Annual Summary
2006
Hawaii Air Quality Data

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STATE OF HAWAII
DEPARTMENT OF HEALTH
CLEAN AIR BRANCH

2006
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 Surveillance and Analysis Section of the State Laboratories Division.

In addition to monitoring the ambient air for criteria pollutants, the State of Hawaii also participates in the national $PM_{2.5}$ speciation and air toxics monitoring programs. EPA determined that speciation was essential for establishing a relationship between particle concentrations and adverse health effects and would provide valuable information for characterizing aerosols, determining the effectiveness of control strategies, and in understanding the effects of particle pollution on atmospheric and regional haze. Toxic air pollutants are substances determined to be hazardous to human health and cause adverse ecological effects. The speciation and air toxics monitors are located at the Pearl City air monitoring station.

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 cane burning; and natural sources, such as windblown dust and volcanic activity. In 2006, the state maintained 16 air monitoring stations on 4 islands. Most commercial, industrial, and transportation activities and their associated air quality effects occur on Oahu, where 9 of the stations are located. Maui and Kauai each have one monitoring station, mainly to measure the air quality impacts from agricultural activities. The continuing eruption of the Kilauea Volcano and air quality impacts associated with geothermal energy production are being monitored at 5 stations on the island of Hawaii. 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 16 monitoring stations during calendar year 2006. 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 2006 speciation and air

toxics data are also included in this report. Trend summaries of pollutants that have at least five years of data are depicted graphically.

The Department of Health also has a web site that displays near real-time air quality data from certain monitoring stations on Oahu and the Big Island. Data is posted approximately two hours after collection and is updated throughout the day. 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 www.hawaii.gov/health/environmental/air/cab/index.html and link to "View the Online Air Quality Data."

To view this entire book as well as books from 2004 and 2005 online, go to: www.hawaii.gov/health/environmental/air/cab/index.html 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:

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Front page photo is a view from the Kalalau lookout on the island of Kauai.

Section 2
DEFINITIONS

"Air Toxics"	Also known as hazardous air pollutants, these are pollutants known or suspected to cause adverse health effects if exposed at sufficient concentrations and durations.
"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"	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"	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 United States Environmental Protection Agency. A federal 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.
“$\mu g/m^3$”	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.
“NAMS”	National Air Monitoring Stations. A subset of the SLAMS network, these sites are used to track trends in certain pollutants and must meet more stringent siting requirements, equipment type, and quality assurance criteria.
“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”	Any dispersed matter, solid or liquid, in which the individual aggregates are larger than the single molecules in diameter, but smaller than 500 microns. 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.
"ppbC"	Parts per billion carbon denotes one particle for every 999,999,999 other particles.
"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, using requirements set by the EPA Office of Air Quality Planning and Standards.
"SPM"	Special Purpose Monitoring stations. These are non-permanent stations established to provide data for special studies in support of air program interests and activities. SPM stations supplement the SLAMS network as circumstances require and resources permit.
"Sulfur Dioxide"	Sulfur dioxide (SO_2) is a colorless gas that easily combines with water vapor forming sulfuric acid. When sulfur dioxide mixes with atmospheric moisture, the result is commonly known as acid rain. 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.
"VOCs"	Volatile Organic Compounds. These compounds are emitted as gases from certain solids or liquids such as paints and lacquers; pesticides; cleansers and disinfectants; automotive products; and hobby supplies including glues and adhesives.
"Vog"	Vog is a local term used 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 ($\mu g/m^3$)	Federal Primary Standard [a] ($\mu g/m^3$)	Federal Secondary Standard [b] ($\mu g/m^3$)
Carbon Monoxide	1-hour 8-hour	10,000 5,000	40,000 10,000	40,000 10,000
Nitrogen Dioxide	Annual	70	100	100
PM_{10}	24-hour Annual [c]	150 50	150 50	150 50
$PM_{2.5}$	24-hour [d] Annual	—— 	65 15	65 15
Ozone	8-hour	157	157	157
Sulfur Dioxide	3-hour 24-hour Annual	1,300 365 80	--- 365 80	1,300 --- ---
Lead [e]	Calendar Quarter	1.5	1.5	1.5
Hydrogen Sulfide	1-hour	35	---	---

[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.

[d] EPA lowered the 24-hour $PM_{2.5}$ standard to 35 $\mu g/m^3$ effective December 17, 2006.

[e] Ambient air monitoring for lead was discontinued in October 1997 with EPA approval. Levels in the state were far below the federal standard since sampling began. With the elimination of lead in gasoline, concentrations were consistently zero or nearly zero. However, lead has been measured since 2003 as part of the $PM_{2.5}$ speciation monitoring program.

Compliance with Air Quality Standards

Carbon Monoxide 1-hour: May not be exceeded more than once per year.
Carbon Monoxide 8-hour: Computed as a moving average, may not be exceeded more than once per year.
Nitrogen Dioxide Annual: Average of all 1-hour values in the year may not exceed the level of the standard.
PM_{10} 24-hour: May not be exceeded more than one day per year, after compensating for days when monitoring did not occur (estimated number of exceedances)
PM_{10} Annual: Average of all 24-hour values in the year may not exceed the level of the standard.
$PM_{2.5}$ 24-hour: The 98th percentile of 24-hour values for the year may not exceed the level of the standard. (The 98th percentile 24-hour value is the value that is higher than 98 percent of all 24-hour values for the year.)
$PM_{2.5}$ Annual: Average of all 24-hour values in the year may not exceed the level of the standard.
Ozone 8-hour: Computed as a moving average, the fourth highest value in the year may not exceed the level of the standard. As of June 15, 2005, the 1-hour ozone standard was revoked for the State of Hawaii.
Sulfur Dioxide 3-hour: May not be exceeded more than once per year.
Sulfur Dioxide 24-hour: May not be exceeded more than once per year.
Sulfur Dioxide 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 calendar quarter may not exceed the level of the standard.

Section 3
SITE LOCATIONS AND DESCRIPTIONS

This section provides detailed descriptions of the monitoring stations in the State of Hawaii. Table 3-1 lists the air pollutant(s) measured at each monitoring station, characterizes the area surrounding the station, and indicates the start dates for air monitoring at the station. Table 3-2 identifies the type of sampler used to measure the concentration of each criteria air pollutant. Figures 3-1, 3-2, 3-3 and 3-4 are maps showing the location of each monitoring station on the islands of Oahu, Kauai, Maui and Hawaii, respectively.

Except for the Puna H station on the Big Island, coordinates for all stations were collected using a carrier phase global positioning system (GPS) with a mapping accuracy of approximately one meter. The coordinates for the Puna H station were collected using a handheld GPS with a mapping accuracy of approximately seven meters.

ISLAND OF OAHU

1. Honolulu

Location description:	In downtown Honolulu, on the roof of the Department of Health building (Kinau Hale) at 1250 Punchbowl Street.
Area description:	Across from a major hospital (Queen's Medical Center) in a business and government district.
Pollutants monitored:	CO, SO_2, PM_{10}, and $PM_{2.5}$
Latitude/Longitude:	21°18'27.27098" N/157°51'19.52241" W
Altitude (meters):	20 m above mean sea level

2. Kapolei

Location description:	In the Kapolei Business Park at 2052 Lauwiliwili Street, near the entrance to Campbell Industrial Park.
Area description:	Commercial and industrial area with nearby residential and agricultural lands. Located south of the Kapolei Fire Station.
Pollutants monitored:	CO, SO_2, NO_2, PM_{10}, and $PM_{2.5}$
Latitude/Longitude:	21°19'25.48126" N/158°05'19.00562" W
Altitude (meters):	17.9 m above mean sea level

3. Liliha

Location description:	On top of the single story administration building of Kauluwela Elementary School at 1486 Aala Street in downtown Honolulu.
Area description:	Mostly a residential and commercial area downwind of the heavily traveled H-1 freeway.
Pollutants monitored:	PM_{10}
Latitude/Longitude:	21°19'08.57706" N/157°51'31.84786" W
Altitude (meters):	17.9 m above mean sea level

4. Makaiwa

Location description: Across from the Honokai Hale subdivision, at 92-670 Farrington Highway, and approximately one mile southeast of Hawaiian Electric Company's Kahe power plant.

Area description: Residential, industrial and agricultural area, approximately 25 miles west of downtown Honolulu.

Pollutants monitored: SO_2

Latitude/Longitude: 21°20'39.36299" N/158°06'46.67939" W

Altitude (meters): 50.9 m above mean sea level

5. Pearl City

Location description: Atop the Leeward Health Center at 860 Fourth Street in Pearl City, approximately 9.5 miles northwest of downtown Honolulu. Approximately 1.5 miles northwest of Hawaiian Electric Company's Waiau power plant and near the naval facilities of Pearl Harbor.

Area description: Commercial, industrial and residential area bordered by Kamehameha highway and the H-1 freeway.

Pollutants monitored: PM_{10}, $PM_{2.5}$, $PM_{2.5}$ speciation, and Air toxics

Latitude/Longitude: 21°23'34.19856" N/157°58'08.85360" W

Altitude (meters): 23.1 m above mean sea level

6. Sand Island

Location description: At the University of Hawaii's Anuenue Fisheries in the Sand Island Industrial Park.

Area description: Light industrial, commercial and recreational area approximately two miles southwest (typically downwind) of downtown Honolulu and near the entrance to the Sand Island State Recreation Area.

Pollutants monitored: O_3 and $PM_{2.5}$

Latitude/Longitude: 21°18'13.81750" N/157°52'16.21590" W

Altitude (meters): 5.3 m above mean sea level

7. University

Location description: On the second floor of the University Square building at 2617 South King Street, near the University of Hawaii.

