



Taranaki's excellent air quality is highly valued.

Air quality

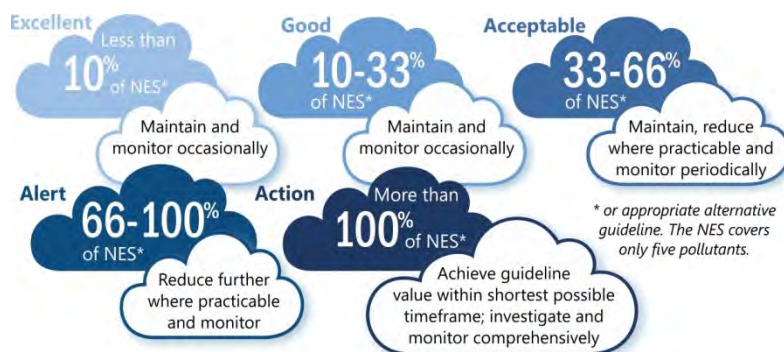
The overall quality of air in the Taranaki region is excellent. Nonetheless, the Council keeps a close eye on air quality as part of State of the Environment monitoring, and as part of resource consent compliance.

Air quality data has been gathered and maintained for more than 20 years at up to 20 representative sites, including urban, industrial, rural, coastal and pristine areas. In general, we use screening methods to monitor air quality at locations that have the most potential for adverse impacts as a result of surrounding land use. This methodology is very useful for giving an indication of the state of the region's air quality and for determining whether there is any justification for further investigation using much more expensive techniques stipulated in the National Environmental Standards. Consistently good results from our air quality monitoring programme confirm that the screening approach is justified and cost effective.

Air quality monitoring

The Council looks at key indicators of ambient air quality, including inhalable particulates; chemicals such as nitrogen oxides, benzene, carbon monoxide, sulphur oxides and formaldehyde; and suspended particulates and deposition. We also monitor visibility.

Results of our programmes are compared with Ministry for the Environment (MfE) national ambient air quality guidelines and National Environmental Standards (NES) as appropriate. MfE uses indicators of environmental performance to categorise air quality across the country (see figure above). These categories are used to describe the air quality within airsheds (defined bodies of air) or regions. Each category has a recommended management action relevant to the degree of air pollution identified.



MfE uses an environmental performance indicator to categorise air quality across the country. These categories describe air quality and have recommended actions where necessary.

Particulate matter

One aspect of air quality the Council measures is the PM₁₀ concentrations (airborne particulate matter of less than 10 micrometres in diameter per cubic metre of air). PM₁₀ comes from sources such as burning coal, oil, wood, petrol and diesel in domestic fires, transportation and industrial processes and from natural sources, including sea salt, dust, pollens and volcanic activity. PM₁₀ is associated with health issues ranging from respiratory irritations to cancer.

The Council also measures PM_{2.5} concentrations around the region. These finer particles, commonly derived from incomplete combustion, pose a greater public health risk than PM₁₀. Currently, there is no NES for PM_{2.5}. However, all PM_{2.5} monitoring results are well within World Health Organisation guidelines.

The NES for PM₁₀ is 50 micrograms per cubic metre (µg/m³) over a 24-hour average period. The NES allows one sample per site to exceed this limit per year.

In 2009, PM₁₀ monitoring at a range of representative sites showed that on a regional basis, Taranaki has no significant air quality issues in relation to PM₁₀. Since 2009, two further surveys have been conducted.

The first survey took place in the five months between January–May 2010. To ensure a 'worst-case' scenario for air quality (high traffic movements and marine influence), Council officers surveyed between two main roads in the New Plymouth CBD that are close to the foreshore. The second survey, conducted in February–March 2012, was taken at Port Taranaki, a site also subject to heavy vehicles and marine influence.

What's the story?

In the Port Taranaki survey, 97% of PM₁₀ daily average results were within the MfE's 'Excellent' or 'Good' categories. Only one result was within the 'Acceptable' category.

In the New Plymouth CBD survey, 56% of the daily average results were within the MfE's 'Excellent' or 'Good' categories, with 40% of results meeting the 'Acceptable' category. The highest daily mean for the entire New Plymouth CBD survey was 46.5 µg/m³, with an overall mean of 16.2 µg/m³.

