

AIR MONITORING

Clean air is something we take for granted in Northland. However what may seem an abundant and pure resource could be ruined if we do not take care of it. In order to protect our air, the Regional Council has developed the **Regional Air Quality Plan** for Northland, which became operative in March 2003.

Direction in State of Environment air monitoring has also come from the recent development of National Environmental Standards for air quality, which has been phased in since 2004. The National Environmental Standards (NES) are mandatory technical environmental standards that were prepared in accordance with sections 43 and 44 of the Resource Management Act 1991. The main purpose of the NES air quality standards is to provide a guaranteed level of protection for the health of all New Zealanders.

The first implementation phase of the National Environmental Standards for Air Quality was the prohibitive and restrictive rules on discharges from certain activities. For example, the burning of tyres is prohibited.



The next phase was the monitoring of ambient air quality. The NES, amongst other things, requires Regional Councils to monitor five key contaminants; Particulate Matter (PM₁₀), Sulphur Dioxide, Nitrogen Dioxide, Carbon Monoxide and Ozone. These ambient standards are based on the existing Ambient Air Quality Guidelines.

For more information on these standards and guidelines check out the following webpages:

- National Environmental Standards for air quality
<http://www.mfe.govt.nz/laws/standards/consolidated-nes-aug2005.pdf>
- Ambient Air Quality Guidelines
<http://www.mfe.govt.nz/publications/air/ambient-air-quality-may02/ambient-guide-may02.pdf>

Based on the requirements of the NES and Regional Air Quality Plan the Council's air quality team monitored inhaleable particulate matter (pages 3 and 4) and dust known as deposited particulates (page 5) in 2004-05. The Regional Council also completed their pesticide-monitoring programme in 2004-05 (Refer to page 6). Sulphur dioxide monitoring has been carried out in previous years and is one of the parameters required by the National Environmental Standards, however none was carried out in 2004-05 because of faulty equipment (Refer to page 7). Therefore the council did not quite meet their **performance target** for State of the Environment monitoring of air quality, which is:

- Monitoring ambient air quality; including monitoring background levels of dust and sulphur dioxide in the Whangarei urban area.

The Sulphur Dioxide (SO₂) monitoring will be reinstated in the next two years when a new SO₂ monitor is installed. In order to ensure that Northland's air remains healthy, the Regional Council will also be purchasing a Carbon Monoxide (CO) monitor, Nitrogen Dioxide (NO₂) monitor and calibrator over the next 3 years, subject to budget approval. The only other parameter that the NES recommends monitoring is Ozone. However, as Ozone is a secondary pollutant, meaning it does not have a direct source, it is highly unlikely to be an issue in Northland and as it is very difficult to sample (monitors have to be installed at extreme heights above ground level), the Regional Council will not be monitoring Ozone anywhere in the near future.

Inhaleable Particulate Matter

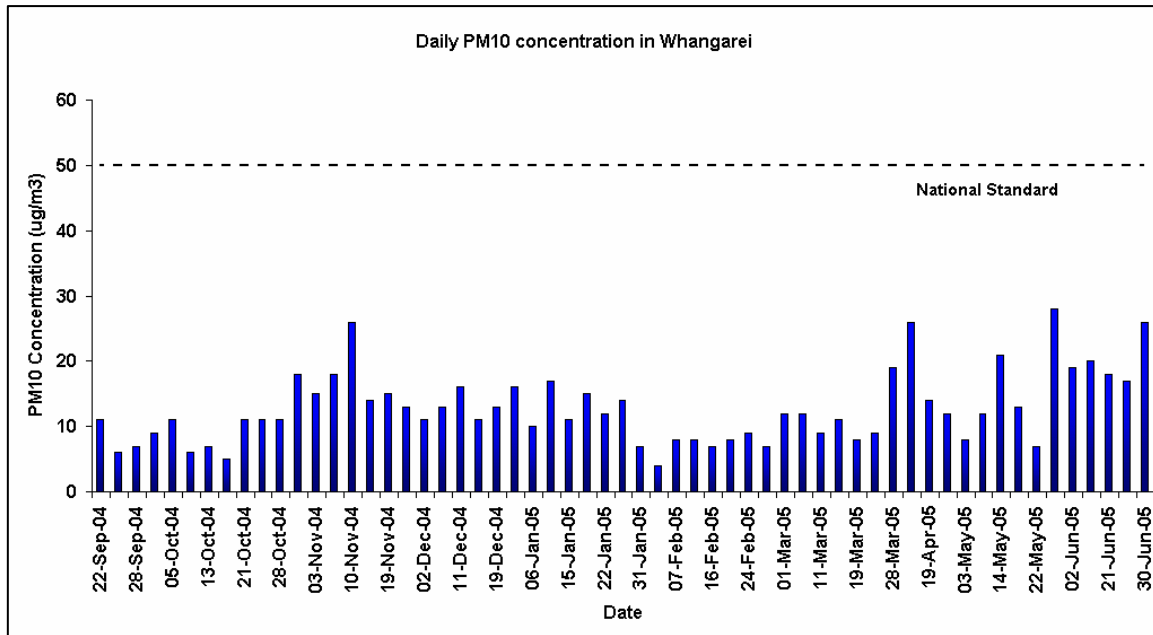
Particulate matter is a collective term used to describe very small solid or liquid particles such as dust, fume, smoke and mist or fog. Particulate material, which has an aerodynamic diameter of less than 10 microns, is referred to as 'PM₁₀'. The average human hair is 50 microns across, so 5 PM₁₀ particles would line up back to back across the average human hair. PM₁₀ in the atmosphere originates from both natural (wind blown dust, forest fires, volcanic emissions, sea spray or pollen) and anthropogenic activities including automobile exhausts, solid fuel burning, and industrial emissions.