Area description: Mostly commercial and residential area with apartments, restaurants and shops. Bordered by three busy streets: South King Street, South Beretania Street, and University Avenue.

Pollutants monitored: CO

Latitude/Longitude: 21°17'29.66208" N/157°49'17.37281" W

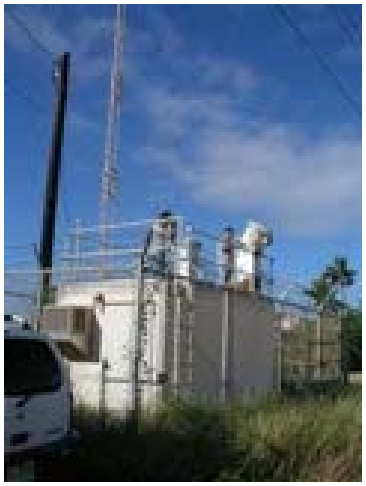
Altitude (meters): 4.7 m above mean sea level

8. Waimanalo

Location description: Within the Waimanalo Wastewater Treatment Facility at 41-1060 Kalanianaole Highway approximately 10 miles east-northeast of downtown Honolulu on the windward (upwind) side of Oahu.
Area description: Rural, agricultural community
Pollutants monitored: PM_{10}
Latitude/Longitude: 21°20'16.21667" N/157°42'16.6539" W
Altitude (meters): 6.7 m above mean sea level

9. West Beach

Location description: Within the Ko'Olina Golf Course, approximately 27 miles west of downtown Honolulu and 1.5 miles northwest of Campbell Industrial Park.
Area description: Resort, recreational, and residential area just north of the Barber's Point Deep Draft Harbor in Kapolei.
Pollutants monitored: SO_2, NO_2, PM_{10}
Latitude/Longitude: 21°19'57.87475" N/158°06'50.86663" W
Altitude (meters): 14.5 m above mean sea level



ISLAND OF KAUAI

Lihue

Location description: In downtown Lihue, on the roof of the District Health Office at 3040 Umi Street.
Area description: Commercial, residential area with nearby agricultural lands
Pollutants monitored: PM_{10}
Latitude/Longitude: 21°58’28.89947” N/159°21’58.09671” W
Altitude (meters): 71.1 m above mean sea level

ISLAND OF MAUI

Kihei

Location description: In upper Kihei within the Hale Piilani Park, bordered on the north by agricultural land.
Area description: Residential and agricultural area. The predominant agricultural activity is growing and harvesting sugar cane.
Pollutants monitored: PM_{10}, $PM_{2.5}$
Latitude/Longitude: 20°46’51.58844” N/156°26’46.94337” W
Altitude (meters): 46.5 m above mean sea level

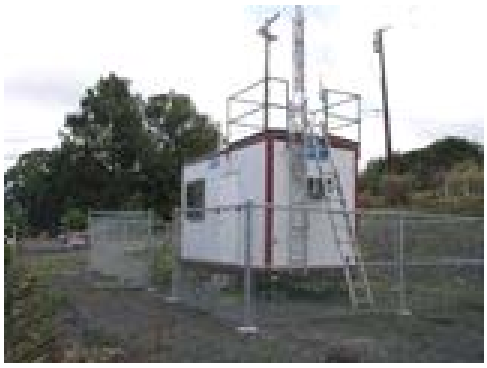
ISLAND OF HAWAII

1. Hilo

Location description: On the grounds of the Adult Rehabilitation Center of Hilo at 1099 Waianuenue Avenue, near the Hilo Medical Center.
Area description: Business and residential area in Hilo.
Pollutants monitored: SO_2
Latitude/Longitude: 19°43’03.22398” N/155°06’37.90606” W
Altitude (meters): 136.76 m above mean sea level

2. Kona

Location description: Located on the upper campus of Konawaena High School at 81-1043 Konawaena School Road in Kealakekua, Hawaii.
Area description: Mostly residential and agricultural area in Kealakekua.
Pollutants monitored: SO_2
Latitude/Longitude: 19°30’27.83302” N/155°55’03.67861” W (January to July)
19°30’35.2” N/155°54’48.3” W (since September)
Altitude (meters): 479.61 m above mean sea level (January to July)
517.25 m above mean sea level (since September)



3. Lava Tree

Location description: On the eastern border of the Lava Tree State Park, near Nanawale Estates.
Area description: Sparse residential and agricultural area
Pollutants monitored: H_2S
Latitude/Longitude: 19°29’11.06393” N/154°54’11.22523” W
Altitude (meters): 192.65 m above mean sea level

4. Puna E

Location description: In the Leilani Estates residential subdivision in Puna.
Area description: Sparse residential and agricultural area, approximately 1.5 miles southwest of the Puna Geothermal Venture power plant.
Pollutants monitored: H_2S, SO_2
Latitude/Longitude: 19°27’50.3594” N/154°53’55.34089” W
Altitude (meters): 207.86 m above mean sea level

5. Puna H

Location description:	Located in the Lanipuna Gardens subdivision in Puna.
Area description:	Sparse residential and agricultural area, approximately one-half mile south-southwest from the Puna Geothermal Venture power plant.
Pollutants monitored:	H_2S
Latitude/Longitude:	19°28’18.6” N/154°53’20.5” W
Altitude (meters):	188.98 m above mean sea level

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

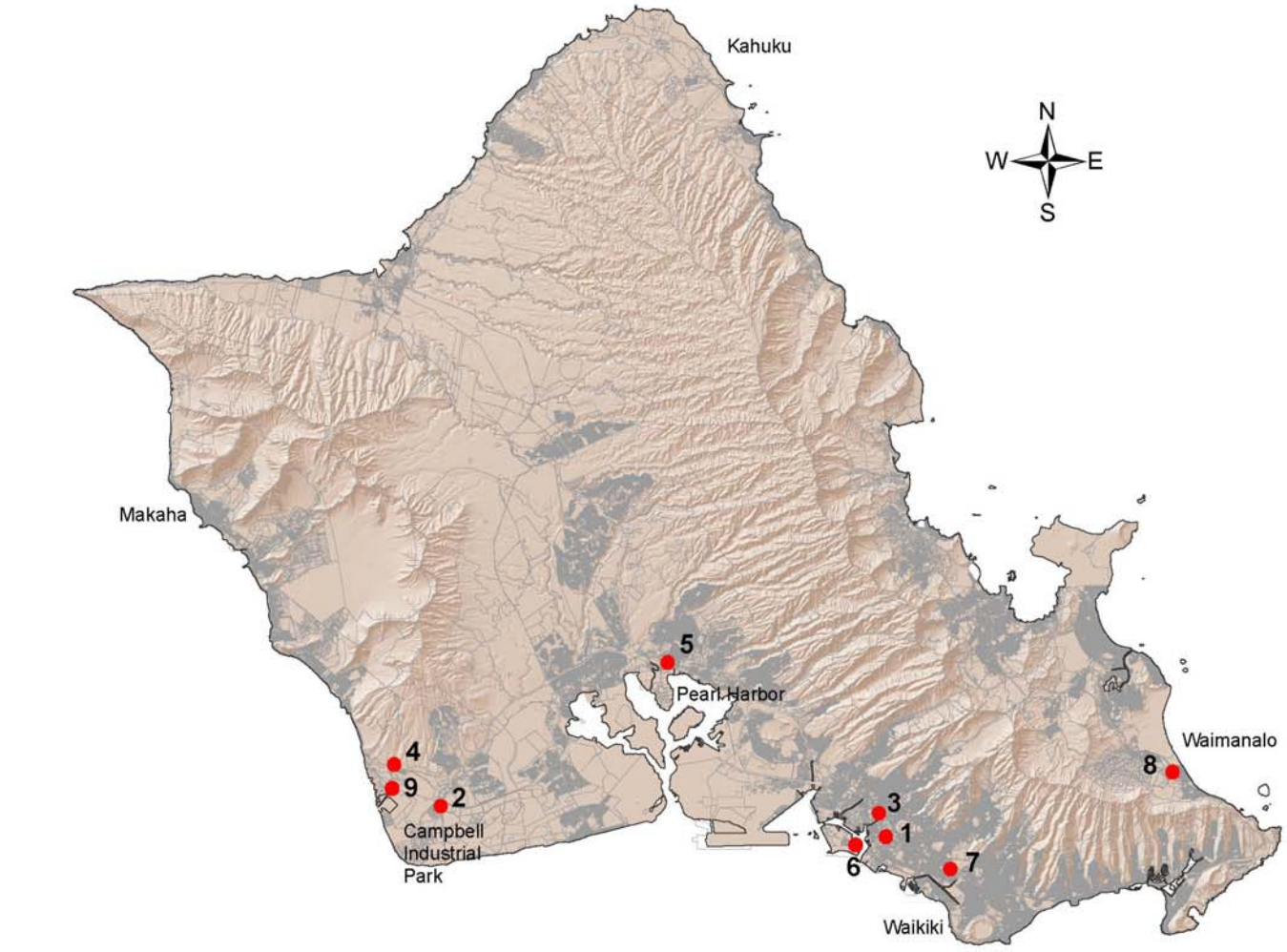
	Station Type								
SITE	**PM_{10}**	**$PM_{2.5}$**	**CO**	**O_3**	**SO_2**	**NO_2**	**H_2S**	**LOCATION SETTING**	**ESTABLISHED**
OAHU									
Honolulu	S	S, C	N	-	S	-	-	Urban & Center City	January 1960
Kapolei	S	S	S	-	S	S	-	Industrial	February 1991
Liliha	N	-	-	-	-	-	-	Urban & Center City	January 1984
Makaiwa	-	-	-	-	S	-	-	Industrial	July 1989
Pearl City	S	S,C	-	-	-	-	-	Urban & Center City	May 1979
Sand Island	-	S	-	N	-	-	-	Urban & Center City	January 1980
University	-	-	S	-	-	-	-	Urban & Center City	November 2002
Waimanalo	S	-	-	-	-	-	-	Agricultural	January 1972
West Beach	S	-	-	-	S	S	-	Commercial	February 1991
KAUAI									
Lihue	S	-	-	-	-	-	-	Urban & Center City	January 1972
MAUI									
Kihei	SPM	S	-	-	-	-	-	Suburban	February 1999
HAWAII									
Hilo	-	-	-	-	SPM	-	-	Center City	March 1995
Kona	-	-	-	-	SPM	-	-	Suburban	April 1997
Lava Tree	-	-	-	-	-	-	SPM	Rural / Agricultural	August 1993
Puna E	-	-	-	-	SPM	-	SPM	Rural / Agricultural	March 1991
Puna H	-	-	-	-	-	-	SPM	Rural / Agricultural	November 2002

