



Review of the Rotorua Air Quality Action Plan

Bay of Plenty Regional Council
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What is the Rotorua Air Quality Action Plan?

Air quality in New Zealand is governed by the Resource Management (National Environmental Standards for Air Quality) Regulations 2004, more commonly referred to as NESAQ. These standards put limits on the amount of pollution that is allowed in the air we breathe. The standards are concerned with pollution particulates that are smaller than 10 micrometres, which are referred to as PM₁₀. This measurement is so small that five PM₁₀ particles can fit across the width of a human hair. They are so small that they act more like a gas and are easily breathed in, which can cause negative health effects. The daily maximum concentration of PM₁₀ allowed under the NESAQ is 50 micrograms for every cubic metre of air (µg/m³).

Airsheds are a tool that allow councils to undertake monitoring and introduce rules to help improve air quality for a specific area. The Rotorua Airshed was created in 2005 to help Regional Council manage the air quality, and transitional targets were set within the NESAQ to allow airsheds sufficient time to meet the standard. The following table sets out the applicable targets for the Rotorua Airshed.

	Number of PM ₁₀ exceedances allowed per year	Did Rotorua Airshed comply?
Original NESAQ target	One or fewer by 1 September 2013	No
Revised NESAQ targets	Unlimited until 31 August 2016	NA
	Three or fewer by 31 August 2020	No
	Only one from 1 September 2020 onwards	Yes

It soon became clear that the Rotorua Airshed would not meet the NESAQ standard for PM₁₀.

Rotorua had the worst air quality in the North Island between 2007 and 2018, with the most exceedances of the NESAQ standard for PM₁₀ every year except 2011. The main source of air pollution in Rotorua has been smoke from solid fuel burners used for home heating. A solid fuel burner is any appliance that burns wood, coal, or pellets.

The Rotorua Air Quality Action Plan was therefore created in 2008 to assist in reaching the NESAQ requirements, and to improve the air quality for the health and enjoyment of the people of Rotorua.

The Action Plan set out a combination of regulatory (i.e. rules) and non-regulatory (voluntary) methods. The six areas covered were:

- Reducing domestic emissions
- Restricting future domestic emissions
- Reducing industrial emissions
- Dry wood
- Community awareness
- Infrastructure development

The goal of the Action Plan was to reduce the amount of particulate matter in the Airshed by 60 tonnes per year in order to meet the air quality standard for PM₁₀ required by the NESAQ.

Has the Action Plan done the job?

Air quality in the Rotorua Airshed has steadily improved since the Action Plan was implemented 14 years ago. For the first time since its establishment, the Rotorua Airshed complies with the air quality standard for PM₁₀ as set out in the NESAQ.

This review will look at the Action Plan and assess the effectiveness of the actions.

Actions Assessment

Reducing domestic emissions – Incentives

- 1 Long term loan** – Homeowners receive an advance from the Council to convert their heating method. The loan is paid back over ten years by a targeted rate to the property.
- 2 Long term loan (Rates postponement)** – Homeowners receive an advance from the Council to convert their heating method. A targeted rate is applied to the property to pay back the loan and the rate is postponed until the property changes ownership.
- 3 EECA Clean Heat funding** – Joint funding venture between EECA and local government to offer funding to upgrade heating in low-income housing.

Expected outcome: *A total of 26.7 tonnes of fine particulates removed from the air.*

Incentives were key in supporting the community in replacing their old inefficient burners with cleaner home heating technology. The incentives programme was funded until 30 June 2021 and it is estimated that 85% of the community replaced their old burners with cleaner technology in this time.

