

State of the Region's Air Quality

September 2010

Many of our daily activities release chemicals and particles into the air we breathe. These air pollutants can cause unpleasant smells, hazy days and affect our health. Ambient air quality (the measure of the "cleanliness" of the air) depends on the amount of pollution produced by human and natural activities, the degree of dispersion due to wind and weather effects, and complex chemical reactions between pollutants. This factsheet explains the trends that have been measured in Auckland over the past years.

Key air pollutants that impact air quality in the Auckland region include fine particles (PM₁₀ and PM_{2.5}), carbon monoxide (CO), nitrogen dioxide (NO₂), and ozone (O₃). These are monitored by the ARC because they are known to endanger human health and well-being. Levels of these pollutants in air are compared to national guidelines and standards or regional air quality targets.

Exceedences

An *exceedence* is when the concentration of a pollutant exceeds the standards. The standards and guidelines are intended to protect human health and if there are exceedences then some members of the public may be affected¹. Auckland's air frequently exceeds standards and guidelines for PM₁₀, PM_{2.5}, NO₂ and CO. Table 1 on page 2 shows the number of exceedences of guidelines and standards that have occurred in Auckland since 1999². The number of exceedences in any one year depends on the sources and what the weather was like. If there is a lot of wind or rain, pollution levels are frequently lower than when it is calm fine weather.

¹ For PM₁₀ there is no known safe level, so people may be affected at concentrations lower than the standard.

² Recent changes to the World Health Organisation ambient air quality guidelines mean that some NZ guidelines and standards are now out of date.

Table 1: Number of exceedences of the standards and guidelines since 1999

Number of days where at least one exceedence has occurred											
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
PM _{2.5}	3	3	4	1	6	5	2	5	1	3	8
PM ₁₀	4	4	7	3	2	2	4	6	7	6	6
NO ₂	27	23	38	30	8	30	26	1	8	0	1
CO	31	3	3	2	0	0	0	0	0	0	0
Total	57	33	49	35	15	36	30	8	16	9	15

Exceedences have occurred in the past due to traffic, home heating, road working or construction activities, or special events such as fireworks during Guy Fawkes Night or 'Christmas in the Park'. Some sites, such as Khyber Pass and Queen Street usually have exceedences due to traffic, whereas others may have exceedences mostly due to home heating (or a combination of both). In order to meet the standards, emissions of PM₁₀ and NO₂ need to be reduced, particularly from vehicles and home heating.

Annual trends

Annual average trends are a good indicator of whether air quality is improving over the longer term. Now that monitoring has been undertaken for many years in Auckland, we can see how concentrations have changed over time. PM₁₀ and CO concentrations appear to have decreased over a number of years at most monitoring sites (except Takapuna), but this trend has recently levelled off. Average annual NO₂ concentrations have been increasing at some sites.

