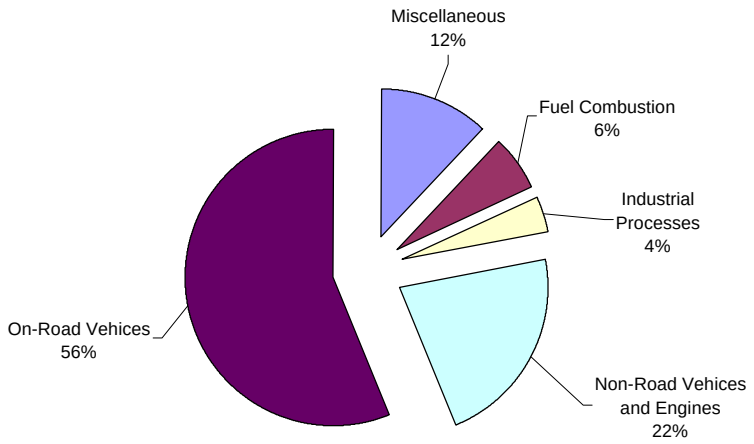
2001 Carbon Monoxide Summary

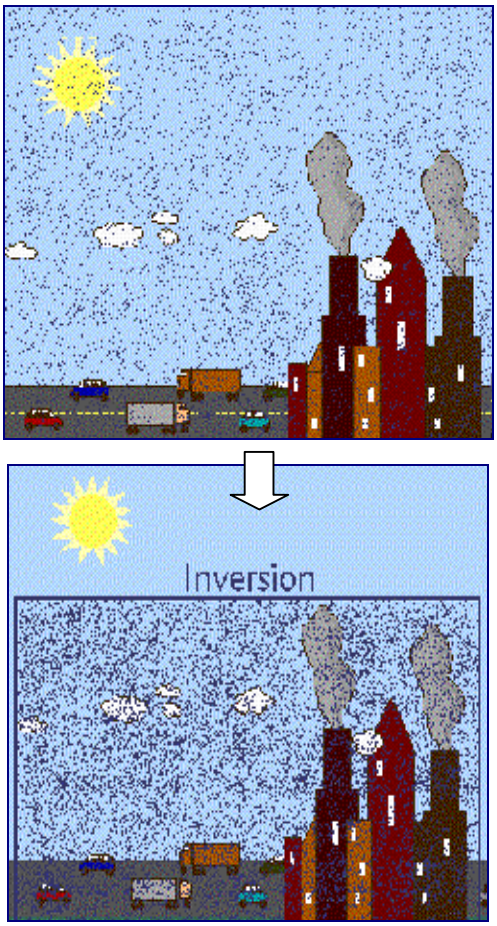
New Jersey Department of Environmental Protection

Figure 1
CO Emissions by Source Category



"How Carbon Monoxide Affects the Way We Live and Breath" USEPA, November 2000

Figure 2: Effect of Atmospheric Inversion on Air Pollution



Nature and Sources

Carbon monoxide (CO) is a colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely. It is a by-product of motor vehicle exhaust, which contributes about 56 percent of all CO emissions nationwide. In cities, automobile exhaust can cause as much as 95 percent of all CO emissions due to heavy traffic congestion. Non-road engines and vehicles, such as construction equipment and boats, contribute about 22 percent of all CO emissions nationwide. Other sources of CO include industrial processes, fuel combustion in sources such as boilers and incinerators, and natural sources such as forest fires. Figure 1 above shows the national average contributions of these sources. During the colder months of the year CO levels are typically higher because motor vehicles do not burn fuel as efficiently when they are cold. Atmospheric inversions are also more frequent during the winter months. Inversions usually occur overnight when cooler air is trapped beneath a layer of warmer air aloft. When this occurs, the inversion acts like a lid, preventing pollution from mixing in the atmosphere and effectively trapping it close to ground level (see Figure 2).

Health Effects

Carbon monoxide enters the bloodstream and reduces the body's ability to distribute oxygen to organs and tissues. The most common symptoms associated with exposure to carbon monoxide are headaches and nausea. The health threat from exposure to CO is most serious for those who suffer from cardiovascular disease. For a person with heart disease, a single exposure to CO at low levels may cause chest pain and reduce that individual's ability to exercise. Healthy people are also affected, but only at higher levels of exposure. Elevated CO levels are also associated with visual impairment, reduced work capacity, reduced manual dexterity, decreased learning ability, and difficulty in performing complex tasks.

Ambient Air Quality Standards for Carbon Monoxide

There are currently two national primary, or health based, standards for carbon monoxide. They are set at a one-hour concentration of 35 parts per million (ppm), and an 8-hour average concentration of 9 ppm. These levels are not to be exceeded more than once in any calendar year. There are no national secondary (welfare based) standards for CO at this time.

