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# **Annual Air Quality Monitoring for Blenheim and Picton 2008**

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**Marlborough District Council**

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## Executive Summary

The main air contaminant of concern in Marlborough is PM<sub>10</sub> (particles in the air less than 10 microns in diameter). In 2008, PM<sub>10</sub> monitoring was carried at two sites in Blenheim, the Redwoodtown bowling club and the historical PM<sub>10</sub> monitoring site in Middle Renwick Road (MRR) in Blenheim. A new air quality monitoring site was established in Picton in May 2008. The methods of monitoring were a Met One Beta Attenuation Monitor (BAM) at the Bowling Club site and a gravimetric high volume sampler at Middle Renwick Road and in Picton. The sampling regime for the latter was one day in three sampling.

Three breaches of the NES for PM<sub>10</sub> of 50 µg m<sup>-3</sup> (24-hour average) were measured at the Bowling Club site during 2008. The maximum concentration was 56 µg m<sup>-3</sup> and this occurred on two days. During 2007 the maximum measured PM<sub>10</sub> concentrations was 62 µg m<sup>-3</sup>. Concentrations of PM<sub>10</sub> measured during 2008 were within the straight line path to compliance with the NES.

The maximum concentration recorded at the MRR site was 51 µg m<sup>-3</sup>. High PM<sub>10</sub> concentrations at this site are not common with previous exceedences occurring only in 2000 and 2003.

In Picton, one exceedence of the air quality guideline of 50 µg m<sup>-3</sup> for PM<sub>10</sub> (24-hour average) was recorded on 2008, and the maximum measured PM<sub>10</sub> concentration was 53 µg m<sup>-3</sup>. This location is currently compliant with the NES because one exceedence is allowed. However, the monitoring was limited to one sample every three days so it is possible that more exceedences occurred. Further air quality monitoring in Picton is recommended.

In 2008 the annual average PM<sub>10</sub> concentration for the Bowling Club site was estimated as 17 µg m<sup>-3</sup>. Annual average concentrations for the MRR and Picton sites were 16 µg m<sup>-3</sup> and 10 µg m<sup>-3</sup>. This compares with annual average PM<sub>10</sub> concentrations of around 15 µg m<sup>-3</sup> (Bowling Club) and 11 µg m<sup>-3</sup> (Middle Renwick Road) for 2007. All annual average concentrations were lower than the MfE guideline of 20 µg m<sup>-3</sup> (annual average).

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## 1 Introduction

In Marlborough, the main air contaminant of concern is PM<sub>10</sub> (particles in the air less than 10 microns in diameter). In the past, concentrations of PM<sub>10</sub> have exceeded national environmental standards (NES) in Blenheim during the winter months. In 2008, the Marlborough District Council air quality programme involved measuring PM<sub>10</sub> concentrations at three sites in Blenheim, two sites in Redwoodtown (Bowling Club and Croquet Club) and a site at 106 Middle Renwick Road (MRR) and at a new Picton site.

National Environmental Standards for ambient air quality (Table 1.1) were introduced in September 2004 (MfE, 2004). Based on air quality monitoring in other urban areas of New Zealand it would seem unlikely that concentrations of NES contaminants other than PM<sub>10</sub> would be in breach in Blenheim. Consequently resources for air quality monitoring have focused on PM<sub>10</sub>. The NES includes specifications for monitoring PM<sub>10</sub> in areas such as Blenheim where breaches are likely.

The regulations specify that if the NES is not met by 2013, Councils will be unable to grant resource consents for discharges of PM<sub>10</sub> to air for that airshed. In addition, between September 2005 and 2013 consents for discharges to air can only be granted if Councils can demonstrate a “straight-line path” to compliance that will not be impinged on by the granting of the consent. This applies only to the airshed which is non-compliant with the NES and if the proposed discharge is likely to result in a “significant” increase in PM<sub>10</sub> concentrations.

The amended regulation (August, 2005) includes slightly different specifications for areas where an operative air quality plan specifies a curved line path to achieving the NES by 2013. The curved line path is not relevant to Blenheim because the air quality plan does not include a curved line path to managing PM<sub>10</sub> concentrations.

In addition to the NES, MfE provides guidelines for ambient air quality (Table 1.2) and air quality indicator categories to assist in the presentation and management of air quality in New Zealand (Table 1.3). Air quality monitoring data in this report are presented relative to air quality guidelines and these indicator categories. These categories provide a useful perspective on the overall quality of the air and provide a valuable tool for evaluating trends in concentrations over time.

In Marlborough previous air quality monitoring includes historical monitoring of PM<sub>10</sub> at the MRR monitoring site, intermittent monitoring of PM<sub>10</sub> at the Redwoodtown site, survey PM<sub>10</sub> monitoring at Picton and Renwick during 2000 and 2002 respectively, visibility surveys and passive sampling for nitrogen oxides and sulphur oxides.

Table 1.1: National Environmental Standards for ambient air quality (MfE, 2004)

Contaminant	NES values		
	Concentration	Averaging Period	Allowable exceedences per year
Carbon monoxide	10 mg m <sup>-3</sup>	8-hour	1
Particles (PM <sub>10</sub> )	50 µg m <sup>-3</sup>	24-hour	1
Nitrogen dioxide	200 µg m <sup>-3</sup>	1-hour	9
Sulphur dioxide <sup>b</sup>	350 µg m <sup>-3</sup>	1-hour	9
Sulphur dioxide <sup>b</sup>	570 µg m <sup>-3</sup>	1-hour	0
Ozone	150 µg m <sup>-3</sup>	1-hour	0

Table 1.2: Ambient air quality guidelines for New Zealand (MfE, 2002)

Contaminant	2002 guideline values	
	Concentration <sup>a</sup>	Averaging Period
Carbon monoxide	30 mg m <sup>-3</sup> 10 mg m <sup>-3</sup>	1-hour 8-hour
Particles (PM <sub>10</sub> )	50 µg m <sup>-3</sup> 20 µg m <sup>-3</sup>	24-hour Annual
Nitrogen dioxide	200 µg m <sup>-3</sup> 100 µg m <sup>-3</sup>	1-hour 24-hour
Sulphur dioxide <sup>b</sup>	350 µg m <sup>-3</sup> 120 µg m <sup>-3</sup>	1-hour 24-hour
Ozone	150 µg m <sup>-3</sup> 100 µg m <sup>-3</sup>	1-hour 8-hour
Hydrogen sulphide <sup>c</sup>	7 µg m <sup>-3</sup>	1-hour
Lead <sup>d</sup>	0.2 µg m <sup>-3</sup> (lead content of PM <sub>10</sub> )	3-month moving, calculated monthly
Benzene (year 2002)	10 µgm <sup>-3</sup>	Annual
Benzene (year 2010)	3.6 µgm <sup>-3</sup>	Annual
1,3-Butadiene	2.4 µgm <sup>-3</sup>	Annual
Formaldehyde	100 µgm <sup>-3</sup>	30-minutes
Acetaldehyde	30 µgm <sup>-3</sup>	Annual
Benzo(a)pyrene	0.0003 µgm <sup>-3</sup>	Annual
Mercury (inorganic) <sup>d</sup>	0.33 µgm <sup>-3</sup>	Annual
Mercury (organic)	0.13 µgm <sup>-3</sup>	Annual
Chromium VI <sup>d</sup>	0.0011 µgm <sup>-3</sup>	Annual
Chromium metal and chromium III	0.11 µgm <sup>-3</sup>	Annual
Arsenic (organic) <sup>d</sup>	0.0055 µgm <sup>-3</sup>	Annual
Arsine	0.055 µgm <sup>-3</sup>	Annual

Notes:



<sup>a</sup> All values apply to the gas measured at standard conditions of temperature (0° C) and pressure (1 atmosphere).

