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# Auckland air quality monitoring programme



Frequently asked questions

## 1. Why do we monitor air contaminants in the Auckland region?

Auckland Council continuously collects air quality data to provide information to aid policy development and evaluation. The data the council collects enables us to quantify ambient air quality in the region and note spatial and temporal variations. This supports the understanding of whether national or regional air quality standards, targets, objectives, and environmental outcomes are being met. Auckland Council has a responsibility to monitor and manage outdoor air quality under the Resource Management Act 1991 (RMA) and the National Environmental Standards for Air Quality (NESAQ).

The specific objectives of the air monitoring programme are to:

- determine the level of contaminants in designated airsheds to compare with NESAQ and Auckland Unitary Plan – Air quality targets
- provide air quality information for policy and strategy development
- assess and evaluate the effectiveness of policies and plans based on air quality trends
- support state of the environment reporting
- generate data for air quality research and modelling
- infer typical air pollution exposure levels experienced by Auckland's population and assess potential health risks
- ensure that there is a good scientific understanding of pollutant levels, trends and sources
- better understand ambient meteorological conditions and provide input into air emissions modelling
- aid the application and processing of resource consents.
- provide information for local, national, and international organisations such as Auckland Transport, NZTA, and World Health Organisation (WHO) Global Environmental Monitoring (GEMS)

## 2. What are the NESAQ air contaminants and their threshold concentrations?

The national environmental standards for air quality (NESAQ) sets five ambient air quality standards for:

- carbon monoxide (CO)
- particulate matter less than 10 micrometres in diameter (PM<sub>10</sub>)
- sulphur dioxide (SO<sub>2</sub>)
- nitrogen dioxide (NO<sub>2</sub>)
- ozone (O<sub>3</sub>)

The ambient standards are the minimum requirements that outdoor air quality should meet in order to guarantee a set level of protection for human health and the environment. The table below provides details of the standards:

Contaminant	Threshold concentration	Time average	Permissible excess per year
CO	10 mg/m <sup>3</sup>	Running 8-hour mean	1
NO <sub>2</sub>	200 µg/m <sup>3</sup>	1-hour mean	9
O <sub>3</sub>	150 µg/m <sup>3</sup>	1-hour mean	0
PM <sub>10</sub>	50 µg/m <sup>3</sup>	24-hour mean	1
SO <sub>2</sub>	350 µg/m <sup>3</sup>	1-hour mean	9
	570 µg/m <sup>3</sup>	1-hour mean	0

## 3. How does the season affect air quality?

Seasonal variations in emissions are significant, both in terms of the amount as well as the relative contributions of sources. Transport and industrial activities are constant throughout the year, while domestic home heating is mainly for the winter season only. In summer, transport is the dominant source for all air pollutants. In winter, domestic sources overtake transport as the dominant source of CO, PM<sub>10</sub> and PM<sub>2.5</sub>.

#### 4. What contaminants and meteorological parameters do you monitor at each site?

The table below summarises the parameters monitored at each site:

Site	Established date	Key contaminants monitored	Ambient conditions monitored
Glen Eden	2005	PM <sub>10</sub> , PM <sub>2.5</sub> , NO <sub>2</sub>	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation, Rainfall
Queen Street	1998	PM <sub>10</sub> , PM <sub>2.5</sub> , NO <sub>2</sub>	Wind speed, Wind direction, Ambient temperature, Relative humidity
Custom Street	2020	PM <sub>2.5</sub> , NO <sub>2</sub> , SO <sub>2</sub> , black carbon	N/A
Khyber Pass Road	1995	PM <sub>10</sub> , NO <sub>2</sub> , CO, BTEX (benzene, toluene, ethylbenzene and xylene)	N/A
Takapuna	1995	PM <sub>10</sub> , PM <sub>2.5</sub> , NO <sub>2</sub>	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation.
Penrose	2000	PM <sub>10</sub> , PM <sub>2.5</sub> , NO <sub>2</sub> , SO <sub>2</sub> , Volatile organic compounds, lead in total suspended particulates	Wind speed, wind direction, ambient temperature, relative humidity, Barometric pressure
Patumahoe	1996	O <sub>3</sub> , PM <sub>10</sub> , PM <sub>2.5</sub> , NO <sub>2</sub>	N/A
Pakuranga	1998	PM <sub>10</sub> , PM <sub>2.5</sub>	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation, rainfall
Papatoetoe	2017	PM <sub>10</sub>	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation, rainfall
Henderson	1993	PM <sub>10</sub> , NO <sub>2</sub> , black carbon	Wind speed, wind direction, ambient temperature, relative humidity, solar radiation

#### 5. What are the Auckland Ambient Air Quality Targets?

The table below outlines the Auckland Ambient Air Quality Targets:

Contaminant	Target	Averaging time
Particles less than 10 microns (PM <sub>10</sub> )	20 µg/m <sup>3</sup>	Annual
Particles less than 2.5 microns (PM <sub>2.5</sub> )	25 µg/m <sup>3</sup>	24 hour
	10 µg/m <sup>3</sup>	Annual
Nitrogen dioxide (NO <sub>2</sub> )	100 µg/m <sup>3</sup>	24 hour
	40 µg/m <sup>3</sup>	Annual
Carbon monoxide (CO)	30 mg/m <sup>3</sup>	1 hour
Sulphur dioxide (SO <sub>2</sub> )	120 µg/m <sup>3</sup>	24 hour
Ozone (O <sub>3</sub> )	100 µg/m <sup>3</sup>	8 hour
Lead	0.2 µg/m <sup>3</sup>	3 month moving average calculated monthly
Benzene	3.6 µg/m <sup>3</sup>	Annual
Benzo[a]pyrene	0.0003 µg/m <sup>3</sup>	Annual
1,3-Butadiene	2.4 µg/m <sup>3</sup>	Annual
Formaldehyde	100 µg/m <sup>3</sup>	30 minutes
Acetaldehyde	30 µg/m <sup>3</sup>	Annual
Mercury (inorganic)	0.33 µg/m <sup>3</sup>	Annual
Mercury (organic)	0.13 µg/m <sup>3</sup>	Annual
Chromium VI	0.0011 µg/m <sup>3</sup>	Annual
Chromium metal and Chromium III	0.11 µg/m <sup>3</sup>	Annual
Arsenic (inorganic)	0.0055 µg/m <sup>3</sup>	Annual
Arsine	0.055 µg/m <sup>3</sup>	Annual

## 6. What is the Auckland air quality index (AQI)?

It is a scale of air pollution that helps us understand air quality across Auckland. It is calculated from air quality data collected at each site.

For each pollutant, the AQI is the data value expressed as a percentage of the level specified in the NESAQ or the Auckland air quality target for each applicable pollutant.

A value of 100 represents the value of the standard or target has been reached. A site's AQI at a given hour is a simple maximum of all AQI-values of a site. AQI rating is used to make different parameters comparable.

Here's an example: Measurement value: 35, if goal value = 50, => AQI value is 70 (%) [i.e.,  $(35/50)*100$ ]

## 7. What are the man-made sources of airborne particulate matter in Auckland?

Motor vehicles, industrial discharges, ships, biomass burning (burning solid fuel fires for domestic heating, backyard burning, crop residue burning), local dust generating activities, road works, construction activities, fireworks displays and lawn mowing.

**8. What are the naturally generated sources of airborne particulate matter in Auckland?** Marine aerosol (sea spray), pollen, local bushfires, local wind-blown dust, smoke from large wildfires in Australia, Australian dust storms.

**9. What is receptor modelling and why do you use it on the air quality data?** Receptor models are mathematical procedures for identifying and quantifying the sources of ambient air pollutants and their effects at a site. Receptor modelling provides a means to determine the relative mass contribution of sources that impact significantly on the total mass of air particulate matter collected at a monitoring site.

## 10. What does recent receptor modelling tell us about the sources of air particulates in Auckland?

- Marine aerosol and motor vehicle emissions are the predominant sources of PM<sub>10</sub> across all sites in Auckland.
- Motor vehicle is the predominant source of PM<sub>2.5</sub> across all sites in Auckland.
- Marine aerosol is a significant contributor to PM<sub>2.5</sub> at Takapuna and Queen Street sites
- In spring and autumn, motor vehicle emissions are the primary man-made source contributor of particulate matter.
- In winter, biomass burning emission is the primary source of airborne particulate matter in most Auckland urban areas. This is primarily due to the use of solid fuel fires for domestic heating.
- At the Queen Street and Khyber Pass Road monitoring sites, motor vehicle emissions are the primary source during winter due to their proximity to busy roadways.

## 11. What does Auckland's air emission inventory tell us about the sources of oxides of nitrogen?

The *Auckland air emissions inventory 2016* report indicates that 85.6% comes from transport, 1.3% from domestic heating and 13.1% from industry discharges.

## 12. What does Auckland's air emission inventory tell us about the sources of sulphur dioxide (SO<sub>2</sub>)?

The *Auckland air emissions inventory 2016* report shows that 59.2% comes from transport, 1.5% from domestic heating and 39.3% from industry discharges.

**13. Where can I find more information about Auckland's air quality? The table below presents a list of publications and where to get them. You can email RIMU to request a particular publication if you are unable to download it from the Knowledge Auckland website.**

