# State of Hawaii
# Annual Summary
# 2018
# Air Quality Data


Kilauea, Hawaii

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Department of Health
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# 2018
# Hawaii Air Quality Data

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# Section 1
# INTRODUCTION

The Department of Health, Clean Air Branch, monitors the ambient air in the State of Hawaii for various gaseous and particulate air pollutants. The U. S. Environmental Protection Agency (EPA) has set national ambient air quality standards (NAAQS) for six criteria pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone, and particulate matter ($PM_{10}$ and $PM_{2.5}$). Hawaii has also established a state ambient air standard for hydrogen sulfide. The primary purpose of the statewide monitoring network is to measure ambient air concentrations of these pollutants and ensure that these air quality standards are met. The stations are maintained and the data are collected by the Air Quality Monitoring Section of the State Laboratories Division.

In addition to monitoring the ambient air for criteria pollutants, the State of Hawaii also participates in the NCore multi pollutant monitoring network; the NCore station in Hawaii is located at the Kapolei monitoring station. The NCore network addresses the following objectives:

- Timely reporting of data to public by supporting AIRNow, air quality forecasting, and other public reporting mechanisms;
- Support for development of emission strategies through air quality model evaluation and other observational methods;
- Accountability of emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors;
- Support for long-term health assessments that contribute to ongoing reviews of the NAAQS;
- Compliance through establishing nonattainment/attainment areas through comparison with the NAAQS;
- Support to scientific studies ranging across technological, health, and atmospheric process disciplines;
- Support to ecosystem assessments recognizing that national air quality networks benefit ecosystem assessments and, in turn, benefit from data specifically designed to address ecosystem analyses; and
- $PM_{2.5}$ speciation monitoring that EPA determined to be essential for establishing a relationship between particle concentrations and adverse health effects and would provide valuable information in characterizing aerosols, determining the effectiveness of control strategies, and understanding the effects of particle pollution on atmospheric and regional haze.

Air pollution is caused by many different man-made and natural sources. There are industrial sources of pollution, such as power plants and refineries; mobile sources, such as cars, trucks, and buses; agricultural sources, such as agricultural burning; and natural sources, such as windblown dust and volcanic activity. In 2018, for the most part, the state maintained 13 air monitoring stations on 4 islands. Most commercial, industrial, and transportation activities and their associated air quality effects occur on Oahu, where 4 of

the stations are located. The monitoring stations on Maui measure the air quality impacts from commercial, industrial, transportation and agricultural activities. The majority of stations are located on the island of Hawaii to measure air quality impacts from the volcano and geothermal energy production. The monitoring station on Kauai is mainly to measure the air quality impacts from cruise ships. The state's ambient air monitoring network is reviewed annually and relocations, additions and/or discontinuations can occur in the future as the need arises.

This report summarizes the validated air pollutant data collected at the 13 monitoring stations during calendar year 2018. Tabular summaries are provided which compare the measured concentrations of criteria pollutants with federal ambient air quality standards and of hydrogen sulfide with the state standard. The 2018 speciation data is also included in this report. Trend summaries of criteria pollutants parameters are shown graphically.

The Department of Health has a web site that displays near real-time air quality data updated throughout the day from the air monitoring stations. The data has not been reviewed for quality assurance and is subject to change but provides the public with viewing access to current air pollutant and meteorological information. To view this data online, go to http://health.hawaii.gov/cab and link to "Hawaii Ambient Air Quality Data."

Additionally, because emissions from the Kilauea volcano may affect communities on the island of Hawaii on a daily basis, the Department of Health has a website dedicated to displaying short term $SO_2$ data from stations located on the island. It provides near real-time 15-minute $SO_2$ averages and advisory level guidance to help individuals protect themselves against possible health effects. To view this data online, go to www.hiso2index.info

To view this entire book as well as books from 2016 and 2017 online, go to: http://health.hawaii.gov/cab and link to "Hawaii Air Quality Data Book."

Questions or comments regarding data in this report and other air quality information should be addressed to:

Clean Air Branch
Department of Health
2827 Waimano Home Road #130
Pearl City, HI, 96782

Phone: (808)586-4200
Fax: (808)586-4359

The Department of Health provides access to its programs and activities without regard to race, color, national origin (including language), age, sex, religion, or disability. Write our Affirmative Action Officer at P.O. Box 3378, Honolulu, Hawaii 96801-3378, or call (808)586-4616 (voice) within 180 days of a problem.

# Section 2
# DEFINITIONS

| | |
|---|---|
| *98th Percentile Value* | The $PM_{2.5}$ 24-hour average or the maximum daily 1-hour $NO_2$ average in the year below which 98% of all values fall. |
| *99th Percentile Value* | The maximum daily 1-hour $SO_2$ value in the year below which 99% of all values fall. |
| *Ambient Air* | The general outdoor atmosphere, external to buildings, to which the general public has access. |
| *Ambient Air Quality Standard* | A limit in the quantity and exposure to pollutants dispersed or suspended in the ambient air. Primary standards are set to protect public health, including sensitive populations such as asthmatics, children, and the elderly. Secondary standards are set to protect public welfare including protection against visibility degradation, and damage to animals, crops, vegetation and buildings. |
| *Carbon Monoxide* | Carbon monoxide (CO) is a colorless, odorless, tasteless gas under atmospheric conditions. It is produced by the incomplete combustion of carbon fuels with the majority of emissions coming from transportation sources. |
| *CFR* | Code of Federal Regulations is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal government. Title 40 is the Protection of the Environment. |
| *Collocated* | This is a procedure required for a certain percentage of $PM_{10}$ and $PM_{2.5}$ samplers in the monitoring network. Collocated samplers determine precision or variation in the $PM_{10}$ or $PM_{2.5}$ concentration measurements of identical samplers run in the same location under the same sampling conditions. |
| *Criteria Pollutants* | These are the six pollutants for which the EPA has established national air quality standards. The pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead and particulate matter ($PM_{10}$ and $PM_{2.5}$). |
| *EPA* | The U. S. Environmental Protection Agency; established to protect human health and the natural environment. |

| | |
|---|---|
| *Hydrogen Sulfide* | Hydrogen sulfide ($H_2S$) is a toxic, colorless gas with a characteristic “rotten egg” odor detectable at very low levels. It occurs naturally during the decomposition of organic matter, near geothermal sources and is also produced during certain industrial processes, including wastewater treatment facilities. |
| *Micron* | One micron is one millionth of a meter or approximately 1/25,000 of an inch. |
| *$\mu g/m^3$* | Micrograms per cubic meter. This is the measurement of air quality expressed as mass per unit volume. |
| *NAAQS* | National Ambient Air Quality Standards. These are pollutant standards that the EPA has established to protect public health and welfare. NAAQS have been set for carbon monoxide, nitrogen dioxide, $PM_{10}$, $PM_{2.5}$, ozone, sulfur dioxide, and lead. These are commonly referred to as criteria pollutants. |
| *NCore* | A multi-pollutant network that integrates several advanced measurement systems for particles, pollutant gases and meteorology. Most NCore stations have been operating since the formal start of the network on January 1, 2011, including Hawaii’s. |
| *Nitrogen Dioxide* | Nitrogen dioxide ($NO_2$) is a brownish, highly corrosive gas with a pungent odor. It is formed in the atmosphere from emissions of nitrogen oxides ($NO_x$). Sources of nitrogen oxides include electric utilities, industrial boilers, motor vehicle exhaust and combustion of fossil fuels. $NO_2$ is also a component in the atmospheric reaction that produces ground-level ozone. |
| *Ozone* | Ozone ($O_3$) is the main constituent in photochemical air pollution. It is formed in the atmosphere by a chemical reaction of nitrogen oxides ($NO_x$) and volatile organic compounds (VOCs) in the presence of sunlight. In the upper atmosphere, $O_3$ shields the earth from harmful ultraviolet radiation; however, at ground level, it can cause harmful effects in humans and plants. |
| *Particulate Matter* | This refers to any solid or liquid matter dispersed in the air. Particulate matter (PM) includes dust, soot, smoke, and liquid droplets from sources such as factories, power plants, motor vehicles, construction, agricultural activities, and fires. |

| | |
|---|---|
| *$PM_{10}$* | Particulate matter that is 10 microns or less in aerodynamic diameter. These are considered “coarse” particles, generally from sources such as road and windblown dust, and crushing and grinding operations. |
| *$PM_{2.5}$* | Particulate matter that is 2.5 microns or less in aerodynamic diameter. Considered “fine” particles, these are generally a result of fuel combustion such as from motor vehicles, utility generation and industrial facilities. Fine particles can also be formed when gases, such as sulfur dioxide and nitrogen dioxide, are chemically transformed into particles. |
| *ppm* | Parts per million is one particle in 1,000,000 other particles. It is approximately one drop in 13 gallons. |
| *SLAMS* | State and Local Air Monitoring Stations. The Clean Air Act requires that every state establish a network of air monitoring stations for criteria pollutants. |
| *SPM* | Special Purpose Monitoring stations. These are stations established to provide data for special studies in support of air program interests and activities. SPM stations supplement the SLAMS network as special circumstances require and adequate resources permit. |
| *Sulfur Dioxide* | Sulfur dioxide ($SO_2$) is a colorless gas that easily combines with water vapor forming sulfuric acid. Emissions of sulfur dioxide are largely from sources that burn fossil fuels such as coal and oil. In Hawaii, another major source of sulfur dioxide emissions is from the eruption of Kilauea Volcano on the Big Island. |
| *Vog* | Vog is a local term used to express volcanic smog. Vog occurs when volcanic gas and particles combine with air and sunlight to produce atmospheric haze. |

# Table 2-1 **State and Federal Ambient Air Quality Standards**

Sources: State standards HAR §11-59; Federal standards 40 CFR Part 50

| Air Pollutant | Averaging Time | Standards | | |
|---|---|---|---|---|
| | | Hawaii State Standard | Federal Primary Standard [a] | Federal Secondary Standard [b] |
| **Carbon Monoxide (CO)** | 1-hour<br>8-hour | 9 ppm<br>4.4 ppm | 35 ppm<br>9 ppm | None |
| **Nitrogen Dioxide ($NO_2$)** | 1-hour<br>Annual | ---<br>0.04 ppm | 0.100 ppm<br>0.053 ppm | ---<br>0.053 ppm |
| **$PM_{10}$** | 24-hour<br>Annual [c] | 150 µg/$m^3$<br>50 µg/$m^3$ | 150 µg/$m^3$<br>--- | ---<br>--- |
| **$PM_{2.5}$** | 24-hour<br>Annual | --- | 35 µg/$m^3$<br>12 µg/$m^3$ | 35 µg/$m^3$<br>15 µg/$m^3$ |
| **Ozone ($O_3$)** | 8-hour | 0.08 ppm | 0.070 ppm | 0.070 ppm |
| **Sulfur Dioxide ($SO_2$)** | 1-hour<br>3-hour<br>24-hour<br>Annual | ---<br>0.5 ppm<br>0.14 ppm<br>0.03 ppm | 0.075 ppm<br>---<br>---<br>--- | ---<br>0.5 ppm<br>---<br>--- |
| **Lead (Pb)** | Rolling 3-month | 1.5 µg/$m^3$ [d] | 0.15 µg/$m^3$ | 0.15 µg/$m^3$ |
| **Hydrogen Sulfide** | 1-hour | 0.025 ppm | None | None |

a ***Primary Standards*** set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children and the elderly.

b ***Secondary Standards*** set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

c Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual $PM_{10}$ standard effective December 17, 2006. However, the state still has an annual standard.

d The state standard is based on calendar quarter.

## Compliance with the National Ambient Air Quality Standards

**CO 1-hour:** May not be exceeded more than once per year.

**CO 8-hour:** May not be exceeded more than once per year.

**$NO_2$ 1-hour:** The 3-year average of the 98$^{th}$ percentile daily maximum 1-hour averages must not exceed the standard.

**$NO_2$ Annual:** Average of all 1-hour values in the year may not exceed the level of the standard.

**$PM_{10}$ 24-hour:** Must not be exceeded more than one day per year, after compensating for days when monitoring did not occur (estimated number of exceedances).

**$PM_{2.5}$ 24-hour:** The 3-year average of the 98$^{th}$ percentile 24-hour concentrations must not exceed the level of the standard.

**$PM_{2.5}$ Annual:** The 3-year average of 24-hour values must not exceed the level of the standard.

**Ozone 8-hour:** The 3-year average of the fourth highest daily maximum value must not exceed the level of the standard.

**$SO_2$ 1-hour:** The 3-year average of the 99$^{th}$ percentile daily maximum 1-hour averages must not exceed the standard.

