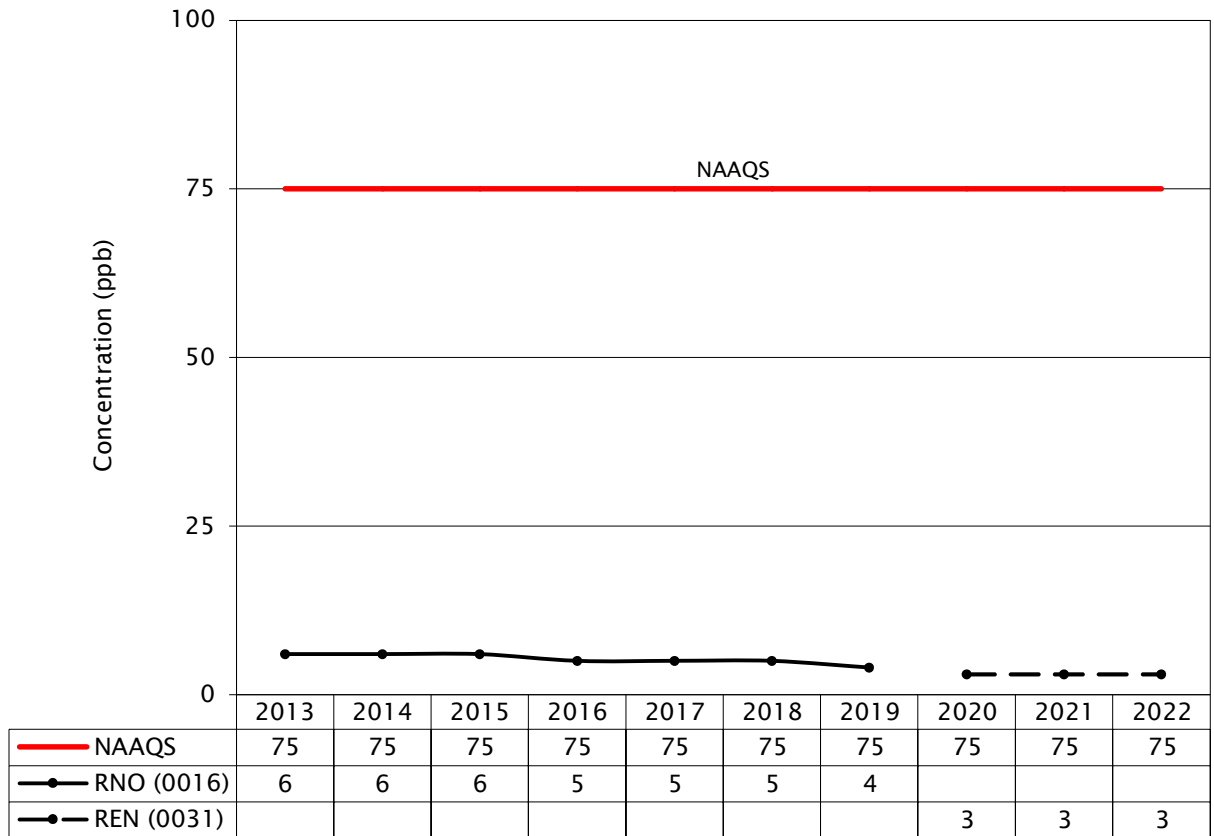
Design Value (2020-22): 3 ppb (REN)

Current Designations: Attainment/Unclassifiable (Entire County)

2022 First High: 4.0 ppb (Jan 13 - REN)

2022 99<sup>th</sup> Percentile: 3.4 ppb (Jan 25 - REN)