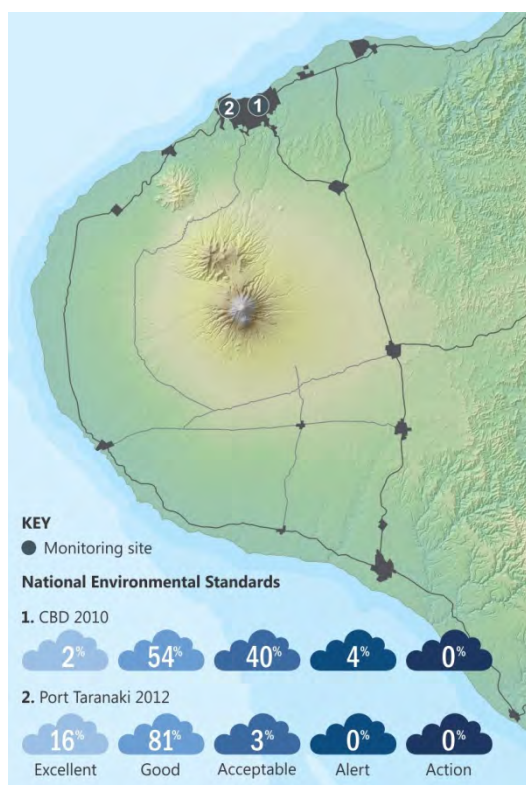
No survey results entered the 'Action' category, meaning no result exceeded the NES of 50 µg/m³.

Traffic flows were found to have no discernible effect. However, onshore winds were found to be a major influence upon air quality, with airborne salt causing PM₁₀ concentrations to double.

A limit of 50 micrograms per cubic metre (µg/m³) is the equivalent of two teaspoons of dust floating in the air within Yarrow Stadium.



A PM₁₀ monitoring site on Bayly Road towards Port Taranaki.



All results from surveys of the New Plymouth CBD (1) and of Port Taranaki (2) were within NES guideline limits.


National comparison

If NES air quality criteria are exceeded in any region in New Zealand, the regional council is required to create a 'gazetted airshed'. This means the area must be legally defined as an airshed (similar to a water catchment), and identified by government notice. The regional council must then conduct further monitoring and reporting on the airshed, taking measures to ensure air quality meets NES guideline values. Taranaki is one of only two regions in New Zealand that have not exceeded NES guidelines and where no 'gazetted air shed' has ever been necessary (the other being the Gisborne region).

In 2012, the Ministry for the Environment reported that 50% of the gazetted airsheds around New Zealand breached the NES 24-hour standard for PM₁₀ on at least two days per year, with 10% of gazetted airsheds exceeding the standard for 21–50 days.

In much of New Zealand, the highest PM₁₀ results occur over winter, with residential heating using wood and coal adding to traffic-related emissions. This is not the case in Taranaki because there is a comparatively low use of solid fuels in the region. The exposed environment also means there are few periods of calm weather in winter.

Find out more

-  *Ambient air quality survey at Bell Block bypass (TRC, 2014) tinyurl.com/TRC5b*
- Inhalable particulates monitoring at Port Taranaki (TRC, 2012) tinyurl.com/TRC5c*
- Inhalable particulates (PM₁₀) regional monitoring report (TRC, 2010) tinyurl.com/TRC5d*
- Is there something in the air? (TRC) tinyurl.com/TRC5a*

Nitrogen oxides

Nitrogen oxides (NO_x) are a group of gases that typically comprise mainly nitric oxide (NO) and nitrogen dioxide (NO₂), and a small proportion of nitrous oxide (N₂O).

Nitrogen oxides are produced from soil, vegetation and other natural sources. They also come from motor vehicles and other fuel combustion processes. Indoor domestic appliances such as gas stoves, or unflued gas heaters can be significant sources of nitric oxide and nitrogen dioxide. These gases can accumulate, particularly in poorly ventilated areas. It is widely accepted that nitrogen dioxide can aggravate asthma and reduce lung defences against bacteria.

Since 1997, the Council has surveyed nitrogen oxides at seven sites throughout the region as part of state of the environment monitoring. In this programme, passive absorption discs that capture target gases are placed at each site. Samples are sent to an external laboratory for analysis, and the results converted to the equivalent exposures for a one-hour period. We also monitor NO_x at other sites in the region as part of consent compliance monitoring.