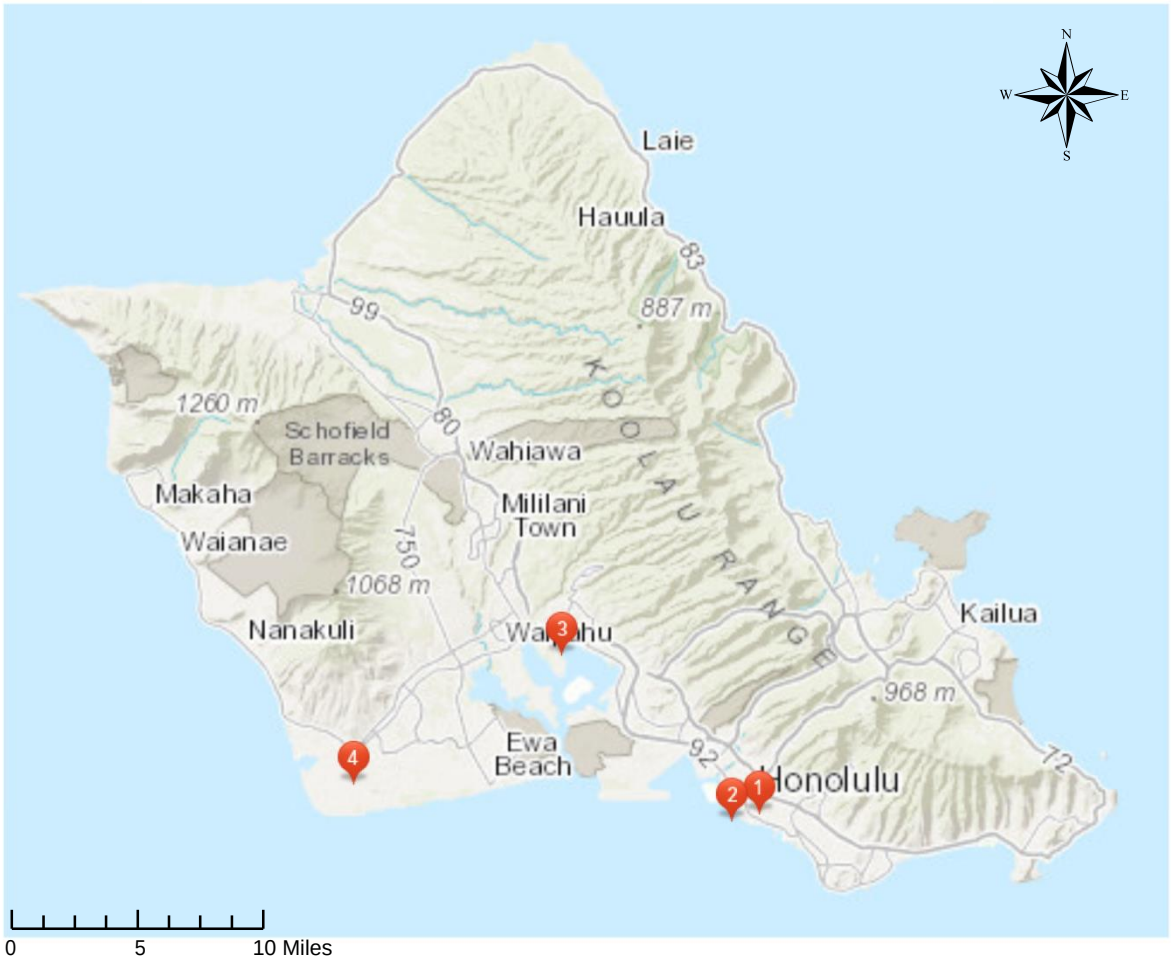
**$SO_2$ 3-hour:** Not be exceeded more than once per year.

**$SO_2$ Annual:** Average of all 1-hour values in the year may not exceed the level of the standard.

**Lead:** Average of all 24-hour values in any rolling 3-month period may not exceed the level of the standard.

# Section 3
# SITE LOCATIONS AND DESCRIPTIONS

**Figure 3-1: Island of Oahu – Air Monitoring Stations**




| Station | Name | Location | Pollutants/Parameters Monitored |
|---|---|---|---|
| 1 | Honolulu | 1250 Punchbowl St. | CO, $SO_2$, $PM_{2.5}$, $PM_{10}$ |
| 2 | Sand Island | 1039 Sand Island Pkwy. | $O_3$, $PM_{2.5}$ |
| 3 | Pearl City | 860 4th St. | $PM_{2.5}$, $PM_{10}$ |
| 4 | Kapolei | 2052 Lauwiliwili St. | CO, $SO_2$, $NO_2$ |
| | Kapolei NCore | 2052 Lauwiliwili St. | CO $_{trace}$, $SO_{2\ trace}$, $NO/NO_y$ , Pb, $O_3$, $PM_{2.5}$, $PM_{2.5}$ speciation, $PM_{10}$, $PM_{10-2.5}$, WS/WD |

The following station descriptions include latitude and longitude in decimal degrees and altitude in meters above mean sea level.

## Honolulu (DH)

| | |
|---|---|
| **Location:** | 1250 Punchbowl St., Honolulu |
| **Latitude:** | 21.30758 |
| **Longitude:** | -157.85542 |
| **Altitude:** | 20 m |
| **Parameters:** | $SO_2$, CO, $PM_{10}$, $PM_{2.5}$ |
| **Established:** | February 1971 |

**Brief Description:**

Located in downtown Honolulu on the roof of the Department of Health building, across from the Queen's Medical Center, in a busy commercial, business and government district.

## Kapolei (KA)

| | |
|---|---|
| **Location:** | 2052 Lauwiliwili St., Kapolei |
| **Latitude:** | 21.32374 |
| **Longitude:** | -158.08861 |
| **Altitude:** | 17.9 m |
| **Parameters:** | $SO_2$, CO, $NO_2$, $PM_{10}$, $PM_{2.5}$, $PM_{2.5}$ speciation, NCore |
| **Established:** | July 2002 |

**Brief Description:**

Located in Kapolei Business Park, southeast of Kapolei Fire Station, next to a drainage canal that separates the park from Barber's Point. Approximately 1.5 miles from Malakole Street in Campbell Industrial Park.

## Pearl City (PC)

| | |
|---|---|
| **Location:** | 860 4th St., Pearl City |
| **Latitude:** | 21.39283 |
| **Longitude:** | -157.96913 |
| **Altitude:** | 23.1 m |
| **Parameters:** | $PM_{10}$, $PM_{2.5}$ |
| **Established:** | May 1979 |

**Brief Description:**

Located on the roof of the Leeward Health Center in a commercial, residential and light industrial area approximately 1.5 miles northwest of the Waiau power plant and near the Pearl Harbor Naval Complex.

## Sand Island (SI)

| | |
|---|---|
| **Location:** | 1039 Sand Island Pkwy., Honolulu |
| **Latitude:** | 21.30384 |
| **Longitude:** | -157.87117 |
| **Altitude:** | 5.3 m |
| **Parameters:** | $O_3$, $PM_{2.5}$ |
| **Established:** | February 1981 |

**Brief Description:**

Located in a light industrial, commercial and recreational area approximately two miles downwind of downtown Honolulu near the entrance to the Sand Island State Recreation Area.

**Figure 3-2: Island of Maui – Air Monitoring Stations**


| Station | Name | Location | Pollutants Monitored |
|---|---|---|---|
| 1 | Kihei | Hale Piilani Park | $PM_{2.5}$ |
| 3 | Kahului | TMK (2)-3-8-007-153 | $PM_{2.5}$ |

## Kihei (KH)

| | |
|---|---|
| **Location:** | Hale Piilani Park, Kihei |
| **Latitude:** | 20.780997 |
| **Longitude:** | -156.44637 |
| **Altitude:** | 46.5 m |
| **Parameters:** | $PM_{2.5}$ |
| **Established:** | February 1999 |

**Brief Description:**

Located in a residential community park, next to agricultural land.

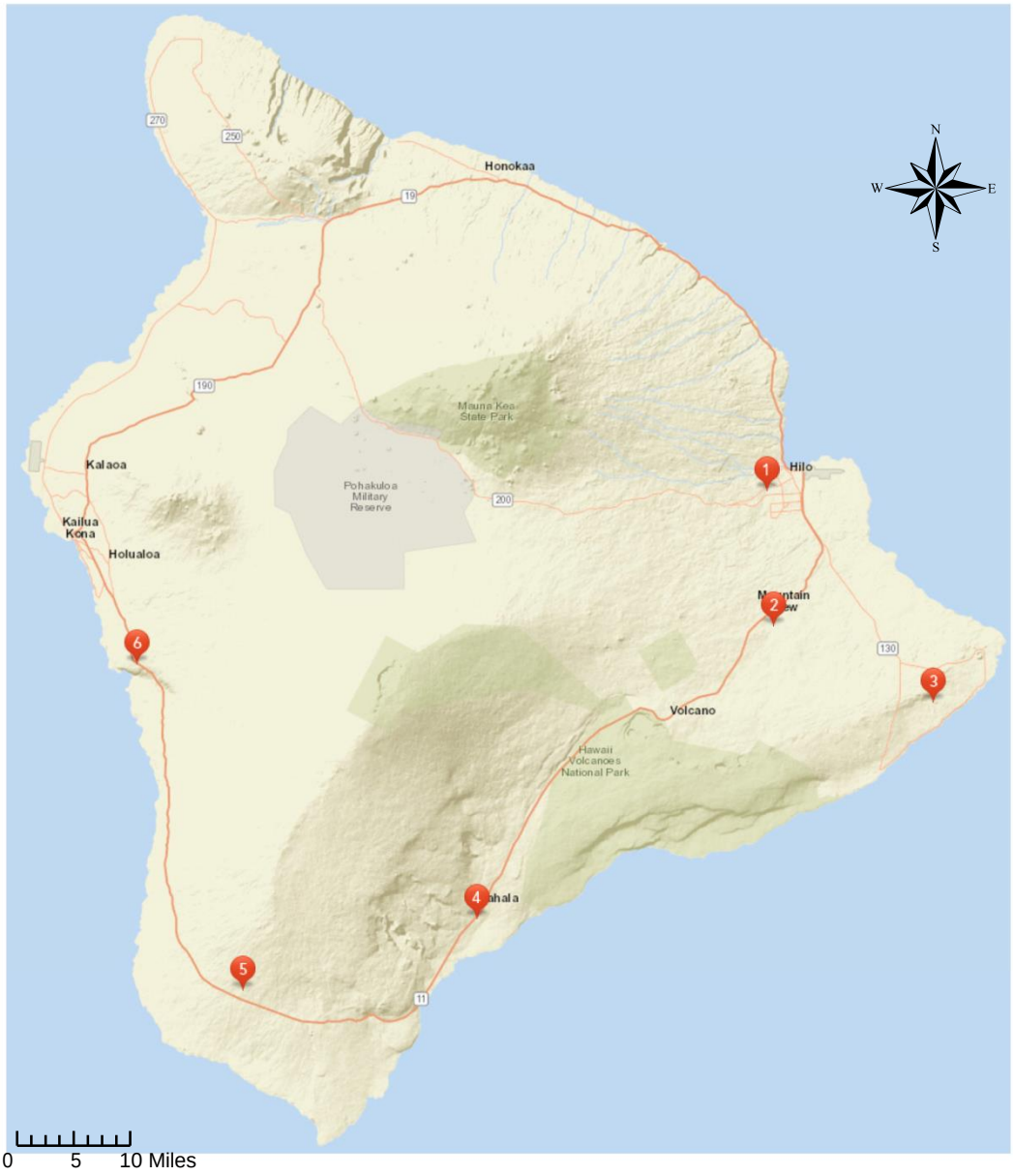
## Kahului (KL)

| | |
|---|---|
| **Location:** | TMK (2)-3—8-007-153, Kahului |
| **Latitude:** | 20.869444 |
| **Longitude:** | -156.492417 |
| **Altitude:** | 55.5 m |
| **Parameters:** | $PM_{2.5}$ |
| **Established:** | January 2016 |

**Brief Description:**

Located within a fenced area off of Mauilani Parkway, TMK 2-3-8-007-153. The area is surrounded primarily by residential land.

## Figure 3-3: Island of Hawaii – Air Monitoring Stations




| Station | Name | Location | Pollutants Monitored |
|---|---|---|---|
| 1 | Hilo | 1099 Waianuenue Ave. | $SO_2$, $PM_{2.5}$ |
| 2 | Mountain View | 18-1235 Volcano Rd. | $SO_2$, $PM_{2.5}$ |
| 3 | Puna E | TMK (3)-1-3-28-37 (Leilani) | $H_2S$ |
| 4 | Pahala | 96-3150 Pikake St. | $SO_2$, $PM_{2.5}$ |
| 5 | Ocean View | 92-6091 Orchid Mauka Circ. | $SO_2$, $PM_{2.5}$ |
| 6 | Kona | 81-1043 Konawaena School Rd. | $SO_2$, $PM_{2.5}$ |

## Hilo (HL)

| | |
|---|---|
| **Location:** | 1099 Waianuenue Ave., Hilo |
| **Latitude:** | 19.71756 |
| **Longitude:** | -155.11053 |
| **Altitude:** | 136.8 m |
| **Parameters:** | $SO_2$, $PM_{2.5}$ |
| **Established:** | January 1997 |

**Brief Description:**

Located near the Hilo Medical Center, this station was established to monitor vog during “Kona” or southerly wind conditions.

## Kona (KN)

| | |
|---|---|
| **Location:** | 81-1043 Konawaena School Rd., Kona |
| **Latitude:** | 19.50978 |
| **Longitude:** | -155.91342 |
| **Altitude:** | 517.2 m |
| **Parameters:** | $SO_2$, $PM_{2.5}$ |
| **Established:** | September 2005 |

**Brief Description:**

Located on the upper campus of Konawaena High School, this station monitors for vog on the west side of the island of Hawaii.