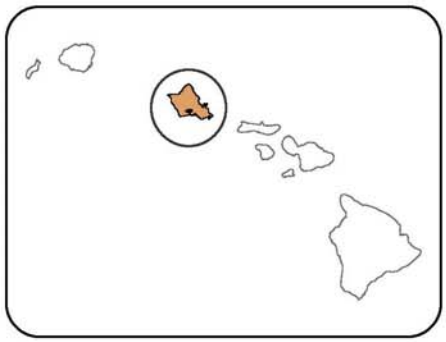
N = (NAMS) National Air Monitoring Station
C = Collocated Site
S = (SLAMS) State and Local Air Monitoring Station
SPM = Special Purpose Monitoring Station, (for monitoring vog, geothermal energy production, or cane burning)

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

Monitoring Station	Sampling Method (Criteria Pollutants and H_2S)							
	PM_{10} Continuous Ambient Particulate Monitor	PM_{10} Manual Ambient Particulate Monitor (1 in 6 days)	$PM_{2.5}$ Manual Ambient Particulate 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
OAHU								
Honolulu	✓		✓ (1 in 3 days)	✓	✓			
Kapolei	✓		✓ (1 in 3 days)	✓	✓		✓	
Liliha	✓							
Makaiwa					✓			
Pearl City	✓		✓(1 in 3 days)					
Sand Island			✓(1 in 6 days)			✓		
University				✓				
Waimanalo		✓						
West Beach		✓			✓		✓	
KAUAI								
Lihue	✓							
MAUI								
Kihei	✓		✓ (1 in 3 days)					
HAWAII								
Hilo					✓			
Kona					✓			
Lava Tree								✓
Puna E					✓			✓
Puna H								✓

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





Station	Name	Location	Pollutants Monitored
1	Honolulu	1250 Punchbowl St.	PM_{10}, $PM_{2.5}$, CO, SO_2
2	Kapolei	2052 Lauwiliwili St.	PM_{10}, $PM_{2.5}$, CO, SO_2, NO_2
3	Liliha	1486 Aala St.	PM_{10}
4	Makaiwa	92-870 Farrington Hwy.	SO_2
5	Pearl City	860 4th St.	PM_{10}
6	Sand Island	1039 Sand Island Pkwy	O_3
7	University	2617 S. King St.	CO
8	Waimanalo	41-1060 Kalanianaole Hwy	PM_{10}
9	West Beach	Ko'Olina Golf Course	PM_{10}, SO_2, NO_2

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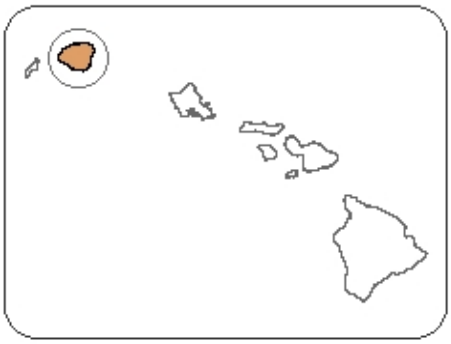
Figure 3-2: Island of Kauai - Air Monitoring Station



Station	Name	Location	Pollutants_Monitored
1	Lihue	3040 Umi St.	PM_{10}

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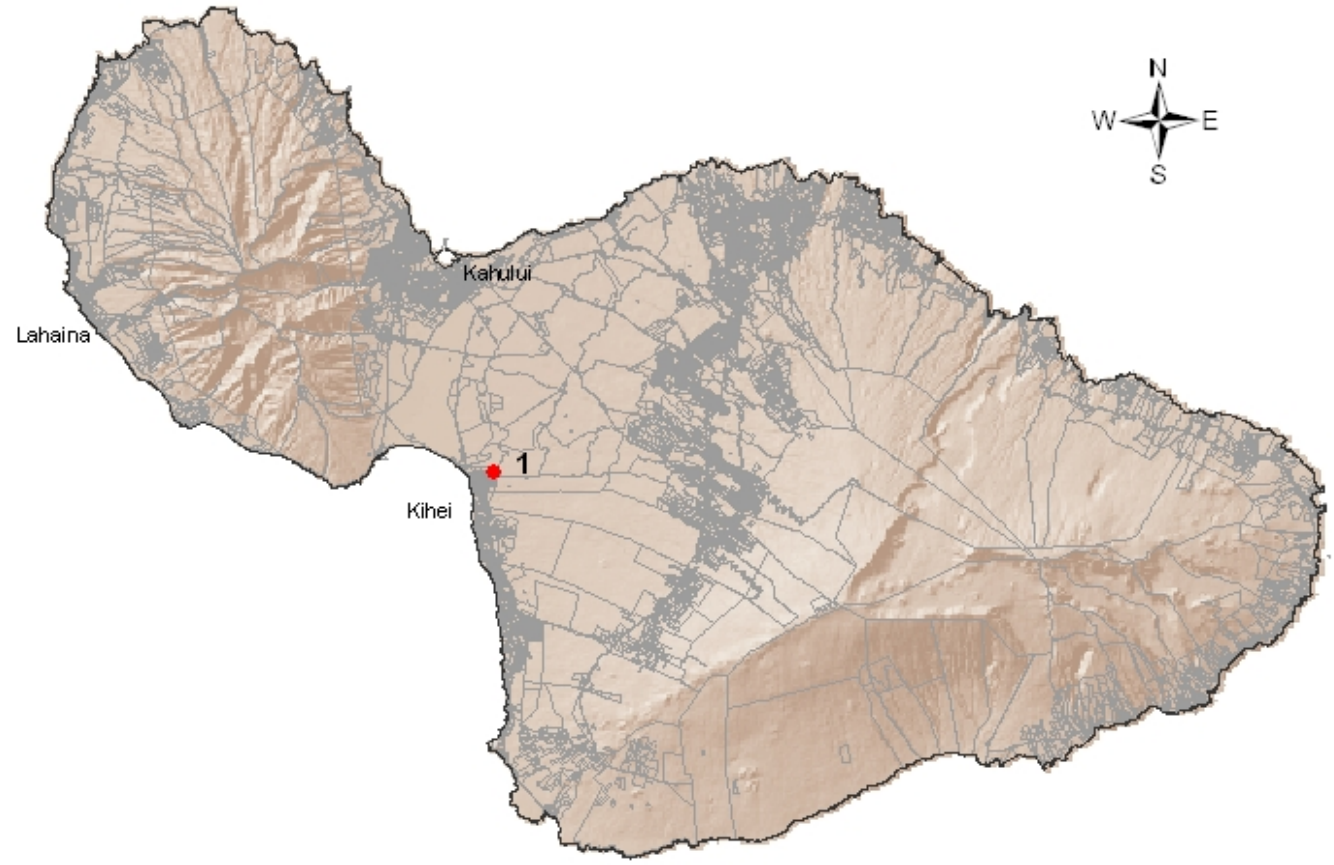
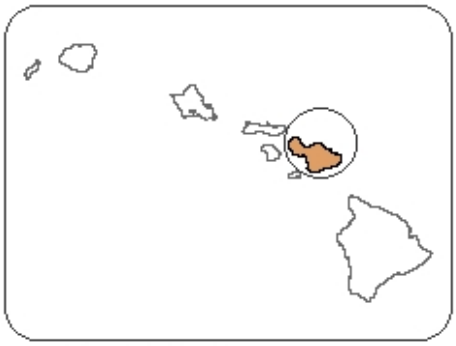
Figure 3-3: Island of Maui - Air Monitoring Station





0 2.5 5 10 Miles

Station	Name	Location	Pollutants_Monitored
1	Kihei	Hale Piilani Park	PM_{10}, PM_{25}