Scientific research has established that PM₁₀ particles are small enough to be inhaled into human lungs where they can aggravate respiratory disorders. People most susceptible to the effects of particles include the elderly; those with existing respiratory disease such as asthma, chronic obstructive pulmonary disease and bronchitis; those with cardiovascular disease; those with infections such as pneumonia; and children.

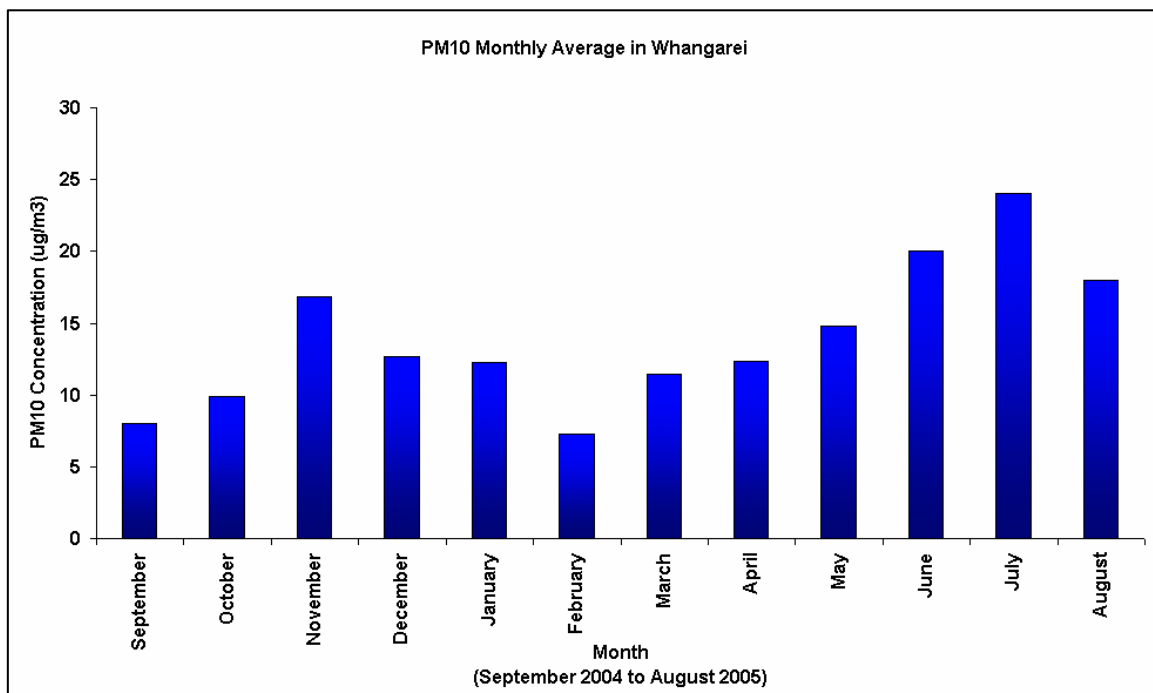
In 2004 – 2005 the Northland Regional Council monitored PM₁₀ in Whangarei throughout the year and briefly in Kaitiāia at the start of the year. Particulate matter was collected on glass fibre filters using high volume samplers. The sampled filters of PM₁₀ were analysed by gravimetric method. The National standard for PM₁₀ is no more than one exceedance in a 12-month period of the limit of 50 micrograms per cubic metre expressed as a 24 hour-mean.