## Mt. View (MV)

| | |
|---|---|
| **Location:** | 18-1235 Volcano Rd., Mt. View |
| **Latitude:** | 19.57002 |
| **Longitude:** | -155.08046 |
| **Altitude:** | 436.5 m |
| **Parameters:** | $SO_2$, $PM_{2.5}$ |
| **Established:** | December 2010 |

**Brief Description:**

Located on the grounds of the Mt. View Elementary School, this station was established to monitor vog during southerly wind conditions.

## Ocean View (OV)

| | |
|---|---|
| **Location:** | 92-6091 Orchid Mauka Circle, Ocean View |
| **Latitude:** | 19.11756 |
| **Longitude:** | -155.77814 |
| **Altitude:** | 862.6 m |
| **Parameters:** | $SO_2$, $PM_{2.5}$ |
| **Established:** | April 2010 |

**Brief Description:**

This station is located in Hawaii Ocean View Estates at the Ocean View fire station and monitors for volcanic emissions.

| Pahala (PA) | | |
|---|---|---|
|  | **Location:** | 96-3150 Pikake St., Pahala |
| | **Latitude:** | 19.2039 |
| | **Longitude:** | -155.48018 |
| | **Altitude:** | 320 m |
| | **Parameters:** | $SO_2$, $PM_{2.5}$ |
| | **Established:** | August 2007 |
| | **Brief Description:** | |
| | The station is on the grounds of the Kau High and Pahala Elementary School, monitoring for volcanic emissions. | |

| Puna E (PE) | | |
|---|---|---|
|  | **Location:** | 13-763 Leilani Ave., Pahoa |
| | **Latitude:** | 19.46399 |
| | **Longitude:** | -154.89871 |
| | **Altitude:** | 207.9 m |
| | **Parameters:** | $H_2S$ |
| | **Established:** | March 1991 |
| | **Brief Description:** | |
| | Located in the Leilani Estates residential subdivision, this station monitors for emissions from the geothermal energy facility approximately 1 mile to the northeast. The station was overcomed by lava on May 5, 2018. | |

## Figure 3-4: Island of Kauai – Air Monitoring Station


| Station | Name | Location | Pollutants Monitored |
|---|---|---|---|
| 1 | Niumalu | 2342 Hulemalu Road | $SO_2$, $NO_2$, $PM_{2.5}$ |

| Niumalu (NI) | | |
|---|---|---|
|  | **Location:** | 2342 Hulemalu Road, Lihue |
| | **Latitude:** | 21.9495 |
| | **Longitude:** | -159.365 |
| | **Altitude:** | 11 m |
| | **Parameters:** | $SO_2$, $NO_2$, $PM_{2.5}$ |
| | **Established:** | April 2011 |
| | **Brief Description:** | |
| | Located in the Niumalu residential subdivision, this station monitors for emissions from the cruise ships in Nawiliwili Harbor approximately 1.0 mile upwind. | |

## Table 3-1 **State of Hawaii Ambient Air Monitoring Network**

| | Pollutants Monitored and Station Type | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **SITE** | **$PM_{10}$** | **$PM_{2.5}$** | **CO** | **$O_3$** | **$SO_2$** | **$NO_2$** | **$H_2S$** | **Lead** | **MONITORING OBJECTIVE** | **LOCATION SETTING** |
| **OAHU** | | | | | | | | | | |
| Honolulu | S | S | S | - | S | - | - | - | Population Exposure | Urban and Center City |
| Kapolei[1] | S | S,C | S | S | S | S | - | S,C | Population Exposure | Suburban |
| Pearl City | S | S | - | - | - | - | - | - | Population Exposure | Urban and Center City |
| Sand Island | - | S | - | S | - | - | - | - | Maximum Concentration ($O_3$)<br>Transport ($PM_{2.5}$) | Urban and Center City |
| **MAUI** | | | | | | | | | | |
| Kihei | - | S | - | - | - | - | - | - | Source Impact (agricultural burning) | Suburban |
| Kahului | - | SPM | - | - | - | - | - | - | Source Impact (agricultural burning) | Neighborhood |
| **HAWAII** | | | | | | | | | | |
| Hilo | - | SPM | - | - | S | - | - | - | Population Exposure | Suburban |
| Kona | - | SPM | - | - | S | - | - | - | Population Exposure ($SO_2$)/<br>Maximum concentration ($PM_{2.5}$) | Suburban |
| Mountain View | - | SPM | - | - | SPM | - | - | - | Source Impact | Suburban |
| Ocean View | - | SPM | - | - | SPM | - | - | - | Welfare Impact ($SO_2$)/<br>Source Impact ($PM_{2.5}$) | Rural |
| Pahala | - | SPM | - | - | SPM | - | - | - | Maximum concentration ($SO_2$)/<br>Source Impact ($PM_{2.5}$) | Rural |
| Puna E | - | - | - | - | - | - | SPM | - | Source Impact (geothermal and volcano) | Suburban |
| **KAUAI** | | | | | | | | | | |
| Niumalu | - | SPM | | - | SPM | SPM | - | - | Source Impact (cruise ships) | Suburban |

C = Collocated Site
S = (SLAMS) State and Local Air Monitoring Station
SPM = Special Purpose Monitoring Station (for monitoring vog, geothermal energy production and cruise ships)
[1] Includes NCore station.

# Table 3-2 **Sampling Equipment at Each Monitoring Station**

| Monitoring Station | $PM_{10}$ Continuous Ambient Particulate Monitor | $PM_{2.5}$ Manual Particulate Monitor | $PM_{2.5}$ Continuous Monitor | CO Continuous Gas Filter Correlation Analyzer | $SO_2$ Continuous Pulsed Fluorescence Ambient Air Analyzer | $O_3$ Continuous UV Photometric Analyzer | $NO_2$ Continuous Chemiluminescence Analyzer | $H_2S$ Continuous Pulsed Fluorescence Ambient Air Analyzer | Lead 1 in 6 Days Total Suspended Particulate Monitor |
|---|---|---|---|---|---|---|---|---|---|
| **OAHU** | | | | | | | | | |
| Honolulu | ■ | | ■ | ■ | ■ | | | | |
| Kapolei | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | ■ |
| Pearl City | ■ | | ■ | | | | | | |
| Sand Island | | | ■ | | | ■ | | | |
| **MAUI** | | | | | | | | | |
| Kihei | | | ■ | | | | | | |
| Kahului | | | ■ | | | | | | |
| **HAWAII** | | | | | | | | | |
| Hilo | | | ■ | | ■ | | | | |
| Kona | | | ■ | | ■ | | | | |
| Mt. View | | | ■ | | ■ | | | | |
| Ocean View | | | ■ | | ■ | | | | |
| Pahala | | | ■ | | ■ | | | | |
| Puna E | | | | | | | | ■ | |
| **KAUAI** | | | | | | | | | |
| Niumalu | | | ■ | | ■ | | ■ | | |

# Section 4
# 2018 AIR QUALITY DATA

To protect the state's air quality from degradation, the Department of Health's Clean Air Branch is responsible for regulating and monitoring pollution sources to ensure that the levels of criteria pollutants remain well below the state and federal ambient air quality standards. Data collected from the ambient air network is validated by the Air Quality Monitoring Section to ensure that the reported data is of good quality and meets all quality control and assurance requirements.

Up until the end of the Kilauea eruption in the Lower East Rift Zone, in August of 2018, the monitoring stations in communities near the volcano recorded higher levels of $SO_2$ and $PM_{2.5}$, with regular exceedances of the NAAQS for $SO_2$ and occasional exceedances of the NAAQS for $PM_{2.5}$. The EPA considers the volcano a natural, uncontrollable event and therefore the state is requesting exclusion of these NAAQS exceedances from attainment/non-attainment determination.

Excluding the exceedances due to the volcano, in 2018 the State of Hawaii was in attainment of all NAAQS.

**Explanation of Summary Tables 4-1 through 4-18:**

- Summaries are by pollutant and averaging period, with the number of occurrences exceeding the NAAQS or, in Table 4-17, the number of exceedances of the state $H_2S$ standard (there is no federal $H_2S$ standard);
- The "Maximum" is the highest and second highest valid values recorded in the year for the averaging period. For $PM_{2.5}$, the maximum and $98^{th}$ percentile concentrations are provided and for $O_3$, the $4^{th}$ highest daily maximum value is also displayed;
- The "Annual Mean" is the arithmetic mean of all valid values recorded in the year;
- "Possible Periods" is the total number of possible sampling periods in the year for the averaging period;
- "Valid Periods" is the total number of acceptable sampling periods after data validation;
- "Percent Recovery" represents the amount of quality data reported;
- Attainment with the NAAQS is determined according to 40 CFR 50.

**Explanation of Tables 4-19 through 4-29:**

- For each pollutant and averaging period, the highest concentration for each month is presented;
- The month with the highest value recorded in the year for each site is highlighted.

## Table 4-1. 2018 Summary of the 24-Hour $PM_{10}$ Averages

| | Maximum | | Annual Mean | No. of 24-hour Averages Greater than 150 µg/m$^3$ | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 2nd High | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **OAHU** | | | | | | | | | | | | | | | | | | |
| Honolulu | 29 | 26 | 12.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 355 | 97.3 |
| Kapolei | 29 | 25 | 10.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 347 | 95.1 |
| Pearl City | 34 | 31 | 14.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 357 | 97.8 |



## Table 4-2. Attainment Determination of the 24-Hour $PM_{10}$ NAAQS

| Station | Exceedances in 2016 | Exceedances in 2017 | Exceedances in 2018 | Sites in violation of the NAAQS |
|---|---|---|---|---|
| Honolulu | 0 | 0 | 0 | 0 |
| Kapolei | 0 | 0 | 0 | 0 |
| Pearl City | 0 | 0 | 0 | 0 |
| Attainment: The standard not to be exceeded more than once per year on average over 3 years.<br>**In 2018, Hawaii was in attainment with the 24-hour $PM_{10}$ NAAQS.** | | | | |

## Table 4-3. 2018 Summary of the 24-Hour $PM_{2.5}$ Averages: SLAMS Stations

| | Maximum | | Annual Mean | No. of 24-hour Averages Greater than 35 µg/m³ | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 98th % | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **OAHU** | | | | | | | | | | | | | | | | | | |
| Honolulu[1] | 12.1 | 7.5 | 3.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 319 | 87.4 |
| Kapolei | 11.2 | 8.7 | 2.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 346 | 94.8 |
| Pearl City | 21.0 | 9.1 | 3.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 349 | 95.6 |
| Sand Island | 10.3 | 7.3 | 3.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 359 | 98.4 |
| **MAUI** | | | | | | | | | | | | | | | | | | |
| Kihei | 12.7 | 11 | 4.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 339 | 92.9 |

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

## Table 4-4. Attainment Determination of the 24-Hour $PM_{2.5}$ NAAQS: SLAMS Stations

| Station | 2016 98th value | 2017 98th value | 2018 98th value | 3-Year Average | Sites in violation of the NAAQS |
|---|---|---|---|---|---|
| Honolulu | 11 | 9.8 | 7.5 | 9.4 | 0 |
| Kapolei | 11[1] | 9.6 | 8.7 | 9.8 | 0 |
| Pearl City | 12 | 14 | 9.1 | 12 | 0 |
| Sand Island | 13 | 10 | 7.3 | 10 | 0 |
| Kihei | 12 | 11 | 11 | 11 | 0 |

Attainment: The 3-year average of the 98th percentile values must be less than or equal to 35 µg/m³.
**In 2018, Hawaii was in attainment with the 24-hour $PM_{2.5}$ NAAQS.**

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

## Table 4-5. Attainment Determination of the Annual $PM_{2.5}$ NAAQS: SLAMS Stations

| Station | 2016 Ann. Avg. | 2017 Ann. Avg. | 2018 Ann. Avg. | 3-Year Average | Sites in violation of the NAAQS |
|---|---|---|---|---|---|
| Honolulu | 2.1 | 3.0 | 3.7 | 2.9 | 0 |
| Kapolei | 4.0[1] | 4.3 | 2.5 | 3.6 | 0 |
| Pearl City | 2.6 | 4.4 | 3.0 | 3.3 | 0 |
| Sand Island | 4.0 | 3.0 | 3.7 | 3.6 | 0 |
| Kihei | 3.7 | 4.1 | 4.5 | 4.1 | 0 |

Attainment: The 3-year average of annual mean values must be less than 15 µg/m³.
**In 2018, Hawaii was in attainment with the annual $PM_{2.5}$ NAAQS.**

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

## Table 4-6. 2018 Summary of the 24-Hour $PM_{2.5}$ Averages: SPM Stations

| | Maximum | | Annual Mean | No. of 24-hour Averages Greater than 35 µg/m$^3$ | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 98th% | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **HAWAII** | | | | | | | | | | | | | | | | | | |
| Hilo | 14.8 | 11 | 3.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 345 | 94.5 |
| Kona | 59 | 36 | 10 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 342 | 93.7 |
| Mt. View | 18 | 17 | 5.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 349 | 95.6 |
| Ocean View | 56 | 38 | 11 | 0 | 0 | 0 | 0 | 2 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 365 | 350 | 95.9 |
| Pahala | 44 | 19 | 5.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 365 | 353 | 96.7 |
| **KAUAI** | | | | | | | | | | | | | | | | | | |
| Niumalu | 12 | 8.4 | 2.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 327 | 89.6 |
| **MAUI** | | | | | | | | | | | | | | | | | | |
| Kahului[1] | 15 | 8.4 | 3.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 295 | 80.8 |

The special purpose stations on Hawaii island were established to monitor ambient air concentrations of $PM_{2.5}$ from volcanic emissions. The special purpose station on Kauai was established to monitor emissions from cruise ships. The special purpose stations on Maui were established to monitor emissions from agricultural burning.

