CHAPTER 11. Air Quality and the Transportation Plan

Background

Air quality in Anchorage is subject to national ambient air quality standards established by the U.S. Environmental Protection Agency (EPA). The EPA has established standards for ground-level ozone, sulfur oxides, nitrogen dioxide, airborne lead, carbon monoxide (CO), and particulate matter less than 2.5 microns in diameter (PM-2.5) and less than 10 microns in diameter (PM-10). These *criteria pollutant* standards were established to protect health, particularly among those most susceptible to the effects of air pollution.

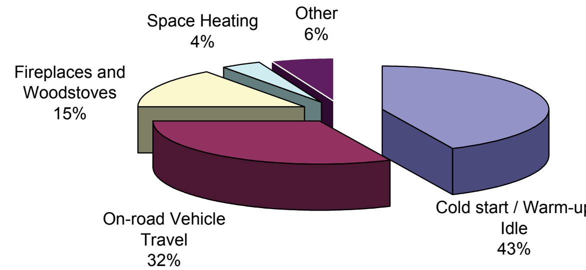
Anchorage enjoys low levels of most types of air pollution. Although almost half the U.S. population live in areas that do not meet the ground-level ozone standard; levels in Anchorage are among the lowest in the United States. Sulfur oxides, nitrogen dioxide, and airborne lead levels in Anchorage are also not significant concerns. Monitored levels of PM-2.5, sometimes called fine particulate, are well below the federal standard.

CO and PM-10 levels are concerns. Although Anchorage now meets air quality standards for all the criteria pollutants, it does experience elevated levels of CO and PM-10. Elevated ambient or outdoor CO concentrations have been shown to cause early onset of angina or chest pain and may be associated with an increase in death rates among the elderly. Elevated ambient levels of PM-10, sometimes called coarse particulate, have been linked with increases in asthma and upper respiratory illness. A local Anchorage study has shown that higher PM-10 concentrations are associated with an increase in outpatient visits for asthma.

The highest CO concentrations in Anchorage occur in mid-winter. When temperatures are cold and daylight hours are fewer than in other seasons, strong temperature inversions develop, trapping vehicle emissions of CO and other pollutants close to the ground. CO emissions also increase during vehicle start-ups when engines are cold. In some neighborhoods, cold starts and warm-up idling account for more than 40 percent of all CO emissions (Figure 11-1). Emissions of volatile organic compounds like benzene are also high during cold starts.

During the past two decades, Anchorage has experienced a dramatic improvement in CO air quality. CO concentrations have dropped by more than 60 percent since the mid-1980s (Figure 11-2), and no violations have been measured since 1996. Advancements in air pollution control technology on newer vehicles and the Anchorage Vehicle Inspection and Maintenance Program have contributed to this improvement in air quality. The MOA Share-A-Ride and vanpool programs have also proved beneficial. More recently the MOA and State of Alaska have promoted the use of engine block heaters to reduce cold start emissions when temperatures fall below 20°F.

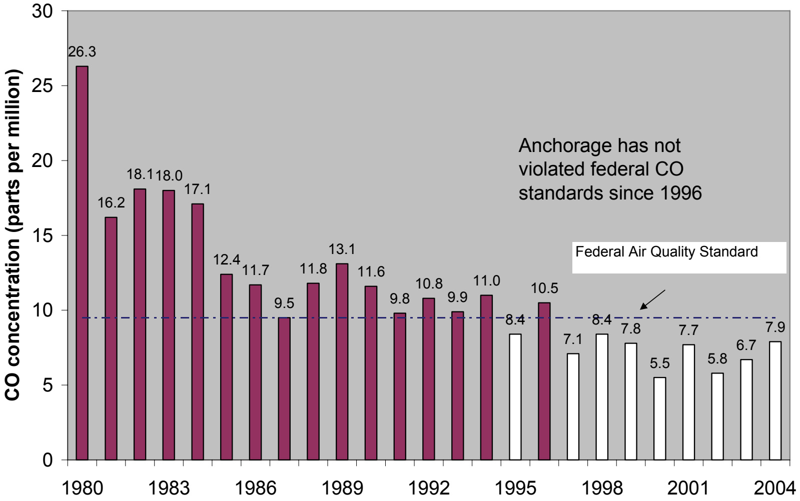
Figure 11-1. Source of CO Emissions in a Typical Anchorage Residential Area