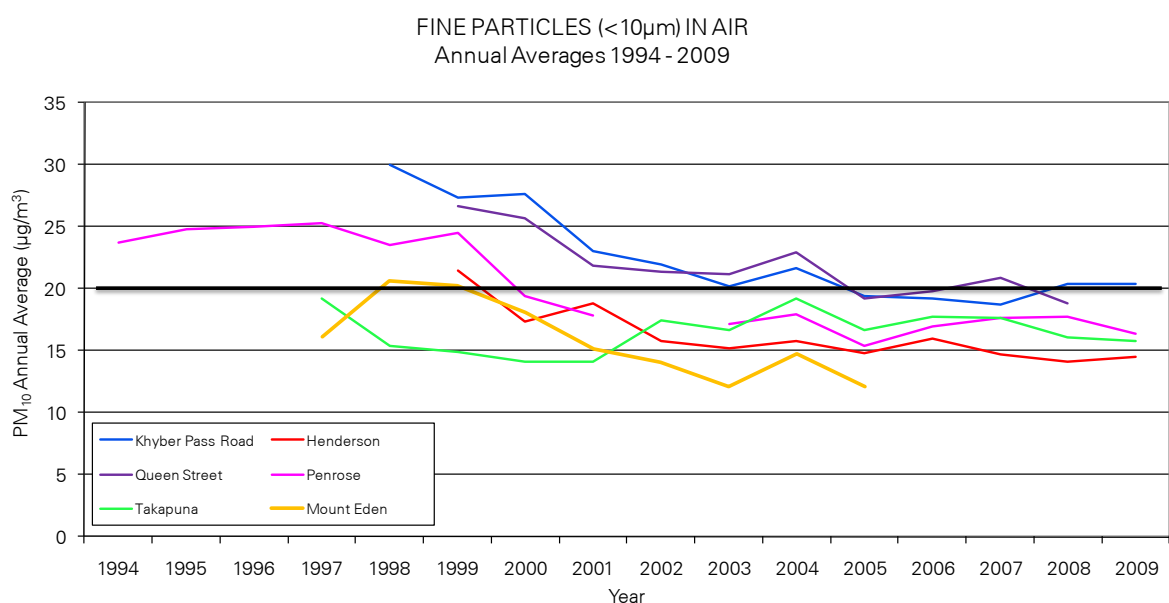


Figure 1: Annual average concentrations of PM₁₀ at long term monitoring sites. The recommended ambient guideline is 20µg/m³ (black line).

Concentrations of sulphur dioxide (SO₂) decreased in the 70's and 80's but steadily increased again in the region from 1995 until 1999. This increase was probably due to the increasing prevalence of diesel vehicles in Auckland's vehicle fleet and to the higher content of sulphur in diesel compared with petrol. Recent reductions in the sulphur content of diesel have resulted in a significant decrease in SO₂ levels, although the concentrations appear to be increasing yet again, possibly due to an increase in light duty diesel vehicles. The recent change in the World Health Organisation air quality guideline for SO₂ to a much lower concentration means that we need to 'keep an eye' on SO₂ levels in Auckland.

Seasonal trends

Concentrations of pollutants such as CO and NO₂ are usually higher in winter than in summer. In the colder months we often get a brown haze over Auckland on calm mornings (Figure 2).

PM₁₀ and PM_{2.5} concentrations can be higher at some sites during winter, depending on what the local sources of the particles are. However, it is also possible to get high PM₁₀ concentrations during summer and exceedences of standards can occur in any season.

Ozone is usually higher during spring, but the highest levels of ozone occur in summer when there is photochemical smog due to sunlight and warm temperatures leading to chemical reactions in the polluted air. Annual average ozone concentrations have changed little over the years.



Figure 2: Photo of Auckland's sky line on a hazy day (19 May 2010)

Daily Trends

Pollution concentrations also vary during the day, depending on the weather and the sources of pollution. Pollutants such as carbon monoxide and nitrogen dioxide have higher levels during rush hours (Figure 3), whereas at some sites particle concentrations can be high later in the evenings when people start using fires to heat their homes (Figure 4).

