File No: 47 01 01
Document No: 2784911
Enquiries to: Jonathan Caldwell

31 July 2013

Hon Amy Adams
Minister for the Environment
Freepost 18 888
Parliament Buildings
Wellington 6160

Dear Minister

Application under National Environmental Standards for Air Quality - Exceptional Circumstances

Waikato Regional Council (WRC) is applying for exceptional circumstances under the National Environmental Standards (NES) for Air Quality to exclude eight consecutive PM_{10} exceedances recorded between 12 May and 6 June 2013 in the Hamilton airshed. Our technical investigation showed that these exceedances were due to dust produced by road works near one of council's two air quality monitoring stations. The other monitoring site did not show any exceedances during the period of road works meaning the recorded exceedances were localised and transient.

The road works were required to complete better access to the Hamilton city Ring Road, which will be a key strategic transport corridor for Hamilton city and an important component of the Access Hamilton Strategy. The Ring Road will enable the distribution of trips and the management of travel and congestion around the city which will improve economic growth and productivity through more efficient movement of people and freight. The Ring Road will perform a traffic distribution function around the city in a manner that is complementary to both the existing and planned state highway and Waikato Expressway corridors. The works are now completed and the PM_{10} levels at this site are back to routine compliant levels. The effects of the roadworks on PM_{10} were only confirmed after the roadworks were nearly completed and methods to prevent or minimise the effects were therefore not able to be instigated.

The above exceedances meant that Hamilton is now classified as a polluted airshed, which is not representative of the air quality trend observed by WRC for this airshed. WRC's view is that the financial implication of such classification is disproportionate to the impact of such a localised and temporary event. Before these records, Hamilton was not a polluted airshed and industrial offsets, pursuant to Regulation 17 of the NES had not been triggered.

The 2011 amendment of the NES for Air Quality inserted a new regulation (16A) to explicitly provide for exceedances of the ambient air quality standards under exceptional circumstances. Exceptional circumstances are not defined in the regulations and may be considered on a case-by-case basis by the Minister for the Environment upon written application by WRC.

The completed application form and supporting technical information are attached including a supporting letter from Hamilton City Council. If further technical information is required regarding this application, please contact Jonathan Caldwell, Environmental Chemist in the Resource Information Group at Waikato Regional Council.

Thank you for your consideration in this matter.

Yours sincerely

Clare Crickett
Acting Chief Executive

Ministry for the Environment
Manatu Mo Te Taiao

OFFICE USE ONLY
Application no:
Date received:
Date accepted:

Resource Management (National Environmental Standards for Air Quality) Regulations 2004 – Regulation 16A Exceptional Circumstances

APPLICATION FORM

Before completing this form please read section 3.8 of the 2011 User's Guide to the revised National Environmental Standards for Air Quality.

Need more help? If you have any questions email air@mfe.govt.nz.

Please send your completed application form and all attachments to air@mfe.govt.nz.

Alternatively, if attachments are too large to email, please post hard copies of the application form and all attachments, along with a CD containing all files, to:

Air Quality NES Exceptional Circumstances
Ministry for the Environment
PO Box 10362
Wellington 6143

1. Applicant details	
Name of regional council	Waikato Regional Council
Contact person	Dr Jonathan Caldwell
Position	Environmental Chemist, Water, Air & Waste programme, Resource Information Group
Email address	Jonathan.Caldwell@waikatoregion.govt.nz
Telephone number	07 859 0502
Mobile number	021 703 137
Postal address	Waikato Regional Council 401 Grey Street, Hamilton East Private Bag 3038 Waikato Mail Centre Hamilton 3240
2. Details of exceedance event	
Contaminant	PM_{10} (24-hour average)
Date of exceedance *(must not be >3 months from date this application is received)*	12/05/13 13/05/13 15/05/13 23/05/13 24/05/13 29/05/13 30/05/13 06/06/13

Relevant airshed	Hamilton Airshed			
Monitoring station and technical specifications of monitor	Peachgrove Road monitoring station Tapered Elemental Oscillating Microbalance (TEOM) with a sample temperature setting of 40°C. Make – Rupprecht & Patashnick Model - 1400a			
Summary of monitoring reading showing exceedance event	Refer to attached documentation			
Analysis of baseline data	Refer to attached documentation			
Source speciation or other analysis	Refer to attached documentation			
Explanation of any previous exceedance event/s from this monitoring station in the past 5 years	Refer to attached documentation			
Monitoring readings covering exceedance event	√ Attached	☐ Not attached		
3. Details of exceptional circumstances				
Exceptional circumstances leading to exceedance	√ Localised impact on a monitor	√ Anthropogenic extreme event	☐ Natural disaster or natural extreme event	☐ Other
Explanation of circumstances leading to exceedance event	Refer to attached documentation			
Reasons why these circumstances were beyond the reasonable control of the regional council	The roadworks were undertaken by Hamilton City Council's contractors. The discharge of dust from roadworks is a permitted activity subject to adherence to general rule 6.1.8 of the Waikato Regional Plan, namely: a. There shall be no discharge of contaminants beyond the boundary of the subject property that has adverse effects on human health, or the health of flora and fauna. c. There shall be no discharge of particulate matter that is objectionable to the extent that it causes an adverse effect at or beyond the boundary of the subject property. No complaints were received regarding dust discharges and therefore there was no indication that objectionable effects were occurring. By the time sufficient evidence had been collected by Waikato Regional Council that roadworks related dust was the main cause of the PM_{10} exceedances, the roadworks had been completed.			
Supporting evidence *(eg, meterological report)*	√ Attached	☐ Not attached		

29/07/13

Dated

Signed

Waikato Regional Council
July 2013

Supporting information for exceptional circumstances application under the National Environmental Standards for Air Quality

Waikato Regional Council monitors air quality in 20 urban airsheds across the Waikato region to meet its statutory function under the National Environmental Standards (NES) for Air Quality. The main air contaminant of concern for this region is PM_{10}, with the main source, during the winter months, being solid fuel burning for domestic home heating.

