Iowa Fine Particulate Monitoring Network Design Values

2020-2022

Iowa DNR
Ambient Air Monitoring Group

What is Fine Particulate Matter ($PM_{2.5}$)?

The term “particulate matter” (PM) includes both solid particles and liquid droplets (excluding water droplets) that are found in outdoor air. Particulate matter may be emitted directly into the air or can form from pollutants that react in the atmosphere. Small particles tend to pose the greatest health concern because they can be inhaled into and accumulate in the respiratory system.

Particles of less than 2.5 microns in diameter are referred to as fine particulate or $PM_{2.5}$.

Sources of $PM_{2.5}$ emissions include all types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Secondary $PM_{2.5}$ is produced in the atmosphere away from sources through atmospheric chemistry.

What are the Design Values for $PM_{2.5}$?

Design values for $PM_{2.5}$ are numbers that are calculated from three years of data gathered at a particular monitoring site. If a design value is greater than the associated standard, the monitor is said to "fail the attainment test". The annual standard for $PM_{2.5}$ is 12.0 $\mu g/m^3$ and the twenty-four hour standard is 35 $\mu g/m^3$.

The design value for the 24-hour $PM_{2.5}$ standard is the three year average of the annual 98^{th} percentile values measured at a monitoring site. The design value for the annual $PM_{2.5}$ standard is the three year average of the annual averages measured at a monitoring site. Additional details about design value calculations are contained in 40 CFR Part 50 Appendix N.

Data Completeness and Validation

If a monitor records 75% of the scheduled samples in each quarter of the year, the year's data is considered complete. EPA allows the use of data substitution in some cases where data is close to the 75% goal. Data used in this report includes all monitors with complete data for 2020-2022 as well as data from one site where substitution was performed.

All values in this report should be considered preliminary. Data values will be certified in May, 2023 and EPA will calculate design values for determination of compliance with the National Ambient Air Quality Standards (NAAQS) later this year.

All Iowa monitoring sites currently have annual and 24-hour design values less than the NAAQS.

What Types of $PM_{2.5}$ Monitoring Data May be Used to Calculate Design Values?

Iowa currently operates two different types of $PM_{2.5}$ samplers. One type collects fine particles by drawing ambient air through a filter over a 24-hour period. The filters are then returned to an analytical laboratory where they are weighed. Provided EPA protocols for handling and weighing the filters are followed, these manual samplers produce data that may be used for design value calculations. Although manual samplers provide accurate concentrations, the data produced is not available in real time, and so EPA has encouraged States to use automated continuous samplers to inform the public of current air quality levels.

EPA has approved the use of certain types of continuous samplers for computing design values, but advises States to conduct ongoing evaluations of the comparability of the data from these samplers to filter samplers. Iowa's humid summers and wintertime nitrate episodes represent a challenging environment in which to demonstrate this comparability. Iowa continues to evaluate the performance of continuous samplers.

Iowa $PM_{2.5}$ Monitors (2022)

AQS Site ID	Site Name	Location	County
190130009	Water Tower	Waterloo	Blackhawk
190450019	Chancy Park	Clinton	Clinton
190450021	Rainbow Park	Clinton	Clinton
191032001	Hoover Sch.	Iowa City	Johnson
191110008	Fire Station	Keokuk	Lee
191130040	Public Health	Cedar Rapids	Linn
191370002	Viking Lake State Park	Rural Site	Montgomery
191390015	Muscatine HS E Campus (Garfield)	Muscatine	Muscatine
191390016	Muscatine, Greenwood Cemetery	Muscatine	Muscatine
191390020	Muscatine, Musser Park	Muscatine	Muscatine
191471002	Iowa Lakes Community College	Emmetsburg	Palo Alto
191530030	Public Health	Des Moines	Polk
191532510	Indian Hills School	Clive	Polk
191550009	Franklin Sch.	Council Bluffs	Pottawattamie
191630015	Jefferson School	Davenport	Scott
191630020	Hayes School	Davenport	Scott
191770006	Lake Sugema	Rural Site	Van Buren
191930021	Irving School	Sioux City	Woodbury