PM₁₀ Concentrations in Northland

Whangarei is the largest commercial centre in Northland, and is home to around 45,000 people. Major factors affecting air quality in Whangarei City include vehicle emissions and domestic fires during winter months. Historical monitoring in this city has noted high concentrations of PM₁₀ that occasionally exceeded the daily national standards. A high volume sampler was placed on the roof of the Northland Regional Council building in Water Street, Whangarei about 4.5 metres above ground level. The results start from when the sampler was installed in September 2004 and indicate that peak PM₁₀ concentrations are consistently below the 24-hour national standard of 50 µg/m³. This is shown in the figure below.



Concentrations during winter months were higher than at other times of the year. Higher particulate matter concentrations during winter are a worldwide phenomenon and are mainly due to calmer weather conditions and chimney discharges from domestic home heating.

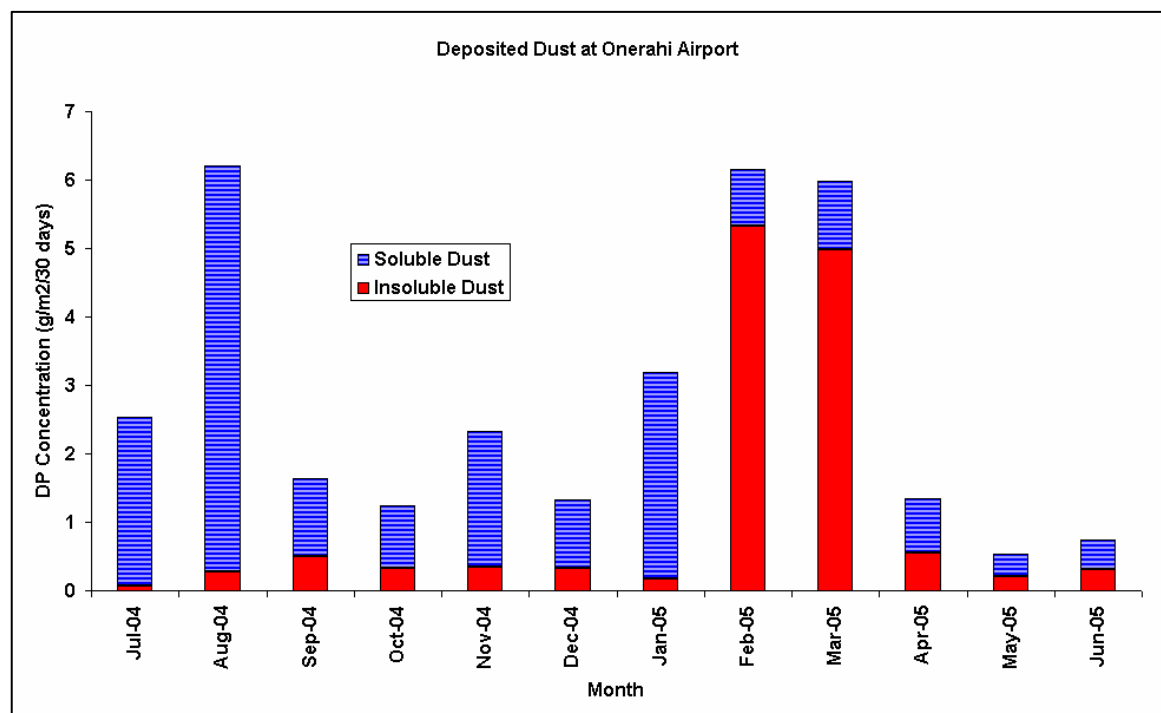


Kaitaia is the second largest commercial centre in Northland and is the northernmost township in New Zealand. Air quality in Kaitaia is influenced by industrial activities, vehicle emissions and during the winter, household fires. A high volume sampler was deployed in a residential section on the outskirts of Kaitaia and the monitoring of PM₁₀ was carried out from December 2002 to September 2004. During this time all results were well below the National standard of 50 µg/m³. Therefore the sampler was removed in September and is now being used to monitor dust nuisance incidents.