Figure 22  
SO<sub>2</sub> (1-hour) Design Values



## Appendix A

### Detailed Summary of Ambient Air Monitoring Data

**Exceedances** highlighted in Yellow

**Violations** highlighted in Red

## NAAQS Exceedances (2020 - 2022)

Pollutant	Averaging Period	Exceedance Dates		
		2020	2021	2022
O <sub>3</sub>	8-hour	Aug: 20-25, 30 Sep: 14-17	Apr: 29 Jun: 16 Jul: 15-17, 24-26 Aug: 6-8, 11-12, 14, 16, 20-26 Sep: 2, 25-26	Jul: 22
PM <sub>2.5</sub>	24-hour	Aug: 16, 19-23, 25, 27-30 Sep: 3, 7, 11-17, 30 Oct: 1	Jul: 23-26 Aug: 6-12, 14, 15-17, 20-26, 27, 29, 31 Sep: 1, 4	Sep: 10-17
PM <sub>10</sub>	24-hour	Sep: 8, 11-13, 15-16	Jul: 24-26, Aug: 6-7, 16-17, 20-26	Sep: 11, 13-16
CO	1-hour	None	None	None
CO	8-hour	None	None	None
NO <sub>2</sub>	1-hour	None	None	None
SO <sub>2</sub>	1-hour	None	None	None
Pb	Rolling 3-month	n/a - Pb was not monitored		

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

### 8-Hour Ozone Averages (ppm) (2022)

Rank	INC (2002)		LEM (2009)		REN (0031)		SRN (0020)		SPK (1005)		SPS (1007)		TOL (0025)	
	Value	Date	Value	Date	Value	Date	Value	Date	Value	Date	Value	Date	Value	Date
1	0.073	07/22	0.067	07/22	0.073	07/22	0.075	07/22	0.070	07/22	0.075	07/22	0.071	07/22
2	0.066	07/24	0.062	06/07	0.067	08/19	0.068	07/21	0.064	07/21	0.066	06/07	0.064	07/21
3	0.065	04/27	0.062	07/21	0.066	07/21	0.067	07/13	0.063	06/06	0.066	07/21	0.063	07/13
4	0.065	04/29	0.061	08/31	0.065	07/23	0.066	07/23	0.063	09/01	0.066	09/01	0.061	07/23
5	0.065	06/07	0.060	05/26	0.065	09/01	0.065	04/29	0.062	06/07	0.064	06/06	0.061	04/29
6	0.064	04/26	0.060	08/07	0.064	06/06	0.065	07/14	0.062	07/13	0.064	07/14	0.061	07/14
7	0.064	05/26	0.059	04/27	0.064	06/07	0.065	08/19	0.061	07/23	0.063	05/26	0.061	08/19
8	0.063	07/14	0.059	06/06	0.064	07/13	0.065	09/01	0.061	08/07	0.063	07/13	0.060	09/01
9	0.062	04/28	0.058	04/29	0.063	05/26	0.064	05/06	0.061	08/19	0.063	07/23	0.060	05/06
10	0.062	06/06	0.058	07/23	0.063	07/14	0.064	05/26	0.060	08/20	0.063	08/23	0.060	05/26

### 4<sup>th</sup> High 8-Hour Ozone Averages (2020-2022) and Design Values (ppm)

Year	INC (2002)		LEM (2009)		REN (0031)		SRN (0020)		SPK (1005)		SPS (1007)		TOL (0025)	
	Value	Date	Value	Date	Value	Date	Value	Date	Value	Date	Value	Date	Value	Date
2020	0.078	09/17	0.079	09/15	0.073	08/23	0.066	08/21	0.072	08/22	0.061	08/18	0.066	08/02
2021	0.078	08/07	0.077	08/22	0.077	07/25	0.079	07/24	0.080	08/22	0.078	07/25	0.078	08/23
2022	0.065	04/29	0.061	08/31	0.065	07/23	0.066	07/23	0.063	06/06	0.066	09/01	0.061	07/23
DV*	0.073		0.072		0.071		0.070		0.071		0.068		0.068	

\* Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years.

### 24-Hour PM<sub>2.5</sub> Averages (µg/m<sup>3</sup>) (2022)

Rank	REN (0031)		SPK (1005)		SPS (1007)		TOL (0025)	
	Value (%ile)	Date	Value (%ile)	Date	Value (%ile)	Date	Value (%ile)	Date
1	173.0	09/16	179.1	09/14	184.0	09/14	149.7	09/16
2	131.5	09/14	111.4	09/16	129.7	09/13	134.9	09/15
3	123.5	09/15	109.7	09/15	99.1	09/15	133.7	09/14
4	95.0	09/13	97.1	09/12	62.8	09/12	123.0	09/11
5	92.7	09/12	94.8	09/13	60.6	09/16	98.7	09/12
6	87.2	09/17	81.8	09/11	46.4	09/10	77.4	09/17
7	74.1 (98)	09/11	76.5	09/17	42.7	09/11	68.0	09/13
8	67.2	09/10	57.6 (98)	09/10	39.2 (98)	09/17	34.7 (98)	09/10
9	24.0	07/25	26.3	07/25	25.2	07/25	24.0	07/25
10	22.2	09/09	25.9	12/25	20.5	12/18	22.8	09/08