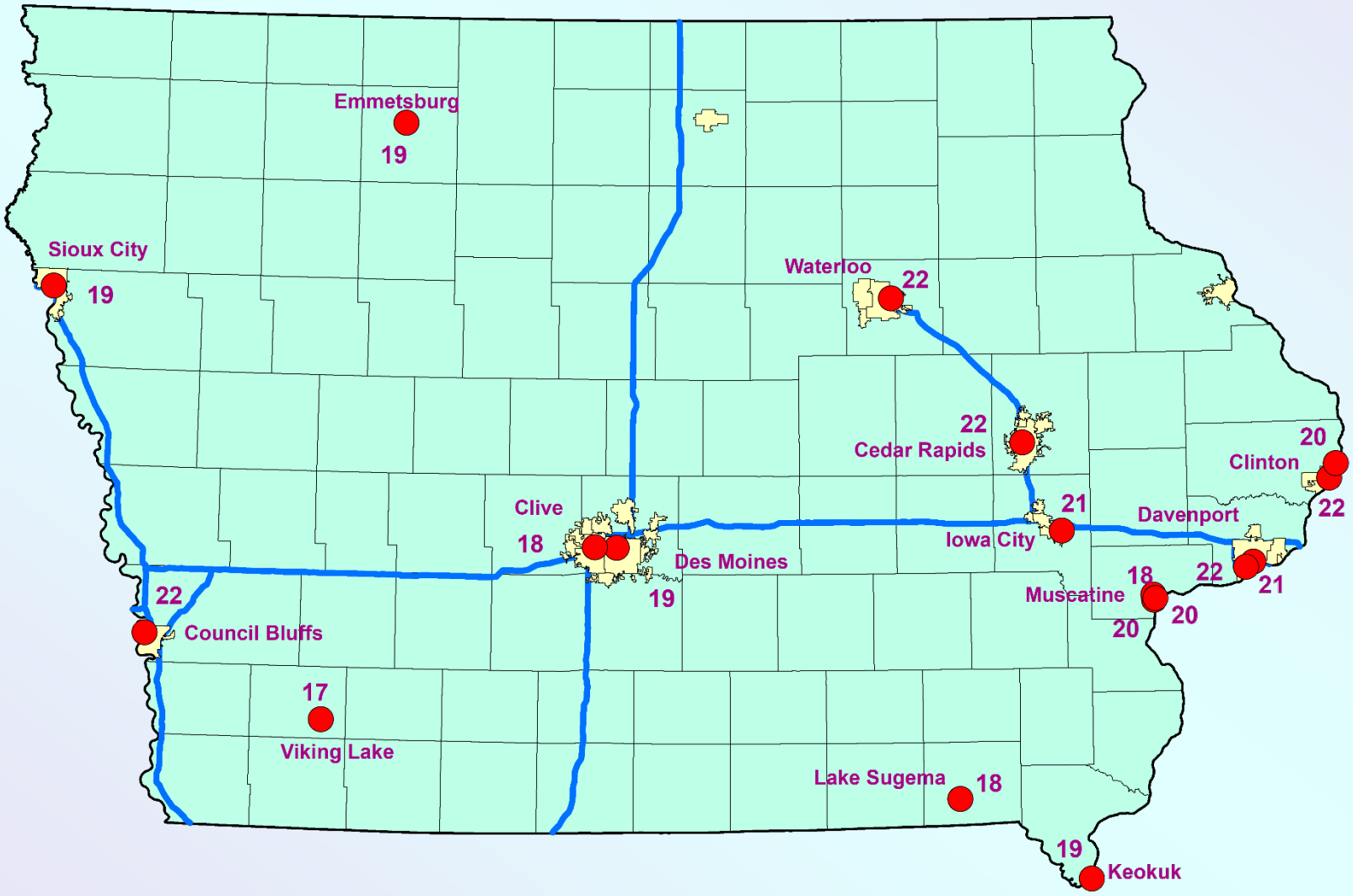
Iowa $PM_{2.5}$ Design Values 2022

(from AQS database 4/6/2023)