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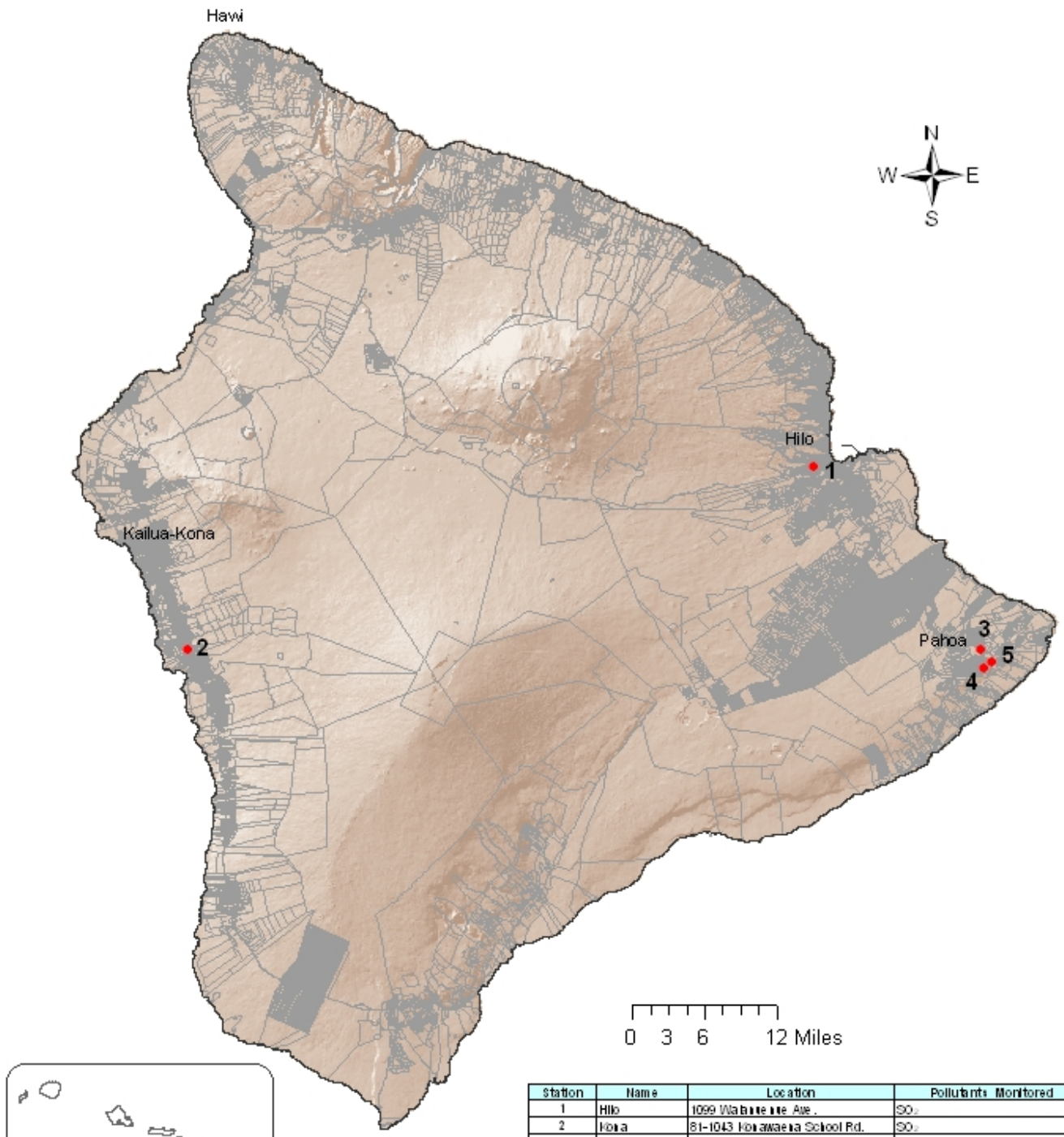
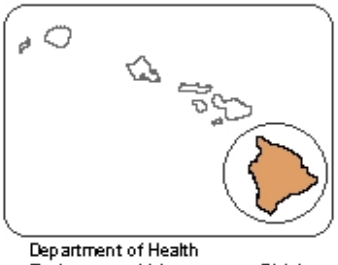
Figure 3-4: Island of Hawaii - Air Monitoring Stations





Station	Name	Location	Pollutants Monitored
1	Hilo	1099 Wainaku Ave.	SO_2
2	Kona	81-1043 Konawaena School Rd.	SO_2
3	Lava Tree	Near Lava Tree State Park	H_2S
4	Puna E	Leilani Subdivision	SO_2, H_2S
5	Puna H	Lanipuna Subdivision	H_2S

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Section 4
2006 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 audited by the Air Surveillance and Analysis Section to ensure that the reported data is of good quality and meets all quality control and assurance requirements.

The following tables summarize the pollutant concentrations measured at each monitoring station. Tables 4-1 through 4-8 are annual summaries grouped by pollutant and provide the number of occurrences exceeding the NAAQS. There is no federal ambient air quality standard for H_2S, and Table 4-9 provides the number of occurrences exceeding the state standard.

The annual statistics provided in tables 4-1 and 4-3 through 4-9 are the highest and second highest $\mu g/m^3$ values recorded in the year for the averaging period, and the annual mean, which is the arithmetic mean of all valid hours recorded in the year. The "Possible Periods" is the total number of sampling periods in the year for the averaging time, "Valid Periods" is the total number of acceptable sampling periods after data validation, and "Percent Recovery" represents the amount of quality data reported. Compliance with the 8-hour O_3 standard is determined by comparing the fourth highest daily maximum 8-hour value in the year to the standard, and that value is included in Table 4-8.

Compliance with the 24-hour $PM_{2.5}$ NAAQS is determined by computing the 98^{th} percentile value which must not exceed the level of the standard. Therefore, the annual statistics in Table 4-2 are the highest and 98^{th} percentile $\mu g/m^3$ values recorded in the year for all stations monitoring for $PM_{2.5}$.

Tables 4-10 through 4-18 are monthly summaries of the range and average of each pollutant for each averaging period. The range is the lowest and highest $\mu g/m^3$ values recorded in the month for the averaging period and the average is the arithmetic mean of all hours recorded in the month. The month with the highest value recorded in the year for each site is highlighted.

In 2006, the State of Hawaii was in attainment for all NAAQS.

Table 4-1 **Annual Summary of 24-Hour PM_{10}**

	Annual Statistics																	
	Maximum		Annual Mean	24-hour Occurrences 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[a]	25	23	13	-	-	-	-	-	-	-	0	0	0	0	0	365	141	39 [b]
Kapolei	59	58	16	0	0	0	0	0	0	0	0	0	0	0	0	365	355	97
Liliha	31	30	16	0	0	0	0	0	0	0	0	0	0	0	0	365	329	90
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	87 [c]	64 [c]	15	0	0	0	0	0	0	0	0	0	0	0	0	365	325	89
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo [d]	36	35	16	0	0	0	0	0	0	0	0	0	0	0	0	61	54	89
West Beach [d]	33 [c]	22	12	0	0	0	0	0	0	0	0	0	0	0	0	61	57	93
KAUAI																		
Lihue '	34	30	11	0	0	0	0	0	0	0	0	0	0	0	0	365	335	92
MAUI																		
Kihei	72	66	22	0	0	0	0	0	0	0	0	0	0	0	0	365	337	92
HAWAII																		
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] Sampler shut down until 8/5/06 due to building re-roofing [b] Does not meet annual minimum data recovery requirements [c] Data flagged, due to fireworks
[d] Sampling is once every 6th day

Table 4-2 **Annual Summary of 24-Hour $PM_{2.5}$**

	Annual Statistics																	
	Maximum		Annual Mean	98th Percentile 24-hour Occurrences Greater than 65 µg/m³ (35 µg/m³ after 12/17)														
	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[a]	10	10	3	-	-	-	-	-	-	-	0	0	0	0	0	122	52	43 [b]
Kapolei	34 [c]	7	4	0	0	0	0	0	0	0	0	0	0	0	0	122	116	95
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	51 [c]	9	4	0	0	0	0	0	0	0	0	0	0	0	0	122	113	93
Sand Island [d]	10	10	5	0	0	0	0	0	0	0	0	0	0	0	0	61	55	90
University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	30 [c]	10	5	0	0	0	0	0	0	0	0	0	0	0	0	122	109	89
HAWAII																		
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] Sampler shut down until 8/5/06 due to building re-roofing [b] Does not meet annual minimum data recovery requirements [c] Data flagged, due to fireworks

[d] Sampling is once every 6th day

Table 4-3 **Annual Summary of Nitrogen Dioxide**

Annual Statistics

	Maximum 1-hr		Annual Mean	Annual Mean Greater than 100 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	66	62	9	-	-	-	-	-	-	-	-	-	-	-	0	8760	8663	99
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	98	64	6	-	-	-	-	-	-	-	-	-	-	-	0	8760	7419	85
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																		
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4-4 **Annual Summary of 1-Hour Carbon Monoxide**

	Annual Statistics																	
	Maximum		Annual Mean	1-hour Occurrences Greater than 40,000 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[a]	2850	1938	501	-	-	-	-	-	-	-	0	0	0	0	0	8760	3612	41
Kapolei	1596	1596	106	0	0	0	0	0	0	0	0	0	0	0	0	8760	8615	98
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University	2736	2736	776	0	0	0	0	0	0	0	0	0	0	0	0	8760	8679	99
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																		
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] Sampler shut down until 8/2/06 due to building re-roofing

Table 4-5 **Annual Summary of 8-Hour Carbon Monoxide**

	Annual Statistics																	
	Maximum		Annual Mean	8-hour Occurrences Greater than 10,000 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[a]	1226	1211	501	-	-	-	-	-	-	-	0	0	0	0	0	8760	3610	41
Kapolei	1183	1169	106	0	0	0	0	0	0	0	0	0	0	0	0	8760	8627	98
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University	1967	1952	776	0	0	0	0	0	0	0	0	0	0	0	0	8760	8669	99
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																		
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] Sampler shut down until 8/2/06 due to building re-roofing