The Waikato Regional Council is applying for exceptional circumstances under the NES for Air Quality to exclude eight consecutive PM_{10} exceedances recorded between the 12th of May and 6th of June 2013 in Hamilton airshed. Our technical investigation showed that these exceedances were due to transient dust produced by road works nearby Council's air quality monitoring station

A detailed technical rationale in support of this application is provided below.

1 Air quality monitoring in Hamilton

Figure 1. Hamilton airshed with location of the two air quality monitoring stations. Peachgrove Rd (Monitoring Station 1) and Ohaupo Rd (Monitoring Station 2).

Waikato Regional Council operates two PM_{10} monitoring stations in Hamilton (refer to Figure 1), which are as follows:

- **Peachgrove Road** located on the south-east side of Hamilton City and monitored since 1998 using a Rupprecht & Patashnick TEOM 1400a. The site meets the requirements of the "Residential Peak" site classification as described in the '*Good Practice Guideline for Air Quality Monitoring and Data Management 2009*' report (MfE, 2009). In addition, measurement of $PM_{2.5}$ using a Thermo FH62 BAM began at this site from 16 May 2013.

- **Waikato Hospital** located on the corner of Ohaupo Road and Lorne Street and monitored since April 2012 using a Thermo FH62 BAM.

2 Recent exceedances in Hamilton that are the subject of this application

The national environmental standard (NES) for PM_{10} is 50 $\mu g/m^3$ as a 24-hour average with one allowable exceedance per 12 month period.

Eight exceedances of the PM_{10} standard (24-hour average) occurred in Hamilton at the Peachgrove Road monitoring station over the period mid May to early June 2013 (refer to Table 1). These exceedances coincided with significant upgrading of the Peachgrove Road, Te Aroha Street and Ruakura Road intersection necessary to complete better access to the Hamilton city Ring Road. The station is approximately 80 metres north east north of this intersection.

Table 1. Exceedances recorded at Peachgrove Rd monitoring station in 2013.

Date	Concentration ($\mu g/m^3$)
12/05/13	60
13/05/13	57
15/05/13	69
23/05/13	127
24/05/13	73
29/05/13	135
30/05/13	95
06/06/13	75

3 Change in airshed status as a result of these recent exceedances

Since the NES 2011 amendments, an airshed is classified as a polluted airshed if that airshed has average exceedances of more than one per 12 month period, for the immediately prior five year period. Based on the previous five year period from 2008 to 2012 Hamilton had an average of 0.8 exceedances and therefore was not classified as a polluted airshed. For the first time since the 2011 amendment, Hamilton has now been classified as polluted because the eight exceedances for 2013 takes the average to 2.4 exceedances for the previous five year period from 7 June 2008 to 6 June 2013. To get reclassified as non-polluted, Hamilton will need to have no more than 1 exceedance per 12 months for a period of 5 years. So the polluted status will stay for at least a further five years and industry offsets pursuant to Regulation 17 of the NES will apply.

4 Summary assessment against five criteria for assessing exceptional circumstances

According to the 2011 Users Guide to the Revised National Environmental Standards for Air Quality, exceptional circumstances (exceptional events) are not defined in the Regulations and will be decided by the Minister for the Environment on a case by case basis. Below are Waikato Regional Council's summary responses to the five criteria that are used to assist the Minister when making a decision.

1. <u>The event affected air quality **and**</u>

Waikato Regional Council provides substantial evidence in this report that shows that a roadworks event affected regional council's PM_{10} monitoring data collected at the Peachgrove Rd monitoring station.

2. <u>The event was not reasonably controllable or preventable and was beyond the control of the regional council **and**</u>

The roadworks were undertaken by Hamilton City Council's contractors. The discharge of dust from roadworks is a permitted activity subject to adherence to general rule 6.1.8 of the Waikato Regional Plan, namely:

a. There shall be no discharge of contaminants beyond the boundary of the subject property that has adverse effects on human health, or the health of flora and fauna.
c. There shall be no discharge of particulate matter that is objectionable to the extent that it causes an adverse effect at or beyond the boundary of the subject property.

No complaints were received regarding dust discharges from the roadworks and therefore there was no indication that objectionable effects were occurring. The effects of the roadworks on PM_{10} monitoring data were only confirmed after the roadworks were nearly completed and methods to prevent or minimise the effects were therefore not able to be instigated.

The Road works carried out by Downer EDI complied with the approved Construction Management Plan and designation conditions that specify what treatment is required. This represents best practice. Dust control measures were applied when deemed necessary (refer to Hamilton City Council email correspondence in section 6).

The impact of this event was not foreseeable. While it is foreseeable to expect dust from roadworks, the actual impact of the dust on PM_{10} monitoring data was not. Exceedances caused by dust generated from roadworks/resuspension of road dust as vehicles move through the roadworks area was not something that the Waikato Regional Council was anticipating.

3. <u>There exists a clear causal relationship between the specific event and the monitored concentration **and**</u>

Currently, Waikato Regional Council monitors PM_{10} using TEOM and BAM instruments. Waikato Regional Council's monitoring strategy is to mainly use automated sampling instruments such as BAMs or TEOMs as they are more cost effective than gravimetric instruments such as Sequential Partisols. By doing this, the Council has the ability to monitor more locations around the region rather than monitor more comprehensively in just a few locations using more expensive techniques. Waikato Regional Council acknowledges that the use of a gravimetric instrument, such as a Sequential Partisol, would have provided the ability to undertake particulate speciation and that this would have provided more conclusive evidence of the source of the particulate that caused the exceedances. Despite this, Waikato Regional Council considers that this report provides sufficient evidence of a causal relationship between the roadworks event and the monitored particulate concentration. For example:

- Comparison of the number, magnitude and time of year of the exceedances with previous monitoring records and a comparison with data collected at a secondary

monitoring station provides clear evidence of an unprecedented, localised transient event or source.