[1] Does not meet <75% data recovery but is >50% in quadrant 4.

## Table 4-7. 2018 Summary of the 8-Hour $O_3$ Averages

| | Maximum | | | Annual Mean | No. of Daily Maximum 8-Hour Averages Greater than 0.070 ppm | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 2nd High | 4th High | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **OAHU** | | | | | | | | | | | | | | | | | | | |
| Sand Island | 0.050 | 0.048 | 0.046 | 0.028 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8755 | 7652 | 87.4 |
| Kapolei | 0.055 | 0.052 | 0.049 | 0.031 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8755 | 7496 | 85.6 |

## Table 4-8. Attainment Determination of the 8-Hour $O_3$ NAAQS

| Station | 2016 4th highest | 2017 4th highest | 2018 4th highest | 3-Year Average | Site in violation of the NAAQS |
|---|---|---|---|---|---|
| Sand Island | 0.048 | 0.048 | 0.046 | 0.047 | 0 |
| Kapolei | 0.048 | 0.049 | 0.049 | 0.049 | 0 |

Attainment: The 3-year average of the annual 4th highest daily maximum 8-hour average must be less than or equal to 0.070 ppm.
**In 2018, Hawaii was in attainment with the 8-hour $O_3$ NAAQS.**

## Table 4-9. 2018 Summary of the 1-Hour and Annual $NO_2$ Averages

| | Maximum 1-hr | | Annual Mean | No. of Daily Maximum 1-Hour Averages Greater than 0.100 ppm | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 98th% | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **OAHU** | **SLAMS stations** | | | | | | | | | | | | | | | | | |
| Kapolei | 0.031 | 0.027 | 0.004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8760 | 8185 | 93.4 |
| **KAUAI** | **SPM Station** | | | | | | | | | | | | | | | | | |
| Niumalu | 0.047 | 0.039 | 0.005 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8760 | 7988 | 91.2 |

Attainment of the annual $NO_2$ NAAQS: The annual mean shall not exceed 0.053 ppm.
**In 2018, Hawaii was in attainment with the annual $NO_2$ NAAQS.**

## Table 4-10. Attainment Determination of the 1-Hour $NO_2$ NAAQS

| Station | 2016 98th value | 2017 98th value | 2018 98th value | 3-Year Average | Site in violation of the NAAQS |
|---|---|---|---|---|---|
| Kapolei | 0.029[1] | 0.033 | 0.027 | 0.030 | 0 |

Attainment: The 3-year average of the 98th percentile values must be less than or equal to 0.100 ppm.
**In 2018, Hawaii was in attainment with the 1-hour $NO_2$ NAAQS.**

[1] Does not meet summary criteria, <75% data recovery in one or more quarters.

## 4-11. 2016 Summary of the 1-Hour $SO_2$ Averages

| | Maximum | | Annual Mean | No. of 1-hour Averages Greater than 0.075 ppm | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 99th% | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **OAHU** | **SLAMS Stations** | | | | | | | | | | | | | | | | | |
| Honolulu | 0.012 | 0.003 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8760 | 8268 | 94.4 |
| Kapolei | 0.013 | 0.006 | 0.006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8760 | 8256 | 94.2 |
| **HAWAII** | **SPM Stations (see NOTE)** | | | | | | | | | | | | | | | | | |
| Hilo | 0.343 | 0.191 | 0.003 | 3 | 4 | 0 | 1 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 8760 | 7960 | 90.9 |
| Kona | 0.161 | 0.094 | 0.006 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 8760 | 8137 | 92.9 |
| Mt. View | 0.619 | 0.325 | 0.005 | 4 | 7 | 2 | 5 | 1 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 8760 | 8357 | 95.4 |
| Ocean View | 1.531 | 0.887 | 0.017 | 9 | 8 | 7 | 6 | 17 | 19 | 21 | 1 | 0 | 0 | 0 | 0 | 8760 | 8301 | 94.8 |
| Pahala | 0.772 | 0.686 | 0.024 | 20 | 12 | 11 | 6 | 20 | 23 | 27 | 2 | 0 | 0 | 0 | 0 | 8760 | 8118 | 92.7 |
| **KAUAI** | **SPM Station** | | | | | | | | | | | | | | | | | |
| Niumalu | 0.033 | 0.003 | 0.0004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8760 | 7728 | 88.2 |

Attainment: The 3-year average of the 99th percentile values must be less than or equal to 0.075 ppm. Effective June 2, 2010.
**In 2018, Hawaii was in attainment with the 1-hour $SO_2$ NAAQS (SLAMS stations only).**

NOTE: The SPM stations on Hawaii Island were established to monitor ambient air concentrations of $SO_2$ from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 1-hour NAAQS from attainment determinations. The SPM station on Kauai was established to monitor emissions from cruise ships.

## Table 4-12. Attainment Determination of the 1-Hour $SO_2$ NAAQS: SLAMS Stations

| | 2016 99th value | 2017 99th value | 2018 99th value | 3-Year Average | Violation of the NAAQS |
|---|---|---|---|---|---|
| **OAHU SLAMS stations** | | | | | N= NO<br>Y= YES |
| Honolulu | 0.007 | 0.004 | 0.003 | 0.005 | N |
| Kapolei | 0.013 | 0.008 | 0.006 | 0.009 | N |
| **HAWAII SPM stations (SEE note)** | | | | | |
| Hilo | 0.313 | 0.359 | 0.191 | 0.288 | Y |
| Kona | 0.044 | 0.041 | 0.094 | 0.060 | N |
| Mt. View | 0.251 | 0.269 | 0.325 | 0.282 | Y |
| Ocean View | 0.532 | 0.480 | 0.887 | 0.633 | Y |
| Pahala | 0.558 | 0.674 | 0.686 | 0.639 | Y |
| **KAUAI SPM station** | | | | | |
| Niumalu | 0.008 | 0.002 | 0.003 | 0.004 | N |

Attainment: The 3-year average of the 99th percentile values must be less than or equal to 0.075 ppm. Effective June 2, 2010.
**In 2018, Hawaii was in attainment with the 1-hour $SO_2$ NAAQS (SLAMS stations only).**

NOTE: The SPM stations on Hawaii Island were established to monitor ambient air concentrations of $SO_2$ from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 1-hour NAAQS from attainment determinations. The SPM station on Kauai was established to monitor emissions from cruise ships.

## Table 4-13. 2018 Summary of the 3-Hour $SO_2$ Averages

| | Maximum | | Annual Mean | No. of 3-hour Averages Greater than 0.5 ppm | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 2nd High | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **OAHU** | **SLAMS stations** | | | | | | | | | | | | | | | | | |
| Honolulu | 0.009 | 0.006 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2920 | 2708 | 92.7 |
| Kapolei | 0.010 | 0.006 | 0.006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2920 | 2680 | 91.8 |
| **HAWAII** | **SPM stations (see NOTE)** | | | | | | | | | | | | | | | | | |
| Hilo | 0.210 | 0.168 | 0.003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2920 | 2573 | 88.1 |
| Kona | 0.119 | 0.070 | 0.006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2920 | 2591 | 88.7 |
| Mt. View | 0.319 | 0.283 | 0.005 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2920 | 2635 | 90.2 |
| Ocean View | 0.899 | 0.601 | 0.017 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2920 | 2646 | 90.6 |
| Pahala | 0.670 | 0.566 | 0.024 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2920 | 2609 | 89.3 |
| **KAUAI** | **SPM station** | | | | | | | | | | | | | | | | | |
| Niumalu | 0.002 | 0.002 | 0.004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2920 | 2478 | 84.9 |

Attainment: 3-hour values not to exceed 0.5 ppm more than once per year.
**In 2018, Hawaii was in attainment with the 3-hour $SO_2$ NAAQS (SLAMS stations only).**

NOTE: The SPM stations on Hawaii island were established to monitor ambient air concentrations of $SO_2$ from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 3-hour NAAQS from attainment determinations.

## Table 4-14. 2018 Summary of the 24-Hour and Annual $SO_2$ Averages

| | Maximum | | Annual Mean | No. of 24-hour Averages Greater than 0.140 ppm | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 2nd High | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **OAHU** | **SLAMS Stations** | | | | | | | | | | | | | | | | | |
| Honolulu | 0.002 | 0.002 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 355 | 97.3 |
| Kapolei | 0.003 | 0.002 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 349 | 95.6 |
| **HAWAII** | **SPM Stations (see NOTE)** | | | | | | | | | | | | | | | | | |
| Hilo | 0.055 | 0.045 | 0.003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 349 | 95.6 |
| Kona | 0.053 | 0.043 | 0.006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 346 | 94.8 |
| Mt. View | 0.080 | 0.053 | 0.005 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 354 | 97.0 |
| Ocean View | 0.278 | 0.172 | 0.017 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 352 | 96.4 |
| Pahala | 0.044 | 0.024 | 0.024 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 341 | 93.4 |
| **KAUAI** | **SPM Station** | | | | | | | | | | | | | | | | | |
| Niumalu | 0.001 | 0.001 | 0.000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 365 | 324 | 88.8 |

Attainment: 24-hour values not to exceed 0.14 ppm more than once per year.
**In 2018, Hawaii was in attainment of the state 24-hour $SO_2$ standard (SLAMS stations only).**

NOTE: The SPM stations on Hawaii island were established to monitor ambient air concentrations of $SO_2$ from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 24-hour NAAQS from attainment determinations.

Attainment: Annual average (from SLAMS stations only) not to exceed 0.03 ppm.
**In 2018, Hawaii was in attainment of the state annual $SO_2$ standard.**

NOTE: The SPM stations on Hawaii island were established to monitor ambient air concentrations of $SO_2$ from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the annual NAAQS from attainment determinations.

## Table 4-15. 2018 Summary of the 1-Hour CO Averages

| | Maximum | | Annual Mean | No. of 1-hour Averages Greater than 35 ppm | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 2nd High | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **OAHU** | **SLAMS stations** | | | | | | | | | | | | | | | | | |
| Honolulu | 1.0 | 1.0 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8760 | 8079 | 92.2 |
| Kapolei | 3.2 | 3.2 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8760 | 8058 | 92.0 |

Attainment: 1-hour values not to exceed 35 ppm more than once per year.
**In 2018, Hawaii was in attainment with the 1-hour CO NAAQS.**

## Table 4-16. 2018 Summary of the 8-Hour CO Averages

| | Maximum | | Annual Mean | No. of 8-hour Averages Greater than 9 ppm | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 2nd High | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **OAHU** | **SLAMS stations** | | | | | | | | | | | | | | | | | |
| Honolulu | 0.8 | 0.7 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8755 | 7768 | 88.7 |
| Kapolei | 2.5 | 2.5 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8755 | 8031 | 91.7 |

Attainment: 8-hour values not to exceed 9 ppm more than once per year.
**In 2018, Hawaii was in attainment with the 8-hour CO NAAQS.**

## Table 4-17. 2018 Summary of the 1-Hour $H_2S$ Averages (State Standard)

| | Maximum | | Annual Mean | No. of 1-hour Averages Greater than 0.025 ppm | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st High | 2nd High | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Possible Periods | Valid Periods | Percent Recovery |
| **HAWAII** | | | | | | | | | | | | | | | | | | |
| Puna E[1] | 1.852[1] | 0.573[1] | 0.003 | 0 | 0 | 0 | 0 | 18 | - | - | - | - | - | - | - | 2982 | 2594 | 87% |

Attainment of the state standard: 1-hour values not to exceed 0.025 ppm.
**In 2018, Hawaii was in attainment of the state 1-hour $H_2S$ standard.**
**[1] Station overcome by lava on 5/5/2018.**

## Table 4-18. 2018 Summary of the Rolling 3-Month Lead Averages

| | Maximum | | Annual Mean | No. of 3-Month Averages Greater than 0.15 µg/m$^3$ | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Rolling 3-Month period ending in the month of | | | | | | | | | | | | Possible Periods | Valid Periods | Percent Recovery |
| | 1st High | 2nd High | All Hours | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | | |
| **HAWAII** | | | | | | | | | | | | | | | | | | |
| Kapolei | 0.001 | 0.001 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 61 | 57 | 93.4 |
| Attainment: Maximum 3-month average concentration for a 3-year period must be less than or equal to 0.15 µg/m$^3$.<br>Note: Sampling for lead conducted 1 in 6 days. Sampling began 1/1/2012 and ended 12/31/2018 with EPA approval. | | | | | | | | | | | | | | | | | | |



## Table 4-19. 2018 Monthly Maximum of 24-Hour $PM_{10}$ Values (µg/m$^3$)

The month with the highest value in the year is highlighted *The state and federal 24-hr $PM_{10}$ standard is 150 µg/m$^3$*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Honolulu | 19 | 29 | 21 | 18 | 19 | 18 | 20 | 23 | 19 | 18 | 18 | 22 |
| Kapolei | 17 | 25 | 19 | 15 | 18 | 14 | 21 | 22 | 25 | 19 | 24 | 29 |
| Pearl City | 34 | 31 | 20 | 20 | 22 | 20 | 20 | 22 | 19 | 23 | 22 | 23 |