### 98<sup>th</sup> Percentiles of 24-Hour PM<sub>2.5</sub> Averages (2020-2022) and Design Values (µg/m<sup>3</sup>)

Year	REN (0031)	SPK (1005)	SPS (1007)	TOL (0025)
2020	69.6	71.4	74.7	64.7
2021	89.3	94.3	89.0	104.7
2022	74.1	57.6	39.2	34.7
Design Value*	78	74	68	68

\* 98<sup>th</sup> percentile, averaged over 3 years.

### Annual PM<sub>2.5</sub> Means (2020-2022) and Design Values (µg/m<sup>3</sup>)

Year	REN (0031)	SPK (1005)	SPS (1007)	TOL (0025)
2020	8.3	11.1	10.9	8.7
2021	12.4	11.9	11.4	10.9
2022	7.9	10.0	10.0	6.6
Design Value*	9.5	11.0	10.0	8.7

\* Annual mean, averaged over 3 years.

24-Hour PM<sub>10</sub> Averages (µg/m<sup>3</sup>)  
(2022)

Rank	REN (0031)		SPK (1005)		SPS (1007)		TOL (0025)	
	Value	Date	Value	Date	Value	Date	Value	Date
1	220	09/16	231	09/14	242	09/14	230	09/15
2	177	09/14	144	09/16	173	09/13	192	09/16
3	162	09/15	141	09/15	132	09/15	187	09/14
4	136	09/13	131	09/12	124	09/12	173	09/11
5	127	09/12	129	09/13	103	10/22	133	09/12
6	114	09/17	119	09/11	95	09/10	111	09/13
7	107	09/11	101	09/17	87	09/16	110	10/22
8	102	09/10	99	09/10	84	09/11	106	09/17
9	58	10/22	85	10/22	55	09/17	73	09/10
10	54	09/09	66	10/18	52	05/19	67	10/21

24-Hour PM<sub>10</sub> Highs (µg/m<sup>3</sup>)  
(2020-2022)

Year	REN (0031)		SPK (1005)		SPS (1007)		TOL (0025)	
	Value	Date	Value	Date	Value	Date	Value	Date
2020	196	09/08	194	09/08	238	09/13	192	09/08
2021	304	08/23	214	08/23	197	08/16	319	08/23
2022	220	09/16	231	09/14	242	09/14	230	09/15

PM<sub>10</sub> Expected Exceedances (2020-2022)  
and Design Values (expected exceedances)

Year	REN (0031)	SPK (1005)	SPS (1007)	TOL (0025)
2020	1	3	5	3
2021	7	5	7	9
2022	3	1	2	4
Design Value*	3.7	3.0	4.7	5.3

\* Expected exceedances averaged over three years.

## Carbon Monoxide (CO)

### 8-Hour CO Averages (ppm) (2022)

Rank	REN (0031)		SPK (1005)	
	Value	Date	Value	Date
1	1.8	09/14	2.3	09/14
2	1.6	09/16	1.8	09/14

### 2<sup>nd</sup> High 8-Hour Averages (2021-2022) and Design Values (ppm)

Year	REN (0031)	SPK (1005)
2021	2.1	2.0
2022	1.6	1.8
Design Value*	2.1	2.0

\* Highest 2<sup>nd</sup> high 8-hour average in the last 2 years.

### 1-Hour CO Averages (ppm) (2022)

Rank	REN (0031)		SPK (1005)	
	Value	Date	Value	Date
1	3.3	09/12	2.7	09/12
2	2.5	09/12	2.6	09/12

### 2<sup>nd</sup> High 1-Hour Averages (2021-2022) and Design Values (ppm)

Year	REN (0031)	SPK (1005)
2021	2.4	2.2
2022	2.5	2.6
Design Value*	2.5	2.6

\* Highest 2<sup>nd</sup> high 1-hour average in the last 2 years.