While the long-term loan via rates postponement was not implemented (as there was minimal interest in this option from the community), the incentives available over the last decade included:

- The Hot Swap scheme – this offered 10-year loans for replacement heating, paid via a targeted rate on your property. This scheme was later broadened to include insulation. Zero emission appliances such as heat pumps had interest-free loans to incentivise cleaner technology.
- Rates rebates for the Hot Swap loans were available for those who qualified for Central Government's Rates Rebate Scheme.
- Low-income heating and insulation grants for low-income owner-occupiers who could not afford to replace their heating or make loan repayments.
- Landlords were also able to take out a loan to insulate or replace a non-compliant burner in their rental properties prior to the Residential Tenancies (Healthy Homes Standards) Regulations 2019 coming into effect.
- The EECA Energywise Warmer Kiwi Homes scheme provided heating and insulation funding for property owners with a community services card, super gold combo card, or those living in deprivation zones 8, 9 and 10. Regional Council allowed owners to put the unfunded amount on their property rates and pay the remaining balance off slowly.

To support the incentive schemes, and ensure suitable replacement heating was being installed, Home Performance Advisors were used to assess each house and consider the location, condition of the property and the occupants' specific requirements.

Results

It is expected that these actions resulted in the anticipated reduction in emissions. Given that the main cause of the air quality issues in Rotorua are from domestic woodburning, these actions (combined with the Reducing domestic emissions – Regulations actions) are considered to have been integral and have had the most significant impact in improving air quality in the Rotorua Airshed. This is evidenced by the reduction in PM₁₀ exceedances and concentrations since these actions were implemented.

Reducing domestic emissions – Regulations

- 4 Backyard burning** – Regional rule to ban outdoor burning of rubbish and green waste.
- 5 Burner upgrade/removal at point of property sale** – Regional rule requiring any solid fuel burner that does not meet the national environmental design standard to be replaced/removed (by the vendor) when the house is sold.
- 6 Indoor open fires** – Regional rule restricting the use of indoor open fires for home heating by a specified date.

Expected outcome: *A total of 40.2 tonnes of fine particulates removed from the air.*

Backyard burning of any materials has been banned within 100 m of any neighbouring dwellings. This is a region-wide rule included in Plan Change 13 - Air Quality (PC 13), which replaced the Regional Air Plan. Plan Change 13 also contains a rule banning the burning anywhere of specific materials, which includes rubbish and green waste. However, discharge from burning for recreational/cultural purposes, such as BBQs, is still permitted, providing that there is no noxious, dangerous, offensive objectionable discharge beyond the property boundary.

A regional rule has been included in PC 13 to ensure that the discharge from any new solid fuel burners installed in any houses across the region (excluding the Rotorua Airshed) meets the NESAQ design and emission standards. However, regional rules can only control the discharge from a burner, rather than the burner itself. This is where the use of a bylaw is helpful to provide for some control over the installation and removal of burners, as otherwise there is the option to simply not use a burner, rather than replacing it with a more efficient burner.

The Rotorua Air Quality Bylaw was created in 2010 and includes a 'point of sale' rule to require any non-compliant burners to be replaced or removed at the time of sale. This rule only applies to the Rotorua Airshed and has been one of the most successful ways of ensuring that older inefficient burners were replaced with cleaner, more efficient heating.

As they are hard to remove, the 'point of sale' rule in the Bylaw also specifically requires that indoor open fires must be rendered inoperable at point of sale. A second rule in the Bylaw bans the discharge from all indoor open fires used for home heating in the Rotorua Airshed. Plan Change 13 only allows for the discharge from existing indoor open fires located within a heritage building or in industrial or trade premises where the fire is used exclusively for the smoking and cooking of food for wholesale or retail sale.

In 2011 an amendment to this section of the Action Plan was suggested:

- 6a Additional burner rules** – Investigate and (if appropriate) introduce rules to further restrict solid-fuel burners.

This was in response to concerns that the rules did not require the removal of old solid-fuel burners unless the house was sold. Research showed that many people will not change their heating appliance until a rule makes them do so. To reach the air quality goal for Rotorua, additional rules were therefore required. Additional rules were investigated and introduced through the review of the Bylaw in 2017, and Plan Change 13 (change to the Regional Air Plan) in 2018. This included the phasing out of coal and multi-fuel burners, along with woodburners installed before 1 September 2005, by the end of January 2020.