New Jersey state standards for CO are based on different units (milligrams per cubic meter as opposed to parts per million) , and our standards are not to be exceeded more than once in any 12-month period. The state has set secondary (welfare based) standards for CO at the same level as the primary standards. The standards are summarized in Table 1.

Table 1

Ambient Air Quality Standards for Carbon Monoxide			
Averaging Period	Type	New Jersey	National
1-Hour	Primary	40 mg/m^3 (35 ppm)	35 ppm
1-Hour	Secondary	40 mg/m^3 (35 ppm)	----
8-Hour	Primary	10 mg/m^3 (9 ppm)	9 ppm
8-Hour	Secondary	10 mg/m^3 (9 ppm)	----

mg/m^3 = Milligrams Per Cubic Meter
ppm = Part per Million

Monitoring Locations

The state monitored CO levels at 15 locations in 2001. These sites are shown in the map (Figure 3) to the right. The site in Fort Lee did not operate between January 21st and April 11th due to construction activities near the site. The Newark Lab site was relocated during 2001 and was not operational until August 6th . The North Bergen site was also shut down and relocated during 2001, so no data from that location are available prior to November 9th.

Figure 3
2001 Carbon Monoxide Monitoring Network

CO LEVELS IN 2001

None of the monitoring sites recorded exceedances of any CO standard during 2001. The maximum one-hour average concentration recorded was 11.6 ppm at the site in East Orange. The highest 8-hour average level recorded was 5.6 ppm, also at the East Orange site. Summaries of the 2001 data are provided in Table 2 and Figure 4.

Figure 4
Highest and 2nd Highest Daily 8-Hour Averages

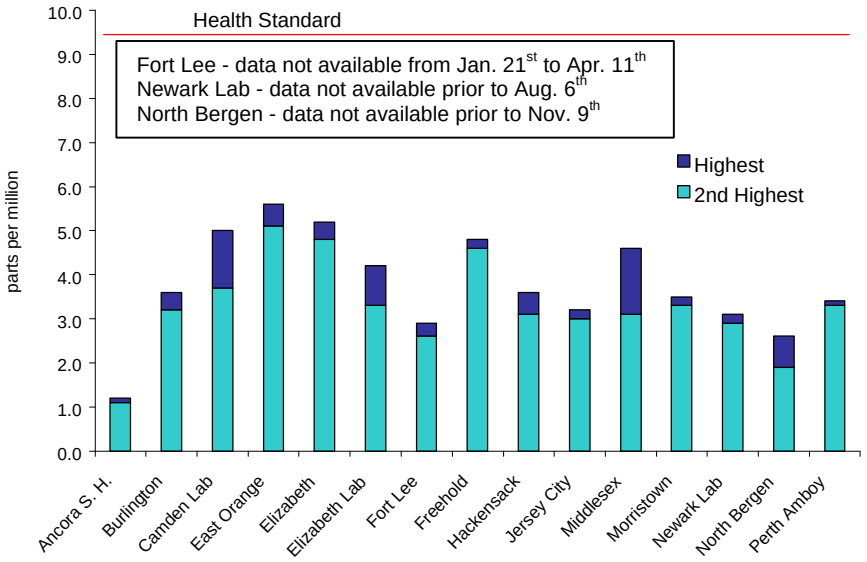


Table 2
Carbon Monoxide Data - 2001
Parts Per Million (ppm)

1-hour standard = 35 ppm
8-hour standard = 9 ppm

Monitoring Sites	Maximum 1-Hour Average	2nd Highest 1-Hour Average	Maximum 8-Hour Average	2nd Highest 8-Hour Average
Ancora S.H.	1.7	1.5	1.2	1.1
Burlington	6.2	4.9	3.6	3.2
Camden Lab	6.1	5.6	5.0	3.7
East Orange	11.6	8.5	5.6	5.1
Elizabeth	6.4	6.1	5.2	4.8
Elizabeth Lab	5.5	5.1	4.2	3.3
Fort Lee[1]	5.2	3.9	2.9	2.6
Freehold	10.0	8.6	4.8	4.6
Hackensack	4.9	4.5	3.6	3.1
Jersey City	5.8	5.1	3.2	3.0
Middlesex	5.0	4.8	4.6	3.1
Morristown	5.8	5.6	3.5	3.3
Newark Lab[2]	5.0	4.7	3.1	2.9
North Bergen[3]	3.1	2.8	2.6	1.9
Perth Amboy	6.0	4.7	3.4	3.3

[1] Data not available from January 21st to March 11th
[2] Data not available prior to August 6th
[3] Data not available prior to November 9th

TRENDS

Carbon monoxide levels have improved dramatically over the past 20 years. The last time the CO standard was exceeded in New Jersey was in January of 1995 (see Figure 5 below). At one time unhealthy levels of CO were recorded on a regular basis – as much as a hundred days a year at some sites. The reduction in CO levels is due primarily to cleaner running cars which are by far the largest source of this pollutant. A trend graph of CO levels showing the maximum, minimum and average 8-hour concentrations recorded by the program over the past eleven years is provided in Figure 6. The graph depicts the second highest 8-hour value recorded, as this is the value that determines if the health standard is being met (one exceedance per site is allowed each year).

