MARLBOROUGH DISTRICT COUNCIL

Ambient Air Quality Monitoring Annual Report 2004

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By
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Ambient Air Quality Monitoring
Annual Report 2004

A report for
Marlborough District Council
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1 INTRODUCTION

The Marlborough District Council (MDC) undertakes ambient air quality monitoring within the Marlborough district.

In 2004, the MDC monitored visibility at four sites in the district from January to December. These sites included Woodbourne, a long term monitoring site since 1999, Elisha Drive, Blenheim, and Picton. This report presents results of all monitoring carried out during 2004 and is in line with the proposed monitoring strategy 2005.

Inhalable particulate is monitored on a year-round basis at one site in Blenheim (Middle Renwick Road). In addition, the MDC monitored inhalable particulate at Brooklyn Drive, Redwoodtown, Blenheim, from 17 April 2004 to 29 September 2004 (winter 2004). Inhalable particulate was then monitored at the Bowling Club, Redwoodtown, from 02 October 2004 until 31 December 2004. Particulate concentrations are reported to MDC by Watercare on a monthly basis.

This report contains an annual summary of visibility and inhalable particulate results for 2004.

2 PARAMETERS MONITORED

2.1 Visibility

Visibility is a measure of the degree to which the atmosphere is transparent. Visibility degradation is caused by haze, which obscures the clarity, colour and form of what is seen through the atmosphere.

The amount of cloud cover, and angle of sun, can also affect visibility. Low cloud and rain can obscure visibility, and therefore weather conditions at the time of observation are recorded. Furthermore, it is desirable to have recordings of visibility made at similar times of the day to minimise variability due to sun angle.

Visibility can be used as an indicator of general air quality. The main factors which affect visibility include particulate matter and nitrogen dioxide (NO_2). Other air pollutants such as other nitrogen oxides (NO_2, NO, N_2O, and other nitrogen oxides are collectively referred to as NO_x), sulphur dioxide (SO_2), ozone (O_3) and volatile organic compounds (VOC) can also affect visibility through secondary particle formation. Fine particles ($PM_{2.5}$) are the most significant contributors to reduced visibility.

Sources of contaminants that cause reduced visibility include natural processes (windblown dust, coastal processes, volcanic eruptions), industrial discharges (SO_2 and NO_x), agricultural discharges such as dust from cultivation and smoke from rural burn-offs, and domestic sources, including home heating and outdoor burning, and vehicles. Visibility may also be enhanced or reduced by weather conditions. Warm dry conditions may favour secondary particle formation, whereas rain can wash particles out of the atmosphere.

Figure 1: Agricultural Burning, Wairau Valley, Marlborough District

2.2 Inhalable Particulate (PM_{10})

Particulate matter refers to numerous substances that exist in the atmosphere. It is a somewhat complex category, encompassing a wide range of chemically and physically diverse substances. Particulate matter includes all solid and aerosol matter that exists in ambient conditions.

Particulate matter has been divided into several categories, based upon the potential health or environmental effect. Total suspended particulate (TSP) consists of all particles which range in size from 20 μm diameter downwards. Particles larger than 20 μm are too large to remain airborne for extended periods, and thus are categorised as deposited particulate.

TSP is sufficiently small to be inhaled, however, the larger particles (10 – 20 μm) are readily filtered out in the nasal cavity. Therefore, it is not considered to be the main cause of concern with respect to health effects. TSP has a nuisance or annoyance effect, degrading the aesthetic quality of the ambient air.

Particles with a diameter of 10 μm or less (PM_{10}) can be inhaled into the respiratory system. The main effect of inhalable particulate is on human health. Major health effects are increased mortality, aggravation of existing respiratory disease, increased hospital admissions, and increased lost days (lost work days, school days, and increase in restricted activity days).

Current research is recognising the division of particulate into finer fractions, including $PM_{2.5}$ and PM_1, which may penetrate beyond the bronchial tubes and deep into the aveoli. These fine particulates contain secondarily formed aerosols (gas-to-particle conversion), combustion particles, and recondensed organic and metal vapours. Larger particles usually contain earth crust materials and fugitive dust from roads and industry.

3 AIR QUALITY GUIDELINES AND STANDARDS

3.1 New Zealand Ambient Air Quality National Environmental Standards

The Ministry for the Environment (MfE) has promulgated National Environmental Standards (NES) for air quality. These standards became law in July 2004, and for several major contaminants they replaced the Ambient Air Quality Guidelines (AAQG) 2002. Both the NES and the AAQG are set to protect human health. The NES must be complied with by 01 September 2005, but allow a number of exceedances per year.

Visibility is an indicator of air pollution i.e. it can be used to indicate the presence of air pollutants which may have an adverse effect on human health. As it is only an indicator criteria, it does not have a guideline or standard value.

Inhalable particulate has recognised direct effects on human health. The NES for inhalable particulate is given in Table 1.

Table 1: Ambient Air Quality Guidelines and Standards

Contaminant	Source	Value	Averaging Period	Purpose
Inhalable particulate (PM_{10})	NZ AAQG 2002	20 $\mu g/m^3$	Annual	Chronic health effects
	NZ NES 2004	50 $\mu g/m^3$	24 hour average	Acute health effects
Fine particulate ($PM_{2.5}$)	NZ AAQG 2002	25 $\mu g/m^3$	24 hours	Monitoring guideline

3.2 New Zealand Environmental Performance Indicators

The Resource Management Act (1991) requires the quality of the environment to be maintained or enhanced. In order to provide guidance on when enhancement should be required, the MfE has provided Environmental Performance Indicators (EPI), as set out in Table 2. These indicators can act as both indicators of poor air quality, and goals which policy can work towards achieving.