Results

These actions have all been implemented, and it is expected that these actions resulted in the anticipated reduction in emissions. The 'point of sale' rule has been one of the most effective actions for improving air quality and phasing out old inefficient burners. Given that the main cause of the air quality issues in Rotorua are from domestic woodburning, these actions (combined with the Reducing domestic emissions – Incentives actions) are considered to have been integral and have had the most significant impact in improving air quality in the Rotorua Airshed. This is evidenced by the reduction in PM₁₀ exceedances and concentrations since these actions were implemented.

Restricting future domestic emissions

- 7 **Restrict solid fuel burners in new houses** – Regional rule to restrict solid-fuel burners in new houses to those that meet the national standards.
- 8 **Restrict new solid fuel burners in existing houses** – Regional rule to restrict new solid fuel burners installed in existing houses to those that meet the national standards.

Expected outcome: Rules will prevent emissions from less efficient heating appliances and restrict new emissions to a total of 5.1 tonnes over five years.

A rule was included in the Rotorua Air Quality Bylaw to require that the installation of any new woodburners (in either new or existing houses) had to meet the national standards. After it was realised that the rules would need to be tougher to have any chance of meeting the national standards, the Bylaw was updated in 2017 to require that any new or replacement woodburners in the Rotorua Airshed must meet an emission rate of 0.60g/kg or less and have a thermal efficiency of at least 65%.

As part of PC 13 (which was notified in 2018), Rotorua Airshed specific rules were brought in to control the discharges to air from solid fuel burners. The new rules aligned with the updated Bylaw, and only allowed the discharge from new woodburners with an emission rate of 0.60g/kg or less, and a thermal efficiency of at least 65%. Plan Change 13 also includes a rule that limits discharge from woodburners to only that from replacements – i.e. if you don't already have a legitimate burner to replace, you aren't able to install a new woodburner as a permitted activity.

The reason for this was because even if new burners being installed in new houses were cleaner more efficient burners, they still would add more and more particulate matter to the Airshed, and it would become even more difficult to reduce emissions and improve the air quality. New houses still have the option of installing a pellet burner as a permitted activity or can apply for a resource consent to install a new woodburner where another one has been removed from another dwelling in the Airshed (this is referred to as 'offsetting').

Results

It is expected that these actions resulted in the anticipated reduction in emissions. There has potentially been even more reductions than anticipated given that the rules have been working for more than five years, and the rules got more stringent through PC 13 and the revised Bylaw. Given that the main cause of the air quality issues in Rotorua are from domestic woodburning, these actions (combined with the Reducing domestic emissions – Regulations and Incentives actions) are considered to have been integral and have had the most significant impact in improving air quality in the Rotorua Airshed. This is evidenced by the reduction in PM₁₀ exceedances and concentrations since these actions were implemented.

Reducing industrial emissions

- 9 **Professional assessment** – Contract a professional air discharge consultant to investigate modern particulate removal methods for major industry.
- 10 **Update consent conditions** – Assess and update conditions if necessary.

Expected outcomes: *A reduction in industrial emissions. This reduction depends on the actions taken and ranges from between five tonnes to 73 tonnes removed from the air.*

These two actions were essentially to focus on the two large sawmills in the Rotorua Airshed at the time – Tachikawa and McAlpines. These sawmills were both located in Ngāpuna and had been subject to air discharge complaints.

A professional air discharge consultant was contracted to undertake a technical review of boilers in the Ngāpuna industrial area. This investigation only covered the Tachikawa sawmill, as McAlpines declined to participate. However, McAlpines did confirm that they would install a wet scrubber to reduce their emissions, which they did, and which decreased their emissions significantly.