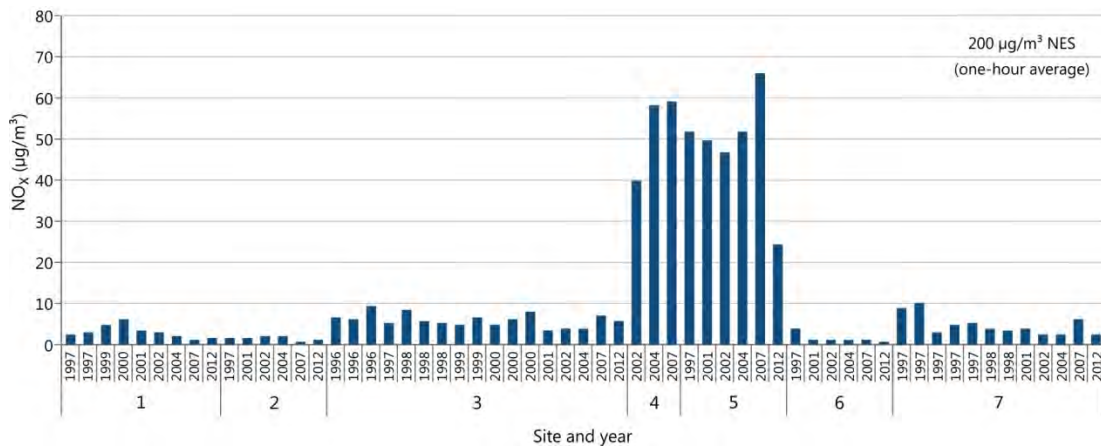
The National Environmental Standard in New Zealand sets the limit of nitrogen dioxide concentration at 200 µg/m³ for a one-hour period.

What's the story?

Since 1997, nitrogen dioxide concentrations at all state of the environment monitoring (SEM) sites have been well within the relevant NES values, with no upward trend in nitrogen oxide concentrations observed.

Five of the SEM sites monitored were consistently within the 'Excellent' category of the MfE Environmental Performance indicator, with nitrogen oxide concentrations less than 10 µg/m³.

In the 2011–2012 survey, the theoretical maximum nitrogen oxide concentrations (calculated for a one-hour period) ranged from 0.7 µg/m³ to 24.7 µg/m³, well below NES limits. The highest result of this survey (24.7 µg/m³) was from near a busy traffic intersection in New Plymouth's urban area (site 5), and still well below limits.



Since 1997, results from all surveys at SEM sites throughout the region have shown good air quality with consistently low levels of nitrogen oxides (calculated one-hour average). See map below for SEM site locations.

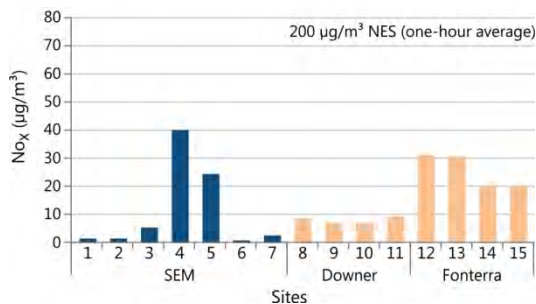
In 2012, the Council also monitored two industrial sites as part of consent compliance monitoring: Fonterra's Whareroa dairy factory generation plant and Downer EDI's asphalt and bitumen plant. Four samples were taken at each site.

Results from this monitoring found that NO_x concentrations at the Fonterra site were comparable with SEM monitoring sites located near major roads. Samples from the Downer site were also well within NES guidelines.