- Comparison of the hourly profiles is not typical of domestic wood burning sources.
- An assessment of the wind direction indicates that the roadworks were generally upwind of the monitoring site and therefore the most likely source.
- The timing of the roadworks (specific stages) generally aligned with the timing of the exceedances.
- Statistical analysis of the monitoring record provides no evidence of a worsening trend in air quality i.e. the recent exceedances are not indicative of the actual air quality status of the airshed.
- The $PM_{2.5}$ to PM_{10} ratio on the days exceedances occurred provides evidence of a prevailing dust source rather than a combustion source.
- Visual observations at the time did not identify smoky fires.

4. <u>The event was caused by human activity that is unlikely to recur at a particular location, or was a natural event</u> **<u>and</u>**

These exceedances coincided with significant upgrading of the Peachgrove Road, Te Aroha Street and Ruakura Road intersection necessary to complete better access to the Hamilton city Ring Road. This type of roadworks has not occurred at this intersection over the 15 year monitoring period and it is not likely that this intersection will require further significant upgrading in the medium term.

5. <u>There would have been no exceedance or violation but for the event</u>

The evidence provided in this report clearly indicates that there would have been no exceedances in Hamilton over this period if it had not been for the roadworks. The eight exceedances occurred over a short period (less than four weeks) in late May and early June which coincided with the timing of the roadworks. Seven of these exceedances occurred in May. The previous 15 year monitoring record has only ever recorded one exceedance having occurred in the month of May. There have been no further exceedances over the 2013 winter period since the roadworks were completed.

<u>Conclusion</u>

The purpose of the Resource Management Act 1991 (Section 5) is to promote the sustainable management of natural and physical resources. It is not expected that the exceedances caused by this short term event would have had any adverse effects on human health in the airshed. International evidence provides a much clearer link between effects on human health and the annual average $PM_{2.5}$ concentrations compared with PM_{10} annual or daily averages. Having a daily or annual average standard for monitoring $PM_{2.5}$ instead of PM_{10} would be one way of avoiding sources such as roadworks impacting on air quality monitoring data and compliance with the NES Regulations.

This recent short term event does not impact on Waikato Regional Council's ability to promote the sustainable management of natural and physical resources in the Hamilton Airshed. However, should the exceedances <u>not</u> be found to meet the Minister's criteria for acceptance as exceptional circumstances then Hamilton Airshed will be classified as a polluted airshed and industry offsets will apply. This would impact on Waikato Regional Council's and Hamilton City Council's ability to provide for the economic well being of the community.

5 Detailed evidence for exceptional circumstances

5.1 Inter-yearly comparison of exceedances and maximum concentrations

The occurrence of an exceptional event causing the eight exceedances is supported by the unusual high number of exceedances and maximum daily concentrations in 2013 and the time of year that these exceedances occurred compared with previous years and the fact that the Ohaupo Rd site monitoring did not record exceedances as shown in Figure 2.

There were no exceedances of 50 µg m^{-3} (24-hour average) measured in Hamilton during 2012 and the daily concentration profile measured at both stations was similar until May of 2013 where a clear difference is evident as a result of the eight exceedances recorded at Peachgrove Rd over a three week period. This is demonstrated in Figure 2 which shows the 24-hourly PM_{10} concentrations measured at Hamilton from 1 January 2012 to 4 August 2013 at the Peachgrove Rd and Ohaupo Rd monitoring stations.