In the past, Tachikawa had experienced issues with their boiler, leading to increased emissions and public complaints. Prior to the technical review process, Tachikawa investigated these issues and took action to reduce emissions. This included tuning and optimising the boiler operation for efficient burning and covering their fuel supply. As a result, the technical review found that no adjustments or additional particulate removal methods were required for the boiler. Tachikawa has since shut down, and the site is now used by Rotorua Forest Haulage (a log transport company).

In 2009/2010 the Consents and Pollution Prevention team completed a review of the consent conditions for both sawmills. The conditions of the McAlpines consent were updated to ensure the wet scrubber they installed was operated appropriately and the particulates being discharged from the boiler operation were reduced. The conditions of the Tachikawa consent were not required to be updated.

In 2011 an amendment to this section of the Action Plan was suggested:

- 10a **Spring/summer exceedances** – Reduce spring/summer emissions from yard and road dust in Ngāpuna

This was in response to the numerous exceedances being experienced in Ngāpuna over the spring and summer months in 2008, 2009 and 2010. This action was never formally adopted into the Action Plan, but plenty of work has been undertaken to address this issue.

An investigation found that the high levels of PM₁₀ were not from the consented boilers in the area but were instead caused by dust emissions (e.g. yard dust, unsealed sites, uncovered stockpiles) from several of the industrial sites. Regional Council worked with all the businesses in the area to produce individualised dust management plans for each site. A Pollution Prevention Officer was assigned to this area to check that dust management plans were followed. The Ngāpuna Dust Management project resulted in sites in the area being much tidier with fewer fugitive dust emissions. Council also received far fewer complaints. The last recorded exceedance attributed to this era of fugitive emissions was in 2011.

A follow up Dust Audit was completed in 2017, which found that the vast majority of businesses with dust management plans in the Ngāpuna area have implemented the recommendations from the previous follow up in 2013 and are well aware of the potential for dust nuisance within the area.

There were three exceedances in 2018, which were caused by a neighbouring industrial source. Modifications to that site were implemented, and there were no further exceedances as a result.

Results

This action has been completed, and it is expected that as a result at least five tonnes of particulates have been removed from the air. This is evidenced by the reduction in complaints and exceedances in this area.

Dry Wood

11 Promote the burning of dry wood.

Expected outcome: *The removal of 0.3 tonnes of fine particulates from the air.*

A 'Dry Wood' campaign was run every year between 2010 and 2020 to promote the burning of properly seasoned (i.e. dry) firewood for better, cleaner burning. The campaign also focussed on raising awareness of the benefits of sourcing firewood early to allow the wood time to dry, and on storing it correctly. The Dry Wood campaign has included newspaper advertising, billboards, ads on the backs of buses, radio, website, and more recently social media posts to spread the message.

Council staff liaised with local wood merchants to check that they could meet demand, and to request that information pamphlets about use and storage of firewood be passed on to customers. Mystery shoppers were used to check that dry wood was being sold, or if it was unseasoned, that this was made clear, and advice given as to how long to dry it out before it was used.

A moisture tester has also been made available at the Regional Council Rotorua Office for anyone wishing to test their wood.

Results

This action has been achieved, and it is expected that as a result 0.3 tonnes of fine particulates have been removed from the air. The promotion of burning of dry wood will continue on Council's website and social media.

Community awareness

12 Promote community awareness of the air quality issue.

Expected outcome: *The removal of 0.5 tonnes of fine particulates from the air and a community feeling of ownership – everyone is an essential part of the solution.*

Over the years, the Rotorua Air Quality Programme was extensively promoted to help the community understand the problem and change their non-compliant heating.

Staff took an engage, educate and encourage approach. Examples of this approach include attending home shows, attending community days, presentations to clubs/health agencies, working with government agencies, liaising with sector/industry groups, and sending individual ratepayer letters to ensure everyone knew what was expected and what help was available.

The Dry Wood campaign has run since 2010, and has included newspaper advertising, billboards, ads on the backs of buses, radio, website, and more recently social media posts to spread the message. These kinds of advertising have also been used to get the message out to the community about the changes to the burner rules. Surveys undertaken before and after some of these campaigns showed a good increase in community awareness as a result of the advertising.