Table 2: Environmental Performance Indicators for Air

Category	Maximum Measured Value	Comment
Action	Exceeds guideline/standard	Completely unacceptable by national and international standards
Alert	Between 66 % and 100 % of the guideline/standard	Warning level, which can lead to guidelines/standards being exceeded if trends are not curbed
Acceptable	Between 33 % and 66 % of the guideline/standard	A broad category, where maximum values might be of concern in some sensitive locations, but are generally at a level which does not warrant dramatic action
Good	Between 10 % and 33 % of the guideline/standard	Peak measurements in this range are unlikely to affect air quality
Excellent	Less than 10% of the guideline/standard	Of little concern. If maximum values are less than a tenth of the guideline/standard, average values are likely to be much less
Not Assessed		Insufficient monitoring data to assess this category

4 MONITORING SITES

4.1 Visibility

There are four sites that were used by MDC for visibility monitoring. They are:

- Elisha Drive, Blenheim (05 Jan 04 to 29 Oct 04)
- MDC Office Roof, Seymour Square, Blenheim (05 Jan 04 to 09 Jul 04)
- Scotland Street, Picton (02 Jan 04 to 28 Oct 04)
- Woodbourne Airport, Woodbourne (02 Jan 04 to 31 Dec 04)

This report presents results of monitoring at Woodbourne, Elisha Drive, MDC Office Roof Blenheim and Picton sites in 2004.

4.2 Inhalable Particulate

There were three sites monitored during this reporting period. They were:

- 106 Middle Renwick Road, Blenheim (operating since 2000).
- Brooklyn Drive, Redwoodtown, Blenheim (April to September 2004)
- Redwoodtown Bowling Club, 65A Weld Street, Blenheim (October to December 2004)

Monitoring was carried out at a private residence on Brooklyn Drive to assess if PM10 concentrations were higher in a more densely housed area than that of the Redwoodtown Bowling Club.

Monitoring was undertaken at the Redwoodtwon Bowling Club previously from September to December 2001, from May to September 2002, and from June to September 2003.

A summary description of each site, as provided by MDC, is included in Table 3.

	Site Area	Where	Purpose	Details	X-coord	Y-coord	Parameter	Old Site ID	New Site ID
Visibility	Blenheim	Elisha Drive, Blenheim	Survey site to monitor visibility	Elevated site , residential over town.	2590680	5962532	Visibility	M1	
	Blenheim	MDC Beehive Building, Seymour Square	Survey site to monitor visibility	On building over town.	2589688	5965710	Visibility	M2	
	Woodbourne	Air Traffic Control Tower	Permanent site to monitor visibility	Airport control tower.	2582409	5965467	Visibility	M3	
	Picton	39 Scotland Street, Picton	Survey site to monitor visibility	Elevated site , residential over town.	2593658	5989592	Visibility	M4	
PM10	Picton	25 Oxford Street	Survey site to monitor PM10	Enclosed site.	2593855	5989623	PM10	None	
	Blenheim	SH6 - 106 Middle Renwick Road	Permanent site to monitor PM10	Enclosed site.	2588212	5966047	PM10	2	
	Blenheim	Brooklyn Drive, Redwoodtown	Survey site to monitor PM10	Enclosed site.				None	
	Blenheim	Blenheim Bowling Club, 65A Weld Street, Redwoodtown	Survey site to monitor PM10	Enclosed site.	2589778	5964037	PM10	3	
SO2 and NO2	Blenheim	SH1 - 34 Main Street	Survey site to monitor SO2 and NO2	Roadside.	2590343	5965502	SO2 and NO2	None	
	Blenheim	Blenheim Bowling Club, 65A Weld Street, Redwoodtown	Survey site to monitor SO2 and NO2	Enclosed site.	2589760	5964034	SO2 and NO2	3	
	Blenheim	Manchester Street, Riverlands Industrial	Survey site to monitor SO2 and NO2	Roadside.	2594114	5963633	SO2 and NO2	None	
	Blenheim	SH6 - 136 Middle Renwick Road	Survey site to monitor SO2 and NO2	Roadside.	2588029	5966019	SO2 and NO2	None	
	Picton	68 Broadway, Picton	Survey site to monitor SO2 and NO2	Roadside.	2593966	5989950	SO2 and NO2	None	

Table 3: MDC Site Description Summary

5 METHODS

5.1 Quality Assurance

All sampling is undertaken by the Marlborough District Council. Sampling operation includes maintenance of the site and calibration of monitoring equipment, and changeover of passive samplers on a monthly basis. Analysis of filters and provision of quality assured data is undertaken by Watercare.

Watercare Services Ltd holds IANZ accreditation for the operation of its laboratory. The Watercare Services Ltd Air Quality Department holds IANZ accreditation for a variety of its air quality sampling and analytical methods, including HiVol PM_{10} sampling.

5.2 Visibility Monitoring

Visibility monitoring was undertaken using manual observations of visibility. No instruments were used for recording visibility. Visibility monitoring was carried out in accordance with the process determined for MDC, and detailed in the ESR report "Visibility observers guide: human judgement of visible air quality" (ESR July 1999). Monitoring required observation of visibility three times per week (Monday, Wednesday and Friday), at each of four sites. Multiple parameters were recorded, including weather conditions, sky colour, presence of haze, smoke, or dust, and farthest distance visible.