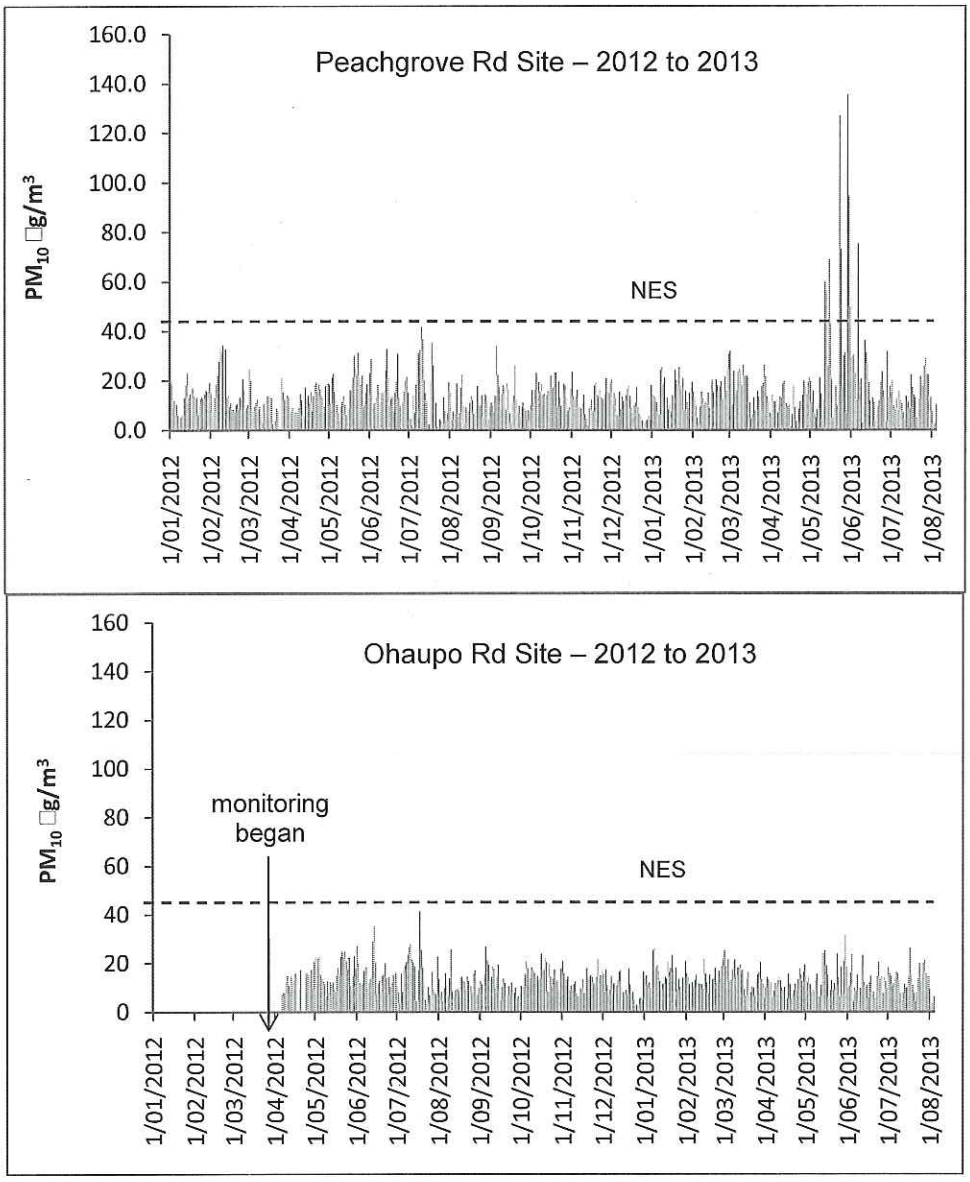

Figure 2. 24-hour average PM_{10} concentrations measured at Peachgrove Rd and Ohaupo Rd sites over the period 2012 to 2013.

Over the previous five year period (2008 to 2012), Hamilton has had a total of four exceedances. Three exceedances occurred in 2009 (one caused by the Australian dust storm in September) and one exceedance occurred in 2011. These exceedances (excepting the Australian dust storm event) were attributed to domestic home heating emissions. A comparison of daily averages measured at Peachgrove Rd monitoring station over the period 2008 to 2013 (refer to Figure 3) also provides further confirmation that the number and magnitude of the exceedances in 2013 is unusual.

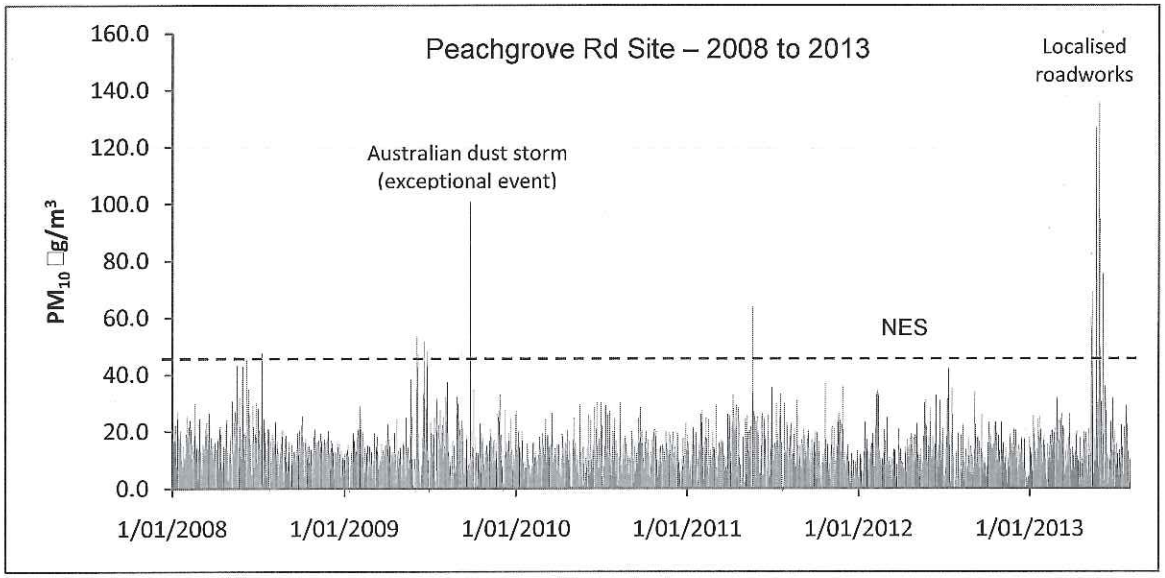

Figure 3. 24-hour average PM_{10} concentrations measured at Peachgrove Rd over the period 2008 to 2013.

An inter-yearly comparison of the number of exceedances measured at Peachgrove Rd station since records began in 1998 is presented in Figure 4. For most years there has either been one or no exceedances and prior to 2013, the highest number of exceedances recorded in a calendar year was three compared with the eight exceedances recorded so far in 2013. Seven of the eight exceedances that have been recorded in 2013 have occurred in May. There has only been one year (other than 2013) where an exceedance occurred in May (one exceedance in 2011 occurred in May). For all other years, exceedances have occurred in either June or July except for the Australian dust storm exceedance that occurred in September 2009.