The Regional Council Pollution Hotline has also been well promoted to ensure that the community knows who to call if they spot any smoky fires or outdoor burning.

Results

This action has been completed, and it is expected that as a result 0.5 tonnes of fine particulates have been removed from the air. Community awareness around air quality will continue to be promoted on Council's website and social media.

Infrastructure development

- 13 **Research** – Continue investigating the geothermal resource to identify potential opportunities.
- 14 **Observe** – Maintain a watch on infrastructure and resource opportunities to enable appropriate and timely responses.

Expected outcome: *Opportunities for renewable energy will be identified, researched, and developed for future use.*

Several reports were commissioned looking into the potential for geothermal energy to be used for home heating in Rotorua. The reports found that this would be cost-prohibitive. It is also unclear how much heat can be taken out of the geothermal field sustainably, without harming the sustainability of the geothermal field and associated geothermal surface features (such as mud pools and geysers).

Even if there were not significant feasibility issues, the main areas where geothermal energy could have the potential to be used are not near the worst of the residential areas for air quality, so would not have a huge impact on reducing air pollution. Therefore, no further investigations have been undertaken.

Bay of Plenty Regional Council staff continue to be active members of the National Air Quality Working Group (NAQWG), which enables us to see what other councils are doing across New Zealand and discuss new technologies and opportunities. We keep up to date with new legislation and make submissions where appropriate – often providing input both to a Council submission, and a joint NAQWG submission. Staff also keep tabs on woodburner manufacturers and newly tested burners so that we are aware of what is available on the market.

Results

This action has been completed. Given that these actions are linked strongly to other areas of work such as energy efficiency, sustainable homes, climate change and the use of the geothermal resource, work in this space is likely to continue in some form.

The Results

The Action Plan has been a resounding success. The combination of the regulatory and non-regulatory actions has worked together to reduce the level of air pollution in the Rotorua Airshed. As a result of the actions, the Airshed is currently meeting the NESAQ target of only one exceedance of the PM₁₀ standard per year.

As shown in Figure 1 below, the number of exceedances of the air quality standard for PM₁₀ has reduced dramatically since 2008. Additionally, in Figure 2, you can see that the general concentrations of PM₁₀ have also reduced, even during the usual winter-time highs.