County	Site Name	City	EPA Site Id	Years	Daily Design Value ($\mu g/m^3$)	Annual Design Value ($\mu g/m^3$)
Black Hawk	Water Tower	Waterloo	19-013-0009	2020-2022	22	7.9
Clinton	Chancy Park	Clinton	19-045-0019	2020-2022	22	8.6**
Clinton	Rainbow Park	Clinton	19-045-0021	2020-2022	20	7.8
Johnson	Hoover Sch.	Iowa City	19-103-2001	2020-2022	21	7.8
Lee	Fire Station	Keokuk	19-111-0008	2020-2022	19	8.2
Linn	Public Health	Cedar Rapids	19-113-0040	2020-2022	22	8.1
Montgomery	Viking Lake State Park	Not in a City	19-137-0002	2020-2022	17	6.7
Muscatine	Muscatine HS E Campus (Garfield)	Muscatine	19-139-0015	2020-2022	20	8.0
Muscatine	Greenwood Cemetery	Muscatine	19-139-0016	2020-2022	18	7.7
Muscatine	Musser Park	Muscatine	19-139-0020	2020-2022	20	8.1**
Palo Alto	Iowa Lakes Community College	Emmetsburg	19-147-1002	2020-2022	19	7.0
Polk	Health Dept.	Des Moines	19-153-0030	2020-2022	19	7.6
Polk	Indian Hills School	Clive	19-153-2510	2020-2022	18	7.4
Pottawattamie	Franklin Sch.	Council Bluffs	19-155-0009	2020-2022	22	8.2
Scott	Jefferson School	Davenport	19-163-0015	2020-2022	21	8.0
Scott	Hayes School	Davenport	19-163-0020	2020-2022	22	8.4
Van Buren	Lake Sugema	Not in a City	19-177-0006	2020-2022	18	7.1
Woodbury	Irving School	Sioux City	19-193-0021	2020-2022	19	7.9
Values greater than 12.0 $\mu g/m^3$ indicate non-attainment with the annual NAAQS.						
Values greater than 35 µg/m3 indicate non-attainment with the Daily NAAQS.						
**Source-oriented site. Annual NAAQS are not applicable.						