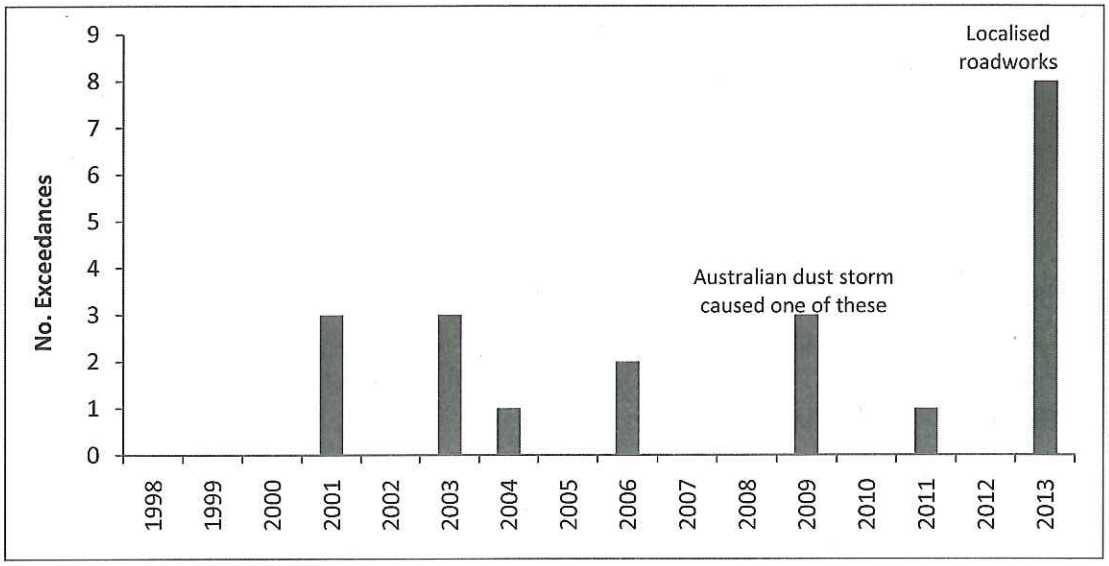

Figure 4. Inter-yearly comparison of the number of exceedances.

Figure 5 shows the maximum and 99.7 percentile 24-hour averages for PM_{10} over the full monitoring record at Peachgrove Rd station. Apart from a maximum reading of around 100 µg m^{-3} (24-hour average) in 2009 as a result of the Australian dust storm, maximum concentrations have been below 80 µg m^{-3} prior to 2013. A maximum concentration of 135 µg m^{-3} in 2013 is further indication of an exceptional or unusual event occurring.

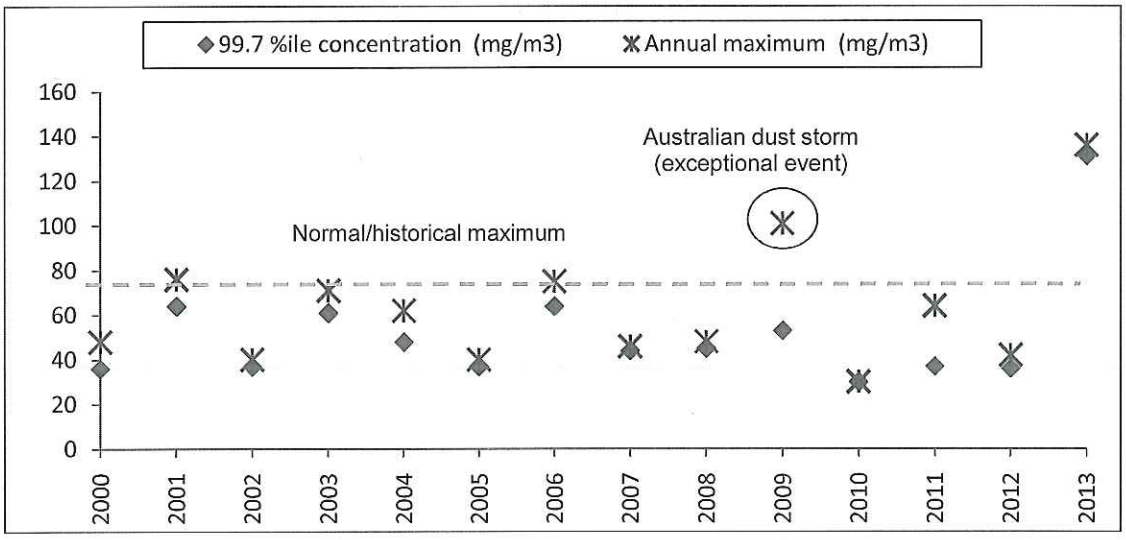

Figure 5. Inter-yearly comparison of maximum and 99.7 percentile PM_{10} concentrations measured at Peachgrove Rd.

5.2 Comparison of monthly averages

The occurrence of an exceptional event causing the eight exceedances is also demonstrated by the large increase in the monthly PM_{10} average for May 2013 compared with previous winter time monthly averages.

While some variation in daily averages may be expected from month to month and year to year, it is unusual to see a large change in the monthly average within a season as monthly averages will tend to smooth out daily variations.

The monthly averaged data for Peachgrove Road and Ohaupo Road monitoring stations were very similar until May 2013 when the monthly average spikes at 33 µg m^{-3} at the Peachgrove Rd site (refer to Figure 6).

Variations in monthly PM_{10} averages for May, June and July over the period 2006[1] to 2013 at the Peachgrove Rd station is provided in Figure 7. The comparison demonstrates that the May 2013 average has been unusual compared to previous May averages and also compared with June and July averages.