Visibility monitoring uses the same methodology as was employed in the project commencing 1999.

The visibility program design is in general accordance with the Ministry for the Environment's (MfE) "Good practice guide for monitoring and management of visibility in New Zealand" (MfE 2001).

5.3 Inhalable Particulate Monitoring

Particulate is collected by drawing air through a filter using a standard high volume (HiVol) air sampler (Figure 3). The inlet on the sampler has a cut-off of 10 microns (PM_{10}), which is the limit for total inhalable particulates. The method for the high volume sampling is Watercare Test Method 0C09, which is based on USEPA cfr40.

Sampling is usually undertaken for a 24 hour period. At the Middle Renwick Road site, sampling has been fixed at a 1 day in 6 regime. This site acts as a background site. At investigation sites, Brooklyn Drive and the Bowling Club in Redwoodtown, sampling occured 1 day in 3.

Figure 2: HiVol PM_{10} Sampler

6 VISIBILITY STUDY – RESULTS AND DISCUSSION

6.1 Visibility Monitoring Summary

Monitoring has been undertaken at Woodbourne from 1999 through to the present day.

Monitoring at the other three sites was undertaken from 1999 to 2000 (reported in the 2001 Annual Report). These sites were not monitored in 2001 or 2002, but monitoring recommenced in 2003 and continued through part of 2004. Only 2004 results have been presented in this report.

The number of observations, and time of day when observations were made, are given in Table 4.

Table 4: Visibility Monitoring Summary

Site	Start Date	End Date (in 2004)	Number of Observations	Observation Times
Woodbourne	02 Jan 04	31 Dec 04	281	08:00 – 09:00 17:00 – 18:00
Elisha Drive	05 Jan 04	29 Oct 04	100	07:40 – 08:50
MDC Office Roof Blenheim	05 Jan 04	09 Jul 04	116	08:00 – 09:00 16:00 – 17:00
Picton	02 Jan 04	28 Oct 04	108	08:30 – 10:00

6.2 Visibility and Presence of Haze

Aside from weather conditions, it is the presence of haze in the atmosphere that can most severely affect visibility. Haze may be caused by natural processes or human activity. It may also be exacerbated by atmospheric conditions, in particular by temperature inversions trapping particulate within a limited atmospheric depth.

Table 5 shows the percentage of observations when haze, dust, or smoke was recorded, for each site. Haze, smoke and dust recordings are taken directly from the field observations. These define "haze" as a brown sky colour. "Smoke" refers to either an individual plume e.g. agricultural fire, or a collection of sources e.g. households. "Dust" is non-smoke plume.

The Elisha Drive site on the south-eastern corner of Blenheim is elevated above the town and has good views over the Wairau Plain. Elisha Drive had the highest percentage of haze and smoke. Haze occurred on 17 % of the monitored days, and smoke was observed on 96% of the monitored days. The extremely high percentage of smoke reflects both domestic home heating and agricultural burnoffs.

At the Picton site, smoke was observed on 57% of monitored days, but haze was not recorded without the presence of smoke. At the Marlborough District Council Office Roof site in

central Blenheim, smoke was only recorded on 27% of monitored days, and haze was not recorded without the presence of smoke. At Woodbourne, smoke was observed on 19% of monitored days and haze on 42% of monitored days.

The frequency of dust events was very low (refer Table 5).

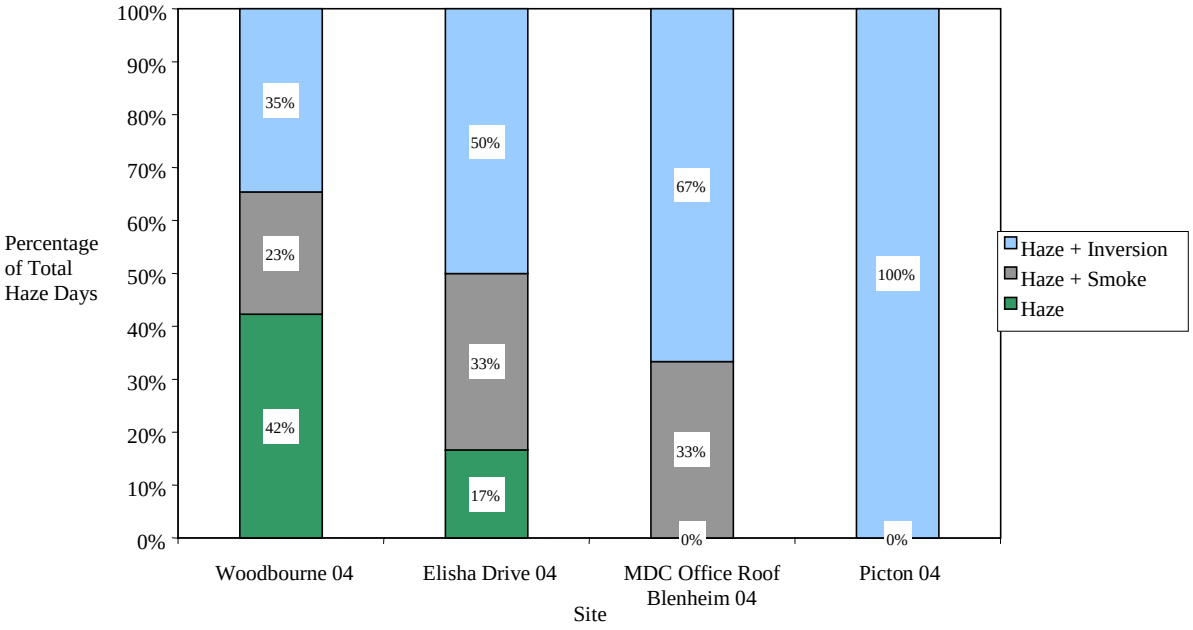
Table 5: Occurrence of haze, smoke and dust