Source: *Anchorage CO Maintenance Plan*, MOA Department of Health and Human Services, September 2003

Despite these improvements, CO concentrations can still approach the standard on days with severe inversions. Anchorage was one of the last cities in the United States to meet the standard for CO, and until recently, was classified as a

Figure 11-2. Anchorage CO Trend



Source: MOA Department of Health and Human Services, 2005

nonattainment area for this pollutant. In 2004, the EPA reclassified Anchorage as a *maintenance area* for CO when it approved Anchorage's air quality plan for maintaining compliance with the CO standard during the next 20 years.

PM-10 levels in Anchorage approach and sometimes exceed federal air quality standards. During the late March/early-April period of spring break-up, melting snow and ice reveal a winter's worth of accumulated sand, grit, and dirt on Anchorage roads. This material is stirred up by passing traffic especially on high-speed, high-volume arterial roadways.

On occasion, dust stirred up from these roads can cause PM-10 levels to approach federal air quality standards. On extremely windy days, when blowing dust from roads combines with naturally occurring windblown dust from glacier river valleys in the Mat-Su Valley, PM-10 levels in Anchorage can reach concentrations two to three times higher than the standard. Because much of the PM-10 experienced on these windy days is from natural sources, these events are not considered violations of the standard, however. Table 11-1 shows maximum PM-10 concentrations for the past decade.

The EPA is currently reviewing the PM-10 and PM-2.5 air quality standards. This process could result in new, more stringent standards. Because Anchorage is currently close to exceeding current PM-10 standards, a more stringent standard could pose difficulties.

Annual average and 24-hour average PM-2.5 concentrations in Anchorage are less than half the current federal standard. Therefore, Anchorage would likely meet a new, more stringent standard, if adopted by EPA. Although PM-10 and PM-2.5 are both particulate matter, they come from distinctly different sources. PM-2.5 is emitted during combustion processes (such as wood burning, diesel and gasoline engines, incineration), and PM-10 originates almost exclusively from geologic mineral sources such as pulverized winter traction sand and finely-ground glacial dust.

Motor vehicles are sources of benzene and other toxic air pollutants. Although the EPA has not established ambient air quality standards for toxic pollutants like benzene, concern about these pollutants is growing. Monitoring suggests that ambient benzene concentrations in Anchorage air

Table 11-1. Maximum 24-Hour Average PM-10 Concentrations by Year, 1996–2005

Calendar Year	PM-10 Concentration (micrograms/ cubic meter)	Comments
1996	**158**	May 14, high wind
1997	139	April 24, low wind
1998	115	March 30, low wind
1999	94	April 3, low wind
2000	111	April 14, low wind
2001	150	March 18, high wind
2002	105	April 4, high wind
2003	**590**	March 12, high wind
2004	97	April 13, low wind
2005	145	April 12, low wind

Bold font indicates that the concentration exceeded the federal air quality standard of 150 micrograms per cubic meter.

Source: MOA Department of Health and Human Services, 2005 are high in comparison with other urban areas in the United States. Vehicle cold start emissions and a gasoline formulation with high benzene content may be responsible. More investigation is needed.

Impact of the 2025 LRTP on Air Pollutant Emissions

Total vehicle trips in Anchorage are expected to increase by approximately 30 percent during the 20-year lifetime of the LRTP. By 2025, approximately 235,000 more motor vehicle trips than in 2005 will be made each weekday.

Impacts of the LRTP and expected growth in travel activity on emissions of CO and PM-2.5 emissions were analyzed with the EPA MOBILE6.2 model. This model was used in conjunction with the Anchorage travel model to estimate emissions from the LRTP network in 2005, 2015, and 2025.