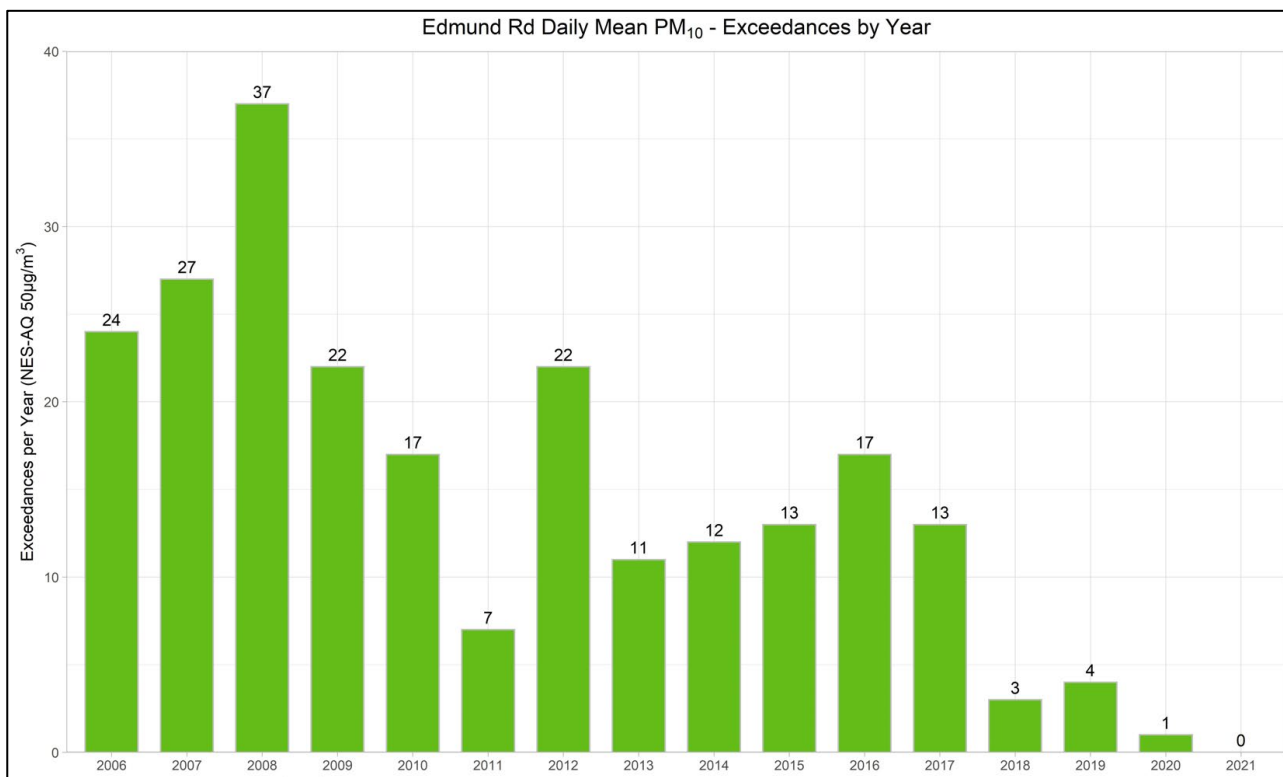


Figure 1 Edmund Rd Daily mean PM₁₀ Exceedances by Year

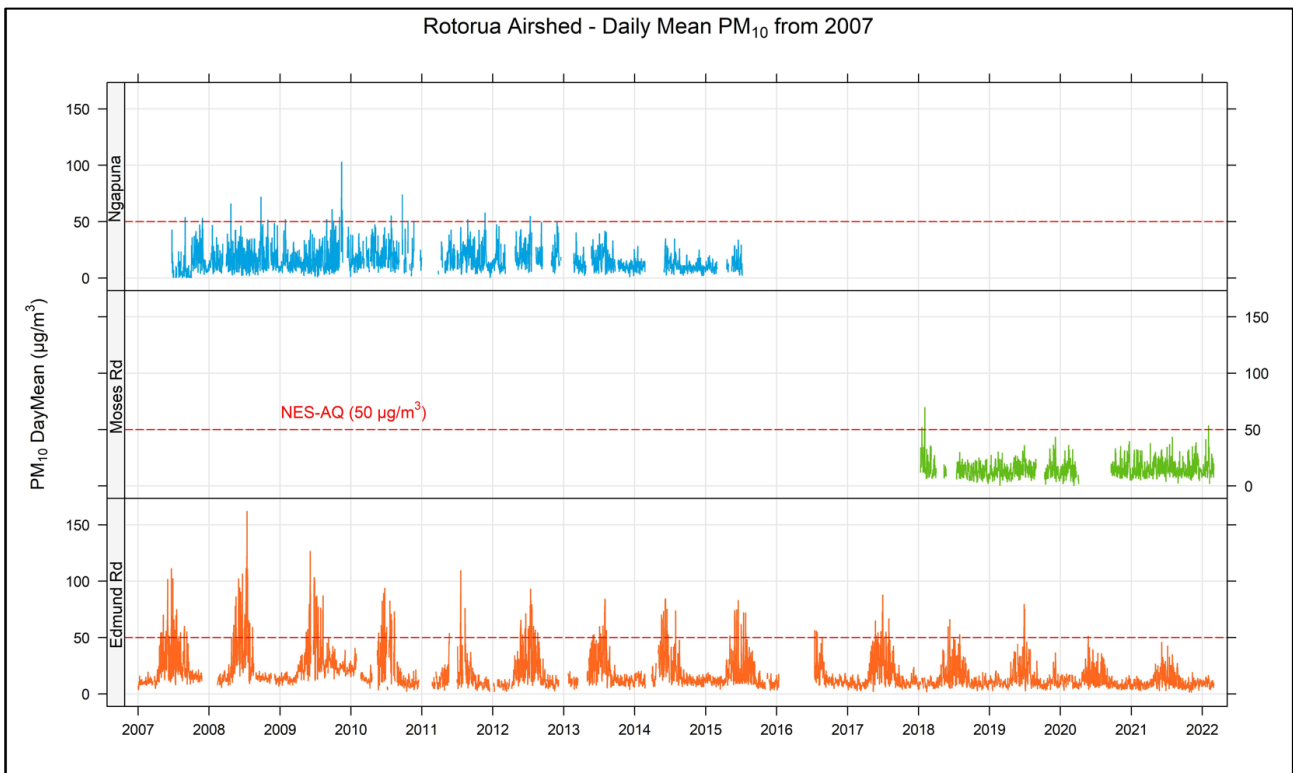


Figure 2 Rotorua Airshed Daily Mean PM₁₀ 2007- 2022

Given that smoke from domestic heating was the main issue, the most effective actions were the combination of the financial incentives and the rules, which worked well together to ensure that the community had to upgrade their heating but could do so without being disadvantaged. However, it is clear that all the actions were required for the overall success of the Action Plan, and each played a vital part in providing a wide-ranging response to the air quality problems in Rotorua.

What's next for air quality in Rotorua?

At the same time as the Rotorua Airshed began meeting the NESAQ standards, Central Government signalled a review of the NESAQ. The main change proposed is a shift from monitoring the coarser particulate matter (PM₁₀) to the finer particulate matter (PM_{2.5}) in order to better protect human health. This is because the finer particulate matter can go past the nose, throat and upper airways, and be deposited deep in the lungs. These particles are now recognised by the Ministry for the Environment as having the highest health risk to humans. The World Health Organisation now also recognises that air pollution is the single biggest environmental threat to human health.

A daily limit of 25 micrograms per cubic metre was proposed in the NESAQ consultation documents. Monitoring for PM_{2.5} in the Rotorua Airshed began in 2019 in anticipation of these proposed changes to the NESAQ. The monitoring indicates that the Airshed will not meet the proposed new PM_{2.5} limit. This year alone, where we have had no wintertime PM₁₀ exceedances, the Airshed has exceeded the proposed PM_{2.5} limit five times (as at 5 August 2022). Figure 3 below shows the PM levels experienced at the Edmund Road monitoring station in relation to the NESAQ PM₁₀ limit and proposed PM_{2.5} limit¹. It also shows the relationship between PM₁₀ and PM_{2.5}.

¹ This data has only been quality assured up to 1 July 2022, and all data since is still raw operational data, which could change slightly during processing. It is also noted that there was an instrument fault in June meaning there is a large portion of missing data in that month.