Site	Number of Observations	Haze as % of Total Observations*	Smoke as % of Total Observations	Dust as % of Total Observations
Woodbourne	281	42.3%	18.9%	0%
Elisha Drive	100	16.7%	96.0%	0.4%
MDC Office Roof Blenheim	116	0%	26.7%	3.4%
Picton	108	0%	56.5%	0.9%

* Haze in absence of smoke and inversion.

Figure 3 shows the overall breakdown of days when haze was recorded. Haze was only recorded on 1 day at Picton, occuring concurrently with smoke and an inversion. Haze occurred concurrently with smoke or inversions on 23-33% of recorded days at sites other than Picton. Observations of inversions being concurrent with haze events, were recorded for over 50% of the time at the Elisha Drive and MDC Office sites and 35% of the time at Woodbourne. In 2004, there was generally less haze than 2003.

Figure 3: Occurrence of Haze, Inversions and Smoke

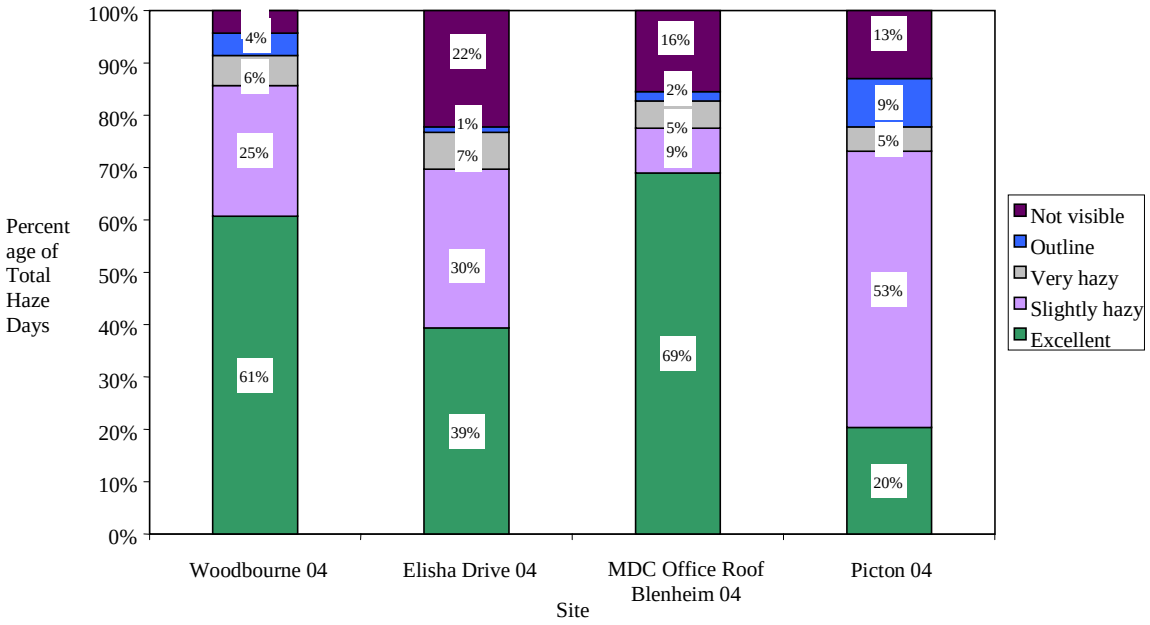


6.3 Overall Clarity Rating for Marlborough District

The overall visual clarity is represented by the distance through the atmosphere over which landmarks and features can be readily observed. It is represented by the ease with which the chosen target landmark for each site is observed, and by the farthest distance (farthest landmark) that can be viewed on an observation day. Visibility observations undertaken by MDC have included the clarity of the target outline, whether the target colour can be determined, and an estimate of farthest distance viewed. These combine to give an indication of the overall visual clarity.

The clarity with which the target could be viewed at each site is shown in Figure 4. Figure 4 shows that for the majority of the time, the target could be seen with excellent clarity, or only slight haziness. At Picton and Elisha Drive sites, the percentage of monitored days with 'excellent' clarity was less then the other two sites. However, information captured in the visibility monitoring program does not offer a definitive reason for this.

Figure 4: Visibility of Target Landmark



The maximum distance viewed each observation day was also recorded. The maximum distance provides an indication of the transparency of the atmosphere. Results are presented in Table 6.

Table 6: Visual Range – Farthest Distance

Site	0-2 km	2-10 km	11-25 km	26-50 km	51-69 km	70+ km
Woodbourne	1%	3%	4%	51%	27%	15%
Elisha Drive	1%	3%	5%	17%	73%	0%
MDC Office Roof Blenheim	1%	9%	12%	24%	24%	30%
Picton	4%	11%	85%	0%	0%	0%

From the Woodbourne, Elisha Drive and MDC Office Roof sites, a maximum visual distance of 25 – 70 km is common. At Picton, the maximum visual distance is usually less than 25 km. This is because topography at Picton limits the number of available landmarks, rather than the visibility at Picton being poorer than the other sites.