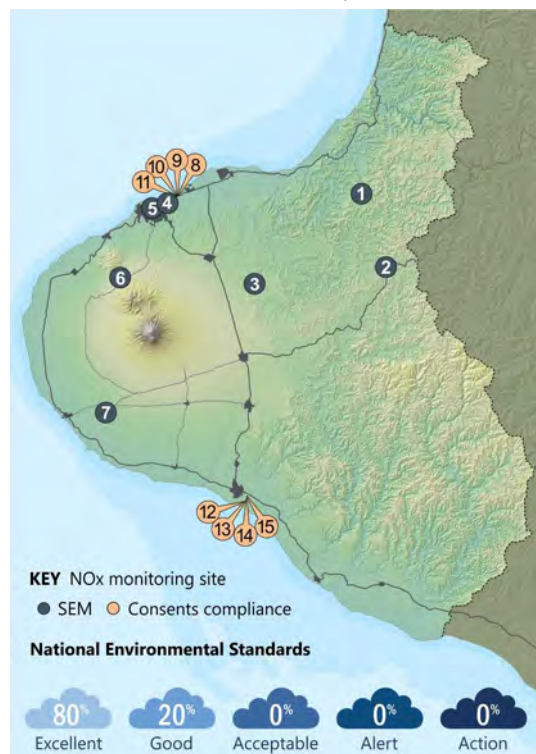
Overall results

Overall, 80% of results from all Council monitoring have been within the Ministry's 'Excellent' category of the environmental performance indicator table. The remaining 20% were within the 'Good' category.

These results indicate that NO_x levels are consistently well below the National Environmental Standard. There is no evidence that NO_x concentrations in the region are increasing.



Results of NO_x monitoring for SEM and consent compliance monitoring in 2012 (calculated one-hour average). See map for the location of monitoring sites.



Monitoring results for SEM and consent compliance are consistently well below the NO_x NES, indicating there are no significant pressures on air quality in the Taranaki region from NO_x sources.

Find out more

- Air emissions consents monitoring reports (TRC) tinyurl.com/TRC5g
- Monitoring of nitrogen oxides (NO_x) levels in Taranaki 2011/2012 (TRC, 2013) tinyurl.com/TRC5e



*'National air quality standards
have never been exceeded
in Taranaki.'*

Volatile organic compounds

The Council also monitors air quality for gases that are classified as volatile organic compounds (VOCs). The four most common VOCs are benzene, toluene, ethylbenzene and xylenes—often found together and referred to as BTEX. These volatile gases occur naturally as a component of crude petroleum and vegetable oils (in small amounts). They are also produced during the combustion of organic matter such as petroleum products. Other common sources of exposure are solvents (including paints and glues), and petrol and diesel fuels.

Short-term or acute exposure to high levels of BTEX components has been associated with skin and sensory irritation, central nervous system depression and adverse effects on the respiratory system. Prolonged or chronic exposure to high levels of these compounds can affect the kidney, liver and blood systems. Studies by the United States Environmental Protection Agency show long-term exposure to benzene can be carcinogenic for humans.

What's the story?

In April 2012, the Council conducted an air quality survey to monitor BTEX at four sites in Taranaki. Results were converted to the equivalent exposures for a one-hour period. All results from the 2012 survey were within the recommended National Ambient Air Quality guidelines (2000).

The theoretical maximum concentrations (calculated one-hour equivalent) of benzene ranged from 7.06 $\mu\text{g}/\text{m}^3$ to 14.5 $\mu\text{g}/\text{m}^3$.


The theoretical maximum concentrations of toluene ranged from 11.4 $\mu\text{g}/\text{m}^3$ to 36.8 $\mu\text{g}/\text{m}^3$.

The theoretical maximum concentrations of xylene ranged from 10.8 $\mu\text{g}/\text{m}^3$ to 19.3 $\mu\text{g}/\text{m}^3$.

Levels of toluene and xylene were found to be far below National Ambient Air Quality guideline values. All toluene and xylene results fell into the MfE 'Excellent' air quality category. Three of the four benzene results were within the MfE 'Acceptable' category. One result fell within the 'Good' category.

The Council also monitors for VOCs around significant potential sources, such as gas production stations, as part consent compliance programmes. Results always fall well within guideline values.