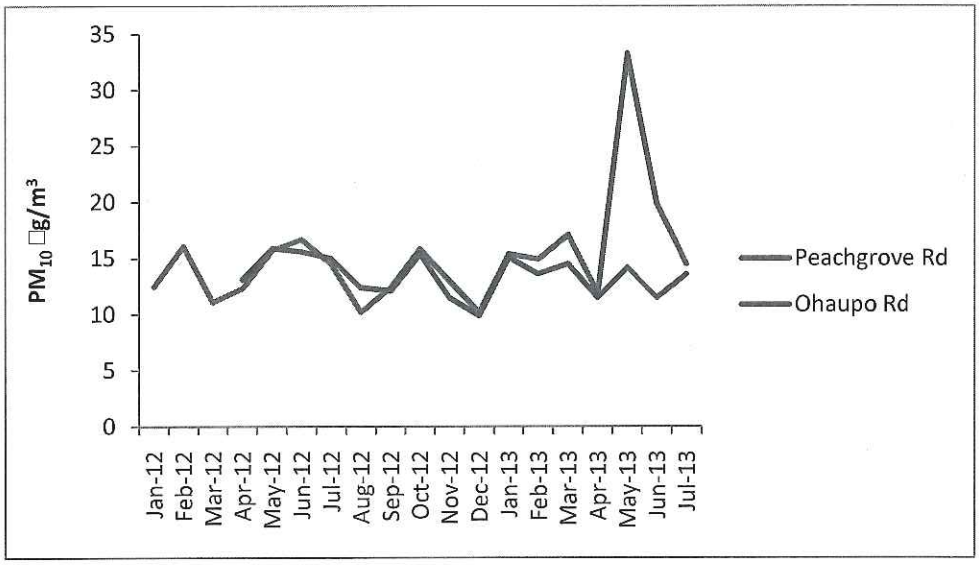

Figure 6. Comparison of monthly PM_{10} concentrations measured at Peachgrove Road and Ohaupo Road in Hamilton in 2012 and 2013.

[1] Incomplete datasets for the wintertime periods prior to 2006 means that monthly averages could not be accurately calculated for the period prior to 2006.

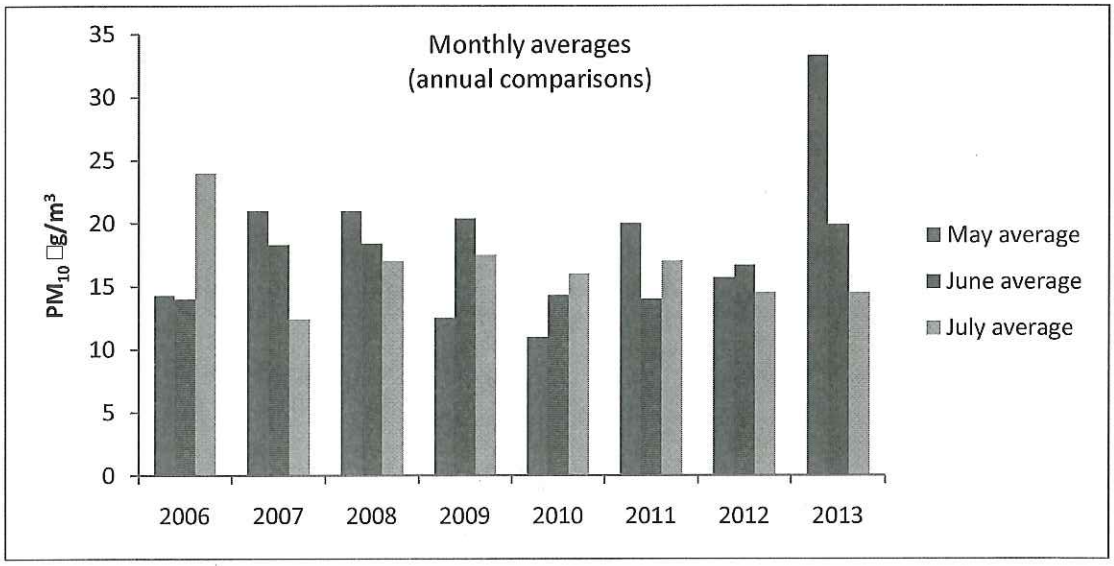

Figure 7. Inter-yearly comparison of monthly PM_{10} averages for May, June and July measured at Peachgrove Rd.

5.3 Hourly profile analysis

The occurrence of an exceptional event causing the eight exceedances is supported by the hourly profiles for exceedances in 2013, which are not consistent with typical hourly profiles normally observed for high pollution days where domestic home heating emissions are the main source. This indicates that an atypical source was responsible for these exceedances.

Hourly PM_{10} concentration profiles for the eight days where an NES exceedance of the 24-hour average occurred in 2013, are presented in Figure 8. The main peak tended to occur between 5 pm to 11 pm but there have been some days where there has been a secondary peak in the morning between 7 am to 9 am.

An averaged profile (refer to Figure 9) of these eight separate hourly profiles provides a better indication of the timing of the peaks. A comparison of this averaged hourly profile with an averaged hourly profile for the eight highest PM_{10} days in 2012 (refer to Figure 10) indicates that the 2013 profile is different from the profile typically observed in situations where woodburner emissions dominate the emission sources. The profile presented in Figure 10 is more typical of woodburner emissions and shows a broad peak that is centred around 11 pm to midnight which gradually reduces down over the early hours of the morning. In comparison, the profile in Figure 9 shows a peak at around 7 to 9 pm with a more dramatic reduction well before midnight and a very low and level concentration from midnight through to 6 am. This provides further evidence that the main source driving these exceedances observed in 2013 is unusual for the Hamilton airshed.