Title	Date	Where to find
The ambient air quality monitoring network in the Auckland region	2006 (published in 2006), 2013 (published in 2013)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Air quality and societal impacts from predicted climate change in Auckland	2019	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Air quality responses to intensive urban scenarios (AQUARIUS)	2016	<a href="mailto:RIMU_environmentaldata@aucklandcouncil.govt.nz">RIMU, environmentaldata@aucklandcouncil.govt.nz</a>
An air quality index for Auckland: Review of some international techniques and example data	2014	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Assessing the carbon abatement reduction potential in Auckland's energy resilience and low carbon action plan	2014	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Assessment of Auckland's brown haze prediction model	2020 (draft)	<a href="mailto:RIMU_environmentaldata@aucklandcouncil.govt.nz">RIMU, environmentaldata@aucklandcouncil.govt.nz</a>
Auckland air emissions inventory	2006 (published in 2014), 2016 (published in 2019)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Auckland air emissions inventory (home heating)	2016 (published in 2018)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Auckland air emissions inventory (industry)	2011 (published in 2015), 2016 (published in 2018)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Auckland air emissions inventory 2016 (sea transport)	2016 (published in 2018)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Auckland air emissions inventory 2016 (transport)	2016 (published in 2019)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Auckland air quality report 2021	2021	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>

Auckland ambient air quality trends for PM <sub>2.5</sub> and PM <sub>10</sub>	2006 - 2015	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Auckland council air quality domestic options: cost benefit analysis	2013 update (published in 2013)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Auckland greenhouse gas inventory	2013 (published in 2015), 2014 (published in 2016) 2015 (published in 2017), 2016 (published in 2019), 2018 (published in 2020)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Auckland motor vehicle emissions inventory	2014	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Auckland region climate change projections and impacts	Dec 2017, Jan 2018, Sep 2020	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Benzene, 1, 3 butadiene and other organic compounds in Auckland	Published in 2009, 2001-2013 (published in 2014)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Change in air pollution levels during Alert Level 3 COVID-19 (28 April-13 May) seen in the Auckland Council air quality monitoring network	Released in May 2020	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Change in air pollution levels for week one of Alert Level 2 COVID-19 (14-20 May) seen in the Auckland Council air quality monitoring network.	Released in May 2020	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Domestic fire emissions 2012: options for meeting the national environmental standard for PM <sub>10</sub>	2013	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>

Effects of fuel and operation on particulate emissions from woodburners	2010	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Elemental analysis results for air particulate matter collected in Auckland - A summary report	2006 to 2015 (published in 2017)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Elemental analysis results for air particulate matter collected in Auckland. A summary report	2006-2015 (published in 2017)	RIMU, <a href="mailto:environmentaldata@aucklandcouncil.govt.nz">environmentaldata@aucklandcouncil.govt.nz</a>
Future trends in motor vehicle emissions in Auckland	2014	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
The health of Tamaki Makaurau/Auckland's natural environment (A synthesis of Auckland Council's state of the environment reporting) Hau (Air)	2020 (published in 2021)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Home heating survey results	2012 (published in 2014)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Investigating arsenic in Auckland's air	2020	RIMU, <a href="mailto:environmentaldata@aucklandcouncil.govt.nz">environmentaldata@aucklandcouncil.govt.nz</a>
The impacts of transport emissions on air quality in Auckland's city centre	2018	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Investigations into reducing emissions from heavy duty diesel vehicles in Auckland – a summary report	2014	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Personal Exposure to Noise and Air Pollution (PENAP) in the Queen Street Valley, Auckland	2014	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Port-Related Air Emissions for the Auckland region 2006 & 2010	2010	RIMU, <a href="mailto:environmentaldata@aucklandcouncil.govt.nz">environmentaldata@aucklandcouncil.govt.nz</a>
A review of air quality monitoring in Auckland: Draft for review	2012	<a href="mailto:RIMU_environmentaldata@aucklandcouncil.govt.nz">RIMU, environmentaldata@aucklandcouncil.govt.nz</a>

A review of research into the effects of shipping on air quality in Auckland	2006-2016 (published in March 2017)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Reduction of air pollution levels seen in the Auckland Council air quality monitoring network for the lockdown (Level 4 Alert) period (26 March-27 April)	2021	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Source apportionment and trend analysis of air particulate matter in the Auckland Region	2006 to 2013 (published in 2017), 2006 to 2020 (published in 2021)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
State of Auckland (Air quality report card)	2006, 2018	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
State of Auckland (Greenhouse gas report card)	2018	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Trends in Auckland's air quality	2006-2018 (published in 2020)	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Urban sources of copper, lead and zinc	Published in 2008	<a href="mailto:RIMU_environmentaldata@aucklandcouncil.govt.nz">RIMU, environmentaldata@aucklandcouncil.govt.nz</a>
Use of background air quality data in resource consent applications	Published in 2014	<a href="https://knowledgeauckland.org.nz/">https://knowledgeauckland.org.nz/</a>
Validation of the Auckland air pollution forecasting pilot study 2017	Released in 2017	<a href="mailto:RIMU_environmentaldata@aucklandcouncil.govt.nz">RIMU, environmentaldata@aucklandcouncil.govt.nz</a>

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Auckland Unitary Plan, E14 Air quality

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<https://www.lawa.org.nz/explore-data/auckland-region/air-quality/> (Accessed 9/6/2021)

[https://cfpub.epa.gov/si/si\\_public\\_record\\_report.cfm?dirEntryId=56100&Lab=NERL](https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=56100&Lab=NERL) (Accessed 18/6/2021)

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