Table 4-6 **Annual Summary of 3-Hour Sulfur Dioxide**

Annual Statistics

	Maximum		Annual Mean	3-hour Occurrences Greater than 1,300 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[a]	43	36	1	-	-	-	-	-	-	-	0	0	0	0	0	2920	1138	39 [b]
Kapolei	12	10	5	0	0	0	0	0	0	0	0	0	0	0	0	2920	2526	87
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	62	55	4	0	0	0	0	0	0	0	0	0	0	0	0	2920	2868	98
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	24	22	2	0	0	0	0	0	0	0	0	0	0	0	0	2920	2382	82
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																		
Hilo	451	405	9	0	0	0	0	0	0	0	0	0	0	0	0	2920	2630	90
Kona	119	90	11	0	0	0	0	0	0	0	0	0	0	0	0	2920	2697	92
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	65	56	5	0	0	0	0	0	0	0	0	0	0	0	0	2920	2431	83
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] Sampler shut down until 8/2/06 due to building re-roofing

[b] Does not meet annual minimum data recovery requirements

Table 4-7 **Annual Summary of 24-Hour Sulfur Dioxide**

Annual Statistics

	Maximum		Annual Mean	24-hour Occurrences Greater than 365 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[a]	13	5	1	-	-	-	-	-	-	-	0	0	0	0	0	365	146	40 [b]
Kapolei	8	8	5	0	0	0	0	0	0	0	0	0	0	0	0	365	363	99
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	17	17	4	0	0	0	0	0	0	0	0	0	0	0	0	365	362	99
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	7	7	2	0	0	0	0	0	0	0	0	0	0	0	0	365	350	96
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																		
Hilo	161	96	9	0	0	0	0	0	0	0	0	0	0	0	0	365	331	91
Kona	31	29	11	0	0	0	0	0	0	0	0	0	0	0	0	365	341	93
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	23	18	5	0	0	0	0	0	0	0	0	0	0	0	0	365	360	99
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] Sampler shut down until 8/2/06 due to building re-roofing

[b] Does not meet annual minimum data recovery requirements

Table 4-8 **Annual Summary of 8-Hour Ozone**

	Annual Statistics [a]																		
	Maximum			Annual Mean	8-hour Occurrences Greater than 157 µg/m^3														
	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																			
Honolulu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	83	83	82	27	0	0	0	0	0	0	0	0	0	0	0	0	8760	8591	98
University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																			
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																			
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																			
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] For compliance with the standard, the fourth highest value in a year may not exceed 157 µg/m^3

Table 4-9 **Annual Summary of 1-Hour Hydrogen Sulfide**

Annual Statistics

	Maximum		Annual Mean	1-hour Occurrences Greater than 35 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																		
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	18	4	1	0	0	0	0	0	0	0	0	0	0	0	0	8760	8166	93
Puna E	21	14	1	0	0	0	0	0	0	0	0	0	0	0	0	8760	8286	95
Puna H	11	8	2	0	0	0	0	0	0	0	0	0	0	0	0	8760	8258	94

Table 4-10 **Monthly Summary of 24-Hour PM_{10} (µg/m^3)**

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

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu [a]	Range								6-17	5-18	7-22	5-22	8-25
	Average								11	11	15	12	15
Kapolei	Range	9-59	8-29	7-22	10-23	10-42	7-58	7-37	9-52	7-36	9-22	9-27	7-45
	Average	21	16	13	16	16	17	18	14	15	16	14	19
Liliha	Range	9-31	7-28	8-28	10-25	12-23	7-23	10-20	9-19	8-19	8-25	10-22	8-30
	Average	19	17	17	18	17	14	14	13	13	16	15	16
Pearl City	Range	8-87 [b]	9-23	8-23	10-23	10-20	6-22	8-19	9-17	7-17	8-23	9-18	6-64 [b]
	Average	20	15	14	17	15	13	14	13	12	15	13	16
Waimanalo (1 in 6 days)	Range	11-21	13-36	8-30	7-32	11-23	6-23	12-23	9-23	sampler	8-23	9-18	7-35
	Average	16	19	17	16	17	13	18	15	down	16	14	19
West Beach (1 in 6 days)	Range	7-22	11-19	8-17	8-19	9-14	5-16	7-16	6-13	5-14	7-15	9-16	6-33 [b]
	Average	13	15	13	11	11	9	12	10	9	11	12	16
Lihue	Range	8-34	0-20	0-15	1-24	0-14	0-19	5-19	9-24	5-26	7-29	5-21	8-30
	Average	17	7	7	11	6	9	12	15	11	15	10	17
Kihei	Range	11-40	12-57	8-31	12-72	12-37	12-53	13-55	14-66	12-33	5-47	7-33	8-39
	Average	23	20	18	23	20	25	24	30	22	20	17	18

[a] Sampler shut down until 8/5/06 for building re-roofing [b] Data flagged due to fireworks

Table 4-11 **Monthly Summary of 24-Hour $PM_{2.5}$ (µg/m^3)**

The month with the highest value in the year is highlighted

The federal 24-hr $PM_{2.5}$ standard is 65 µg/m^3 (35 µg/m^3 after 12/17/07)

Compliance with the standard is determined by computing the 98th percentile value which may not exceed the level of the standard

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu [a]	Range							3-6	2-5	2-4	0-10	1-8	2-10
	Average							4	3	3	4	3	4
Kapolei	Range	3-5	3-5	2-7	1-7	2-5	2-5	2-7	1-4	2-4	2-9	2-6	1-34 [b]
	Average	4	4	4	5	4	3	3	2	2	5	4	6
Pearl City	Range	2-6	1-6	2-7	2-7	2-5	2-4	2-7	1-4	2-4	2-9	2-9	2-51 [b]
	Average	3	3	4	4	4	3	3	3	2	5	4	8
Sand Island	Range	3-7	2-8	3-5	6-8	4-10	2-6	4-8	2-6	3-7	3-7	3-10	3-7
	Average	5	5	4	6	6	4	5	3	5	5	6	4
Kihei	Range	0-7	1-6	2-9	2-8	0-6	2-8	2-6	3-10	3-5	2-10	2-7	3-30 [b]
	Average	4	4	5	5	4	5	3	5	4	5	5	7

[a] Sampler shut down until 7/19/06 due to building re-roofing

[b] Data flagged due to fireworks

Table 4-12 **Monthly Summary of 1-Hour Nitrogen Dioxide (µg/m^3)**

The month with the highest annual value is highlighted **There are no 1-hour state or federal standards for nitrogen dioxide**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Kapolei	Range	2-62	2-66	0-45	2-26	2-47	2-30	2-26	2-26	2-47	2-41	2-38	0-45
	Average	12	11	10	8	8	8	7	9	9	11	9	9
West Beach	Range	0-62	0-98	0-51	0-28	0-64	0-36	0-17	0-23	0-23	0-30	0-45	0-45
	Average	11	8	8	4	5	4	4	4	4	7	7	7

Table 4-13 **Monthly Summary of 1-Hour Carbon Monoxide (µg/m^3)**

The month with the highest annual value is highlighted

The state 1-hr CO standard is 10,000 µg/m^3, the federal 1-hr CO standard is 40,000 µg/m^3

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu [a]	Range								114-1596	0-1482	0-1254	228-2850	228-1254
	Average								548	510	320	652	479
Kapolei	Range	0-570	0-570	0-798	0-456	0-798	0-1482	0-1596	0-684	0-456	0-684	0-456	0-342
	Average	51	80	40	99	108	150	208	170	109	101	37	117
University	Range	0-2166	228-2280	342-2736	228-1824	456-1938	0-1710	114-1368	342-1824	342-1824	228-1938	456-2166	342-2280
	Average	449	839	1076	708	852	660	642	745	797	851	875	810

[a] Sampler shut down until 8/2/06 due to building re-roofing

Table 4-14 **Monthly Summary of 8-Hour Carbon Monoxide (µg/m^3)**

The month with the highest annual value is highlighted

The state 8-hr CO standard is 5,000 µg/m^3, the federal 8-hr CO standard is 10,000 µg/m^3

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu [a]	Range								185-1126	0-1083	0-684	228-1226	228-827
	Average								548	513	317	653	478
Kapolei	Range	0-684	0-285	0-314	0-257	0-475	14-385	0-1183	0-456	0-171	0-242	0-228	14-214
	Average	57	79	41	99	110	150	206	171	108	102	37	116
University	Range	0-1582	342-1610	371-1967	314-1667	570-1525	57-1482	242-1211	399-1240	442-1340	356-1525	556-1468	485-1268
	Average	445	839	1072	713	851	661	643	746	797	849	876	810

[a] Sampler shut down until 8/2/06 due to building re-roofing

Table 4-15 **Monthly Summary of 3-Hour Sulfur Dioxide (µg/m^3)**

The month with the highest annual value is highlighted **The state and federal 3-hr SO_2 standards are 1300 µg/m^3**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu [a]	Range								0-11	0-3	0-43	0-5	0-5
	Average								1	<1	2	<1	<1
Kapolei	Range	1-5	3-7	3-6	3-8	3-12	3-5	3-6	5-7	3-7	4-8	5-8	3-10
	Average	3	5	5	5	6	4	5	5	5	5	5	5
Makaiwa	Range	0-13	3-34	2-16	0-15	3-46	3-41	3-62	3-23	4-55	0-32	4-45	5-18
	Average	2	4	3	3	4	4	4	6	7	3	7	6
West Beach	Range	0-24	1-10	1-10	1-17	2-22	0-17	0-9	0-11	0-9	0-10	0 -7	0-5
	Average	3	3	3	3	3	3	1	1	2	2	2	2
Hilo	Range	3-174	3-405	3-451	3-8	0-89	0-12	0-12	0-324	0-59	1-235	2-172	3-104
	Average	10	11	26	5	2	2	2	8	3	13	12	5
Kona	Range	5-86	7-65	5-42	5-119	3-40	3-45	3-44	3-26	3-70	3-53	3-56	5-90
	Average	12	14	10	14	10	10	11	7	10	8	8	11
Puna E	Range	0-7	0-23	5-56	5-9	5-20	5-5	0-5	5-65	5-6	5-47	5-10	5-7
	Àverage	3	4	6	5	5	5	5	6	5	6	6	5