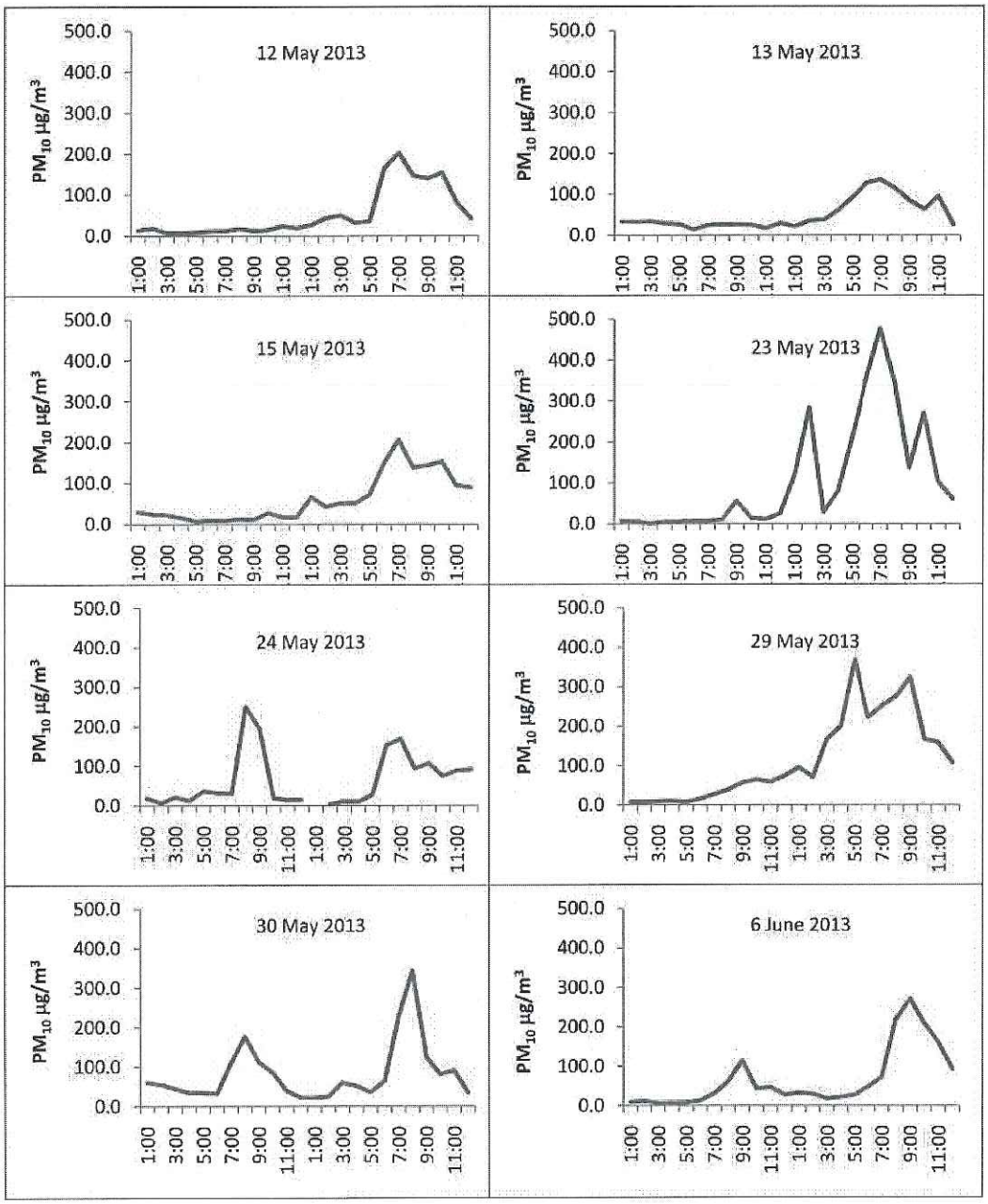

Figure 8. Hourly PM_{10} concentration profiles for days when exceedances occurred.

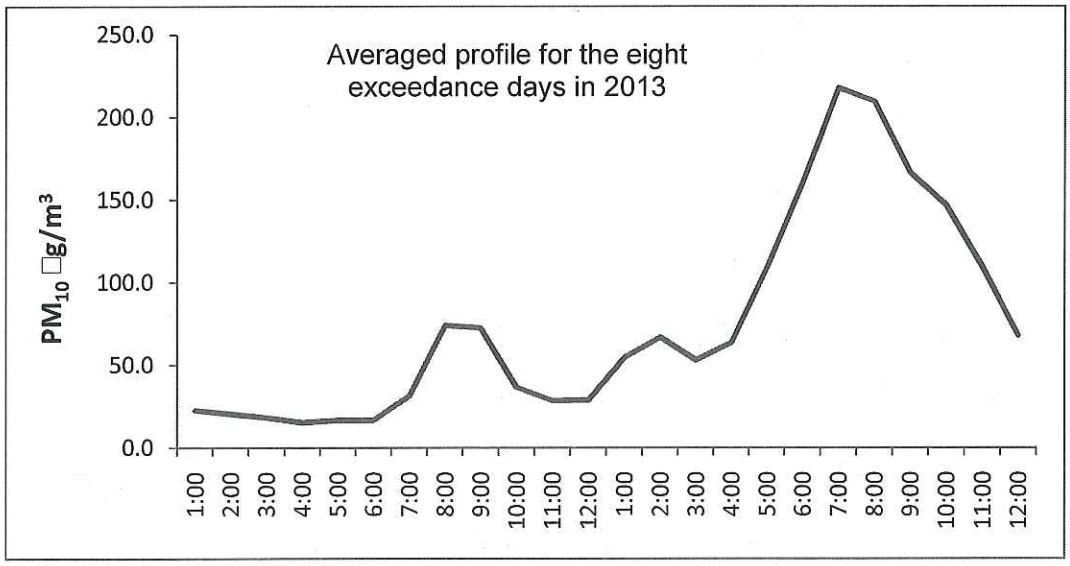

Figure 9. Averaged hourly PM_{10} concentration profile for the eight exceedance days in 2013.