## Table 4-20. 2018 Monthly Maximum of 24-Hour $PM_{2.5}$ Values ($\mu g/m^3$)

The month with the highest value in the year is highlighted *The federal 24-hr $PM_{2.5}$ standard is 35 $\mu g/m^3$*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SLAMS Stations** | | | | | | | | | | | | |
| Honolulu | 9.1 | 12.0 | - | 6.4 | 6.0 | 9.2 | 7.8 | 7.0 | 5.2 | 7.3 | 5.2 | 5.2 |
| Kapolei | 11.0 | 10.0 | 9.0 | 8.7 | 6.9 | 7.0 | 6.2 | 5.2 | 3.5 | 2.0 | 3.0 | 4.0 |
| Pearl City | 21.0 | 11.0 | 8.2 | 10.0 | 5.8 | 10.0 | 7.4 | 8.8 | 4.3 | 6.2 | 4.7 | 7.1 |
| Sand Island | 7.8 | 9.7 | 7.3 | 6.8 | 4.7 | 10.0 | 7.7 | 7.4 | 6.7 | 6.4 | 6.2 | 5.9 |
| Kihei | 7.5 | 13.0 | 11.0 | 11.0 | 11.0 | 12.0 | 12.0 | 7.7 | 7.4 | 6.0 | 6.2 | 8.4 |
| **SPM Stations** | | | | | | | | | | | | |
| Niumalu (cruise ships) | 5.7 | 11.0 | 12.0 | 7.5 | 3.5 | 8.4 | 8.7 | 9.4 | 5.9 | 4.3 | 5.5 | 7.0 |
| Hilo (volcano) | 14.0 | 10.0 | 8.4 | 13.0 | 12.0 | 15.0 | 11.0 | 6.6 | 5.5 | 3.2 | 4.0 | 4.1 |
| Kahului | 8.3 | 15.0 | 8.5 | 11.0 | 5.5 | 7.2 | 7.6 | 5.0 | 5.2 | 2.7 | 2.8 | 5.4 |
| Kona (volcano) | 13.0 | 16.0 | 17.0 | 14.0 | 59.0[1] | 49.0[1] | 34.0 | 28.0 | 5.7 | 2.5 | 3.2 | 3.9 |
| Mt. View (volcano) | 17.0 | 18.0 | 12.0 | 12.0 | 15.0 | 18.0 | 14.0 | 18.0 | 5.8 | 4.3 | 9.7 | 11.0 |
| Ocean View (volcano) | 13.0 | 8.3 | 18.0 | 15.0 | 46.0[1] | 56.0[1] | 37.0[1] | 31.0 | 8.4 | 6.1 | 5.4 | 6.7 |
| Pahala (volcano) | 26.0 | 25.0 | 24.0 | 21.0 | 7.6 | 12.0 | 15.0 | 16.0 | 19.0 | 19.0 | 18.0 | 16.0 |

[1] Elevated values occurred during LERZ eruption.

## Table 4-21. 2018 Monthly Maximum of 1-Hour $NO_2$ Values (ppm)

The month with the highest value in the year is highlighted *The federal 1-hour standard for $NO_2$ is 0.100 ppm*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kapolei | 0.029 | 0.029 | 0.026 | 0.023 | 0.024 | 0.014 | 0.014 | 0.016 | 0.022 | 0.017 | 0.026 | 0.031 |
| Niumalu | 0.021 | 0.039 | 0.040 | 0.039 | 0.035 | 0.025 | 0.026 | 0.033 | 0.035 | 0.028 | 0.037 | 0.047 |

## Table 4-22. 2018 Monthly Maximum of 1-Hour CO Values (ppm)

The month with the highest value in the year is highlighted *The federal 1-hr CO standard is 35 ppm, the state standard is 9 ppm*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Honolulu | 0.9 | 1.0 | 1.0 | 0.7 | 0.8 | 0.8 | 0.4 | 0.6 | 0.8 | 0.8 | 0.9 | 0.9 |
| Kapolei | 1.8 | 1.1 | 1.4 | 3.2 | 2.9 | 0.3 | 0.2 | 0.2 | 0.3 | 0.4 | 0.4 | 0.3 |



## Table 4-23. 2018 Monthly Maximum of 8-Hour CO Values (ppm)

The month with the highest value in the year is highlighted *The federal 8-hr CO standard is 9 ppm, the state standard is 4.4 ppm*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Honolulu | 0.7 | 0.6 | 0.6 | 0.6 | 0.7 | 0.7 | 0.3 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 |
| Kapolei | 1.2 | 0.9 | 1.1 | 2.5 | 2.5 | 0.3 | 0.2 | 0.2 | 0.2 | 0.4 | 0.2 | 0.1 |

## 4-24. 2018 Monthly Maximum of 8-Hour $O_3$ Values (ppm)

The month with the highest value in the year is highlighted *The federal 8-hr $O_3$ standard is 0.070 ppm*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sand Island | 0.043 | 0.045 | 0.051 | - | 0.047 | 0.031 | 0.028 | 0.027 | 0.032 | 0.038 | 0.042 | 0.043 |
| Kapolei NCore | 0.044 | 0.052 | 0.049 | 0.055 | 0.047 | 0.034 | 0.032 | 0.034 | 0.038 | 0.039 | 0.043 | 0.045 |

## Table 4-25. 2018 Monthly Maximum of 1-Hour $SO_2$ Values (ppm)

The month with the highest value in the year is highlighted *The federal 1-hr $SO_2$ standard is 0.075 ppm (75 ppb)*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SLAMS Stations** | | | | | | | | | | | | |
| Honolulu | 0.001 | 0.002 | 0.007 | 0.006 | 0.001 | 0.012 | 0.002 | 0.000 | 0.003 | 0.000 | 0.001 | 0.000 |
| Kapolei | 0.004 | 0.005 | 0.005 | 0.006 | 0.007 | 0.013 | 0.005 | 0.002 | 0.006 | 0.005 | 0.003 | 0.004 |
| **SPM Stations (see NOTE)** | | | | | | | | | | | | |
| Niumalu (cruise ships) | 0.003 | 0.001 | 0.002 | 0.001 | 0.001 | 0.003 | 0.003 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 |
| Hilo (volcano) | 0.191 | 0.159 | 0.025 | 0.095 | 0.343[1] | 0.232[1] | 0.169[1] | 0.013 | 0.017 | 0.006 | 0.006 | 0.007 |
| Kona (volcano) | 0.036 | 0.055 | 0.025 | 0.013 | 0.120[1] | 0.161[1] | 0.100[1] | 0.041 | 0.003 | 0.003 | 0.002 | 0.002 |
| Mt. View (volcano) | 0.619 | 0.392 | 0.432 | 0.161 | 0.325[1] | 0.176[1] | 0.139[1] | 0.038 | 0.024 | 0.017 | 0.034 | 0.007 |
| Ocean View (volcano) | 0.224 | 0.542 | 0.717 | 0.161 | 1.114[1] | 1.531[1] | 0.339[1] | 0.355[1] | 0.004 | 0.003 | 0.004 | 0.003 |
| Pahala (volcano) | 0.624 | 0.772 | 0.759 | 0.382 | 0.659[1] | 0.686[1] | 0.738[1] | 0.175[1] | 0.013 | 0.013 | 0.011 | 0.011 |

NOTE: The SPM stations on Hawaii Island were established to monitor ambient air concentrations of $SO_2$ from volcanic emissions. Although Hilo and Kona stations are designated SLAMS, the values are still mostly attributed to volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 1-hour NAAQS from attainment determinations. [1] Elevated values occurred during LERZ eruption.

## Table 4-26. 2018 Monthly Maximum of 3-Hour $SO_2$ Values (ppm)

The month with the highest value in the year is highlighted *The state and federal 3-hr $SO_2$ standard is 0.5 ppm*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SLAMS Stations** | | | | | | | | | | | | |
| Honolulu | 0.001 | 0.002 | 0.006 | 0.003 | 0.001 | 0.009 | 0.002 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 |
| Kapolei | 0.003 | 0.004 | 0.004 | 0.004 | 0.006 | 0.010 | 0.004 | 0.001 | 0.005 | 0.003 | 0.003 | 0.003 |
| **SPM Stations (see NOTE)** | | | | | | | | | | | | |
| Niumalu (cruise ships) | 0.001 | 0.001 | 0.002 | 0.001 | 0.001 | 0.002 | 0.001 | 0.000 | 0.000 | 0.002 | 0.000 | 0.001 |
| Hilo (volcano) | 0.128 | 0.141 | 0.023 | 0.071 | 0.168 | 0.210 | 0.103 | 0.006 | 0.005 | 0.003 | 0.004 | 0.004 |
| Kona (volcano) | 0.032 | 0.033 | 0.021 | 0.011 | 0.070 | 0.119 | 0.068 | 0.036 | 0.003 | 0.002 | 0.002 | 0.001 |
| Mt. View (volcano) | 0.319 | 0.283 | 0.169 | 0.061 | 0.225 | 0.116 | 0.081 | 0.028 | 0.013 | 0.015 | 0.014 | 0.006 |
| Ocean View (volcano) | 0.156 | 0.351 | 0.439 | 0.082 | 0.899[1] | 0.601[1] | 0.255 | 0.149 | 0.004 | 0.002 | 0.003 | 0.002 |
| Pahala (volcano) | 0.437 | 0.475 | 0.349 | 0.192 | 0.566[1] | 0.428 | 0.670[1] | 0.114 | 0.010 | 0.010 | 0.009 | 0.008 |

NOTE: The SPM stations on Hawaii Island were established to monitor ambient air concentrations of $SO_2$ from volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 3-hour NAAQS from attainment determinations. [1] Elevated values occurred during LERZ eruption.

## Table 4-27. 2018 Monthly Maximum of 24-Hour $SO_2$ Values (ppm)

The month with the highest value in the year is highlighted *The state 24-hr $SO_2$ standard is 0.14 ppm*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SLAMS Stations** | | | | | | | | | | | | |
| Honolulu | 0.000 | 0.001 | 0.002 | 0.001 | 0.000 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Kapolei | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 | 0.002 | 0.002 | 0.003 | 0.003 | 0.002 | 0.001 |
| **SPM Stations (see NOTE)** | | | | | | | | | | | | |
| Niumalu (cruise ships) | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Hilo (volcano) | 0.035 | 0.034 | 0.007 | 0.028 | 0.045 | 0.055 | 0.026 | 0.002 | 0.002 | 0.002 | 0.001 | 0.002 |
| Kona (volcano) | 0.013 | 0.008 | 0.008 | 0.005 | 0.053 | 0.043 | 0.041 | 0.025 | 0.002 | 0.002 | 0.001 | 0.001 |
| Mt. View (volcano) | 0.091 | 0.063 | 0.038 | 0.026 | 0.078 | 0.032 | 0.019 | 0.009 | 0.005 | 0.007 | 0.005 | 0.004 |
| Ocean View (volcano) | 0.049 | 0.071 | 0.076 | 0.037 | 0.278[1] | 0.172[1] | 0.107 | 0.056 | 0.001 | 0.001 | 0.001 | 0.001 |
| Pahala (volcano) | 0.172 | 0.089 | 0.076 | 0.056 | 0.165[1] | 0.152[1] | 0.212[1] | 0.043 | 0.005 | 0.006 | 0.006 | 0.006 |

NOTE: The SPM stations on Hawaii Island were established to monitor ambient air concentrations of $SO_2$ from volcanic emissions. Volcanic eruptions are considered natural events and therefore EPA may exclude the exceedances of the 24-hour NAAQS from attainment determinations. [1] Elevated values occurred during LERZ eruption.

## Table 4-28. 2018 Monthly Maximum of 1-Hour $H_2S$ Values (ppm)

The month with the highest value in the year is highlighted *The state 1-hour $H_2S$ standard is 0.025 ppm*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Puna E[1] | 0.002 | 0.003 | 0.001 | 0.001 | 1.852[1] | - | - | - | - | - | - | - |

[1] Station overcome by lava on 5/5/2018.

## Table 4-29. 2018 Monthly Maximum of Rolling 3-Month Lead Values (µg/m$^3$)

The month with the highest value in the year is highlighted *The federal rolling 3-month lead standard is 0.15 µg/m$^3$*

| Station | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kapolei NCore (1 in 6 days) | 0.001 | 0.010 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |

# Section 5
# 2018 $PM_{2.5}$ SPECIATION DATA

Atmospheric aerosols are solid or liquid particles suspended in air that come directly from a variety of sources (primary) or are formed by chemical reactions (secondary). Primary and secondary particles tend to have long lifetimes in the atmosphere and can travel long distances, up to hundreds or perhaps thousands of miles. Sources include dust from roads, construction, and agriculture; combustion particles from motor vehicles, electric utilities and agricultural burning; and particles from natural sources such as the ocean or volcano.

Most of the $PM_{2.5}$ is a combination of the following components: sulfates, nitrates, ammonium, elemental carbon, organic compounds, water and metals. The EPA selected target particulates of interest based on data use objectives, primary constituents of $PM_{2.5}$, and the capability and availability of current analytical methods.

The filter-based speciation sampler collects samples once every 3 days for analyses performed by an EPA contract laboratory. The speciation sampler is located at the Kapolei NCore monitoring station.