Deposited Particulate Monitoring

Deposited particulates are relatively larger dust particles with a diameter of at least 30 microns. While particles of this size are unlikely to cause health effects, elevated concentrations are indicative of a dust nuisance problem, which can manifest itself as soiled surfaces, dirty washing and reduced visibility.

Northland Regional Council monitors the concentration of deposited particulate at Onerahi airport using deposited particulate gauges. The gauges are collected on a monthly basis and the solution analysed for soluble and insoluble components. The figure below clearly shows that dust levels are elevated during summer months.



The higher peak in August 2004 is more difficult to explain and may be due to sample contamination. The figure clearly illustrates that levels of soluble dust are higher than insoluble dust in all months except February and March, suggesting that in general most of the dust at the sampling site is sourced from sea salts. The location of the sampling site at Onerahi is consistent with this result as typically 90% of the aerosol in the marine boundary layer is sea salt particles. However, February and March results are dominated by wind blown dust from the airport and surrounding residential area.

While there is no specific limit set for deposited particulates, the Ministry of Health previously specified a “nuisance” guideline value of 4 grams per square metre per 30 days over and above typical background concentrations which in Whangarei is approximately 10 grams per square metre per 30 days depending on the time of year, weather condition and wind speed/direction.

Pesticide Monitoring

In 2003 the Northland Regional Council initiated an ambient pesticide monitoring programme due to the higher number of spray drift complaints the Council was receiving. The programme was designed to identify whether agrichemicals were present at detectable or dangerous concentrations in ambient air.

Similarly to the inhalation of sulphur dioxide or particulate matter, there is a range of potential health risks that are associated with elevated concentrations of pesticides in air, particularly respiratory problems. There is also the potential risk to nearby horticultural crops, pasture and native plants.

The first phase of this study involved sampling adjacent to Tauraroa School. Sampling was carried out from July to August 2003 for a range of chemicals, including most commonly used agrichemicals such as 2,4 Dichlorophenoxy esters, MCPA, MCPB, Metsulphuron, triclopyr and picloram. All the results were below detection limits for all agrichemicals tested for.

In 2004-05 the second phase of the study was carried out. It involved sampling in residential areas adjacent to horticultural properties when spray drift complaints were received during the spraying season. The majority of results from this second phase were also below detection limits. Only one compound called Chloropyrifos (an organophosphate insecticide) was detected on two occasions from the Tara Road sampling site but levels were still well below the guideline value.

Pesticide monitoring will not be continued next financial year because all test results have been extremely low, predominately below detection limits.

Sulphur Dioxide

Sulphur dioxide (SO₂) is a colourless, soluble gas with a characteristic pungent smell. It is mainly produced by the combustion of fossil fuels containing sulphur and some industrial processes.

The symptoms of SO₂ inhalation may include wheezing, chest tightness, shortness of breath or coughing, which are related to reductions in ventilatory capacity (for example, reduction in forced expiratory volume in one second, or FEV1), and increased specific airway resistance. If exposure occurs during exercise, the observed response may be accentuated because of the increased breathing rate associated with exercise. A wide range of sensitivity is evident in both healthy individuals and more susceptible people, such as asthmatics, the latter being the most sensitive to irritants.

In Northland, the most significant industrial source of sulphur dioxide is the New Zealand Refining Company Limited, located at Marsden Point. The prevailing wind in this area frequently disperses emissions from the refinery towards the Whangarei Heads, a predominantly rural, residential area. To ensure that emissions from the refinery do not pose any health risk to the local community, permanent sulphur dioxide monitors were located at Urquhart's Bay, Mcleod's Bay and Manaia School. In previous years SO₂ monitoring has not identified any occasions during which the ambient concentration of sulphur dioxide has equalled or exceeded either the current Ambient Air Quality Guidelines or the new National Environmental Standards for Air Quality.

Unfortunately in 2004 – 05 State of the Environment monitoring of SO₂ was not carried out because of faulty equipment. However a new sulphur dioxide monitor is planned for purchase in 2005-06 and therefore SO₂ monitoring will be reinstated within the next 2 years.