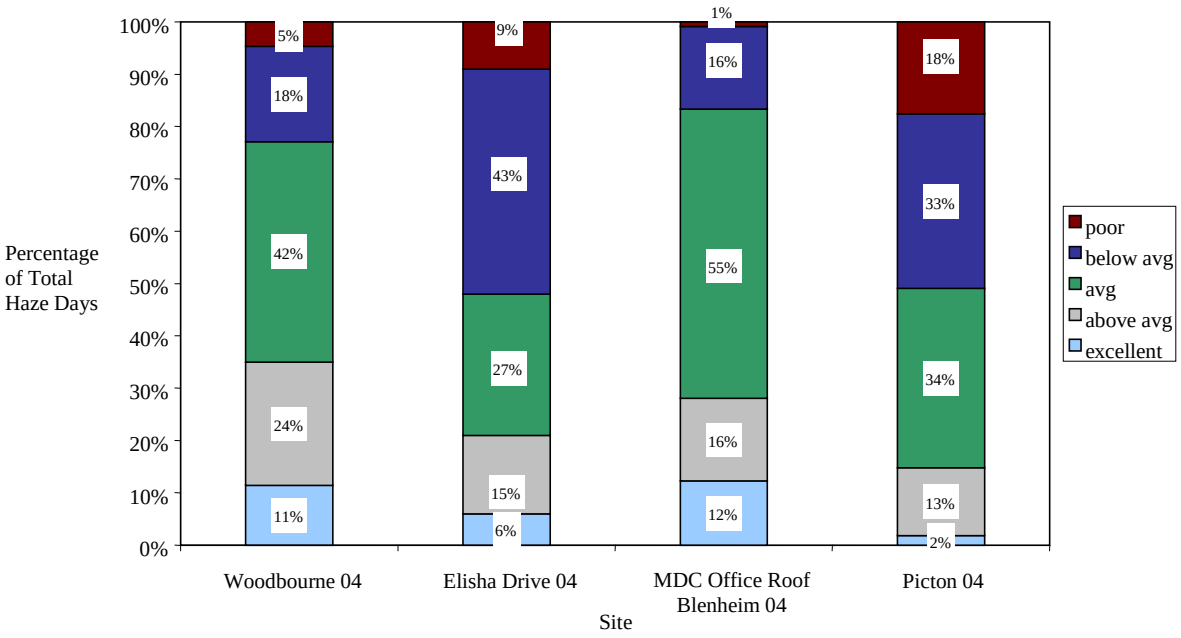
6.4 Overall Visibility

The overall visibility gives an indication of how good visibility is on each day. Visibility observations undertaken by MDC included an assessment of the overall visibility on each observation day. The overall visibility rating is presented in Figure 5.

Figure 5: General Visibility Rating

Figure 5 shows that in 2004, overall visibility was average or above average for 49% to 83% of the time. Elisha Drive and Picton sites had more below average visibility days than in previous years. Good visibility was recorded at the Woodbourne and MDC Blenheim.

Figure 5: General Visibility Rating



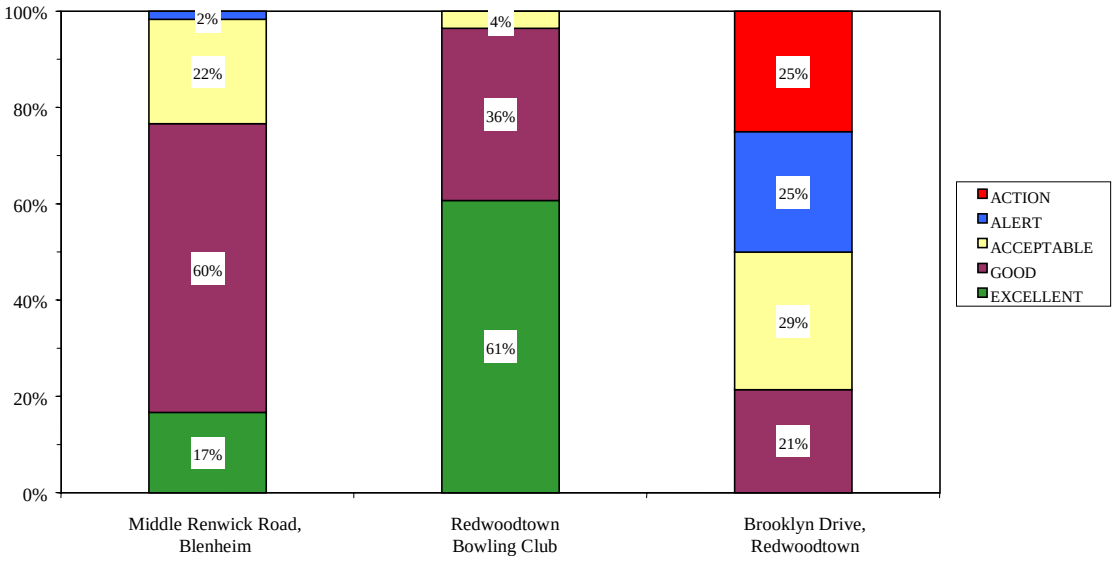
7 INHALABLE PARTICULATE – RESULTS AND DISCUSSION

7.1 Ambient Particulate in Marlborough

Site performance in 2004 was good. Two of three sites achieved over 95% valid data. Individual results are: Middle Renwick Road 98%; Brooklyn Drive 100%, and Redwoodtown bowling Club 88% valid data (Redwoodtown Bowling Club only had 3 months of sampling, so 1 missing value gave a high percentage of lost data).