<sup>b</sup> The sulphur dioxide guideline values do not apply to sulphur acid mist.

<sup>c</sup> The hydrogen sulphide value is based on odour nuisance and may be unsuitable for use in geothermal areas.

<sup>d</sup> The guideline values for metals are for inhalation exposure only; they do not include exposure from other routes such as ingestion. These other routes should be considered in assessments where appropriate.

Table 1.3: Environmental Performance Indicator categories for air quality (MfE, 2002)

Category	Value relative to guideline	Comment
Excellent	Less than 10% of the guideline	Of little concern: if maximum values are less than a tenth of the guideline, average values are likely to be much less
Good	Between 10% and 33% of the guideline	Peak measurements in this range are unlikely to affect air quality
Acceptable	Between 33% and 66% of the guideline	A broad category, where maximum values might be of concern in some sensitive locations but generally they are at a level which does not warrant urgent action
Alert	Between 66% and 100% of the guideline	This is a warning level, which can lead to exceedences if trends are not curbed
Action	More than 100% of the guideline	Exceedences of the guideline are a cause for concern and warrant action, particularly if they occur on a regular basis

An emission inventory that was undertaken for Blenheim in 2005 indicated that domestic home heating was the main source of PM<sub>10</sub> emissions, contributing to around 85% of the daily wintertime PM<sub>10</sub> (Wilton, 2005b). Other sources of PM<sub>10</sub> in the urban areas of Blenheim included outdoor burning (6%), motor vehicles (7%) and industry (2%).

## 2 Methodology

Two methods of monitoring PM<sub>10</sub> were used during 2008. A Met One beta attenuation monitor (BAM) measured PM<sub>10</sub> concentrations at the Redwoodtown - Bowling Club site. The BAM, which is a NES compliant air quality monitor provides continuous hourly average PM<sub>10</sub> concentrations. A gravimetric high-volume sampler, a method compliant with the MfE (2002) reference method specifications, was used at the MMR site and the Picton site. A high volume sampler was also used at the Redwoodtown – Croquet Club site from the start of 2008 until the end of April 2008. The high-volume sampling was carried out based on a one day in three sampling regime with samples collected over a 24-hour period from midnight to midnight.

Metrological data, including wind speed and wind direction, were obtained from a NIWA site on the outskirts of Blenheim.

### 2.1 Air quality monitoring sites

There are two permanent air quality monitoring sites in Blenheim, the Redwoodtown Bowling Club and the Middle Rewick Road (MRR) site. Figure 2.1 shows the MRR site, which provides a historical record of PM<sub>10</sub> in Blenheim and is located to the north-west of Blenheim, and the Redwoodtown sites (Bowling Club, Brooklyn Drive and Croquet Club), which are located to the south and south east within the main urban area. The Brooklyn Street site was a temporary location used during 2004. In 2008 a new site was established in Picton.

A site at the Croquet Club was established in 2007 for the purposes of evaluating the relationship between Brooklyn Street area PM<sub>10</sub> and PM<sub>10</sub> concentrations measured at the Bowling Club. This was considered important because PM<sub>10</sub> concentrations of the magnitude measured during 2004 at Brooklyn Street had not been measured at the Bowling Club and because the reductions required in PM<sub>10</sub> concentrations in Blenheim had been dependent on the Brooklyn Street results. The results from work undertaken in 2007 and reported in the '2007 Air Quality Monitoring Report' (Wilton, 2008) indicated that the Brooklyn Street site was likely to be affected by localised sources PM<sub>10</sub> of PM<sub>10</sub> and should not be used for air quality management purposes.



Figure 2.1: Location of air quality sites in Blenheim for 2008.

### 2.1.1 Middle Renwick Road (MRR) monitoring site

The MRR air quality monitoring site was established in the back yard area of a Council site at 106 Middle Renwick Road. Figure 2.2 shows the surrounding area, and Figure 2.3 shows the high-volume sampler located at the MRR monitoring site. Site details are shown in Table 2.1.



Figure 2.2: Aerial photo of the MRR air quality monitoring site (note: pink dot depicts monitoring site)



Figure 2.3: PM<sub>10</sub> monitor at the MRR air monitoring site

Table 2.1: Site summary details for the MRR air quality monitoring site

<b>Site name</b>	<b>Blenheim – 106 Middle Renwick Road</b>
Site contact details	Marlborough District Council
Description of site	Empty sealed back yard area
Site category	Residential neighbourhood
Purpose of site and sources	To measure ambient air concentrations of PM <sub>10</sub> at the historical air quality monitoring site in Blenheim. Main source during the winter months is solid fuel burning for domestic heating.
Proposed duration of monitoring	Ongoing
Contaminants monitored	PM <sub>10</sub>
Site co-ordinates	E 2589778 N 5964037
Date of site installation	January 2000
Meteorological characteristics of area	Low wind speeds occur regularly during the winter months. Temperature inversions are likely.
Sample frequency	One day in three from May 2005 One day in six prior to this during the summer and one day in three during the winter.
Inlet height	1.5 metres
Averaging period	24-hour

### 2.1.2 Redwoodtown – Bowling Club Monitoring Site

The 2007 monitoring site in Redwoodtown was carried out at the now permanent air quality monitoring site established at the Blenheim Bowling Club on Weld Street. Figures 2.4 and 2.5 show the surrounding area and the location of the monitoring site within the Bowling Club grounds. Summary site details are given in Table 2.2.





Figure 2.4: Aerial photo of the Redwoodtown – Bowling Club air quality monitoring site (note: pink dot depicts monitoring site)



Figure 2.5: PM<sub>10</sub> monitor at the Redwoodtown – Bowling Club air quality monitoring site

Table 2.2: Site summary details for the Redwoodtown – Bowling Club air quality monitoring site

Site name	Redwoodtown – Bowling Club
Site contact details	Marlborough District Council
Description of site	The site is located at the Blenheim Bowling Club, which is to the south-east of central Blenheim. The surrounding area includes a bowling green, gravel petanque area and paved areas.
Site category	Residential neighbourhood
Purpose of site and sources	To measure worst-case ambient air concentrations of PM <sub>10</sub> in Blenheim. The main source during the winter months is solid fuel burning for domestic heating. The site is downwind of a large residential area for meteorological conditions conducive to poor air quality.
Proposed duration of monitoring	Ongoing
Contaminants monitored	PM <sub>10</sub>
Site co-ordinates	2589778E, 5964037N
Date of site installation	January 2002 – intermittent monitoring until 2005
Meteorological characteristics of area	Low wind speeds occur regularly during the winter months. Temperature inversions are likely.
Sample frequency	One day in three
Inlet height	1.5 metres
Averaging period	24-hour

### 2.1.3 Redwoodtown- Croquet Club Monitoring Site

The Croquet Club monitoring site was established in June 2007 with the purpose of providing an indication of the relationship between PM<sub>10</sub> concentrations measured near the vicinity of the Brooklyn Street site and PM<sub>10</sub> measured at the Bowling Club. In 2008, air quality monitoring took place at this site from the start of 2008 until the end of April. The PM<sub>10</sub> sampler at this site is shown in Figure 2.6. Site details are shown in Table 2.3.