[a] Sampler shut down until 8/2/06 due to building re-roofing

Table 4-16 **Monthly Summary of 24-Hour Sulfur Dioxide (µg/m^3)**

The month with the highest annual value is highlighted **The state and federal 24-hr SO_2 standards are 365 µg/m^3**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu[a]	Range								0-3	0-2	0-13	0-1	0-2
	Average								1	<1	2	<1	<1
Kapolei	Range	2-4	3-6	3-5	4-6	3-7	3-5	5-5	5-6	5-6	5-8	5-7	3-8
	Average	3	5	5	5	6	4	5	5	5	5	6	5
Makaiwa	Range	0-5	3-11	2-6	1-6	3-13	3-9	3-17	4-8	5-14	0-11	5-17	5-9
	Average	2	4	3	3	4	4	4	6	7	3	7	6
West Beach	Range	2-7	2-4	2-4	2-7	3-7	1-6	0-3	0-3	0-3	0-3	0-4	0-3
	Average	3	3	3	3	3	3	1	1	1	2	1	2
Hilo	Range	3-72	3-93	3-161	5-5	0-16	0-5	0-4	1-96	1-15	3-73	3-59	3-37
	Average	10	11	25	5	2	2	2	8	3	14	12	5
Kona	Range	6-26	8-29	5-21	9-29	5-16	7-17	5-18	3-13	4-19	3-21	3-18	7-31
	Average	12	14	10	14	10	10	11	7	10	9	8	11
Puna E	Range	0-5	0-9	5-14	5-6	5-10	5-5	3-5	5-18	5-5	5-23	5-7	5-6
	Average	3	4	6	5	5	5	5	6	5	6	6	5

[a] Sampler shut down until 8/2/06 due to building re-roofing

Table 4-17 **Monthly Summary of 8-Hour Ozone (µg/m^3)**

The month with the highest annual value is highlighted **The state and federal 8-hr O_3 standards are 157 µg/m^3**

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Sand Island	Range	7-83	10-82	4-73	10-81	8-68	5-44	3-30	0-37	2-40	0-49	0-54	4-63
	Average	46	49	37	36	33	20	13	13	13	17	17	35

Table 4-18 **Monthly Summary of 1-Hour Hydrogen Sulfide (µg/m^3)**

The month with the highest annual value is highlighted
The state H_2S standard is 35 µg/m^3, there is no federal ambient air standard for H_2S

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Lava Tree	Range	0-3	0-1	0-3	1-3	1-3	1-3	1-3	1-4	0-18	0-3	0-1	1-3
	Average	<1	1	1	1	2	2	2	3	2	1	1	1
Puna E	Range	0-1	0-21	0-1	0-4	0-14	0-1	0-1	0-3	0-3	0-3	0-3	0-3
	Average	<1	<1	<1	<1	<1	<1	<1	<1	1	1	1	1
Puna H	Range	0-4	0-0	1-6	1-11	1-4	0-6	0-7	0-7	1-7	0-8	0-7	1-8
	Average	<1	0	2	2	3	2	1	2	2	2	2	2

Section 5
$PM_{2.5}$ 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 at the Pearl City monitoring station collects samples once every 6 days for analyses performed by an EPA contract laboratory.

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 Parameters**

Parameter	1st High µg/m3	2nd High µg/m3	Annual Arithmetic Mean	No. of Samples
CARBON				
Organic Carbon	2.25	2.15	1.587	60
Elemental Carbon	0.58	0.57	0.225	60
METALS				
Aluminum	0.377	0.066	0.0182	60
Antimony	0.036	0.021	0.0177	60
Arsenic	0.002	0.001	0.0008	60
Barium	0.059	0.030	0.0085	60
Bromine	0.007	0.006	0.0018	60
Cadmium	0.026	0.018	0.0079	60
Calcium	0.080	0.077	0.0237	60
Cerium	0.050	0.050	0.0085	60
Cesium	0.023	0.023	0.0096	60
Chlorine	4.850	1.200	0.5763	60
Chromium	0.039	0.008	0.0024	60
Cobalt	0.011	0.001	0.0008	60
Copper	1.270	0.083	0.0254	60
Europium	0.006	0.006	0.0025	60
Gallium	0.008	0.007	0.0013	60
Gold	0.004	0.004	0.0019	60
Hafnium	0.014	0.014	0.0060	60
Indium	0.032	0.017	0.0089	60
Iridium	0.006	0.004	0.0024	60
Iron	0.084	0.068	0.0249	60
Lanthanum	0.076	0.049	0.0083	60
Lead	0.015	0.015	0.0024	60
Magnesium	1.160	0.151	0.0472	60
Manganese	0.019	0.004	0.0014	60
Mercury	0.006	0.006	0.0028	60
Molybdenum	0.009	0.005	0.0033	60
Nickel	0.013	0.008	0.0018	60
Niobium	0.008	0.003	0.0019	60
Phosphorus	0.008	0.008	0.0061	60
Potassium	13.600	1.180	0.2716	60
Rubidium	0.007	0.002	0.0010	60
Samarium	0.006	0.005	0.0026	60
Scandium	0.019	0.019	0.0089	60
Selenium	0.004	0.002	0.0011	60
Silicon	0.216	0.189	0.0299	60
Silver	0.015	0.015	0.0067	60

Table 5-1 Continued

Parameter	1st High µg/m3	2nd High µg/m3	Annual Arithmetic Mean	No. of Samples
Sodium	0.824	0.815	0.3206	60
Strontium	0.322	0.026	0.0072	60
Sulfur	4.580	1.870	0.3358	60
Tantalum	0.018	0.010	0.0039	60
Terbium	0.009	0.006	0.0024	60
Tin	0.016	0.016	0.0113	60
Titanium	0.009	0.008	0.0029	60
Tungsten	0.021	0.019	0.0035	60
Vanadium	0.052	0.006	0.0028	60
Yttrium	0.006	0.004	0.0013	60
Zinc	0.134	0.012	0.0044	60
Zirconium	0.020	0.007	0.0025	60
IONS				
Ammonium Ion	1.16	1.05	0.139	60
Potassium Ion	15.10	1.21	0.281	60
Sodium Ion	0.93	0.88	0.422	60
Total Nitrate	0.40	0.33	0.172	60
Sulfate	13.50	5.02	1.096	60

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

Parameter	Collection Method	Analysis Method
Carbon	SASS[1] Quartz Filter	Thermal Optical Transmittance
Metals	SASS Teflon Filter	Energy Dispersive X-Ray Fluorescence
Ions	SASS Nylon Filter	Ion Chromatography

[1] Trademarked equipment: Speciation Air Sampling System

Section 6
AIR TOXICS

The Clean Air Act identified 188 hazardous air pollutants (HAPs) that have been associated with adverse environmental and health effects. Ambient monitoring for air toxics is just one element of the entire air toxics assessment process which may also include regulatory approaches.

A subset of 33 HAPs was selected in EPA's Urban Air Toxics Strategy as having the greatest impact on the public and environment in urban areas. National monitoring efforts have been directed towards these 33 HAPs, but based on consultation with the EPA, a review of available methodology and resource limitations, the state decided to focus its monitoring efforts on 11 of these 33 HAPs. Following is a brief description of the 11 air toxics being monitored at the Pearl City station. The descriptions are from the EPA website on air toxics which can be found at www.epa.gov/ttnatw01/hlthef/hapindex.html.

There are no ambient air quality standards for air toxics.

- Benzene
  Uses: constituent in motor fuels; solvent for fats, waxes, resins, oils, inks, paints, plastics and rubber.
  Sources: emissions from burning of coal and oil, gasoline service stations and motor vehicle exhaust.
- 1,3-Butadiene
  Uses: used in production of rubber and plastics and in copolymers including acrylics.
  Sources: motor vehicle exhaust, manufacturing and processing facilities, forest fires or other combustion, cigarette smoke.
- Carbon tetrachloride
  Uses: used to make refrigerants and propellants for aerosol cans, as a solvent for oils, fats, lacquers, varnishes, waxes, and resins, and as a grain fumigant and dry cleaning agent.
  Sources: accidental releases from production and uses and in indoor air from building materials or products and in cleaning agents used in the home.
- Chloroform
  Uses: mainly to make the refrigerant HCFC-22.
  Sources: release associated with its manufacture and use, as well as its formation in the chlorination of drinking water, wastewater, and swimming pools. Also may be emitted by pulp and paper mills, hazardous waste sites and landfills.