The air quality measured at each site, relative to NES, was determined by calculating the Environmental Performance Indicator (EPI) for three sites. The EPI's are shown graphically in Figure 6. It is noted that the EPI for Redwoodtown Bowling Club only reflects air quality at this site from October to December 2004, thus is not representative of annual site quality.

Figure 6: Comparison of PM_{10} to EPI



There were no exceedances of the NES at Middle Renwick Road, Blenheim site in 2004. Air quality was in the "alert" category for 2% of the time, in the "acceptable" category for 22% of the time, in the "good" category for 60% of the time, and in the "excellent" category for 17% of the time (refer to Table 2 for explanation of categories). The percentage of "good" air quality was similar to previous years. It is noted that this site was shifted to 1 day in 6 sampling in 2004, which reduces the amount of data and increases the potential to miss high particulate days.

At the Brooklyn Drive site, Redwoodtown, air quality was very poor with respect to PM_{10}, the standard was exceeded on 14 monitored days, resulting in 25% of days in "action" category, 25% "alert", 29% "acceptable", 21% "good", and 0% "excellent". It should be noted that the "alert" category is likely to be higher than would be observed over a whole year because monitoring occurred over the winter only, when exceedances were more likely to occur.

At the Redwoodtown Bowling Club site, air quality appeared to be good on the basis of EPI's. However, monitoring at this site only commenced in October 2004 when the winter heating season had finished. Therefore, results cannot be considered to be representative.

The regular occurrences of "alert" categories since monitoring commenced, and the occurrence of "action" category (standards have been exceeded) at Brooklyn Drive, Redwoodtown, indicate the need to improve air quality in Blenheim with respect to PM_{10}.

PM_{10} concentrations are shown in Figure 7 (Middle Renwick Road, Blenheim), Figure 8 (Brooklyn Drive, Redwoodtown), and Figure 9 (Redwoodtown Bowling Club). Summary statistics are presented in Table 7.

Table 7: PM_{10} Summary Statistics 2004

Site	No. of Samples	Maximum ($\mu g/m^3$)	Minimum ($\mu g/m^3$)	Average ($\mu g/m^3$)	No. of Exceedances of NES*
Middle Renwick Road, Blenheim	60	34.7	1.1	12.8	0
Brooklyn Drive, Redwoodtown	56	84.9	6.0	35.5	14
Bowling Club, Redwoodtown	28	18.3	0.7	5.6	0