## Nitrogen Dioxide (NO<sub>2</sub>)

### 1-Hour NO<sub>2</sub> Averages (ppb) (2022)

Rank	REN (0031)	
	Value (%ile)	Date
1	51.6	02/14
2	49.3	01/31
3	49.0	01/03
4	48.9	11/22
5	48.6	11/30
6	47.6	01/25
7	47.2	11/17
8	47.2 (98)	11/23
9	46.8	01/18
10	46.6	02/02

### 98<sup>th</sup> Percentiles of 1-Hour NO<sub>2</sub> Averages (2020-2022) and Design Value (ppb)

Year	REN (0031)
2020	46.4
2021	47.1
2022	47.2
Design Value*	47

\* 98<sup>th</sup> percentile, averaged over 3 years

### NO<sub>2</sub> Annual Mean (2022) and Design Value (ppb)

	REN(0031)
Annual Mean	11.8
Design Value*	12

\* Annual Mean of all 1-hr averages.

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

### 1-Hour SO<sub>2</sub> Averages (ppb) (2022)

Rank	REN (0031)	
	Value (%ile)	Date
1	4.0	01/13
2	3.5	01/18
3	3.5	02/14
4	3.4 (99)	01/25
5	3.3	11/23
6	2.9	11/30
7	2.7	01/12
8	2.7	01/17
9	2.7	03/26
10	2.7	11/26

### 99<sup>th</sup> Percentiles of 1-Hour SO<sub>2</sub> Averages (2020-2022) and Design Value (ppb)

Year	REN (0031)
	Value
2020	3
2021	3
2022	3
Design Value*	3

\* 99<sup>th</sup> percentile of 1-hour daily maximum concentrations, averaged over 3 years.

## **Appendix B**

### **Monitoring Stations in Operation from 1963 to 2022**

## Monitoring Stations in Operation (2013 - 2022)

AQS Site Name (AQS Site ID)	Ozone	PM <sub>2.5</sub>	PM <sub>10</sub>	TSP	HC	CO	NO <sub>2</sub>	SO <sub>2</sub>	Lead
Incline (32-031-2002)	93-22	99-02	99-02			99-02	99-02		
Lemmon Valley (32-031-2009)	87-22		87			87-16			
Reno3 (32-031-0016)	82-19	99-19	88-19	85-87		83-19	84-19	11-19	
Reno4 (32-031-0031)	20-22	20-22	20-22			20-22	20-22	20-22	
Plumb-Kit (32-031-0030)			06-17						
South Reno (32-031-0020)	88-22		11-17			88-14			
Sparks (32-031-1005)	79-22	12-22	88-22	85-87		80-22			
Galletti (32-031-0022)		13-14	88-14			88-14			
Toll (32-031-0025)	02-22	19-22	02-22			02-16			
Spanish Springs (32-031-1007)	17-22	17-22	17-22						

## Monitoring Stations in Operation (1963 - 2012)

AQS Site Name (AQS Site ID)	Ozone	PM <sub>2.5</sub>	PM <sub>10</sub>	TSP	HC	CO	NO <sub>2</sub>	SO <sub>2</sub>	Lead
Health - Kirman (32-031-0001)				63-89					
Sparks - Greenbrae ES (32-031-0002)			85-90	68-90					
Reno - Cal-Neva (32-031-0003)				68-89					
Reno - Veterans ES (32-031-0004)				68-69					
Reno - Harrah's (32-031-0005)	76-82					72-81	72-85		
Reno - Jesse Beck ES (32-031-0006)				72-89					
Reno - Airport (32-031-0007)				72-89					
Reno - Fairgrounds (32-031-0008)				72-74					
Reno - Fish & Game (32-031-0009)				74-89					
Reno - Kings Row ES (32-031-0010)				77-89					
Reno - Stead (32-031-0011)				77					
Reno - Huffaker ES (32-031-0014)				80-89					
Reno - Center Street (32-031-0015)						82-85	82-90		
Sparks - Fire (32-031-1001)				68-69					
Verdi - ES (32-031-1002)				68-89					
Sparks - Nugget (32-031-1003)				72-80					
Sparks - TMWRF (32-031-1004)				74-89					
Sparks - Victorian (32-031-1006)			88	80-89					
Incline - Pump (32-031-2001)				72-89					
Wadsworth - Fire (32-031-2003)				73-75					
Empire - School (32-031-2005)				76-77					
Reno - Sun Valley (32-031-2006)			88-05	80-89					