Table 5-1 lists the parameters measured, highest and second highest values recorded in the year, the annual arithmetic mean of all valid samples and the total number of samples collected in the year. Table 5-2 lists the analysis methods for each parameter.

With the exception of lead, there are no ambient air quality standards for the individual components of speciated $PM_{2.5}$.

For more information on EPA's speciation program, go to:
www.epa.gov/ttn/amtic/speciepg.html

## Table 5-1. Annual Summary of $PM_{2.5}$ Speciation Data

| Parameter | 1st High (µg/m³) | 2nd High (µg/m³) | Annual Mean (µg/m³) | No. of Samples | Percent Recovery |
|---|---|---|---|---|---|
| **CARBON** | | | | | |
| Organic Carbon | 0.616 | 0.579 | 0.2624 | 92 | 75 |
| Elemental Carbon | 1.145 | 0.299 | 0.0858 | 92 | 75 |
| **METALS** | | | | | |
| Aluminum | 0.104 | 0.101 | 0.0053 | 88 | 72 |
| Antimony | 0.056 | 0.046 | 0.0030 | 88 | 72 |
| Arsenic | 0.005 | 0.004 | 0.0001 | 88 | 72 |
| Barium | 0.073 | 0.053 | 0.0035 | 88 | 72 |
| Bromine | 0.007 | 0.006 | 0.0010 | 88 | 72 |
| Cadmium | 0.018 | 0.018 | 0.0014 | 88 | 72 |
| Calcium | 0.119 | 0.103 | 0.0376 | 88 | 72 |
| Cerium | 0.088 | 0.085 | 0.0056 | 88 | 72 |
| Cesium | 0.086 | 0.062 | 0.0062 | 88 | 72 |
| Chlorine | 1.523 | 1.322 | 0.4606 | 88 | 72 |
| Chromium | 0.009 | 0.007 | 0.0007 | 88 | 72 |
| Cobalt | 0.003 | 0.003 | 0.0003 | 88 | 72 |
| Copper | 0.014 | 0.012 | 0.0024 | 88 | 72 |
| Indium | 0.023 | 0.022 | -0.0014 | 88 | 72 |
| Iron | 0.075 | 0.072 | 0.0197 | 88 | 72 |
| Lead | 0.022 | 0.017 | 0.0012 | 88 | 72 |
| Magnesium | 0.138 | 0.135 | 0.0413 | 88 | 72 |
| Manganese | 0.007 | 0.005 | 0.0002 | 88 | 72 |
| Nickel | 0.041 | 0.020 | 0.0045 | 88 | 72 |
| Phosphorus | 0.007 | 0.003 | 0.0002 | 88 | 72 |
| Potassium | 0.093 | 0.071 | 0.0265 | 88 | 72 |
| Rubidium | 0.005 | 0.005 | 0.0004 | 88 | 72 |
| Selenium | 0.006 | 0.005 | 0.0006 | 88 | 72 |
| Silicon | 0.129 | 0.105 | 0.0254 | 88 | 72 |
| Silver | 0.019 | 0.017 | 0.0009 | 88 | 72 |
| Sodium | 1.204 | 0.928 | 0.3697 | 88 | 72 |
| Strontium | 0.006 | 0.005 | 0.0005 | 88 | 72 |
| Sulfur | 1.550 | 1.385 | 0.2262 | 88 | 72 |
| Tin | 0.055 | 0.043 | 0.0011 | 88 | 72 |
| Titanium | 0.012 | 0.011 | 0.0017 | 88 | 72 |
| Vanadium | 0.042 | 0.021 | 0.0028 | 88 | 72 |
| Zinc | 0.008 | 0.008 | 0.0017 | 88 | 72 |
| Zirconium | 0.033 | 0.031 | 0.0021 | 88 | 72 |

Table 5-1 Continued

| Parameter | 1st High (µg/m3) | 2nd High (µg/m3) | Annual Mean (µg/m3) | No. of Samples | Percent Recovery |
|---|---|---|---|---|---|
| **IONS** | | | | | |
| Ammonium Ion | 1.07 | 1.06 | 0.056 | 86 | 70 |
| Potassium Ion | 0.04 | 0.04 | 0.013 | 86 | 70 |
| Sodium Ion | 1.47 | 0.85 | 0.370 | 86 | 70 |
| Total Nitrate | 0.55 | 0.49 | 0.139 | 86 | 70 |
| Sulfate | 4.56 | 4.26 | 0.677 | 86 | 70 |

**Table 5-2. Speciation Collection and Analysis Methods**

| Parameter | Collection Method | Analysis Method |
|---|---|---|
| Carbon | URG 300N Quartz Filter | Thermal Optical Transmittance |
| Metals | Met-One SASS Teflon Filter | Energy Dispersive X-Ray Fluorescence |
| Ions | Met-One SASS Nylon Filter | Ion Chromatography |

# Section 6
# AMBIENT AIR QUALITY TRENDS

The following graphs illustrate 5-year trends for $PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_2$, $O_3$, and CO from 2014 to 2018 at all SLAMS stations monitoring for those pollutants.

Figures 6-1 and 6-2 are graphs of the $PM_{10}$ annual and maximum 24-hour averages.

Figure 6-3 is the graph of the $PM_{2.5}$ annual averages. Attainment of the $PM_{2.5}$ 24-hour standard is based on the $98^{th}$ percentile value at each station, which is depicted in Figure 6-4.

Figures 6-5 and 6-6 are graphs of the $SO_2$ annual and maximum 24-hour averages.

Figure 6-7 and 6-8 shows the annual and maximum 1-hour averages of $NO_2$ compared to the federal NAAQS.

Attainment of the 8-hour ozone standard is achieved by averaging 3 years of the fourth highest daily maximum 8-hour average concentrations, which must not exceed 0.070 ppm (standard effective October 1, 2016). Figure 6-9 is a graph of the fourth highest daily maximum values recorded at the Sand Island and Kapolei (since 2011) ozone monitoring stations in the past five years.

The graphs for 1-hour and 8-hour carbon monoxide (figures 6-10 and 6-11, respectively) represent the maximum 1-hour or 8-hour values recorded in the year.

Criteria pollutant levels remain below state and federal ambient air quality standards at all SLAMS stations in the state.