* Exceedance of 50 $\mu g/m^3$, 2004 NES

Figure 7: PM_{10} concentrations (24 hr avg) at Middle Renwick Road, Blenheim

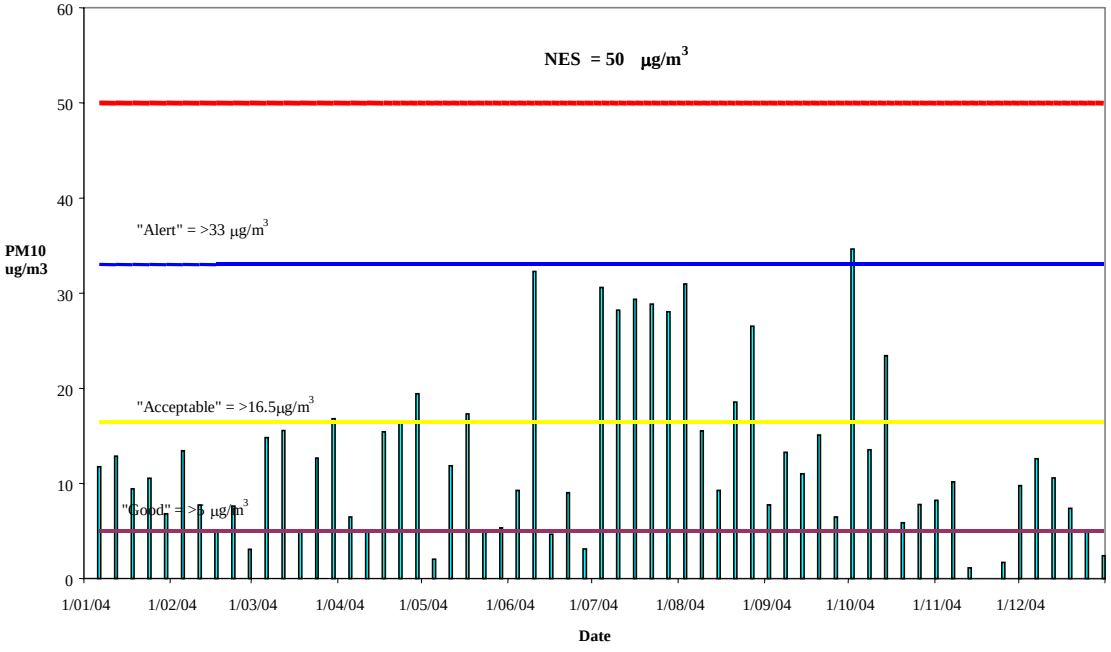
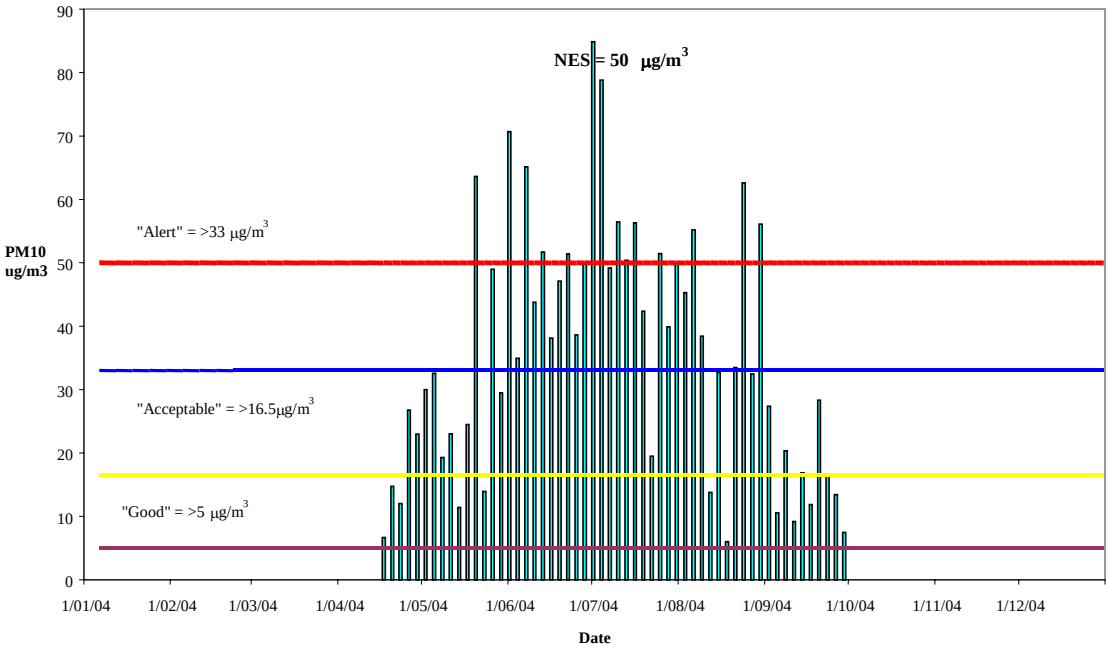
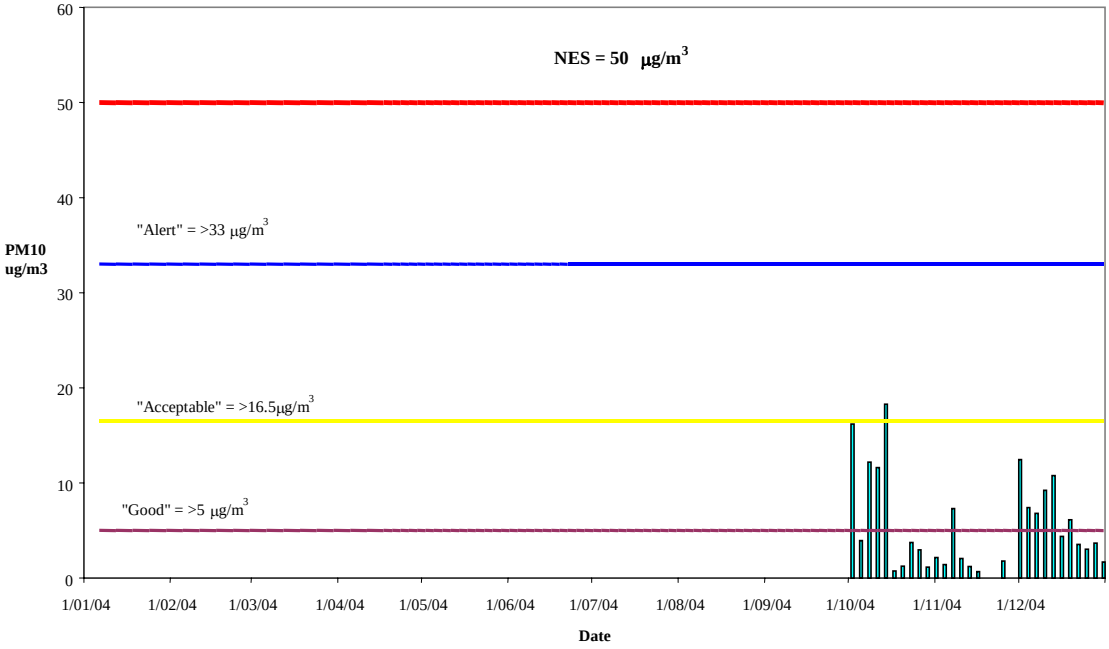


Figure 8: PM_{10} concentrations (24 hr avg) at Brooklyn Drive, Redwoodtown



Note: Sampling was undertaken at this site from 17 April to 29 September 2004

Figure 9: PM_{10} concentrations (24 hr avg) at Bowling Club, Redwoodtown



Note: Sampling commenced at this site 2 October 2004

7.2 Exceedances of Ambient Air Quality Guidelines for PM_{10}

The NES for PM_{10} of 50 $\mu g/m^3$ was exceeded at Brooklyn Drive, Redwoodtown on 14 monitored days in 2004. Exceedances occurred between the end of May and the end of August. There were no exceedances at the Middle Renwick Road, Blenheim site in 2004.