- Propylene dichloride
  Uses: as a chemical intermediate in the production of chlorinated organic chemicals; as an industrial solvent; in photographic film manufacture; for paper coating and petroleum catalyst regeneration.
  Sources: mainly occupational exposures or from evaporation from wastewater that contains the chemical.
- Methylene chloride
  Uses: paint strippers and removers; as a metal cleaning and finishing solvent in electronics manufacturing; as an agent in urethane foam blowing; and as a propellant in aerosols for paints, automotive products and insect sprays.
  Sources: occupational and consumer exposure from spray painting or other aerosol uses.
- Tetrachloroethylene (perchloroethylene or PERC)
  Uses: dry cleaning and metal degreasing operations.
  Sources: mainly occupational exposure
- Trichloroethylene
  Uses: industrial degreasing of metal parts
  Sources: in the vapor of degreasing operations; in consumer products such as correction fluids, paint removers and strippers, adhesives, spot removers and rug-cleaning fluids.
- Vinyl chloride
  Uses: used to make polyvinyl chloride (PVC)
  Sources: outgas from new plastic parts such as in new cars
- Acetaldehyde
  Uses: used in the production of perfumes, polyester resins and dyes. Also used as a fruit and fish preservative, as a flavoring agent, a denaturant for alcohol, in fuel and as a solvent in rubber, tanning and paper industries.
  Sources: ubiquitous in the environment; formed as a product of incomplete wood combustion in fireplaces and woodstoves, coffee roasting, burning tobacco and vehicle exhaust fumes.
- Formaldehyde
  Uses: mainly in manufacturing resins and particleboard products. Also used as an analytical reagent, and in concrete and plaster additives, cosmetics, disinfectants, fumigants, photography and wood preservation.
  Sources: in indoor air as it is released from various consumer products such as building materials and home furnishings. Found in ambient air from power plants, manufacturing facilities, incinerators, auto exhaust emissions, and from smoking.

Table 6-1 **Annual Summary of Air Toxics Data**

Sampling is conducted for 24 hours once every 6 days

Parameter	1st High ppbC	2nd High ppbC	Annual Arithmetic Mean	No. of Samples
VOCs				
Benzene	5.16	4.32	1.48	59
1,3-Butadiene	0.05	0.05	0.05	59
Carbon tetrachloride	0.49	0.30	0.098	59
Chloroform	0.10	0.10	0.05	59
1,2-Dichloropropane	0.15	0.15	0.15	59
Dichloromethane	0.05	0.05	0.05	59
Tetrachloroethylene	0.10	0.10	0.10	59
Trichloroethylene	0.01	0.01	0.01	59
Vinyl chloride	0.10	0.10	0.10	59
ALDEHYDES				
Acetaldehyde	1.76	1.62	1.03	50
Formaldehyde	1.90	1.89	1.35	50

Table 6-2 **Air Toxics Collection and Analysis Methods**

Parameter	Collection Method	Analysis Method
VOCs	Canister-Subambient Pressure	Gas Chromatograph
ALDEHYDES	Cartridge-DNPH-Silica Sep Pak	High Performance Liquid Chromatography (HPLC)-Photodiode Array

Section 7
AMBIENT AIR QUALITY TRENDS

The following graphs illustrate 5-year trends for PM_{10}, $PM_{2.5}$, ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide from 2002 to 2006 at all SLAMS stations monitoring for those pollutants.

The graphs for PM_{10}, $PM_{2.5}$, sulfur dioxide and nitrogen dioxide (figures 6-1, 6-2, 6-3 and 6-4, respectively) represent the annual averages for each year and for each station that monitors for that pollutant. Annual averages are derived by calculating the arithmetic mean of all valid hours recorded in the year. Included in the graphs are the state and federal annual standard(s).

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 157 $\mu g/m^3$. Figure 6-5 is a graph of the fourth highest daily maximum value recorded at the Sand Island ozone monitoring station in the past five years.

The graphs for 1-hour and 8-hour carbon monoxide (figures 6-6 and 6-7, respectively) represent the average of the daily maximum 1-hour or 8-hour values recorded in the year. These values are obtained by taking the highest recorded 1-hour or 8-hour value for each day then calculating the arithmetic mean of all those hours to arrive at the annual maximum average.

Air quality in the State of Hawaii continues to be one of the best in the nation, and criteria pollutant levels remain well below state and federal ambient air quality standards.