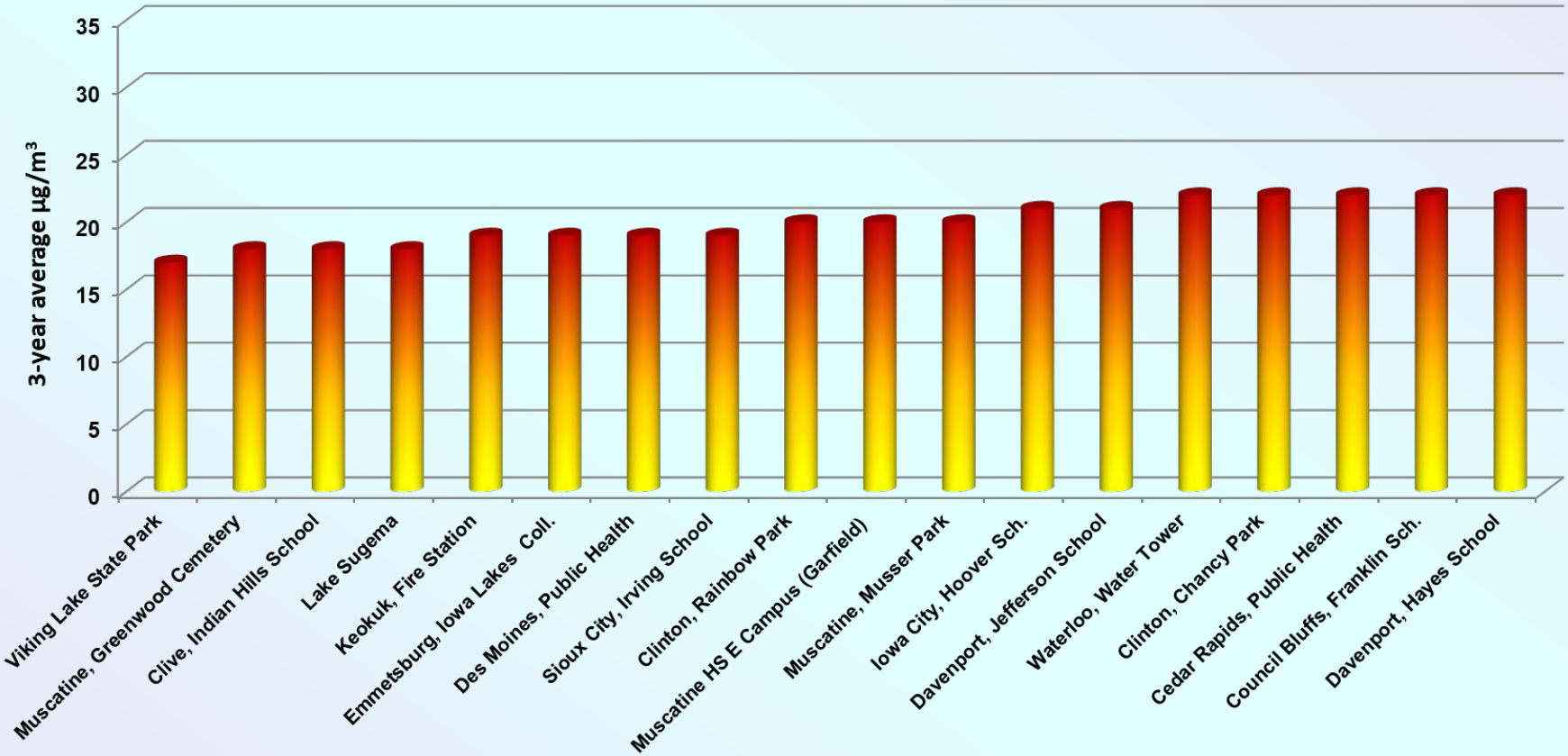
Iowa $PM_{2.5}$ 24-hour Design Values 2020-2022

(NAAQS Standard is 35 µg/m^3)