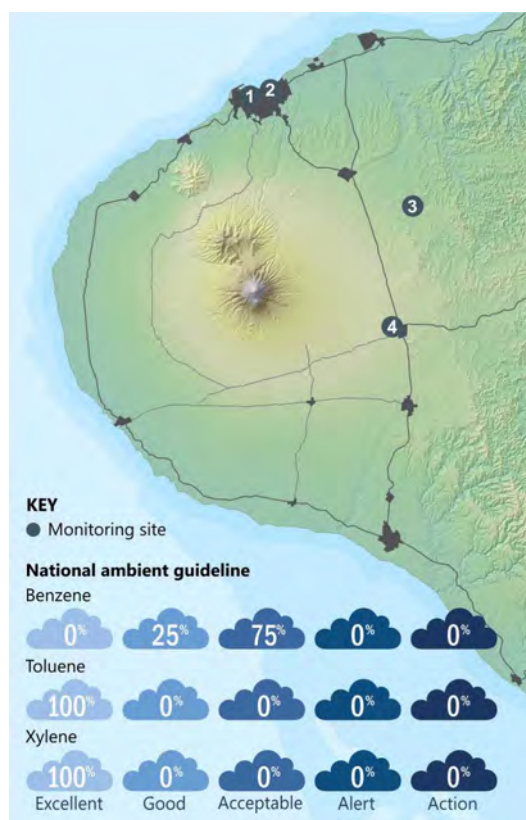
Find out more

 *Air emissions consents monitoring reports*
tinyurl.com/TRC5g

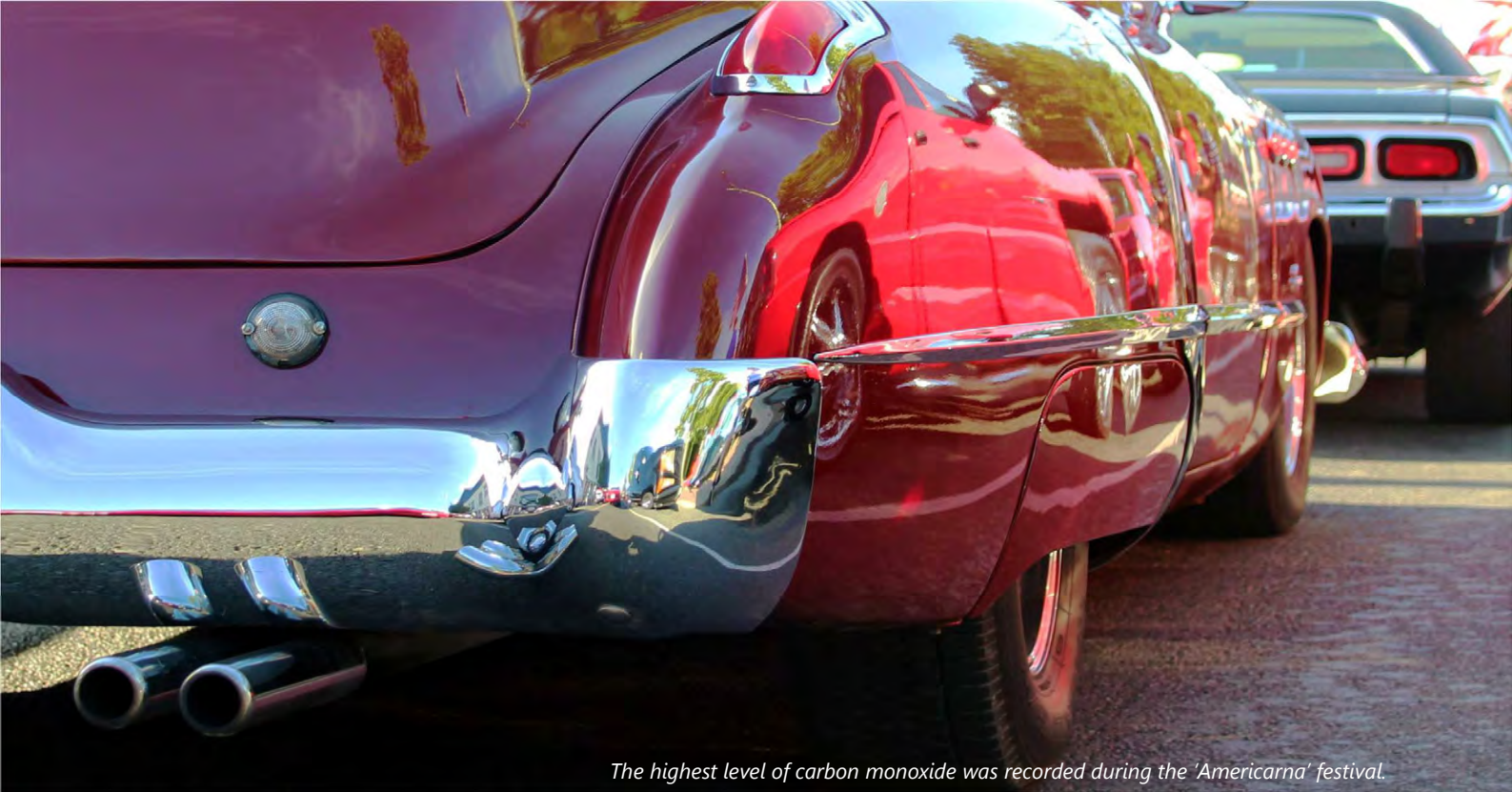
Air monitoring survey of hydrocarbon compounds (BTEX) in Taranaki region (TRC, 2013)
tinyurl.com/TRC5h