Figure 7-1 **PM_{10} Annual Average 2002 - 2006**

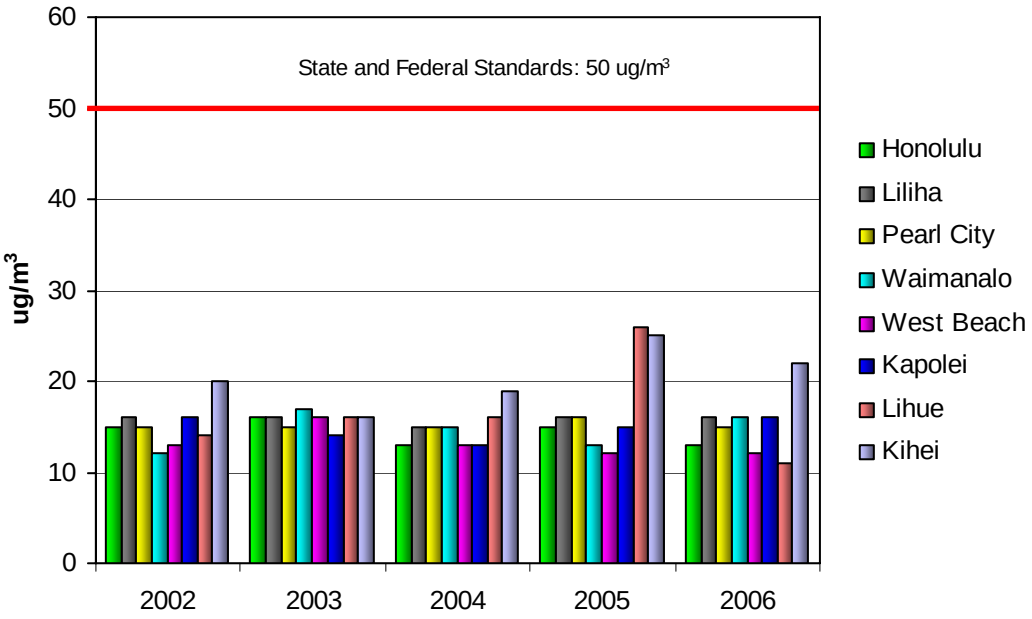


Figure 7-2 **$PM_{2.5}$ Annual Average 2002 - 2006**

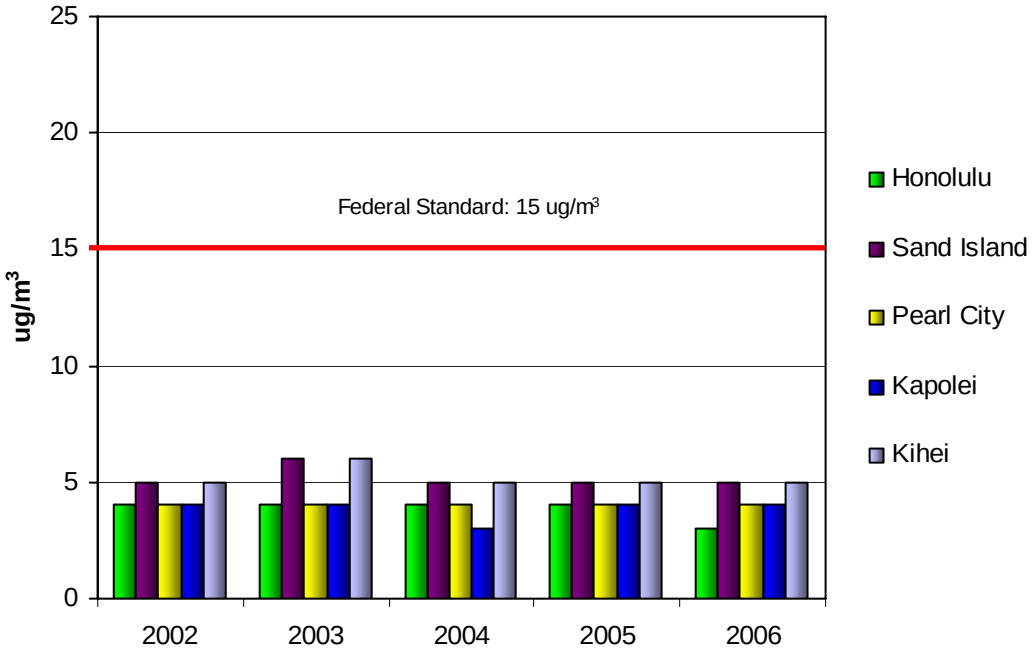


Figure 7-3 **Annual Average Sulfur Dioxide 2002 - 2006**

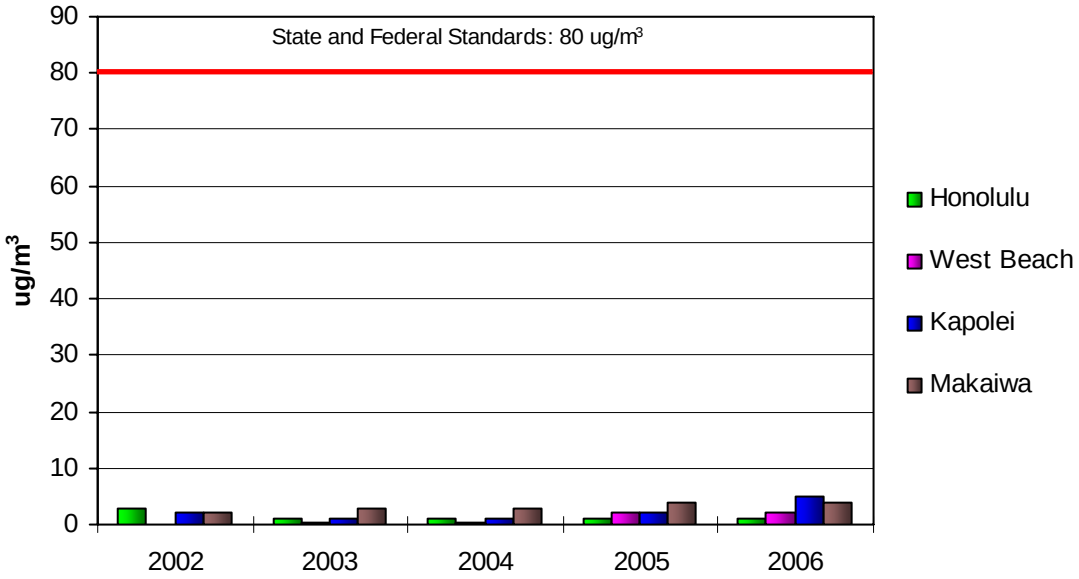


Figure 7-4 **Annual Average Nitrogen Dioxide 2002 - 2006**

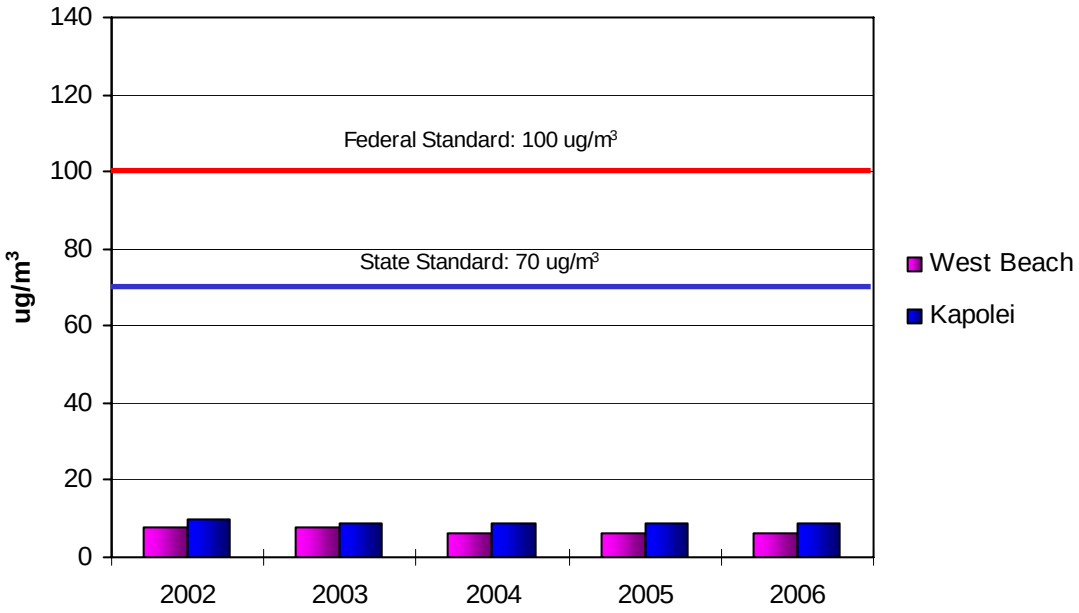


Figure 7-5 **4th Highest Daily Maximum 8-Hour Ozone 2002 - 2006**

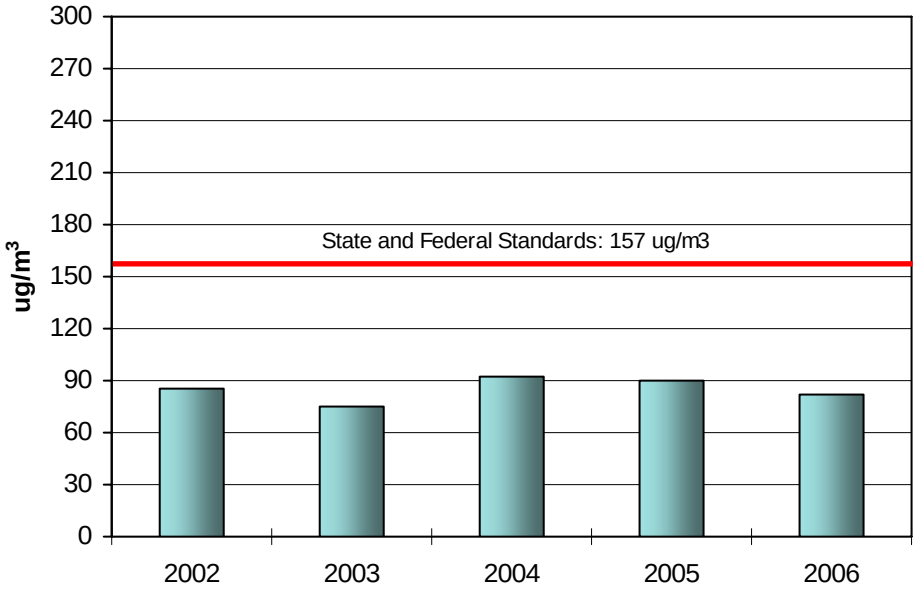
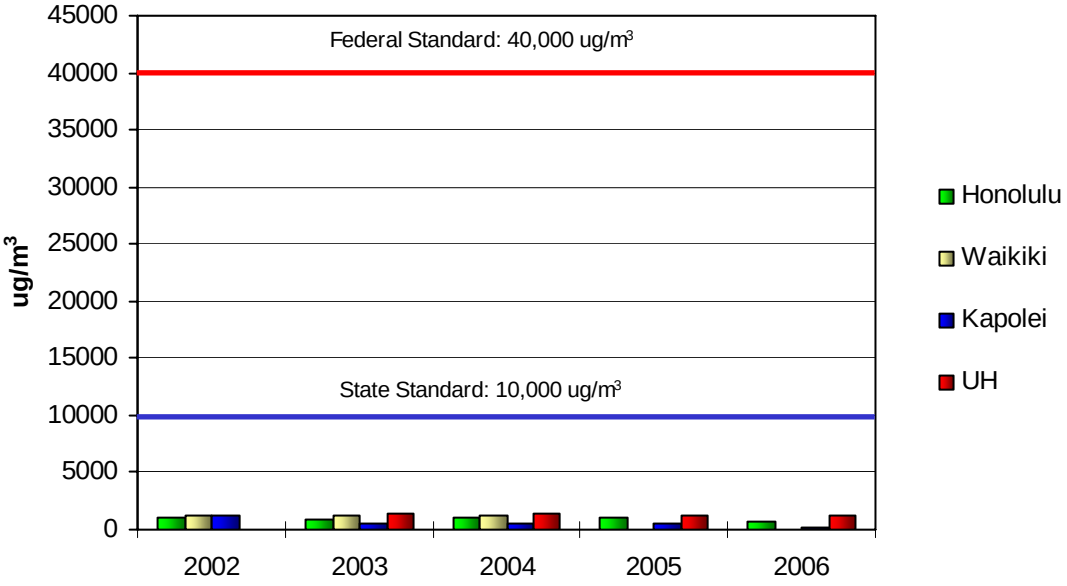
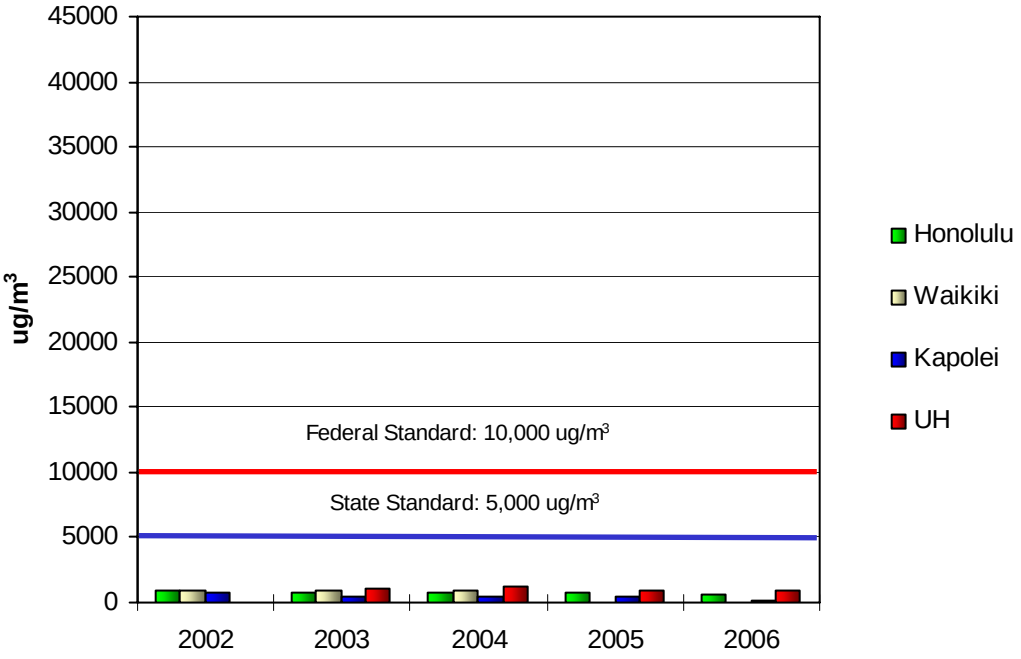


Figure 7-6 **Average of Daily Maximum 1-Hour Carbon Monoxide 2002 - 2006**



Waikiki station closed 11/04; UH station began operation 11/02

Figure 7-7 **Average of Daily Maximum 8-Hour Carbon Monoxide 2002 - 2006**



Waikiki station closed 11/04; UH station began operation 11/02