Federal Air Quality Standards

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National Ambient Air Quality Standards (NAAQS)

The concept of regulating air pollution to achieve national ambient air quality standards (NAAQS) was introduced in the federal Clean Air Act (CAA) of 1970. The NAAQS address six specific pollutants that are now commonly referred to as criteria pollutants: carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), particulates (PM-10 and PM-2.5), sulfur dioxide (SO_2), and lead (Pb). The 1970 CAA included a schedule for all states to reach an acceptable level of ambient air quality. Regions of the country where the measured concentrations exceed the air quality standards are designated as "nonattainment areas." States are divided into attainment, nonattainment, and unclassifiable areas for each of the criteria pollutants. The nonattainment areas are further classified based on the severity of the pollution problem. Presently, Michigan's 83 counties are classified as in attainment for 1-hour O_3, CO, NO_2, PM-10, SO_2, and Pb. On April 15, 2004, a number of counties were designated non-attainment for the 8-hour O_3 NAAQS. Designations for the PM-2.5 NAAQS are expected in December 2004.

There are two standard goal levels for most of the criteria pollutants: primary and secondary. The primary level standard is set to protect the public health with an adequate margin of safety. The secondary level standard is set to protect public health and welfare. Welfare in this context includes damage to plants and animals, impairment of visibility and economic damage. The national ambient air quality standards are found in Table 1.

Title I in the CAAA of 1990 is the most current effort to achieve the NAAQS in all areas of the United States with respect to criteria pollutants. The provisions of Title I require states to evaluate the air quality within their boundaries for all six criteria pollutants. For areas that are designated nonattainment, the state is responsible for developing control strategies to reduce emissions and bring areas into compliance with the NAAQS.

Table 1.
National Ambient Air Quality Standards
40 CFR Part 50

Pollutant	Primary Standard	Secondary Standard
Particulate Matter (as PM-10)		
Annual arithmetic mean (3 Yr. Average)	50 µg/m^3	50 µg/m^3
Maximum 24 hour concentration	150 µg/m^3	150 µg/m^3
Particulate Matter (as PM-2.5)		
Annual arithmetic mean (3 Yr. Average)	15 µg/m^3	15 µg/m^3
Maximum 24 hour concentration(1)	65 µg/m^3	65 µg/m^3
Sulfur dioxide		
Annual arithmetic mean	(0.03 ppm) 80 µg/m^3	----
Maximum 24 hour concentration*	(0.14 ppm) 365 µg/m^3	----
Maximum 3 hour concentration*	-----	(0.5 ppm) 1300 µg/m^3
Carbon monoxide		
Maximum 8 hour concentration*	9 ppm (10 mg/m^3)	_____
Maximum 1 hour concentration*	35 ppm	_____
Ozone		
1 hour standard (2) Maximum daily hourly average concentration	0.12 ppm (235 µg/m^3)	0.12 ppm (235 µg/m^3)
8 hour standard Maximum daily hourly 8 hour average concentration	0.08 ppm	0.08 ppm
Nitrogen dioxide		
Annual arithmetic mean	0.053 ppm (100 µg/m^3)	0.053 ppm (100 µg/m^3)
Lead		
Maximum arithmetic mean over a quarter	1.5 µg/m^3	1.5 µg/m^3

* Not to be exceeded more than once a year per site.

(1) Three-year average of 98th percentile concentration.

(2) Even though a new 8-hour ozone standard was adopted in July 1997, the 1 hour standard continues to apply as of May 2004..

Violation of Standards

An area is considered to be in violation of the sulfur dioxide, nitrogen dioxide, or carbon monoxide standard at a site if either:

(A) the applicable annual standard is exceed; or

(B) two or more excursions of an applicable 1-hour, 3-hour, 8-hour, or 24-hour standard are measured, within a single calendar year.

When criterion (B) is applied, two excursions constitute one violation, three excursions mean two violations, and so on.