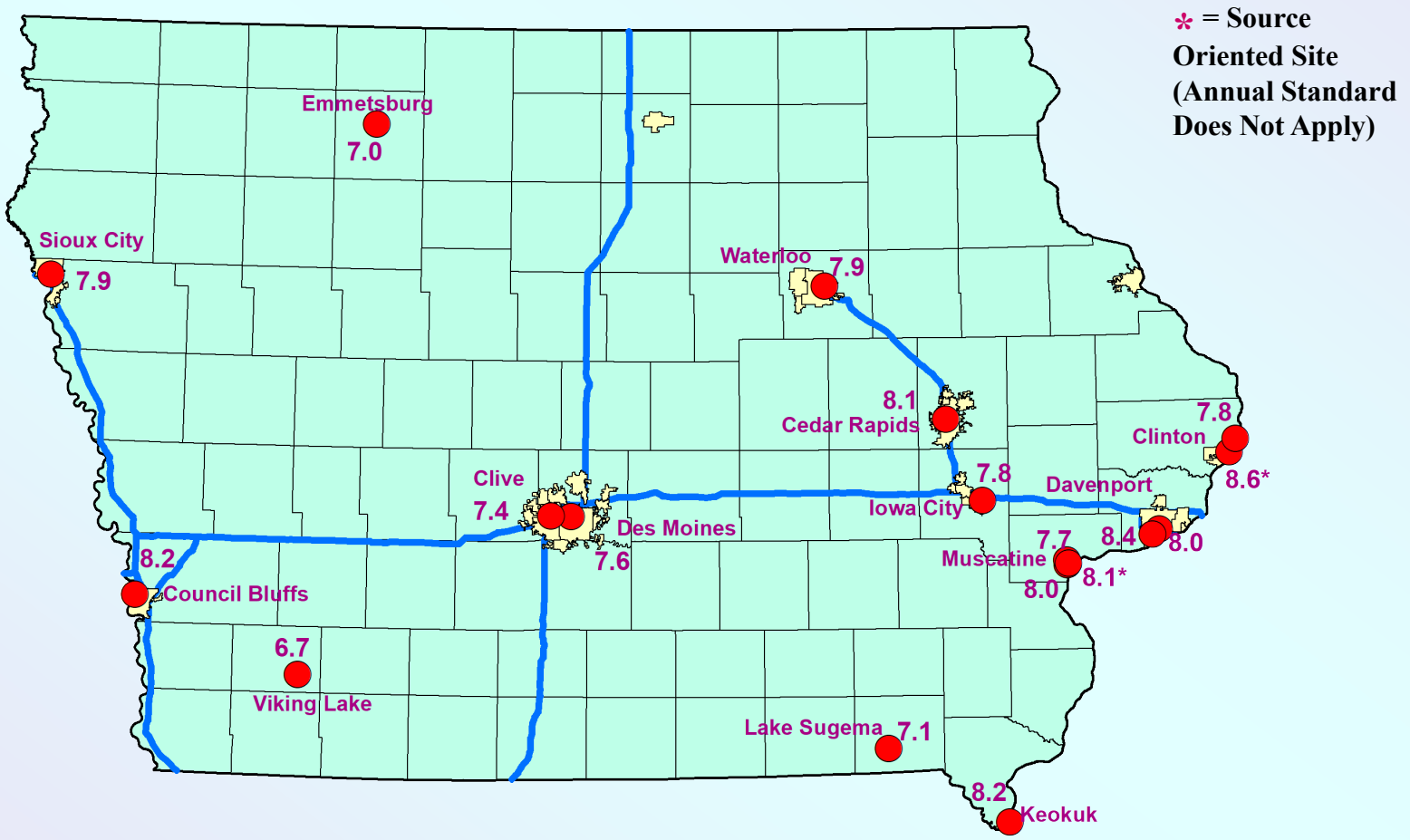
24-hour $PM_{2.5}$ Design Values 2020-2022

(NAAQS Standard is 35 µg/m³)