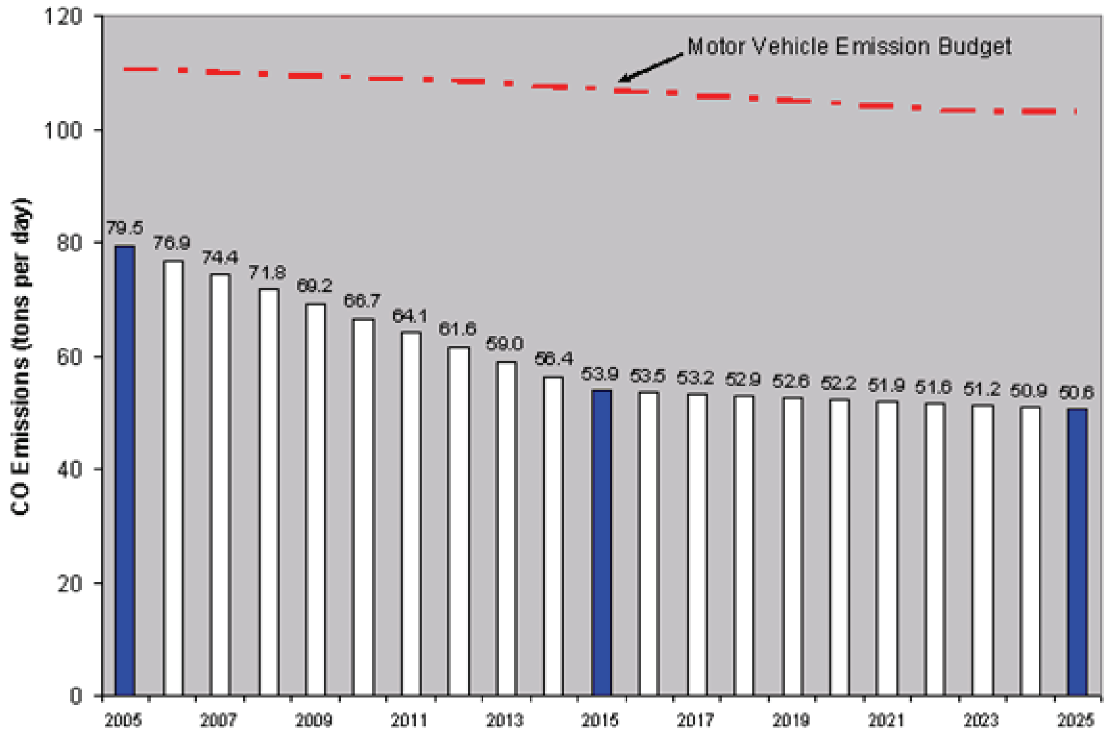
Air quality modeling tools available for evaluating PM-10 emissions are limited. MOBILE6.2 is incapable of estimating PM-10 emissions resulting from roadway dust. Thus, a *qualitative* analysis of the impact of growth in travel envisioned in this LRTP was performed to evaluate PM-10 impacts.

Carbon Monoxide Emission Projections

During the next 20 years, improvements in emission control technology and new low-sulfur gasoline requirements are expected to lower CO emissions in the average vehicle by about half. Despite the anticipated growth in travel, CO emissions in Anchorage are expected to decline during the 2005-2025 lifetime of the LRTP.

Because Anchorage is a CO maintenance area, federal regulations on transportation conformity require a demonstration that the 2025 LRTP will not interfere with maintaining compliance with the CO standard. The budget for CO emissions from motor vehicles is established in the *Anchorage Carbon Monoxide Maintenance Plan* (prepared by the MOA Department of Health and Human Services and adopted by the Anchorage Metropolitan Area Transportation Solutions and Anchorage Assembly in 2003) as a means to ensure continued compliance with the CO standard. Figure 11-3 illustrates that projected emissions are well below the budget for the lifetime of the LRTP.