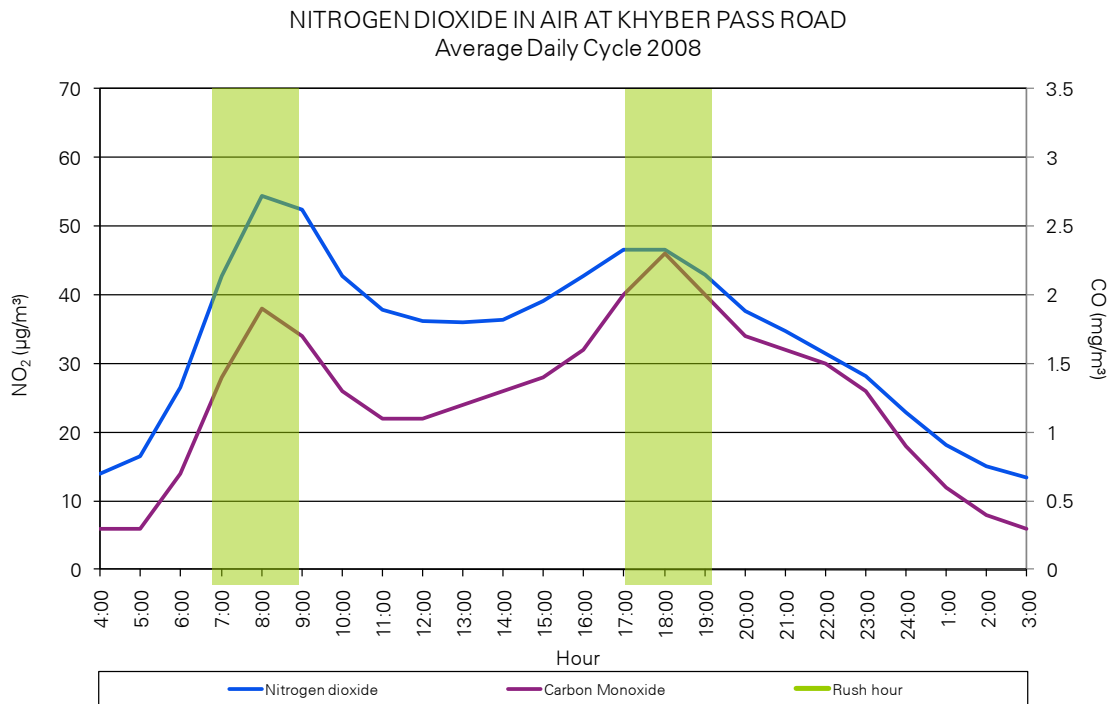


Figure 3: Variation of nitrogen dioxide and carbon monoxide during the day at Khyber Pass Road

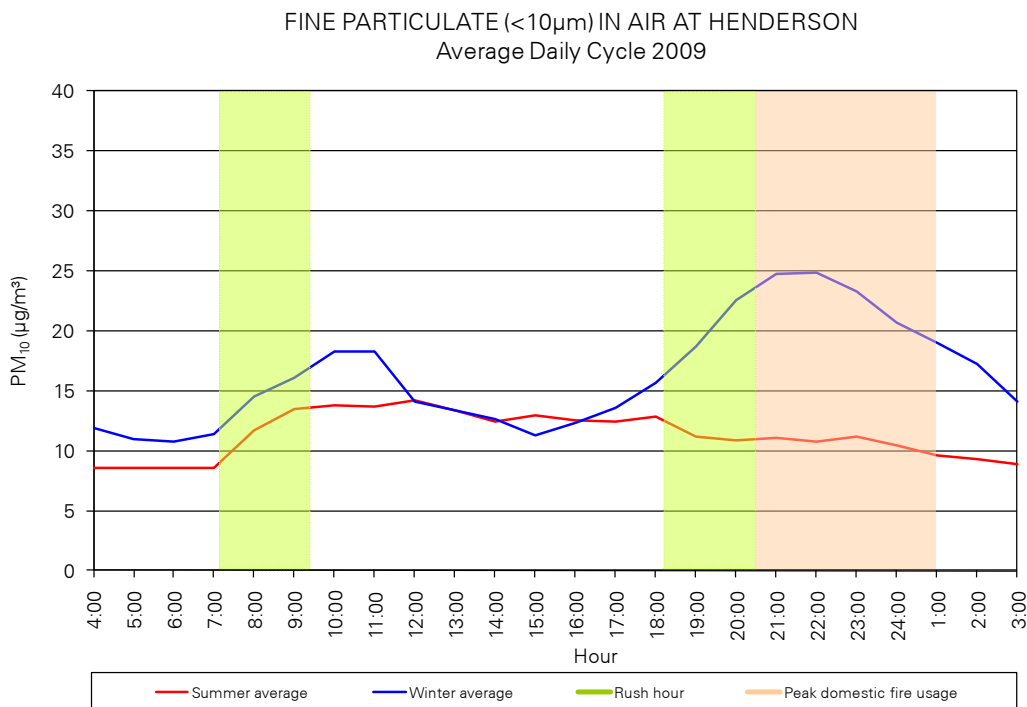


Figure 4: Variation of particle concentrations over the day at Lincoln Road, Henderson

For further information, refer to *Airfacts 7: Air Quality Standards and Targets* and *Airfacts 3: Air Monitoring in the Auckland Region* available on our website at www.arc.govt.nz. Alternatively, contact us on 09 366 2000.

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