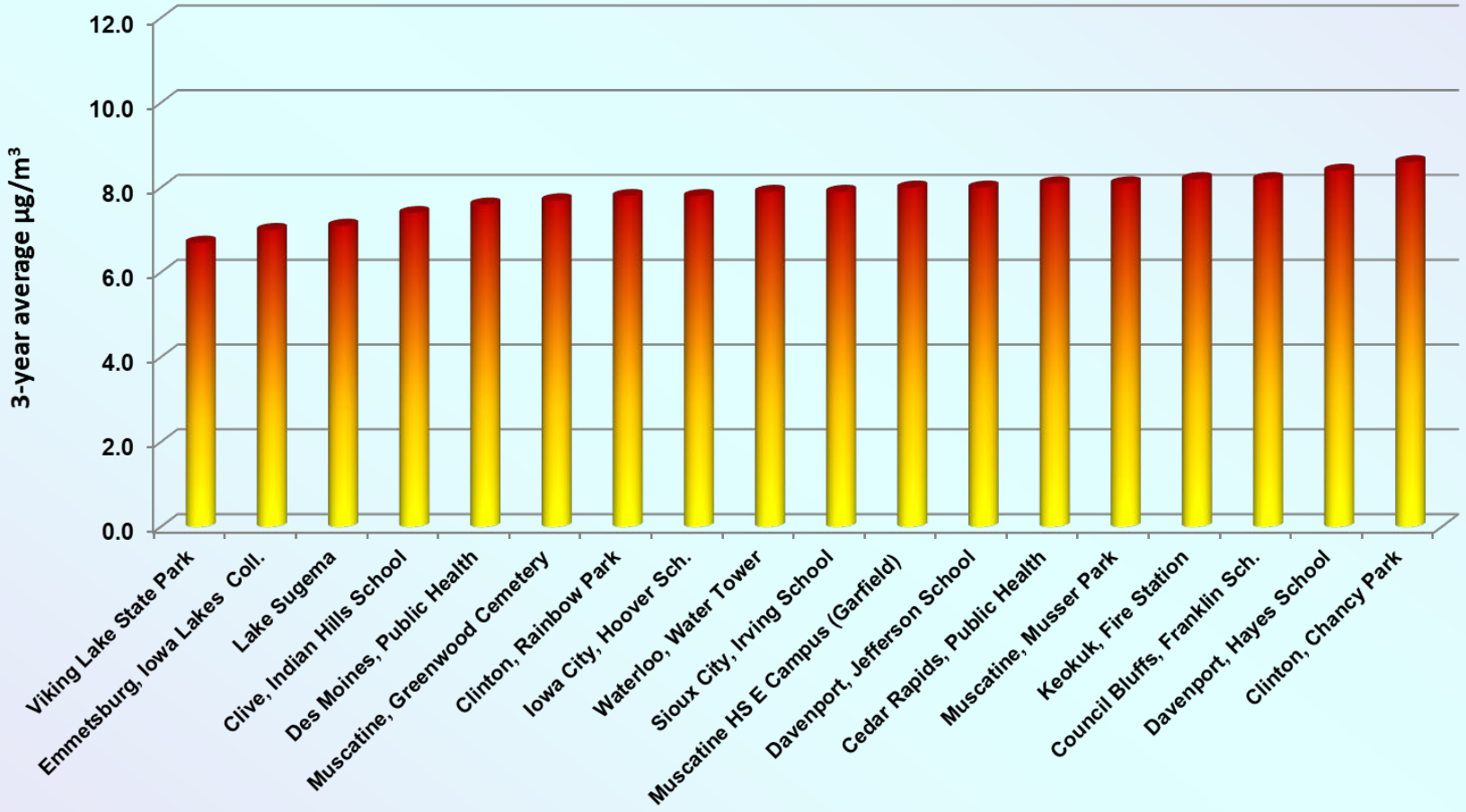
Iowa $PM_{2.5}$ Annual Design Values 2020-2022

(NAAQS Standard is 12.0 µg/m³)