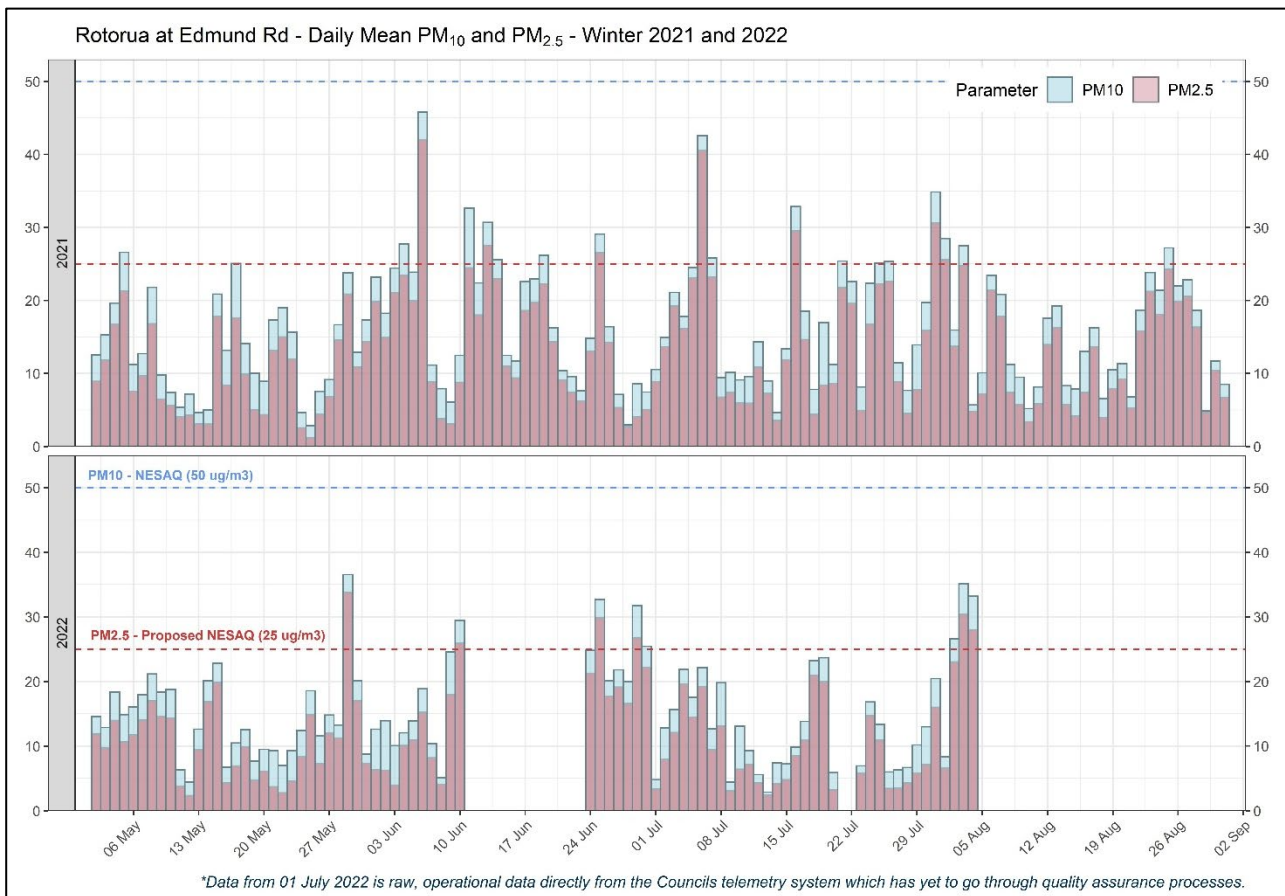


Figure 3 Rotorua at Edmund Road Daily Readings Winter 2021 and 2022

The Airshed has recently been extended to ensure that new areas of residential development around Rotorua are subject to the same rules as the rest of Rotorua and will not contribute significant amounts of particulate matter into the Airshed, undoing all the hard work the community has done over the last 15 years.

Despite the great levels of success we have had, we cannot become complacent now. This year we have already had one PM₁₀ exceedance, and it was unexpectedly at the Moses Road monitoring station before Winter, indicating the exceedance was caused by an industrial source. This therefore means any winter-time exceedance resulting from domestic home heating in Winter 2022 will tip us out of compliance with the NESAQ.

A new Action Plan will likely be required to map out how we will approach this next phase of improving air quality in Rotorua and meeting the amended NESAQ standards. We are expecting that the amended NESAQ will be released in 2022/2023, and Regional Council will assess future options at that time.

Acknowledgements

The success of the Action Plan and improvements to air quality in Rotorua would not have been possible without the collaboration and support from the Rotorua Air Quality Working Party, Rotorua Lakes Council, Toi Te Ora Public Health, Lakes DHB, and Kāinga Ora – Homes and Communities.

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