Lead

The primary and secondary standard for lead is 1.5 µg/m^3. The calculation to determine compliance with the standard is the maximum arithmetic mean averaged over a calendar quarter.

PM-10

The PM-10 24-hour standard is violated if the expected number of days per calendar year with maximum number of 24-hour concentrations above 150 µg/m^3 is greater than 1 averaged over a three-year period. The PM-10 average annual arithmetic mean, averaged over a three-year period, must not exceed 50 µg/m^3 to comply with the annual standard.

PM-2.5

The PM-2.5 24-hour standard is violated if the three-year average of the 98^{th} percentile 24-hour concentration is greater than 65 µg/m^3. The PM-2.5 average annual arithmetic mean, averaged over a three-year period, must not exceed 15 µg/m^3 to comply with the annual standard.

Ozone

The 1-hour ozone standard is violated when the one hour limit of 0.12 ppm is exceeded on more than four days during the past three years. In other words, the fourth highest daily value in a consecutive three-year period must be 0.12 ppm or less to be considered in attainment (based on a complete data set).

The 8-hour ozone standard is violated if the annual fourth highest daily maximum 8-hour concentration, average over three years, exceeds 0.08 ppm.

Ozone

Ozone (O_3), itself, is often not emitted directly as a pollutant except in certain processes. Precursors of ozone, including VOCs and nitrogen oxides, are used as surrogate compounds which are regulated to reduce ozone. VOCs are compounds of carbon that combine with nitrogen oxides in the presence of sunlight to form ozone, a major pollutant in urban and industrial areas. Reduction of ambient ozone concentrations is accomplished through the limitation of VOC emissions from industrial processes, consumer products, and motor vehicle exhaust. The CAA Amendments of 1990 also require a reduction in nitrogen oxide emissions unless a specific waiver for a nonattainment area is obtained.

An example of an industrial process that uses VOCs is surface coating operations. Paint, varnishes, lacquers, primers, inks and cleaners contain thinners and solvents that evaporate during the application process and release VOCs into the air. VOCs include compounds such as toluene, methyl ethyl ketone, glycol ethers, xylene, methanol and isopropanol. Some VOCs are also classified as hazardous air pollutants (HAPs), or air toxics. However, VOCs not regulated under the federal air toxics program may be regulated under Title I provisions for ozone nonattainment areas. Thus, virtually all VOC emissions are regulated by state or federal regulations. The emission limitation specified in the conditions of an air use permit is based on the most stringent rule. Specific VOCs that are exempt by Michigan rules are listed in the definition of "Volatile Organic Compounds" in Part 1 of the Michigan *Administrative Rules for Air Pollution Control*.

Under the CAA, 1-hour ozone nonattainment areas are divided into five separate classifications depending on the severity of the ozone problem. If an ozone nonattainment area cannot demonstrate that it will achieve attainment with the standard by the specific deadline, it will be automatically reclassified to the next (more stringent) nonattainment classification.

The 1990 CAA Amendments described initiatives with the 1-hour ozone NAAQS in mind. Since promulgation of the 8-hour standard, there has been much controversy over use of the 13-year old detailed requirements for a different standard and after many things have changed. The USEPA has recently promulgated Phase I of the 8-hour ozone implementation rules, describing, in part, how states must modify State Implementation Plans (SIPs) to address the new 8-hour nonattainment areas. This rule does not address all aspects needed; however, the USEPA estimates that Phase II of the rules will be promulgated in the summer of 2004. As of January 16, 2001, the entire state of Michigan is designated attainment for the 1-hour ozone standard.

8-Hour Ozone Attainment Designations

On April 15, 2004, the USEPA announced the nonattainment areas for the 8-hour ozone standard in each state. Table 2 shows those areas listed for Michigan

Table 2.
Designation of 8-hour ozone nonattainment areas in Michigan.