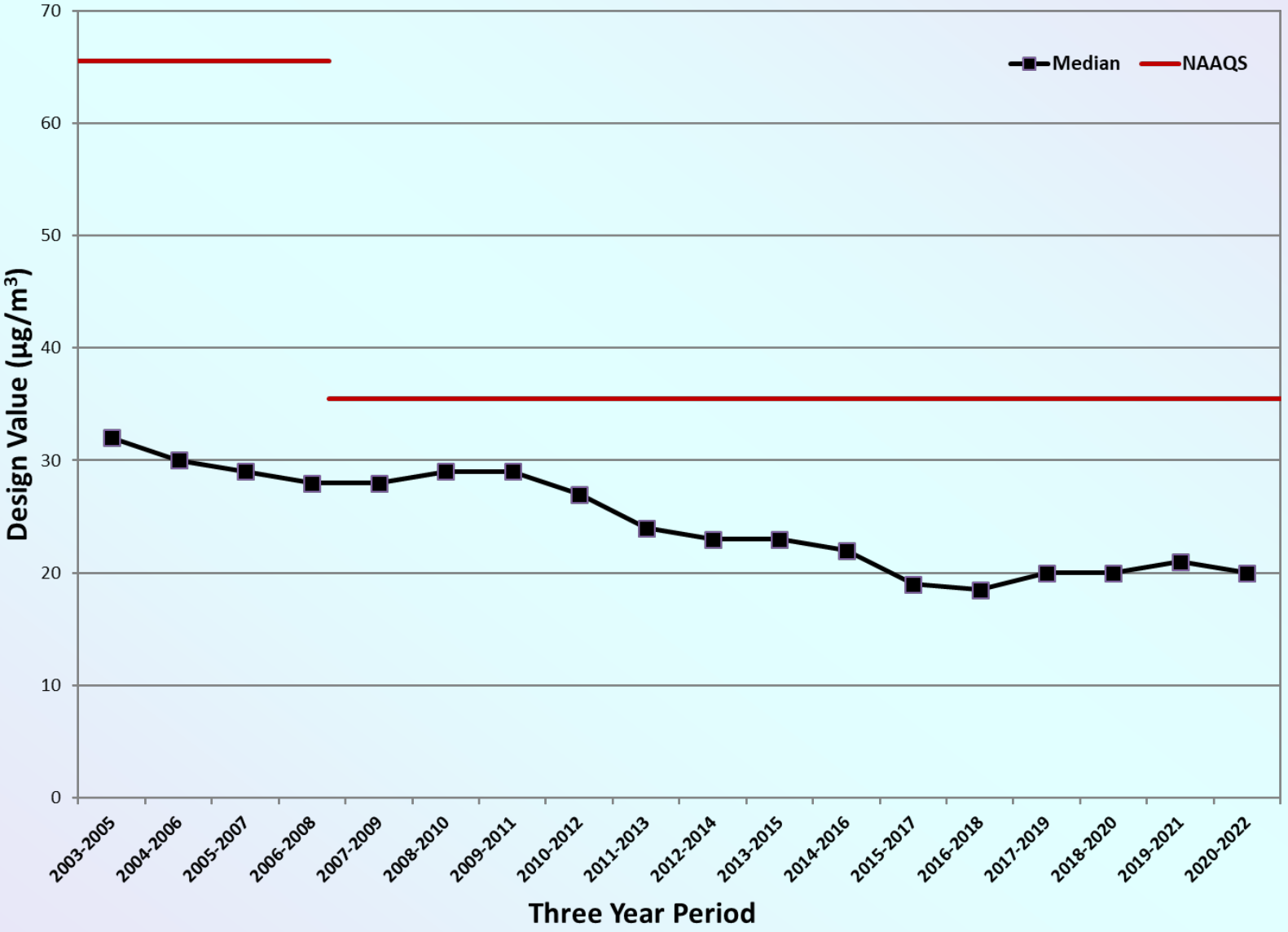


Annual $PM_{2.5}$ Design Values 2020-2022

(NAAQS Standard is 12.0 µg/m³)