Because there is no NES for any volatile organic compound, the Council uses the National Ambient Air Quality guidelines detailed in the Ministry for the Environment (MfE) internal document *Health Effects of Eleven Hazardous Air Contaminants and Recommended Evaluation Criteria* (October 2000). These guidelines suggest one-hour average values of:

- 22 $\mu\text{g}/\text{m}^3$ for benzene
- 500 $\mu\text{g}/\text{m}^3$ for toluene
- 1000 $\mu\text{g}/\text{m}^3$ for xylene.



VOC monitoring results are measured against MfE's National Ambient Air Quality guidelines. The highest results were from the site located in New Plymouth's urban area near a busy traffic intersection (site 2).



The highest level of carbon monoxide was recorded during the 'Americarna' festival.

Carbon monoxide

Carbon monoxide (CO) is the result of incomplete fossil fuel combustion. For example, it comes from motor vehicle emissions and from burning wood or coal for home heating or industrial purposes.

In high concentrations carbon monoxide can cause dizziness or aggravate heart conditions. It can be fatal. In New Zealand, the NES for carbon monoxide is 10 mg/m³ (calculated as an eight-hour average).

In February 2012, the Council conducted one month of continuous monitoring for carbon monoxide in central New Plymouth. The monitoring was carried out to determine the 'worst-case scenario' for air quality associated with vehicle emissions. To assist in interpreting survey results, traffic count data was obtained from the New Plymouth District Council.

What's the story?

Carbon monoxide concentrations in New Plymouth met the NES, with monitoring results showing low levels of CO in the area most of the time.

The highest one-minute level of carbon monoxide recorded during the one-month survey was 10.6 mg/m³. This was detected on a Friday night during the 'Americarna' festival. This relatively high carbon monoxide emission rate is a reflection of the high number of vehicles with large engine capacities running at low revolutions per minute in the streets at that time. The highest eight-hour concentration over the same evening was 0.6 mg/m³, or only 6% of the NES.

We also routinely undertake consent compliance monitoring for carbon monoxide in Taranaki around significant potential sources such as gas production stations. Results are reported publicly in individual annual monitoring reports. Results never reach more than a trivial level of either the National Ambient Air Quality guidelines or NES guideline values.



Air quality monitoring at an exploration site.

Flare investigation clears the air

A Taranaki Regional Council investigation has found that flaring of hydraulic fracturing (fracking) fluids has minimal effects on air quality even very close to well sites.

More than 95% of fracking fluids are simply water and an inert 'proppant' such as sand or ceramic beads that are injected into a fractured zone to keep the newly created micro channels open. The fluids also contain a mixture of other substances in small quantities. The return flow from a fractured well can also contain produced hydrocarbons.

Usually hydrocarbon exploration operators recover fracking fluids for reuse or for off-site disposal. Sometimes, for the safety of workers or equipment, disposal via a flare is required. This process of 'flaring' involves combusting and vaporising the recovered fluids.

Previous examination of the effects of flaring on air quality at well sites found that beyond 100 metres downwind of a flare, there is no elevation of risk to public health over normal everyday exposure. Despite this, with increased fracturing activity in Taranaki, and for the sake of certainty, the Council decided to further evaluate air emissions.

These investigations tested emission and ambient air samples collected both at and downwind of a flare in the process of combusting/vaporising recovered fluids. The fluids included biocides, gelling and gel breaking agents, inert proppants such as sand or microscopic beads, and 'slicking agents'. The samples were tested for tiny particles known as particulate matter (PM); dioxins and furans; polyaromatic hydrocarbons; aldehydes, volatile organic compounds (including benzene) and methanol. More conventional measures of combustion efficiency—oxygen, carbon dioxide, carbon monoxide, nitrogen oxides, and sulphur dioxide—were also investigated. Results showed:

- no elevation of dioxins or furans concentrations
- PM levels at or below those generally found throughout the region

- polyaromatic hydrocarbon levels lower than those found in central city areas
- volatile organic compounds (including benzene), aldehyde and methanol levels well within Ministry for the Environment guidelines
- no trace of carbon monoxide, and minimal levels of the other conventional products of combustion.