Figure 11-3. Projected CO Emissions from Anchorage Transportation Network



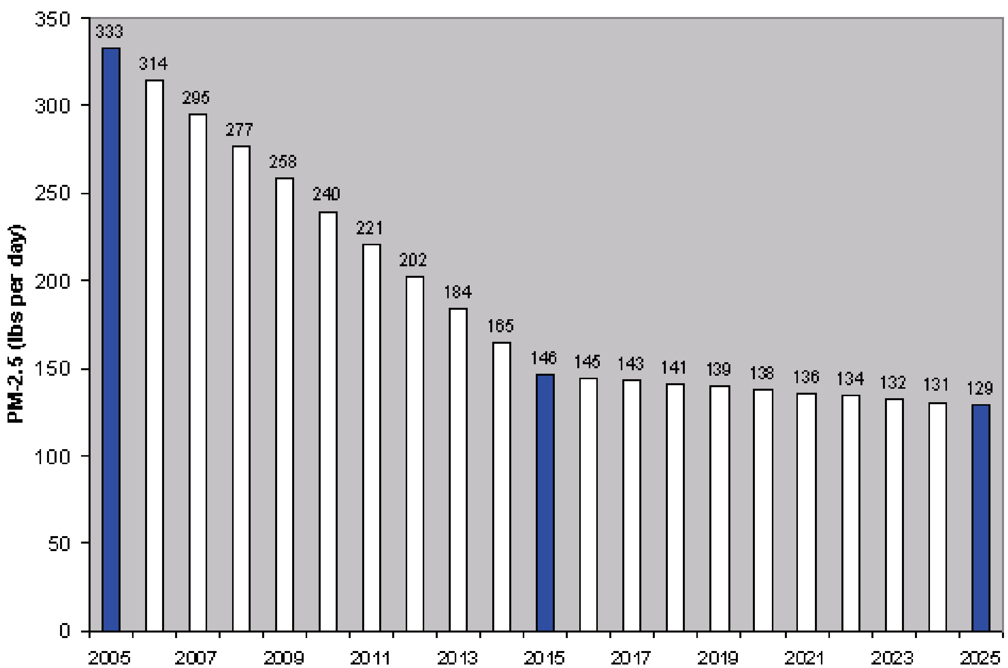
Source: *Anchorage CO Maintenance Plan*, MOA Department of Health and Human Services, September 2003 transportation network, unless the third factor in the equation, roadway silt loading, is addressed,

Silt loadings are affected by road sanding, dirt, and mud track-out from construction sites, topsoil operations, and dirt spillage during hauling operations. The MOA is working to develop cost-effective ways to reduce or mitigate the impact of roadway silt that has the potential to be re-entrained by passing traffic. Chapter 10 includes a policy statement and action item that supports this effort. During the next few years, it is important that these emissions be successfully controlled to ensure that Anchorage remains in compliance with the PM-10 standard.

PM-2.5 Emission Projections

Improvements in emission control technology for motor vehicles and low-sulfur fuels are expected to substantially reduce transportation-related PM-2.5 emissions during the next 20 years. In particular, stringent new EPA standards for heavy-duty diesel engines become effective by 2007. In addition, new requirements for low-sulfur diesel fuel will lower the sulfur content in Alaska diesel fuel from the current level of 750 parts per million to just 15 parts per million in 2006. Emission reductions for PM-2.5 will be realized as trucks equipped with these low-emission diesel engines replace the older, dirtier fleet vehicles. Modeling projections suggest transportation network PM-2.5 emissions will drop by approximately 60 percent even as travel increases during the next 20 years (Figure 11-4).

Figure 11-4. Projected PM-2.5 Emissions from Anchorage Transportation Network



Source: MOA Department of Health and Human Services, 2005

Because Anchorage is an attainment area for PM-2.5, no emission budget has been established for this pollutant.

2025 LRTP Impacts on PM-10 Emissions

As noted earlier in this chapter, PM-10 emissions were not modeled and quantitative projections of PM-10 emissions were not prepared; however, EPA has developed an equation that allows PM-10 emissions related to roadway dust to be estimated.

Although some have questioned the validity of the equation for developing quantitative estimates of PM-10 emissions, the general relationships described in the equation are useful in a qualitative analysis of future PM-10 emissions. These relationships are stated below.

7. PM-10 emissions increase proportionally with vehicle miles traveled.
8. PM-10 emissions increase exponentially in relation to vehicle weight. (Large vehicles contribute disproportionately to PM-10 emissions.)
9. PM-10 emissions increase with increasing roadway silt loadings. (Dirty roads result in increased PM-10 emissions.)

Regardless of the configuration of the transportation network envisioned in the LRTP, the number of vehicle miles traveled is expected to increase by approximately 30 percent. A slight increase in the proportion of large vehicles (trucks and buses) is also expected. These factors are expected to increase PM-10 emissions from the