Table 2.3: Site summary details for the Redwoodtown - Croquet Club air quality monitoring site

Site name	Redwoodtown - Croquet Club
Site contact details	
Description of site	The site is located at the Blenheim Croquet Club, which is to the south-east of central Blenheim.
Site category	Residential neighbourhood
Purpose of site and sources	To evaluate the relationship between PM <sub>10</sub> concentrations measured in the vicinity of the 2004 Brooklyn Street site and those measured at the Bowling Club.
Proposed duration of monitoring	Temporary – 2007 only
Contaminants monitored	PM <sub>10</sub>
Site co-ordinates	2590564, 5963568
Date of site installation	June 2007
Meteorological characteristics of area	Low wind speeds occur regularly during the winter months. Temperature inversions are likely.
Sample frequency	One day in three
Inlet height	1.5 metres
Averaging period	24-hour



Figure 2.6: Location of the Redwoodtown - Croquet Club air monitoring site

#### 2.1.4 Picton

The Picton monitoring site was established in May 2008 with the purpose of providing an indication of likely PM<sub>10</sub> concentrations and to determine if further air quality monitoring will be required. Figure 2.7 shows that location of monitoring site at Lincoln Street. Figure 2.8 shows the high volume sampler at the Lincoln Street site. Site details are shown in Table 2.4.



Figure 2.7: Location of the Picton monitoring site on Lincoln Street.



Figure 2.8: High volume sampler at the Lincoln Street site.



Table 2.4: Site summary details for the Picton air quality monitoring site

Site name	Picton
Site contact details	Lincoln Street – Picton
Description of site	The site is located at the bottom of Victoria Park in Picton, which is to the northeast of Picton township
Site category	Residential neighbourhood
Purpose of site and sources	To determine PM <sub>10</sub> concentrations in Picton and evaluate if further air quality monitoring is necessary.
Proposed duration of monitoring	2008
Contaminants monitored	PM <sub>10</sub>
Site co-ordinates	2595170E 5990899N
Date of site installation	May 2008
Meteorological characteristics of area	Low wind speeds occur regularly during the winter months. Temperature inversions are likely.
Sample frequency	One day in three
Inlet height	1.5 metres
Averaging period	24-hour

## 2.2 Quality assurance

The operation of high volume PM<sub>10</sub> samplers and the changing of filters were carried out by MDC staff. Flow calibrations were carried out every 3-4 months, normally during the morning. Filters were couriered to Watercare Services Ltd, who undertook filter weighing in accordance with the New Zealand and Australia standard for high volume sampling. Watercare services hold IANZ accreditation, for high volume PM<sub>10</sub> sampling.

Transportation of filters occurs at the end of each month, with filters stored and transported in snaplock bags at ambient temperature. Quality assurance methods include the analysis of one field blank per site per month. Field blanks outside of the “acceptable” range ( $\pm 8$  mg per filter) are noted in a report from Watercare Services.

Operation of the BAM is also carried out by MDC staff. Hourly data is recorded by the instrument and logged by an iQuest iRIS 320 datalogger. Results are telemetered hourly to MDC and stored in the hydrotel database.

### 3 Air quality monitoring in Blenheim

#### 3.1 PM<sub>10</sub> concentrations at Redwoodtown – Bowling Club

Concentrations of PM<sub>10</sub> in Redwoodtown were measured using the NES compliant BAM.

The maximum measured PM<sub>10</sub> concentration was 56 µg m<sup>-3</sup> (24-hour average) and was recorded on 20 May and the 10 June. There were three measured exceedences of the air quality guideline and the NES for PM<sub>10</sub> (50 µg m<sup>-3</sup>, 24-hour average). Figure 3.1 shows the 24 hour average PM<sub>10</sub> concentrations measured at the Redwoodtown – Bowling Club site during 2008.

The NES allows for one exceedence of 50 µg m<sup>-3</sup> (24-hour average). Subsequent breaches must be publicly notified within a month of it occurring. The MDC notified two breaches based on the measured BAM concentrations in 2008.

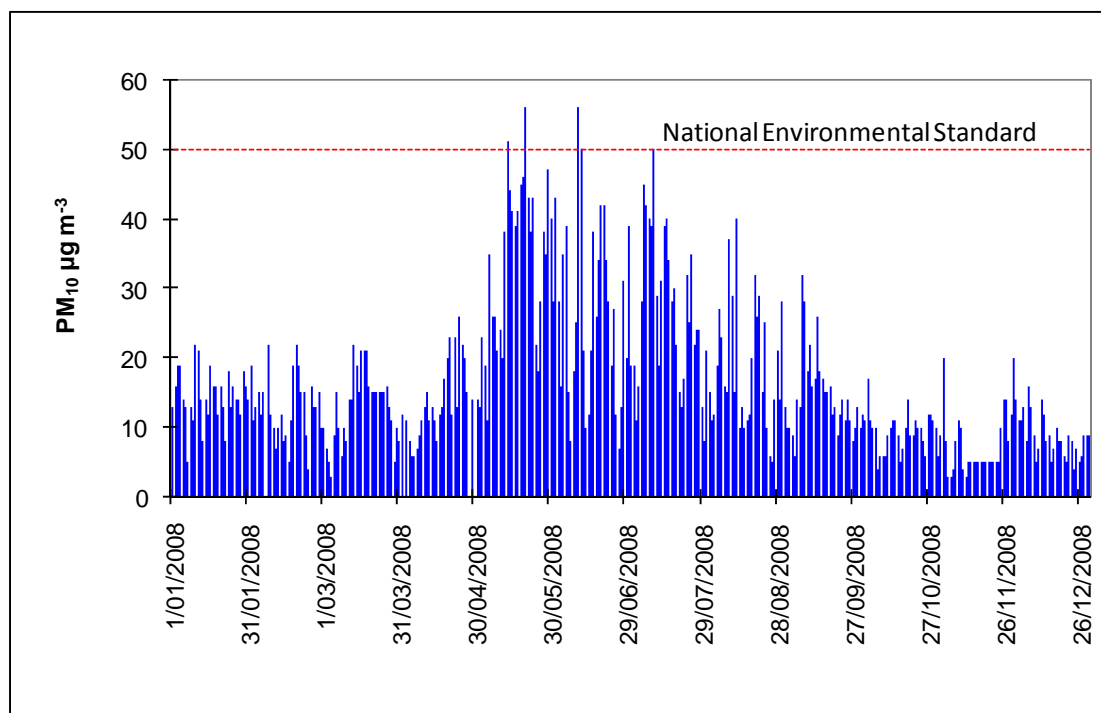


Figure 3.1: 24-hour average PM<sub>10</sub> concentrations measured at the Redwoodtown – Bowling Club site during 2008

Figure 3.2 compares daily and PM<sub>10</sub> concentrations measured during 2005 to 2008 to the MfE air quality indicator categories (shown in Table 1.3). The majority of the PM<sub>10</sub> concentrations measured were less than 66% of the air quality guideline, within the “acceptable” and “good” air quality categories. The proportion of PM<sub>10</sub> concentrations in the alert or action categories for 2008 was 10%, compared with 6% in 2007. Monthly variations in the distribution of PM<sub>10</sub> concentrations for 2008 are shown in Figure 3.3.