**Figure 6-1. $PM_{10}$ Annual Average: 2014-2018**

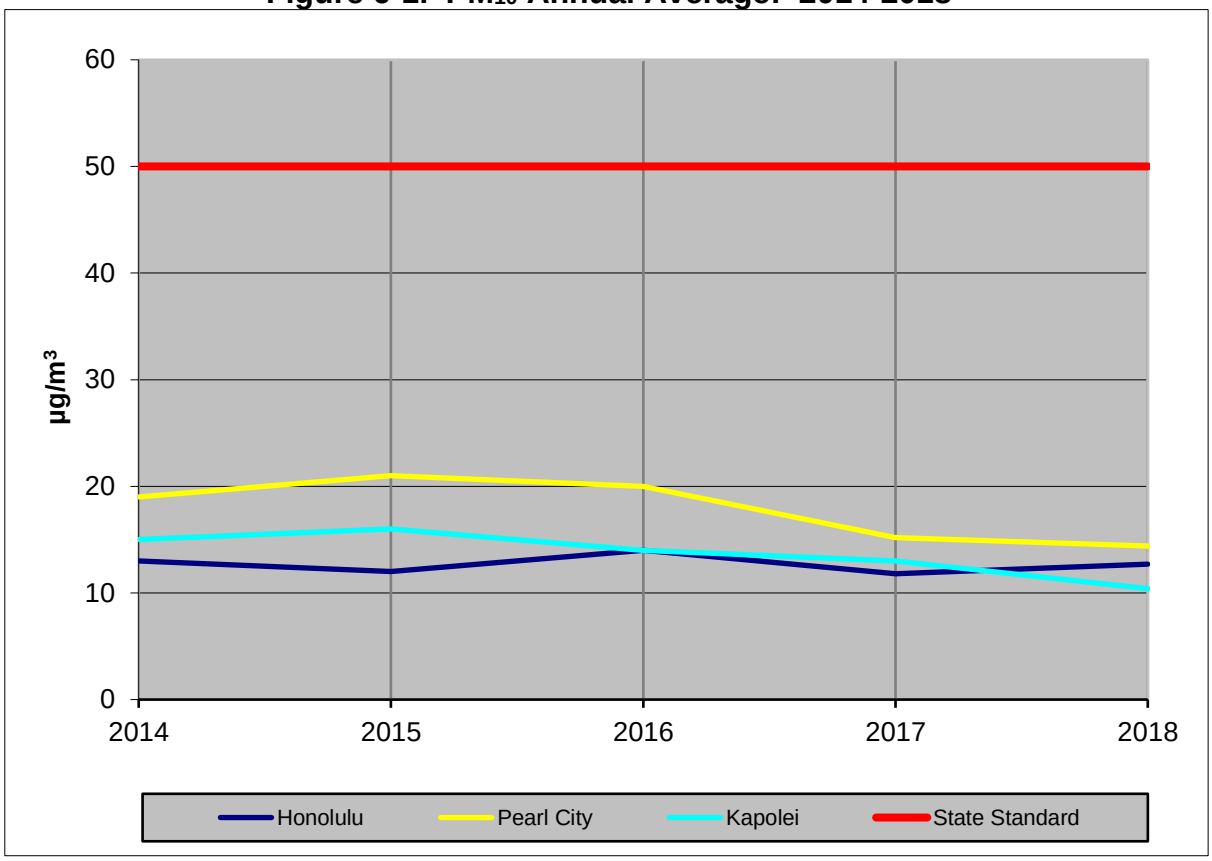



**Figure 6-2. $PM_{10}$ Maximum 24-Hour Average: 2014-2018**

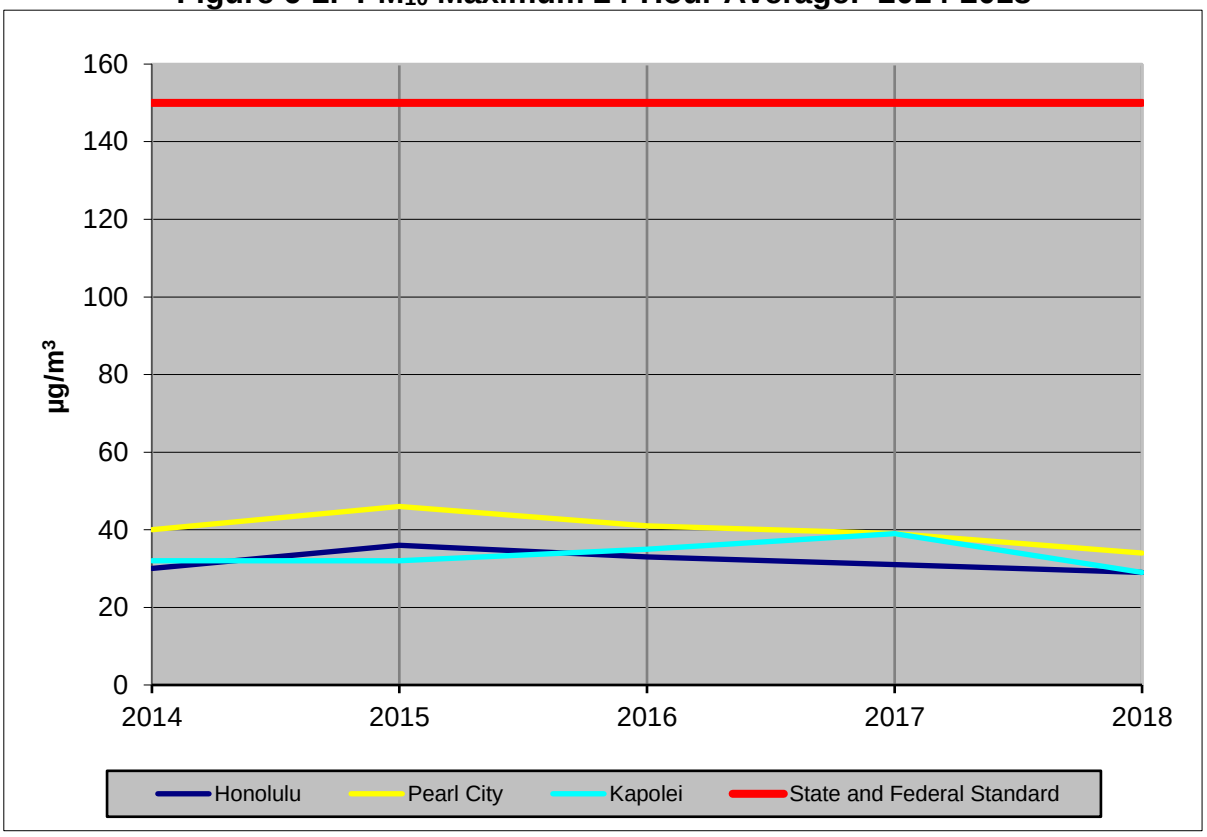


**Figure 6-3. $PM_{2.5}$ Annual Average: 2014-2018**

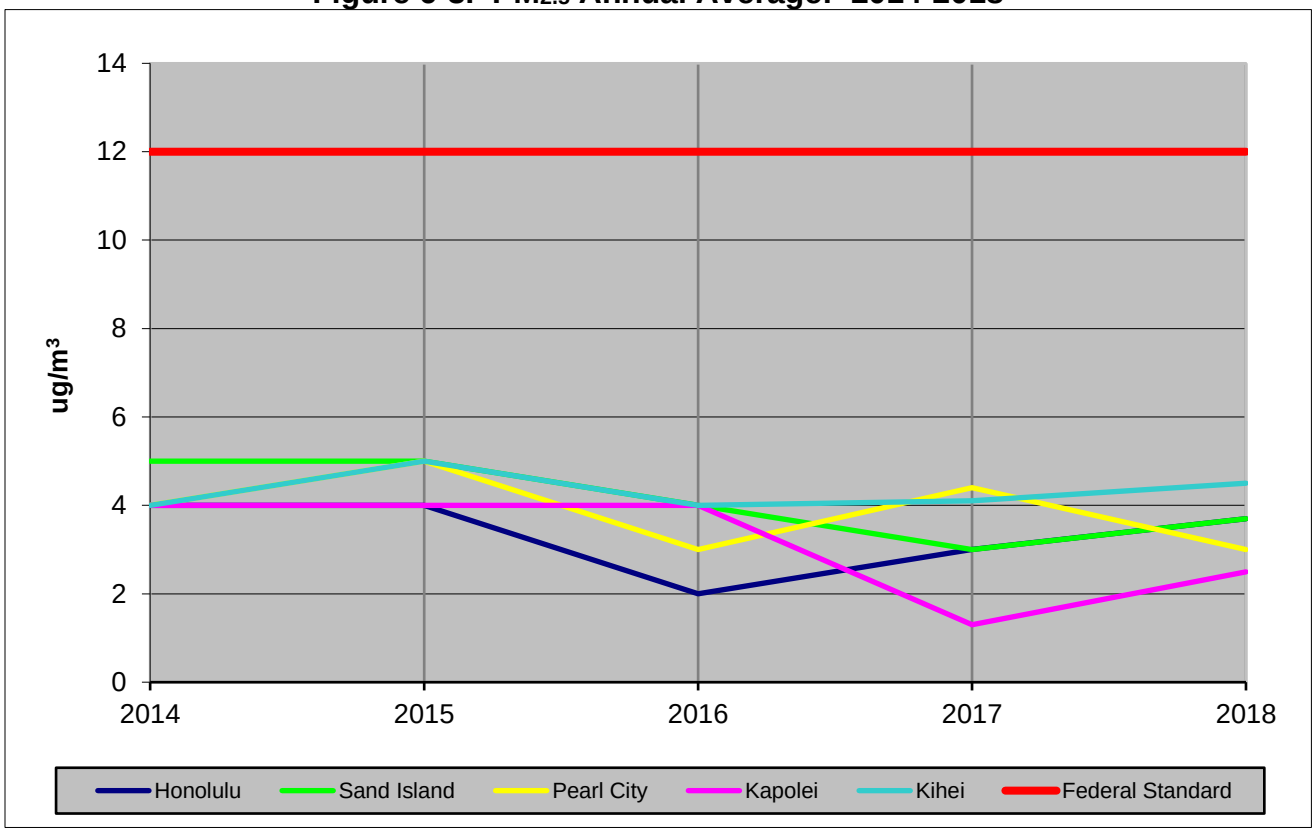



**Figure 6-4. $PM_{2.5}$ 98th Percentile 24-Hour Average: 2014-2018**

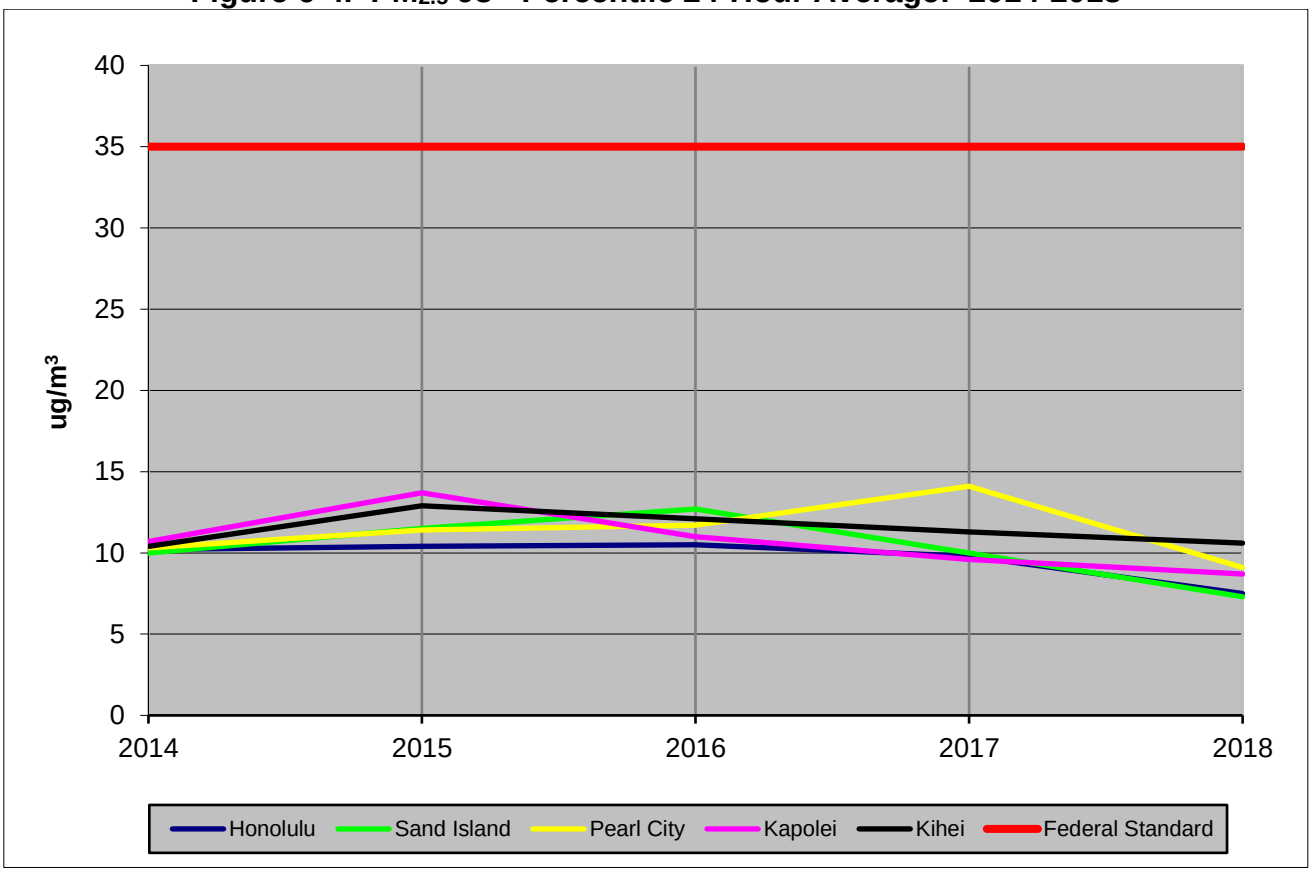


**Figure 6-5. $SO_2$ Annual Average: 2014-2018**

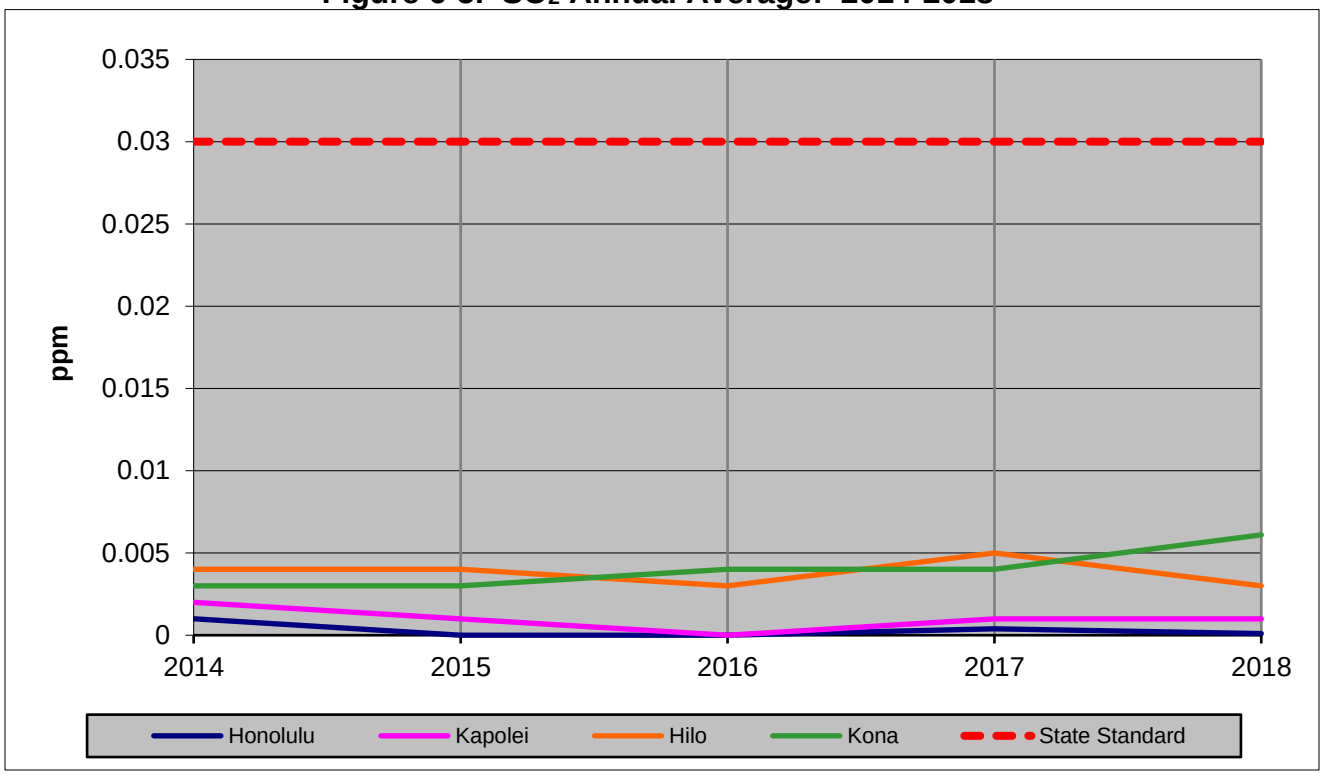