"It's important to note that on some measures, the air quality downwind of the flare was better than that found in most New Zealand cities," says the Council's Director—Environment Quality, Gary Bedford. "In simple terms, mowing your lawns with a two-stroke mower would have more effect on the quality of the air you're breathing than standing downwind beyond the boundary of a flare and well site. While we have previously investigated emissions from flaring, this is the first time we have looked specifically at the compounds associated with fracking. The results are reassuring, and will be very useful for us as we set standards for future activity by the industry." Mr Bedford says that while exploration and production companies endorsed and cooperated with the project, its design and implementation were completely independent of any influence or direction from the companies. The design of the investigation and reporting of results were also subject to peer review.

The results of the study are consistent with others overseas. The Barnett shale area of Texas, with 16,000 producing wells within 13,000 square kilometres, found shale gas production activities have not resulted in community exposure to volatile organic compounds at levels that would pose a health concern.

A similar density of hydrocarbon production in Taranaki would mean 8,000 producing wells in the region, instead of just the 37 producing wells existing. According to these studies, even if hydrocarbon production in the region was to expand significantly, public health would not be compromised. The full report can be found online at www.trc.govt.nz/hydraulic-fracturing/.



Flaring tests were conducted on fracking fluids on site to ascertain the impacts it has on air quality.



Regional Air Quality Plan objectives maintain high standards of ambient air quality in Taranaki.

Our responses

Regional Air Quality Plan for Taranaki

The *Regional Air Quality Plan for Taranaki* was reviewed in 2010 and became operative in July 2011. In the plan the Council set an objective to “maintain the existing high standard of ambient air quality in the Taranaki region and to improve air quality in those instances or areas where air quality is adversely affected, whilst allowing for communities to provide for their economic and social well-being”.

The reviewed plan included two main changes: a prohibition on ‘backyard burning’ on residential properties in urban areas (outdoor fires excluding hāngi and barbeques), and provision for ‘reverse sensitivity’ (protecting existing rural activities such as poultry broiler sheds from encroachment by lifestyle development).

In developing the plan, the 14 air quality standards introduced in the Government’s National Environmental Standards were taken into account. These include:

- ▷ seven activity standards that ban various activities that discharge unacceptable contaminants into the air (landfill fires, burning of tyres in the open, bitumen burning for road maintenance, burning of coated wire in the open, burning of oil in the open, high temperature hazardous waste incinerators, and school/healthcare incinerators unless consented)
- ▷ five ambient air quality standards for carbon monoxide (CO), fine particulate (PM₁₀), nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and ozone (O₃)
- ▷ a design standard for new small-scale domestic wood-burning appliances, and the prohibition of discharge from certain woodburners
- ▷ a requirement for landfills over one million tonnes of refuse to collect greenhouses gas emissions.

Future directions

In March 2015, the Parliamentary Commissioner for the Environment called for the government to amend the National Environmental Standards by including a standard for PM_{2.5} (a subset of PM₁₀ fine particulate), for both any 24-hour period and also as an annual average. As already mentioned (see Particulate matter *page 131*) the Council already conducts routine monitoring for PM_{2.5}. Results show that the region’s air quality is well within the World Health Organisation (WHO) guideline of 25 µg/m³ (24-hour average) and

in all likelihood would be well within the WHO annual guideline of 10 µg/m³. Therefore the Council and region are already well positioned in the event of future changes to the NES.

Resource consent management

In addition to the conditions related to specific permitted and non-permitted activities detailed in the *Regional Air Quality Plan*, the Council assesses the effects of air discharges on a case-by-case basis when considering resource consent applications. To regulate the potential effects on the environment, some air discharge resource consents are granted with consent conditions.

As at 30 June 2014, the total number of air discharge consents held in Taranaki was 332. This is an increase of 6% since 2008/2009, when there were 306 resource consents.

Within this total, the number of air discharge consents for emissions from hydrocarbon exploration and servicing facilities has increased over the past five years, from 145 in 2008/2009 to 206 in 2013/2014.