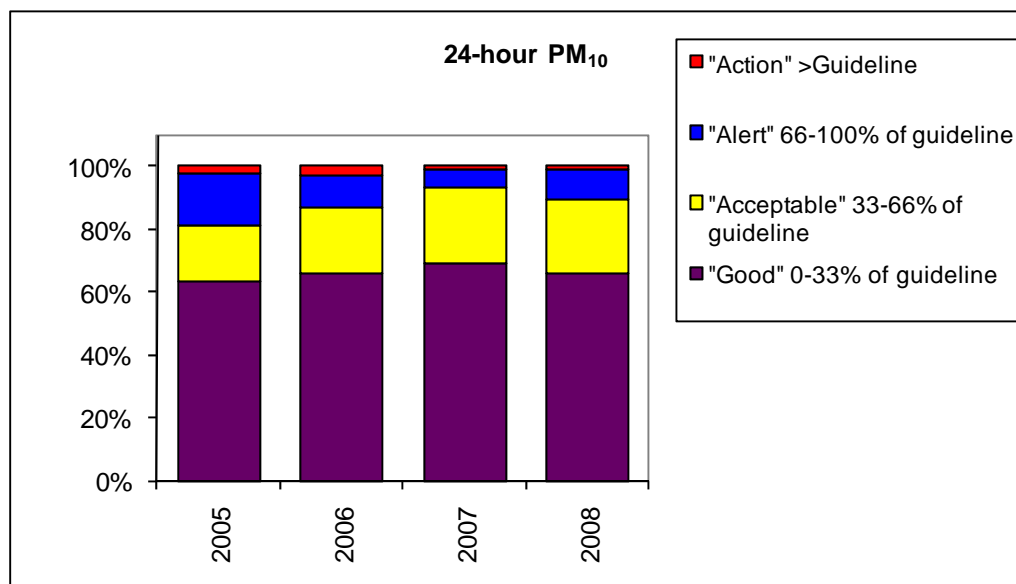


Figure 3.2: Comparison of PM<sub>10</sub> concentrations measured at Redwoodtown – Bowling Club site during 2005 to 2008 to MfE air quality indicator categories

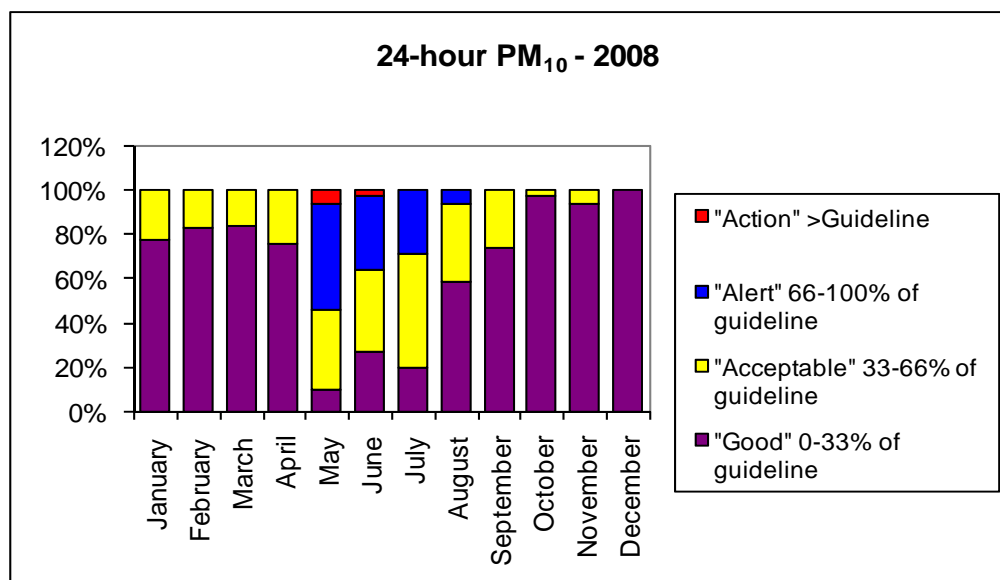


Figure 3.3: Comparison of daily PM<sub>10</sub> concentrations each month during 2008 to MfE air quality indicator categories

The annual average PM<sub>10</sub> concentration for 2008 was 17 µg m<sup>-3</sup>. This compares to an estimated annual average for 2007 of 15 µg m<sup>-3</sup>. An annual average guideline for PM<sub>10</sub> of 20 µg m<sup>-3</sup> is specified by the Ministry for the Environment. The NES does not include an annual average concentration for PM<sub>10</sub>.

Table 3.1 shows summary statistics for PM<sub>10</sub> monitoring results from the Redwoodtown – Bowling Club site since monitoring commenced in 2002. Note, however, that the monitoring period has varied from year to year, with 2005 being the first year when monitoring was conducted from January to December and that the 2004 monitoring was for a different site in Brooklyn Street.

Table 3.1: Summary of PM<sub>10</sub> concentrations measured at Redwoodtown – Bowling Club site from 2002-2008

	2002	2003	2004	2005	2006	2007	2008
Monitoring method	Hi-vol	Hi-vol	Hi-vol	Hi-vol	BAM	BAM	BAM
"Good" 0-33% of guideline	18%	22%	46%	63%	66%	69%	66%
"Acceptable" 33-66% of guideline	62%	30%	22%	17%	21%	24%	23%
"Alert" 66-100% of guideline	10%	26%	20%	17%	10%	6%	10%
"Action" >Guideline	10%	22%	12%	3%	3%	1%	1%
Percentage of valid data	14%	7%	22%	32%	68%	99%	99%
Annual average ( $\mu\text{g m}^{-3}$ )	-	-	22	18	17	15	17
Measured PM <sub>10</sub> concentrations above 50 $\mu\text{g m}^{-3}$	5	6	10	3	6	5	3
Extrapolated PM <sub>10</sub> concentrations above 50 $\mu\text{g m}^{-3}$	16	34	31	9	10	4	3
99.7 %ile concentration ( $\mu\text{g m}^{-3}$ )	58	60	79	57	55	57	55
Annual maximum ( $\mu\text{g m}^{-3}$ )	58	60	81	58	59	62	56
Number of records	50	27	82	115	247	360	363

### 3.2 PM<sub>10</sub> concentrations at the MRR site

Figure 3.4 shows the daily average PM<sub>10</sub> concentrations measured at the MRR site in 2008. The maximum concentration recorded by the high volume sampler was 51  $\mu\text{g m}^{-3}$  and this was measured on 13 May. In 2007 no measurements above the 50  $\mu\text{g m}^{-3}$  guideline were recorded with a maximum recorded concentration of 28  $\mu\text{g m}^{-3}$ . The only other years that concentrations above 50  $\mu\text{g m}^{-3}$  have been recorded at this site are 2000 (56  $\mu\text{g m}^{-3}$ ) and 2003 (75  $\mu\text{g m}^{-3}$ ).