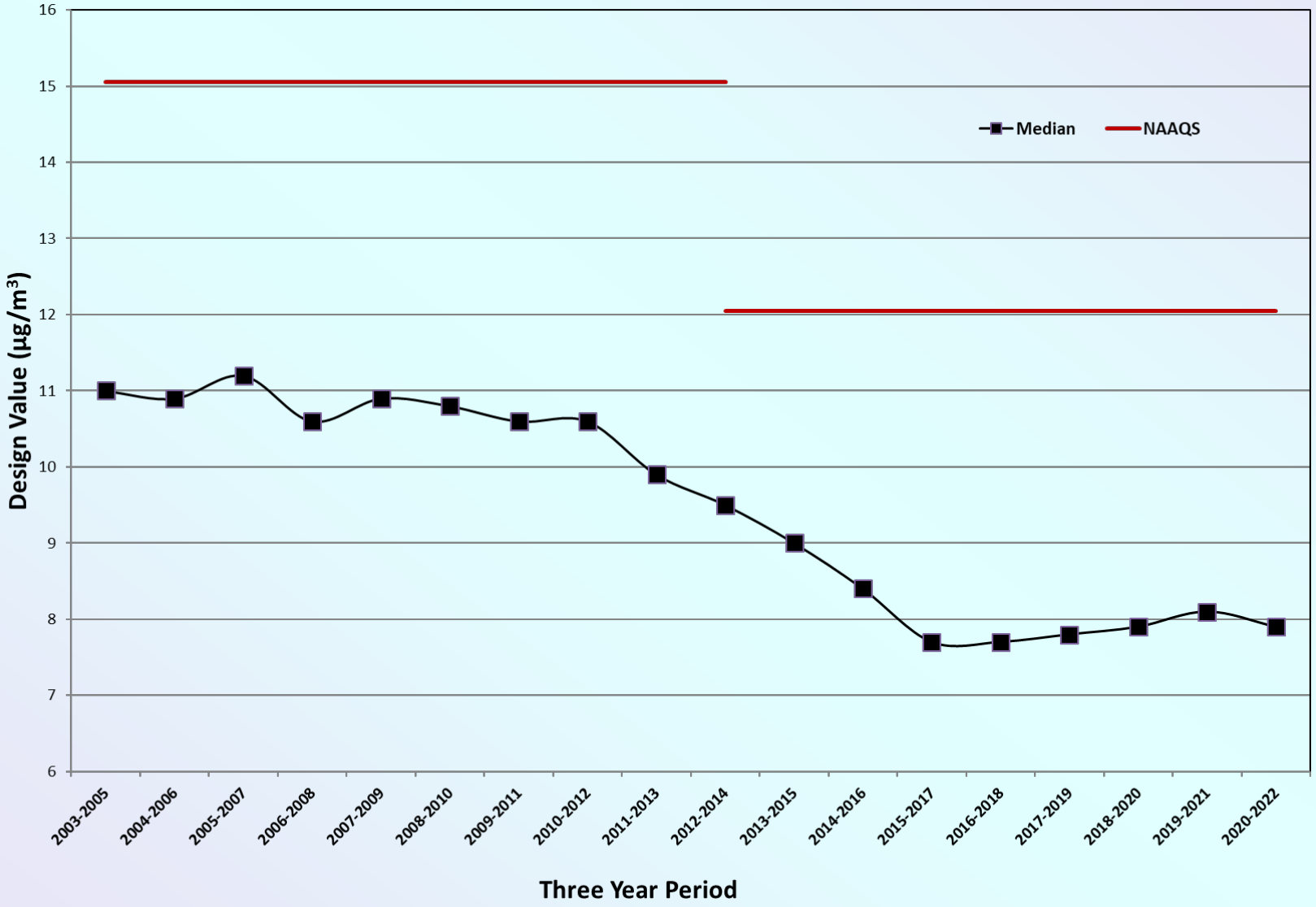


Median $PM_{2.5}$ 24-Hour Design Values in Iowa $PM_{2.5}$ Monitoring Network



Median $PM_{2.5}$ Annual Design Values in Iowa $PM_{2.5}$ Monitoring Network

(Source oriented monitoring sites are not included)



Web Resources

Calculation of the $PM_{2.5}$ Design Values is treated in Appendix N of 40 CFR Pt. 50:

http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr50_main_02.tpl

EPA's Design Value calculations for $PM_{2.5}$ and other pollutants:

https://www.epa.gov/air-trends

Information from EPA on $PM_{2.5}$ standards:

https://www.epa.gov/naaqs/particulate-matter-pm-air-quality-standards

Historical Air Pollution Data for Iowa and Other States:

https://www.epa.gov/outdoor-air-quality-data

Web links listed are as accessed on 4/12/2023