**Figure 6-6. $SO_2$ Maximum 24-Hour Average: 2014-2018**

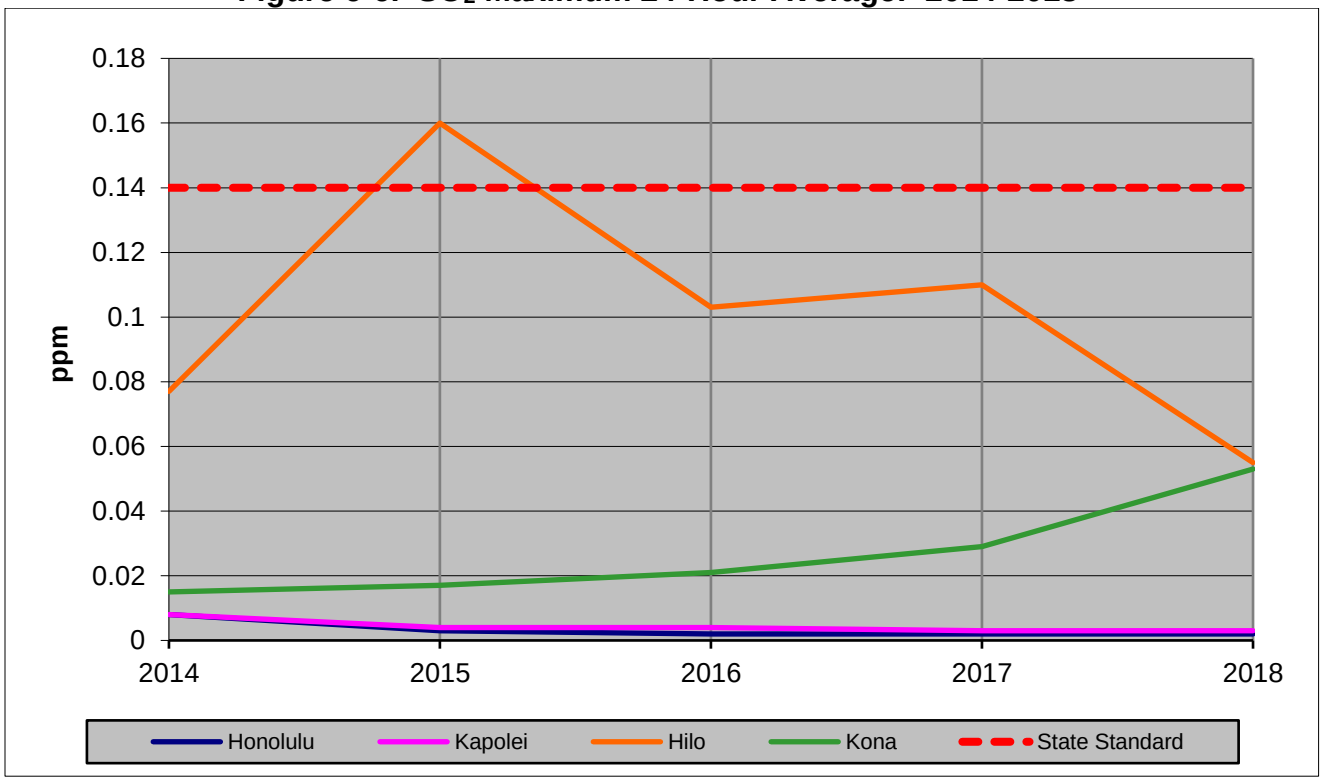


**Figure 6-7. $NO_2$ Annual Average: 2014-2018**

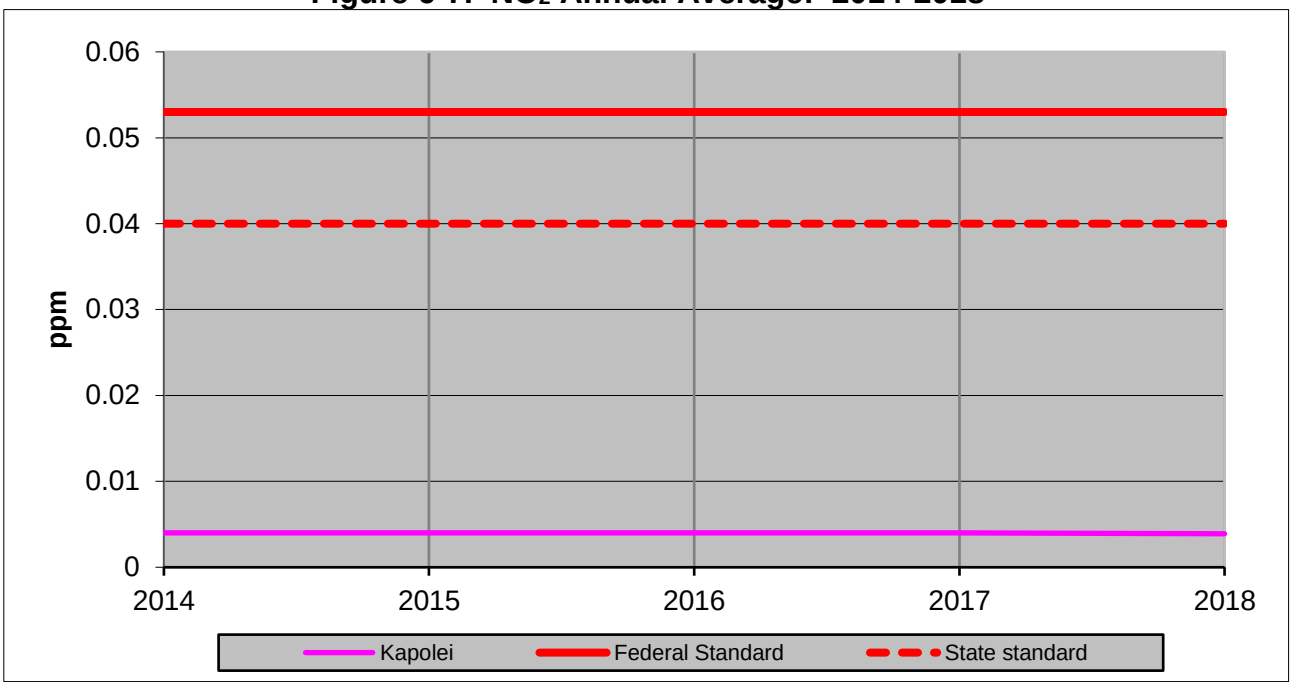



**Figure 6-8. $NO_2$ Maximum 1-Hour Average: 2014-2018**

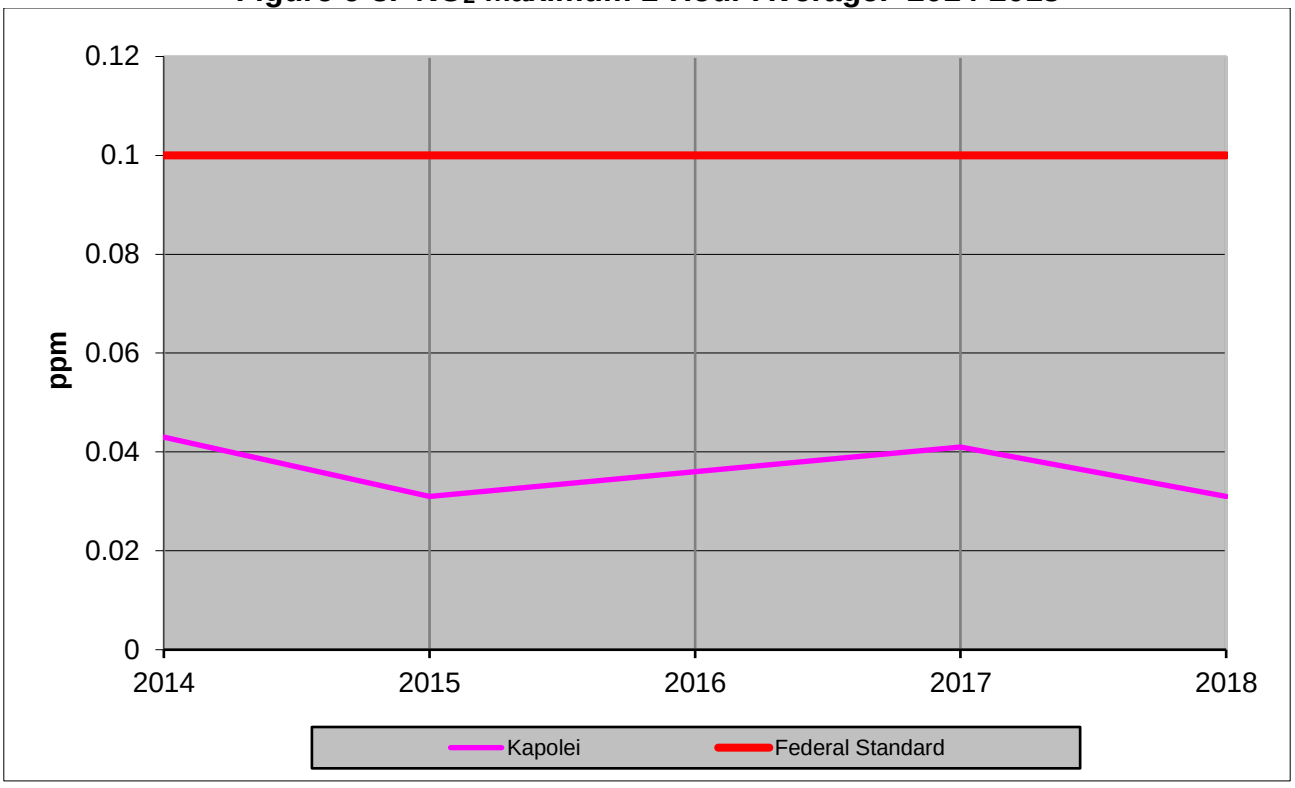


**Figure 6-9. $O_3$ Fourth Highest Daily Maximum 8-Hour Average: 2014-2018**

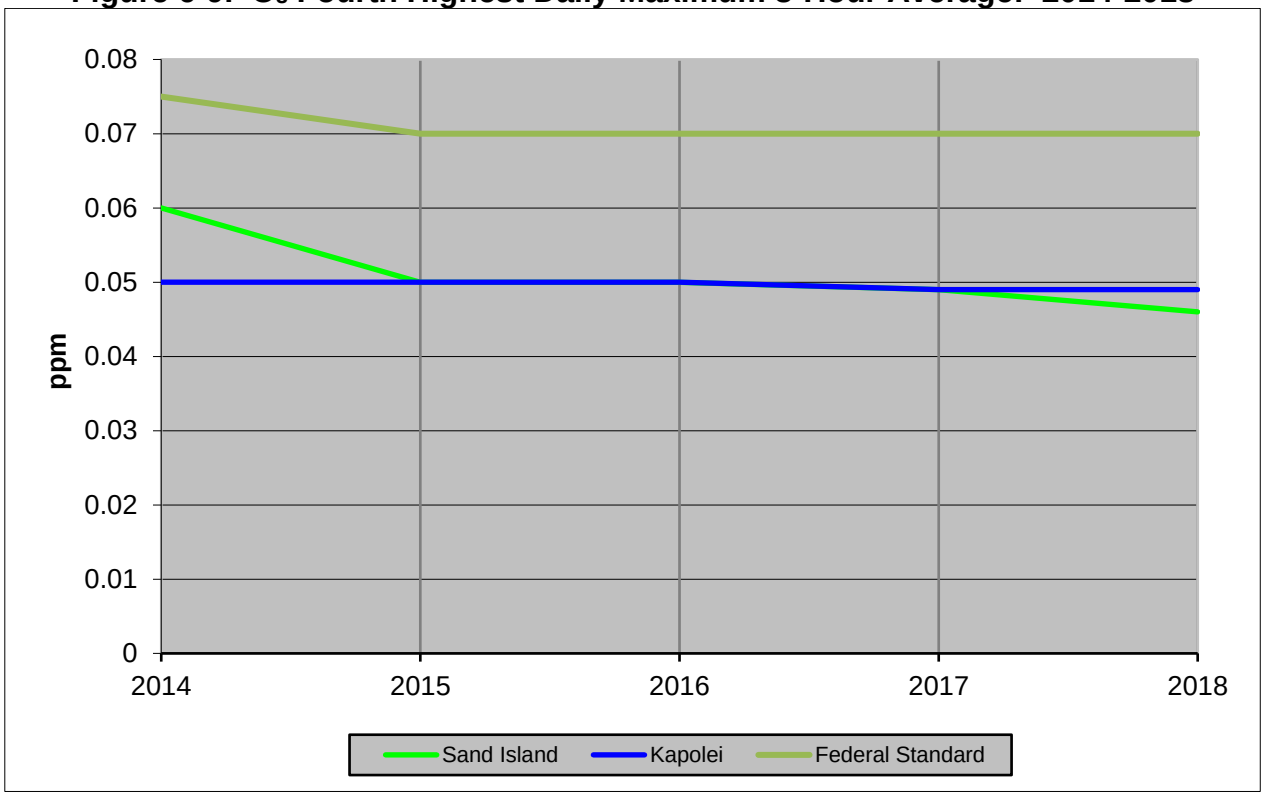



**Figure 6-10. CO Maximum 1-Hour Average: 2014-2018**

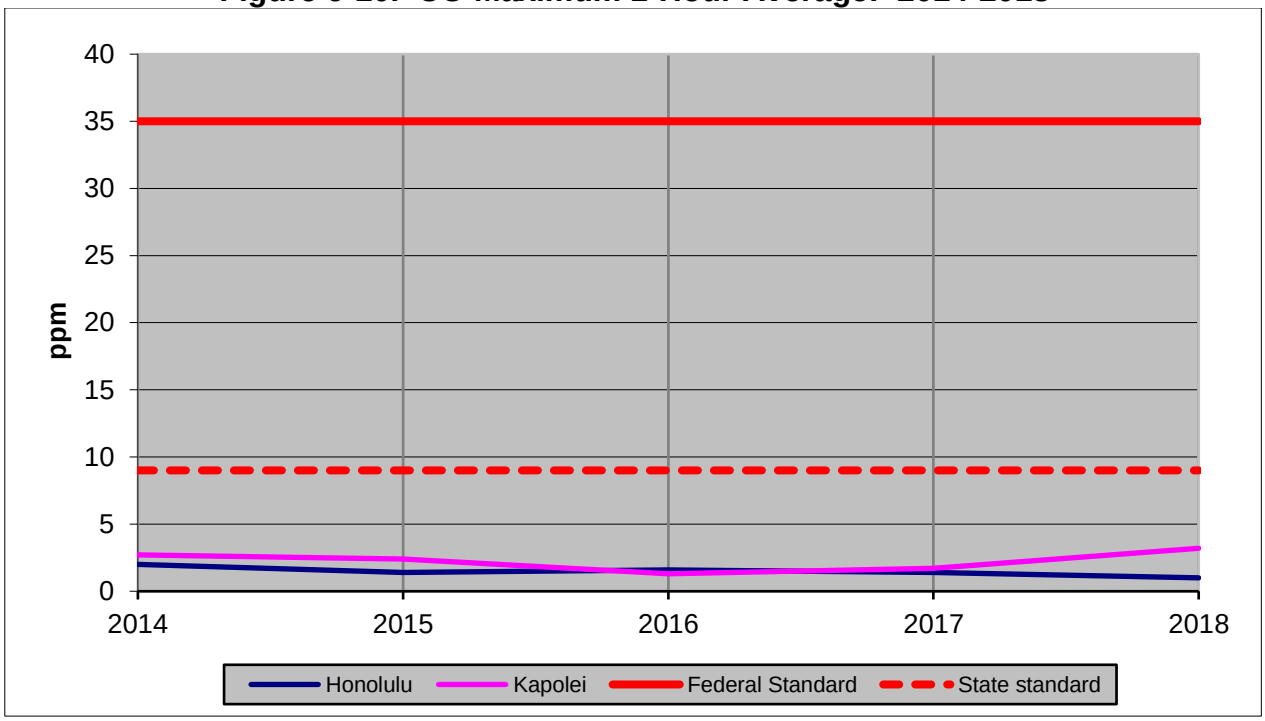


**Figure 6-11. CO Maximum 8-Hour Average: 2014-2018**