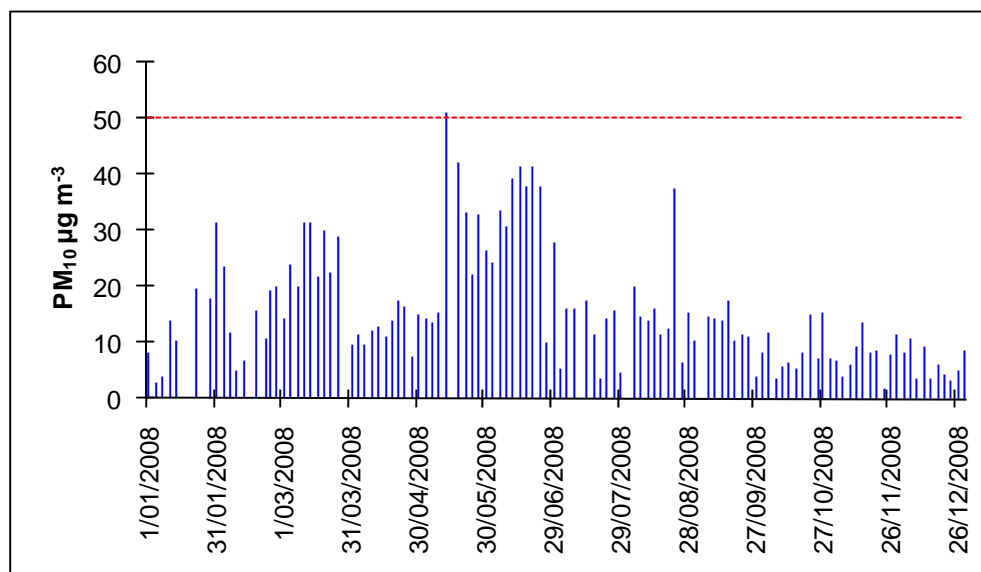


Figure 3.4: Daily winter PM<sub>10</sub> concentrations measured at the MRR site during 2008.

Changes in PM<sub>10</sub> concentrations relative to MfE air quality indicator categories (shown in Table 1.3) at the MRR site from 2001 to 2008 are shown in Figure 3.5. The majority of the PM<sub>10</sub> concentrations measured were less than 66% of the air quality guideline, within the “acceptable” and “good” air quality categories. The proportion of PM<sub>10</sub> concentrations in the alert or action categories for 2008 was 8%. Figure 3.6 shows the monthly variations in PM<sub>10</sub> concentrations compared to air quality indicators for 2008.

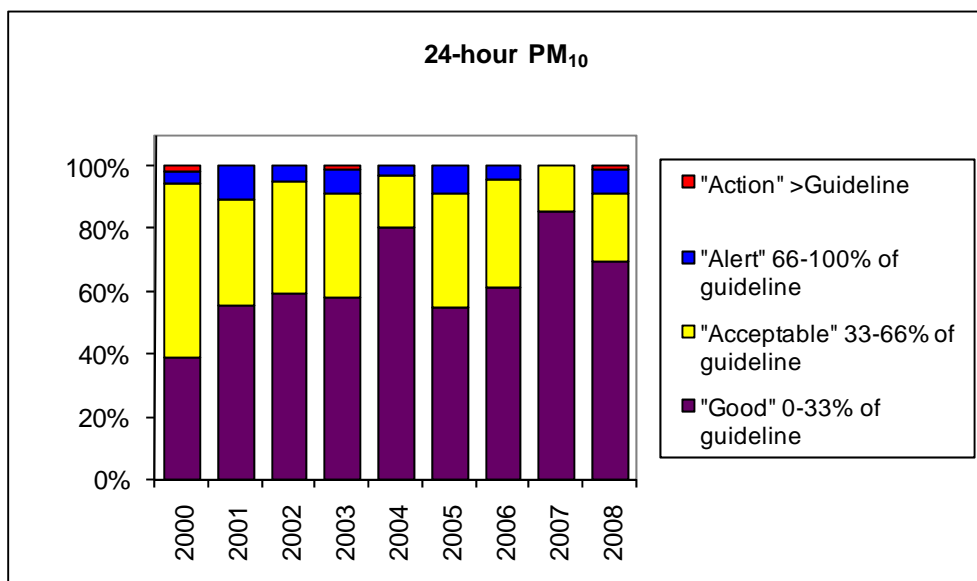


Figure 3.5: Comparison of PM<sub>10</sub> concentrations measured at the MRR site from 2000 to 2007 to MfE air quality indicator categories

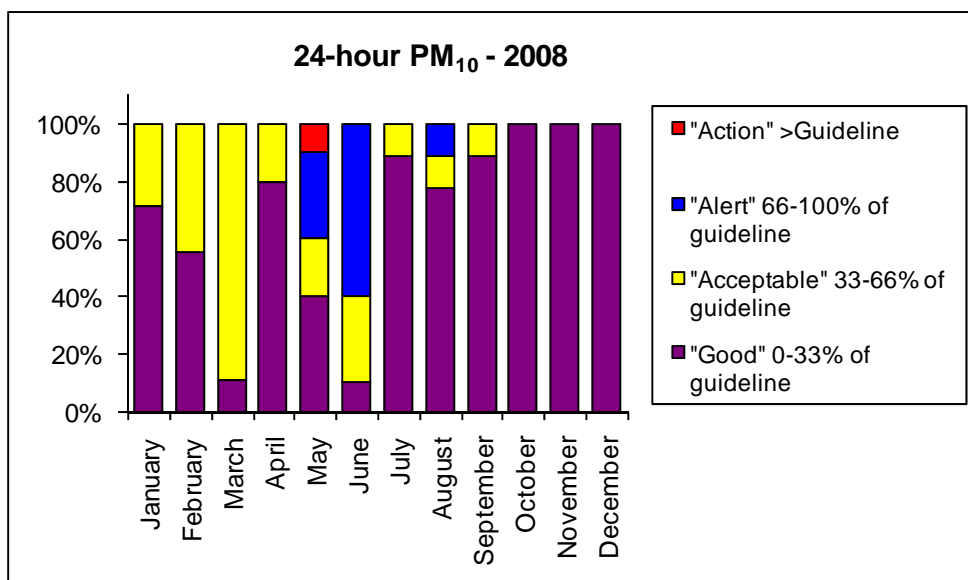


Figure 3.6: Comparison of daily PM<sub>10</sub> concentrations each month during 2008 to MfE air quality indicator categories

The estimated annual average PM<sub>10</sub> concentration for the MRR site for 2008 is 16 µg m<sup>-3</sup>. This annual average is higher than 2007 (11 µg m<sup>-3</sup>) and 2006 (14 µg m<sup>-3</sup>), but lower than has been recorded historically (19 µg m<sup>-3</sup> in 2000 and 18 µg m<sup>-3</sup> in 2001)

Summary statistics for PM<sub>10</sub> monitoring results are shown in Table 3.2.