The number of resource consents held for emissions from industry such as landfills (dust, odour, landfill gas) and from chemical and metal processing (odour) has reduced in the past six years.

Resource consent monitoring

When the Council grants resource consent for a significant activity, it implements an annual compliance monitoring programme to ensure the consent holders meet the conditions set out in the consent. These conditions usually relate to the manner of operation, the quantity and quality of the discharge, and the permitted extent of effects in the receiving environment. In the 2013/2014 year, the Council undertook 140 individual resource consent monitoring programmes that had an air quality monitoring component. Sites included sewage plants, petrochemical and petroleum production facilities, landfills, composting sites, dairy processing and manufacturing factories, metal smelting and galvanizing plants, meatworks, fertiliser storage, pig and poultry farms, quarries and abrasive blasters.

Year	2010/2011	2011/2012	2012/2013	2013/2014
Number of consents with air quality monitoring	122	135	139	140

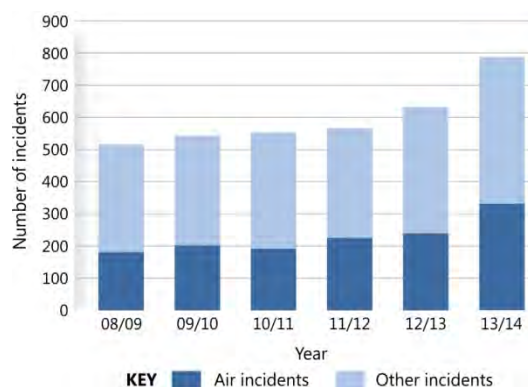
The number of consent monitoring programmes with an air quality component has increased since 2010/2011.

Incidents investigated

The Council records the number of complaints received from the general public on air quality including complaints of odour.

In the 2013/2014 year, the Council recorded 325 air incidents, accounting for 42% of the total incidents reported in that year.

The majority of air quality complaints relate to offensive odour. Complaints about air quality and odour came mostly from dairy farms, meat and by-product processing, municipal waste treatment, private housing, and pig and poultry farms. The number of air incidents reported has increased over the past five years, from 177 incidents in 2008/2009 to 325 incidents in 2013/2014. This can partly be attributed to a 2011 change to regulations which resulted in an increase in reported incidents in relation to backyard burning.



Air quality complaints 2008 to 2014. Investigations can find a complaint to be unsubstantiated.

All complaints are investigated and enforcement action is taken where appropriate. However, a complaint does not necessarily constitute further action and in some cases, investigation can find a complaint to be unsubstantiated. In the 2013/2014 year, the Council issued 19 abatement notices and 33 infringement notices relating to air quality incidents.

Prosecution

Regrettably, there are times when monitoring or resource investigations require further action, and on the rare occasion prosecution is warranted. In the 2013/2014 year, the Council brought two cases relating to air quality (odour) before the courts.

Glencore Grain (NZ) Ltd pleaded guilty to three charges relating to odour discharges from a palm kernel extract storage facility at Port Taranaki in November 2013. The company was fined \$67,500.

The South Taranaki District Council also pleaded guilty to a charge relating to odour discharges from the Eltham Wastewater Treatment Plant between March and May 2014, following the unsuccessful treatment of waste buttermilk. STDC was fined \$115,000.

Information, education and advice

The Council provides information and advice to the public relating to air quality in the region. Highlights of the past five years include:

- ▶ producing a guide to the requirements of the *Regional Air Quality Plan for Taranaki* (2011) for all farmers in the region. The guide covers effluent disposal, burning, spraying, fertiliser applications and pig and poultry farming
- ▶ inclusion of information on air quality in the Council's *Environmental Management Guide* for businesses and industries
- ▶ 2012 distribution of a flier to all households in Taranaki providing information on the ban of backyard burning in the urban areas of Taranaki, together with advice and guidance on how to dispose of household waste.



In the past five years, the Council has produced informative fliers on the backyard burning ban in Taranaki's urban areas, and on the disposal of household waste.

Find out more

- 🔗 *Air domain report (MfE 2014) tinyurl.com/TRC5k*
- Regional Air Quality Plan for Taranaki tinyurl.com/TRC5i*
- TRC consent processing and administration annual reports 2010 to 2014 tinyurl.com/TRC5j*