In addition to exceedances, the EPI category of "alert", i.e. ambient PM_{10} concentrations greater than 33 $\mu g/m^3$, was reached on 14 days at Brooklyn Drive, Redwoodtown. The effect of meteorology on ambient PM_{10} was evaluated.

Meteorological data from the Landcare Research Station is purchased from NIWA by MDC. The data obtained is wind speed, wind direction, rainfall and temperature.

The exceedance dates, ambient PM_{10} concentrations, and meteorological data is summarised in Table 8 below. Hourly wind speed and temperature results, and wind directions are shown graphically in Appendix A.

Table 8: PM_{10} Exceedances and Meteorological Data

Date	Middle Renwick Road, Blenheim PM_{10} ($\mu g/m^3$)	Brooklyn Dr, Redwoodtown PM_{10} ($\mu g/m^3$)	Rainfall (mm)	Average Temp (°C)	Average Wind Speed (m/s)
20/05/04	NS	63.6	0.0	9.6	2.5
01/06/04	NS	70.6	0.2	9.6	3.3
07/06/04	NS	65.1	0.0	4.6	2.0
13/06/04	NS	51.7	0.0	7.5	3.2
22/06/04	9.0	51.4	0.0	6.7	4.1
01/07/04	NS	84.9	0.0	5.9	2.0
04/07/04	30.6	78.8	0.4	4.7	2.1
10/07/04	28.2	56.5	0.0	4.3	2.7
13/07/04	NS	50.3	0.4	5.2	2.2
16/07/04	29.4	56.3	2.0	7.4	1.2
25/07/04	NS	51.4	0.0	4..9	2.7
06/08/04	NS	55.2	16.8	11.0	2.9
24/08/04	NS	62.6	0.0	3.6	2.0
30/08/04	NS	56.1	0.0	4.0	2.6

NS – no sample, due to 1 day in 6 regime at this site

Ambient PM_{10} concentrations were exceeded on days that typically had cool nights (0.4 – 6 °C) (refer Appendix A), and low wind speeds (average less than 5 m/s). This is expected where domestic heating is the major source of particulate – cool nights encourage heating use, and low wind speeds reduce dispersion.

8 COMPARISON OF PARTICULATE AND VISIBILITY DATA, 2004

In 2004, there were a total of 28 days when the NES standard was breached, or when the MfE "alert" category was reached (Table 8). Visibility was monitored from the Elisha Drive and MDC office sites on some of these days. Days which had high particulate and visibility are presented in Table 9.

Table 9: Comparison of PM_{10} to Atmospheric Visibility

Date	Middle Renwick Rd, Blenheim $PM_{10}(\mu g/m^3)$	Brooklyn Dr, Redwoodtown PM_{10} ($\mu g/m^3$)	Haze	Inversion	General Visibility Rating
26/05/04	NS	49.0	N	Y	average
04/06/04	9.3	35.0	N	N	Below average
16/06/04	4.7	38.1	N	N	average
25/06/04	NS	38.6	N	Y	average
28/06/04	3.1	49.8	N	N	Above average
07/07/04	NS	49.2	N	Y	average
19/07/04	NS	42.4	N	Y	poor
09/08/04	15.5	38.4	N	Y	Below average
30/08/04	NS	56.1	N	Y	Above average

NS No Sample collected

In 2004, there was little haze recorded. High particulate days often co-incided with inversion conditions. The weather conditions during high particulate events are indicative of calm, clear weather, with poor potential to disperse contaminants. These conditions can be expected to occur on several occasions every winter, and a corresponding high particulate concentration can likewise be expected every winter.

9 SUMMARY

9.1 Visibility

Visibility was monitored at three sites in the area for most of 2004 and at one site for six months. The method of monitoring used was that developed by ESR in 1999, which is consistent with the MfE GPG "Good practice guide for monitoring and management of visibility in New Zealand" (MfE 2001).

Smoke was the most prominent observation from Elisha Drive, MDC Office Roof, and Picton sites with smoke observed from the Elisha Drive site on 96 % of days monitored. Haze was observed from Woodbourne and Elisha Drive sites with haze being the most prominent observation (42.3 %) at the Woodbourne site. Dust observations were less than 5 % at all sites monitored.

9.2 Inhalable Particulate

Inhalable particulate (PM_{10}) was monitored using a HiVol sampler. The method is the MfE's reference method. Watercare Services Ltd holds IANZ accreditation for HiVol PM_{10} sampling and analysis.

PM_{10} is monitored at a permanent site at 106 Middle Renwick Road, Blenheim. In addition to the permanent site, MDC monitors at investigative sites and suspected "hot spots" every winter. In 2004, PM_{10} was also monitored through the winter at Brooklyn Drive, Redwoodtown. Sampling recommenced at the Redwoodtown Bowling Club in October 2004.

In 2004, there were fourteen exceedances at the Brooklyn Drive, Redwoodtown site. There were no exceedances at Middle Renwick Road, Blenheim.

The increase in exceedances indicates ambient air quality has not improved in Blenheim. Exceedances typically occur in winter, on cool nights with low wind speed. These meteorological conditions occur every winter, suggesting that with the current rates of particulate discharge, exceedances will continue to occur every winter.

APPENDIX A

PM_{10} Exceedance – Meteorological Data

Appendix A contains 29 pages including cover