Table 3.2: Summary of PM concentrations measured at the MRR monitoring site from 2000 to 2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
"Good" 0-33% of guideline	39%	55%	59%	58%	80%	55%	61%	85%	69%
"Acceptable" 33-66% of guideline	56%	34%	36%	33%	17%	37%	35%	15%	21%
"Alert" 66-100% of guideline	4%	11%	5%	7%	3%	9%	4%	0%	8%
"Action" >Guideline	2%	0%	0%	1%	0%	0%	0%	0%	1%
Percentage of valid data	15%	20%	22%	22%	16%	25%	33%	32%	31%
Annual average ( $\mu\text{g m}^{-3}$ )	19	18	15	16	13	17	14	11	16
Measured PM <sub>10</sub> concentrations above 50 $\mu\text{g m}^{-3}$	1	-	-	1	-	-	0	0	1
Extrapolated PM <sub>10</sub> concentrations above 50 $\mu\text{g m}^{-3}$									3
99.7 %ile concentration ( $\mu\text{g m}^{-3}$ )	53	46	40	67	46	47	42	27	48
Annual maximum ( $\mu\text{g m}^{-3}$ )	56	48	41	75	49	49	45	28	51
Number of records	54	74	81	81	60	93	121	116	113

### 3.3 PM<sub>10</sub> and meteorology in Blenheim

Variations in meteorological conditions and hourly average PM<sub>10</sub> concentrations on 13 May, 20 May and 10 June, when the 24-hour average PM<sub>10</sub> measured at the Redwoodtown – Bowling Club site using the BAM sampler exceeded the NES are shown in Figure 3.7.

Daily patterns in PM<sub>10</sub> concentrations are typical of high pollution events in Blenheim which occur when wind speeds are low and the wind is from a westerly direction. The highest PM<sub>10</sub> concentrations typically occur during the evening period when low winds and temperature inversion conditions coincide with households lighting fires for home heating. On 20 May a morning peak in PM<sub>10</sub> concentrations was also apparent at around 8am.

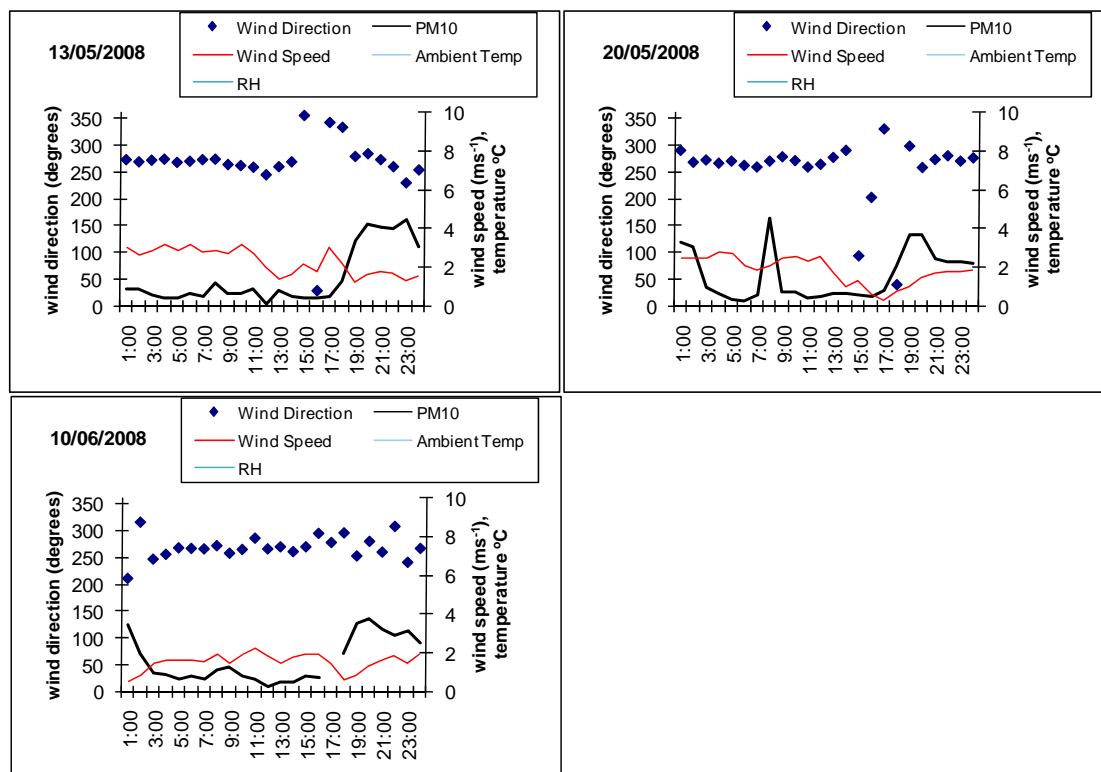


Figure 3.7: Hourly average wind speed and wind direction when PM<sub>10</sub> concentrations exceeded the 50 µg m<sup>-3</sup> at Blenheim.

Hourly wind direction and wind speed, measured at the NIWA meteorological monitoring site on the outskirts of Blenheim, are shown in Figure 3.8 for the months May to August 2008.

As with previous years, the predominant wind direction is westerly. The wind speed was greater than 2 m s<sup>-1</sup> for much of the winter, although periods of low wind speeds were apparent at times, especially in May and from mid July. The greatest prevalence of low wind speeds for winter 2008 occurred in May.