Figure 5
Carbon Monoxide
Unhealthy Days 1985-2001

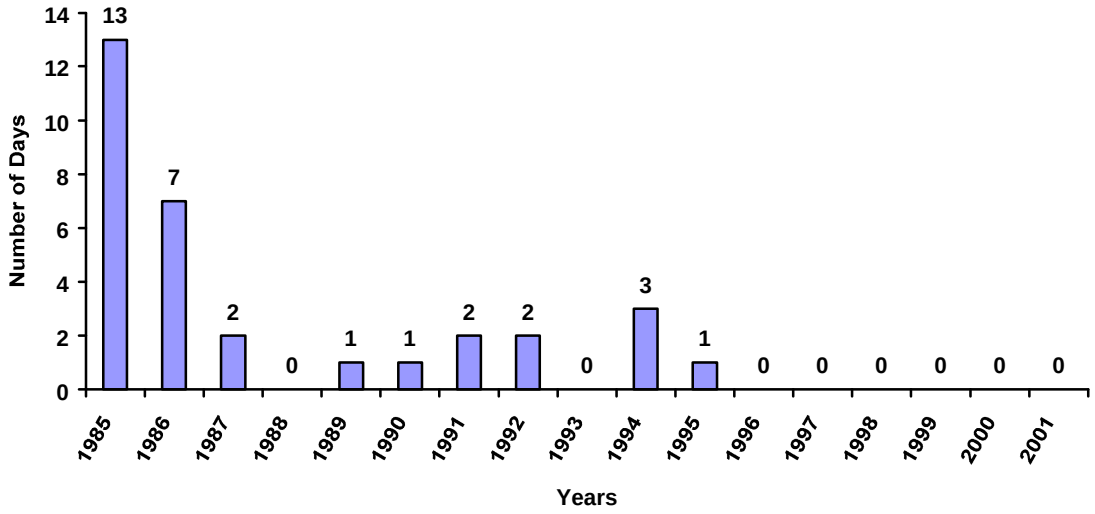
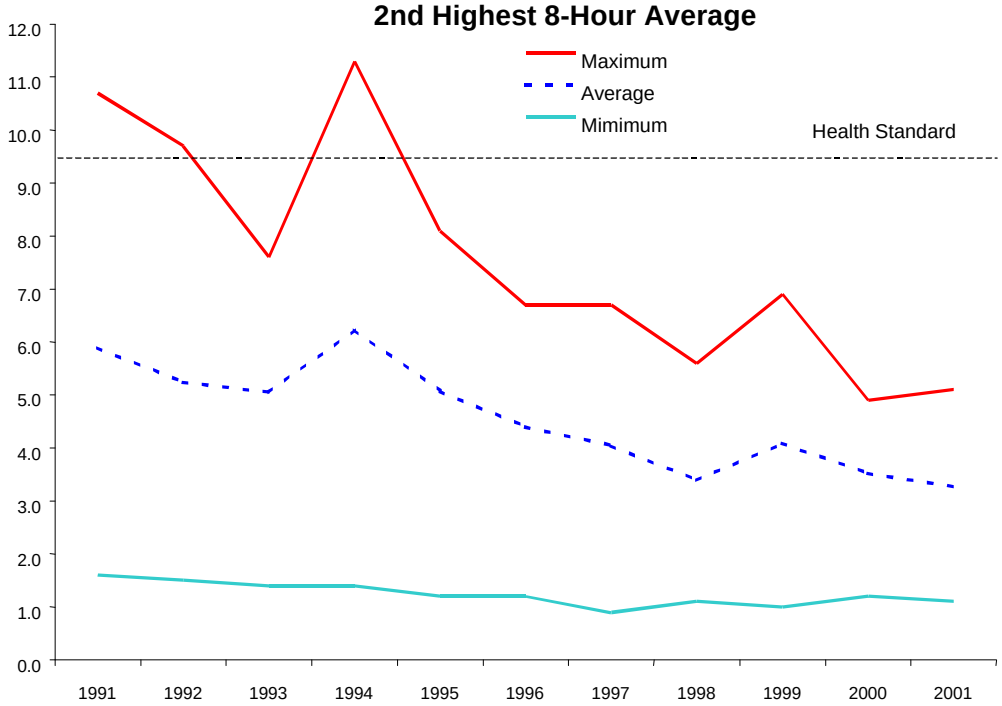


Figure 6
Carbon Monoxide Air Quality, 1991 - 2001
2nd Highest 8-Hour Average



References

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