DESIGNATED GEOGRAPHIC AREA		CLASSIFICATION
Battle Creek MSA[1]:	Calhoun County	Unclassifiable
Benton Harbor MSA:	Berrien County	Unclassifiable
Detroit-Ann Arbor CMSA[2]:	Livingston County Macomb County Monroe County Oakland County Saint Clair County Washtenaw County Wayne County	Moderate
Flint MSA:	Genesee County	Transitional
Grand Rapids MSA:	Kent County Ottawa County	
Jackson MSA:	Jackson County	Unclassifiable
Kalamazoo MSA:	Kalamazoo County	Unclassifiable
Lansing-East Lansing MSA:	Clinton County Eaton County Ingham County	Unclassifiable
Muskegon MSA:	Muskegon County	Moderate
Saginaw-Bay City-Midland MSA:	Bay County Midland County Saginaw County	Incomplete Data

[1] MSA - Metropolitan Statistical Area [2] CMSA - Consolidated Metropolitan Statistical Area

Specific requirements for ozone nonattainment areas are listed below:

Table 3.
8-hour ozone nonattainment area requirements for stationary sources effective June 15, 2004.

	Ozone Nonattainment Classification		
	Basic Subpart 1	Marginal	Moderate
Major Source Emission Minimum	100 tons per year of VOCs (may be NOx)	100 tons per year of VOCs (may be NOx)	100 tons per year of VOCs & NOx
Standard	RACT To Be Determined	RACT To Be Determined	RACT To Be Determined
New or Modified Source Offset Ratios	1.1 to 1	1.10 to 1	1.15 to 1
Major Milestones Requirements	SIP Due 2007	SIP Due 2007	SIP Due 2007
Attainment Date	2009	2007	2010

Carbon Monoxide

Mobile internal combustion engines are the predominant contributors to ambient carbon monoxide concentrations. This includes all commercial and private cars, buses and trucks. Carbon monoxide results from incomplete combustion of fossil fuels such as gasoline. Emission control devices have been required on all new vehicles for several years, however, their maintenance and performance is not monitored for compliance in most states.

As of August 30, 1999, all areas of Michigan have been designated attainment for the carbon monoxide standard. The Detroit carbon monoxide nonattainment area, shown in Table 4 below, is now a maintenance area.

Table 4.
Geographic designation of Carbon Monoxide attainment status

Designated Geographic Area	Designation
Detroit Area: Macomb, Oakland, Wayne Counties-area included within the following (counterclockwise): Lake St. Clair to 14 Mile Road To Kelly Road, N. to 15 Mile Road To Hayes Road. S. to 14 Mile Rd. to Clawson City boundary, following N. Clawson City boundary to N. Royal Oak City Boundary to 13 Mile Road to Evergreen Rd. to Southern Beverly Hills City Boundary to Southern Bingham Farms City boundary to Southern Franklin City Boundary to Inkster Road, south to Pennsylvania, extending East to the Detroit River.	Maintenance

Particulate Matter

PM-10 refers to particulate in the air with a diameter of less than 10 microns. The experts collectively chose 10 microns as the particle size which is most likely to be retained in the lungs of humans.

In 1996, the USEPA approved the State Implementation Plan (SIP) revision for the Wayne County, Michigan, particulate matter nonattainment area. The SIP consists of State Administrative Rule 374 and is intended to satisfy the contingency measures requirement specified in section 172(c)(9) of the CAA. As of October 4, 1996, all Michigan areas were designated as attainment for PM-10. Attainment maps\status can be viewed at www.michigan.gov/deqair. Click on Air Monitoring (on the menu on the left), then select the bulleted item, "Attainment Maps\Status" under "Information" in the center of the page.

Current Air Quality Information

Detailed information on air quality trends in Michigan, attainment areas, locations of monitoring stations, and meteorological data can be found in the *Michigan 2002 Annual Air Quality Report* by the Air Quality Division. This report is also available at the MDEQ website, www.michigan.gov/deqair, by clicking on "Air Publications" on the center menu, and then selecting "Annual Reports."