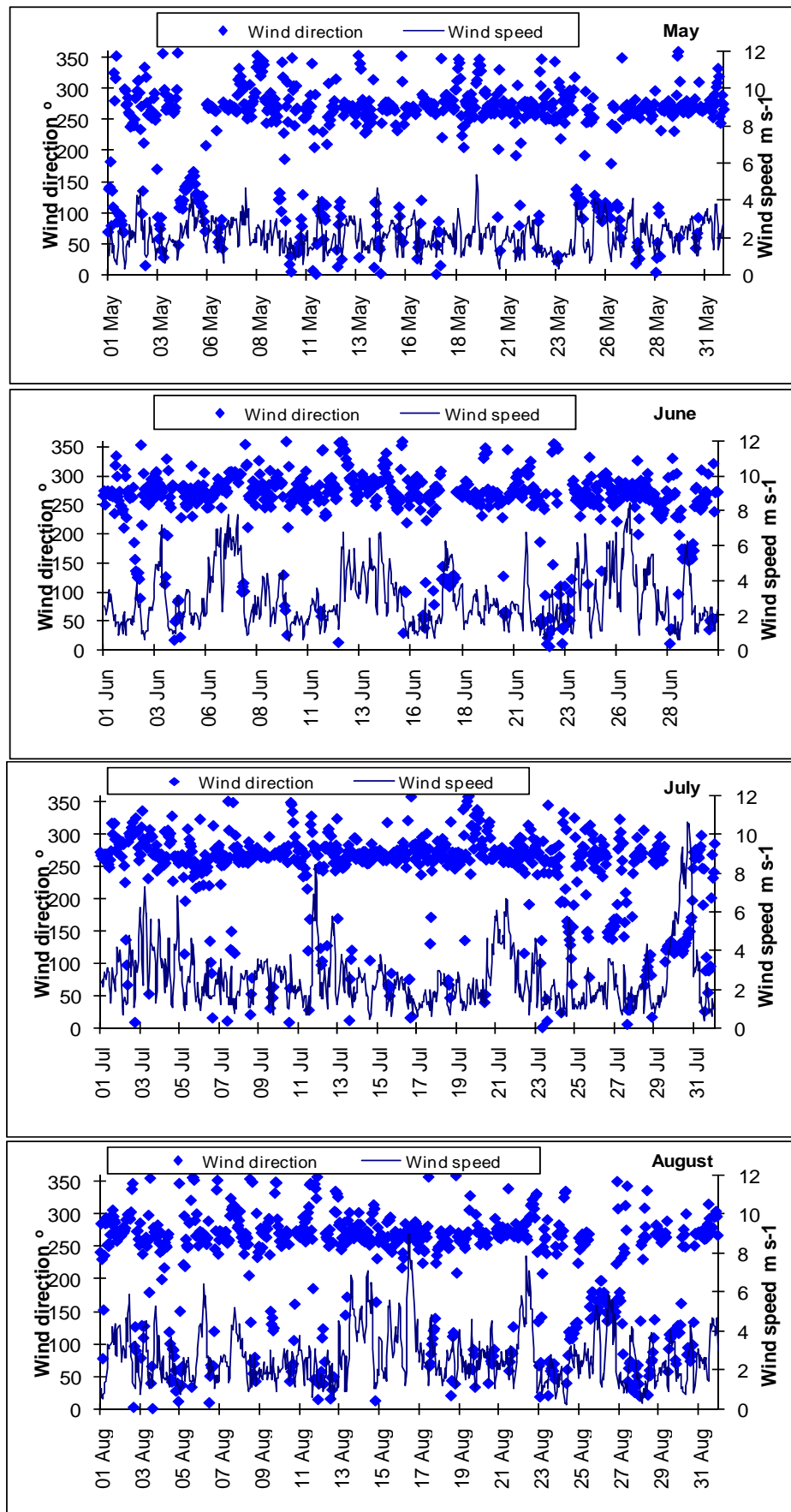


Figure 3.8: Hourly average wind speed and wind direction in Blenheim for May to August 2008

## 4 Air Quality Monitoring in Picton



An air quality monitoring site was established in Picton in May 2008. One exceedence of the air quality guideline for PM<sub>10</sub> (50 µg m<sup>-3</sup>, 24-hour average) was recorded during 2008. The highest PM<sub>10</sub> concentration was 53 µg m<sup>-3</sup> (24-hour average) and occurred on 30 June. A statistical extrapolation of the air quality data suggests that 4 exceedences of the air quality guideline could have occurred during 2008. Twenty four hour average PM<sub>10</sub> concentrations measured at Picton during 2008 are shown in Figure 4.1.

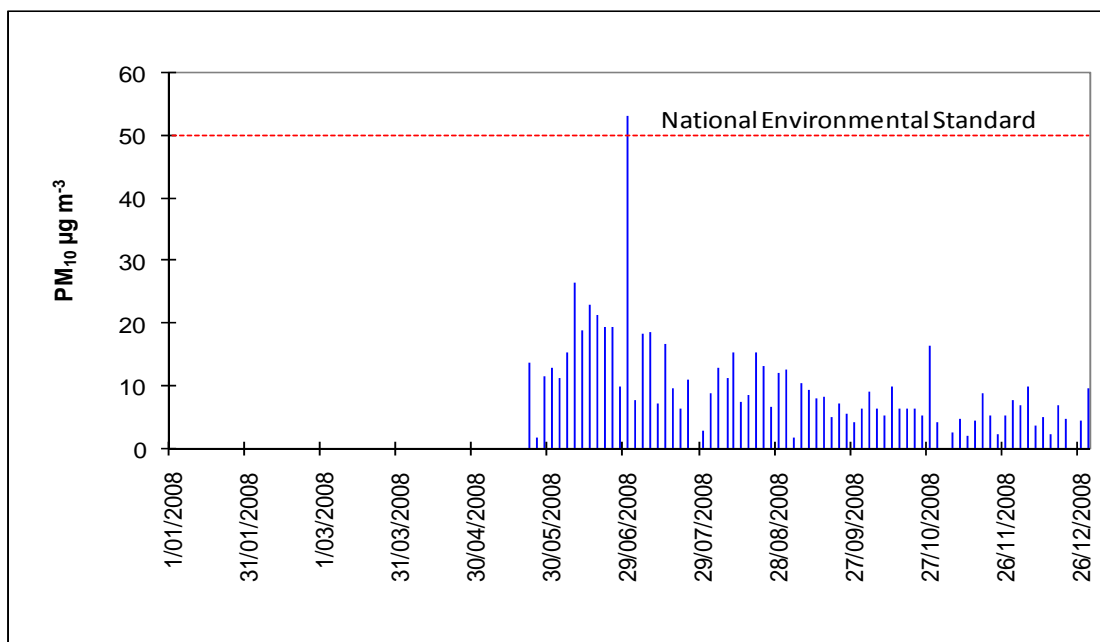


Figure 4.1: 24-hour average PM<sub>10</sub> concentrations measured at Picton

Figure 4.2 compares PM<sub>10</sub> concentrations measured during 2008 to the MfE air quality indicator categories (shown in Table 1.3). Ninety nine percent of PM<sub>10</sub> concentrations measured were less than 66% of the air quality guideline, within the “acceptable” and “good” air quality categories. Figure 4.3 shows the monthly variations in the distribution of PM<sub>10</sub> concentrations for 2008.

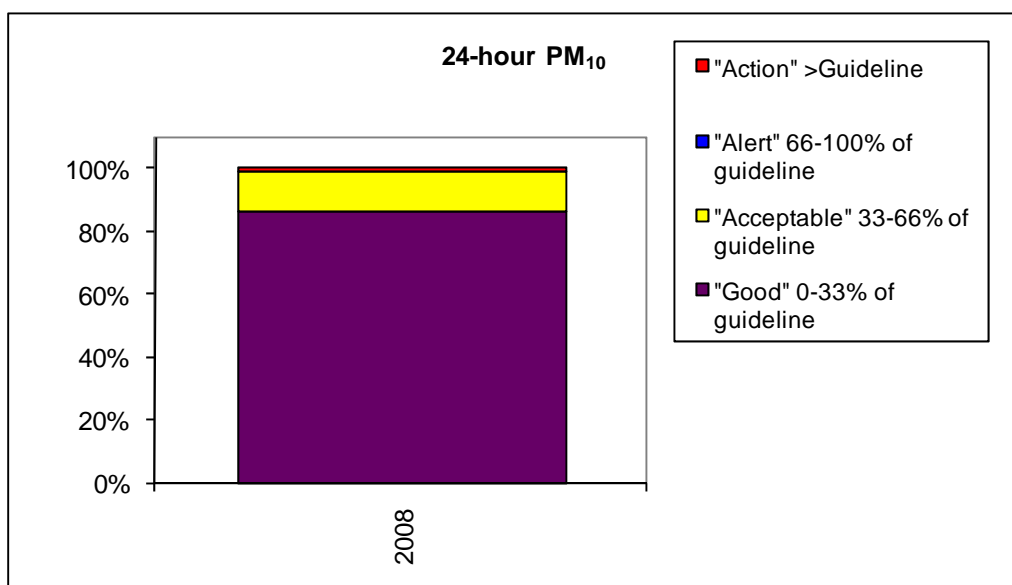


Figure 4.2 Comparison of PM<sub>10</sub> concentrations measured at Picton during 2008 to MfE air quality indicator categories

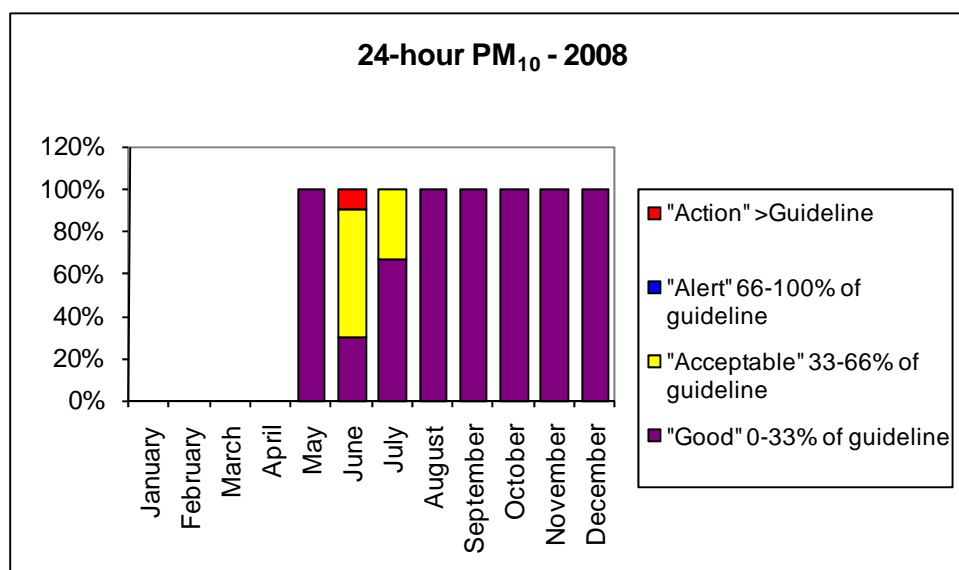


Figure 4.3: Comparison of daily PM<sub>10</sub> concentrations each month from May to December 2008 to MfE air quality indicator categories

In 2008, the annual average estimated PM<sub>10</sub> concentration was 10 µg m<sup>-3</sup>.

Table 4.1 shows summary statistics for PM<sub>10</sub> monitoring results from the Picton site for 2008.

Table 4.1: Summary of PM<sub>10</sub> concentrations measured at Picton

	2008
"Good" 0-33% of guideline	86%
"Acceptable" 33-66% of guideline	13%
"Alert" 66-100% of guideline	0%
>Guideline	1
Percentage of valid data	20%
Annual average (µg m <sup>-3</sup> )	10
Measured PM <sub>10</sub> concentrations above 50 µg m <sup>-3</sup>	1
Extrapolated PM <sub>10</sub> concentrations above 50 µg m <sup>-3</sup>	4
Annual maximum (µg m <sup>-3</sup> )	53
Number of records	72



## 5 Straight line path (SLiP)

Figure 5.1 compares concentrations of PM<sub>10</sub> in Blenheim to the 2007 straight line path (SLiP) to compliance with the NES. The starting point for the the latter was revised in 2008 based on an evaluation of PM<sub>10</sub> concentrations at the Redwoodtown Bowling Club monitoring site and the Croquet Club site. It was determined that the worst case PM<sub>10</sub> concentration for Blenheim was likely to be around 66  $\mu\text{g m}^{-3}$  once differences between the high volume sampling method and BAM were accounted for.

Concentrations of PM<sub>10</sub> during 2008 were within the SLiP.

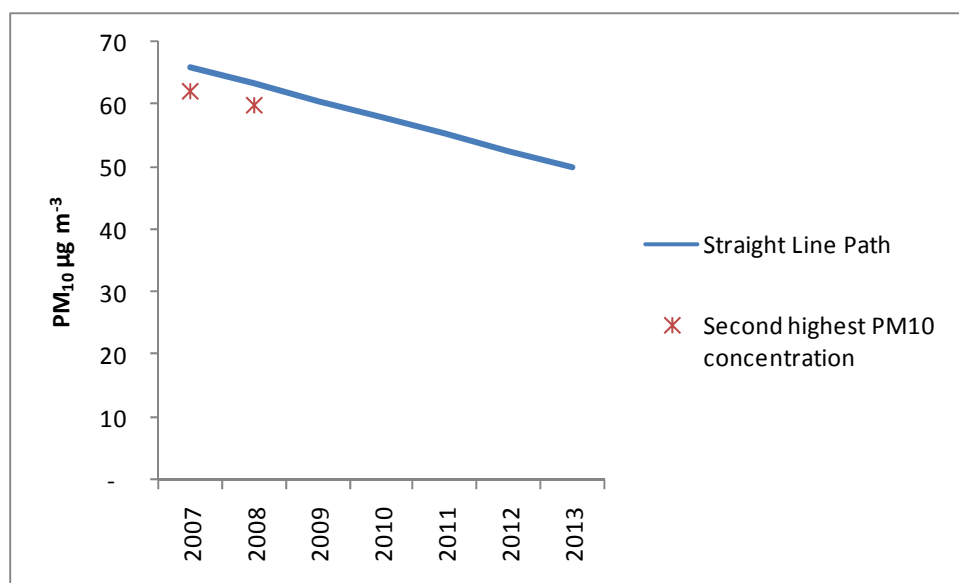


Figure 5.1: Comparison of PM<sub>10</sub> concentrations measured during 2008 to the straight line path to compliance with the NES.

## 6 Summary

Concentrations of PM<sub>10</sub> were measured at four sites in Marlborough during 2008. In Blenheim air quality took place at the historical MRR site, the NES compliant site at the Bowling Club - Redwoodtown, and at the Croquet Club in Redwoodtown. A new site was established in Picton. The purpose of the latter site was to evaluate likely PM<sub>10</sub> concentrations in Picton and determine if further monitoring is necessary.

At the Croquet Club – Redwoodtown site, air quality monitoring using a high volume sampler was based on a one day in three sampling until the end of April 2008. No exceedances of the air quality guideline 50 µg m<sup>-3</sup> (24-hour average) were recorded.

A maximum concentration of 51 µg m<sup>-3</sup> was recorded at the MRR site and this was the only exceedance of the air quality guideline of 50 µg m<sup>-3</sup> for PM<sub>10</sub> (24-hour) for this site. Three exceedances of the NES for PM<sub>10</sub> were recorded at the Redwoodtown – Bowling Club site during 2008. The maximum measured PM<sub>10</sub> concentration at this site was 56 µg m<sup>-3</sup> and was recorded on the 10 June.

Concentrations of PM<sub>10</sub> measured in Blenheim during 2008 were within the straight line path to compliance with the NES.

In Picton, there was one measured exceedance of the 50 µg m<sup>-3</sup> guideline for PM<sub>10</sub> (24-hour) average (53 µg m<sup>-3</sup>). However, monitoring was carried out on only one day in three so it is possible that concentrations exceeded the 50 µg m<sup>-3</sup> on a non sample day. A statistical extrapolation of the PM<sub>10</sub> concentrations suggests that there may have been up to four exceedences. Further air quality monitoring at the Picton site is recommended.

The annual average PM<sub>10</sub> concentration measured at the Redwoodtown – Bowling Club site during 2008 was 17 µg m<sup>-3</sup>. This compares with the 2007 annual average of 15 µg m<sup>-3</sup>. The estimated annual average for the MRR site, and the Picton site were 16 µg m<sup>-3</sup> and 10 µg m<sup>-3</sup>.

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