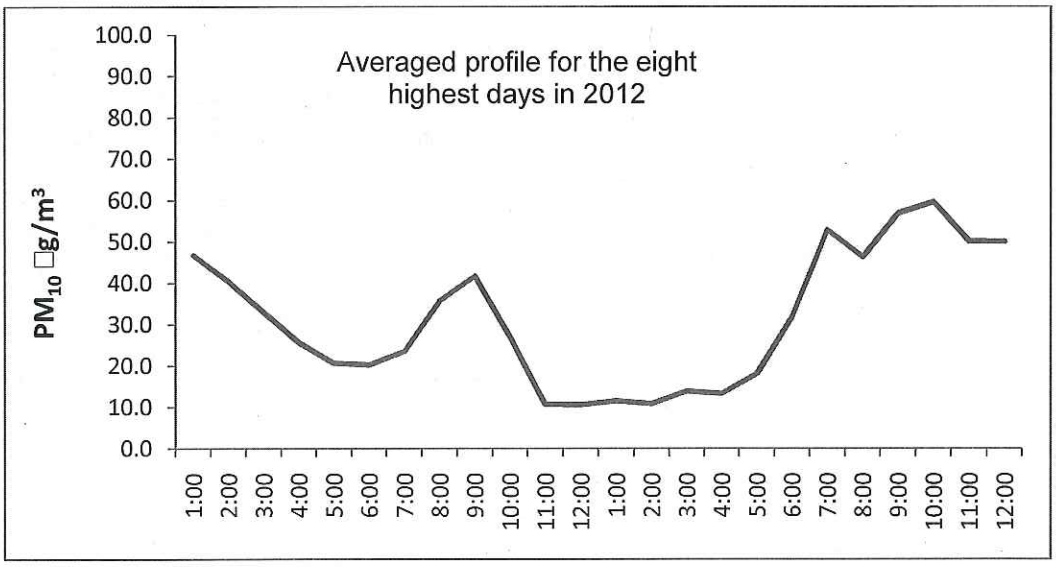

Figure 10. Averaged hourly PM_{10} concentration profile for the eight highest days in 2012.

5.4 Wind direction

The exceptional contribution of dust produced by roadworks to the eight exceedances is supported by matching up the timing of peak PM_{10} concentrations with wind travelling from the direction of the roadworks (a potential source of PM_{10}).

The location of the Peachgrove Rd monitoring station relative to the roadworks that have been occurring on Ruakura Rd and Peachgrove Rd over May and June 2013 is shown in Figure 11. Wind travelling from 135 to 260 degrees (i.e. south-east to west) is the direction most likely to transport dust from the roadworks activities on Ruakura Rd and Peachgrove Rd to the monitoring station. An analysis of wind direction at the times when peak hourly PM_{10} concentrations have occurred on the eight days when there were exceedances indicate that the peaks coincided with wind directions from this quadrant (refer to Table 2). A

windrose (refer to Figure 12) for the period 10 May 2013 to 8 June 2013 indicates that the predominant wind direction over this period was also from the south-east and south-east-south directions which supports the evidence that the roadworks were contributing to elevated PM_{10} concentrations over this period.

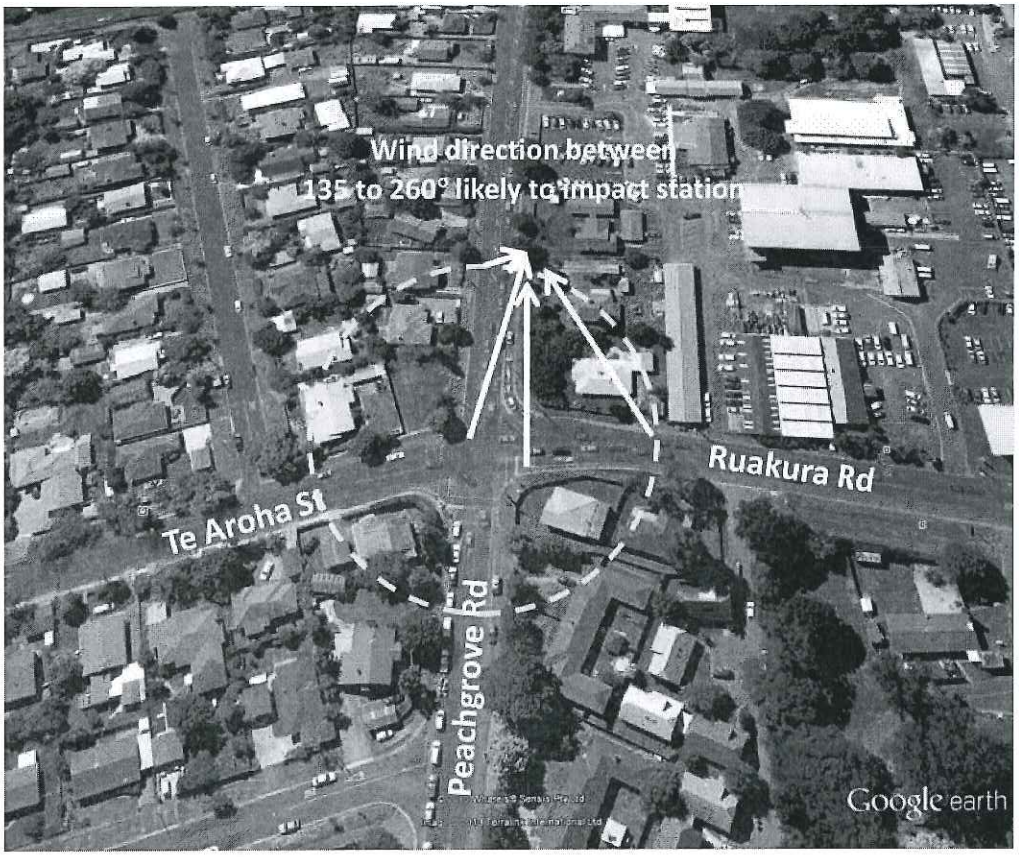

Figure 11. Location of Peachgrove Rd monitoring station (red cross) in relation to the roadworks occurring on Ruakura Rd and Peachgrove Rd intersection (yellow dotted circle defines approximate extent).

Table 2. Hourly wind directions at peak PM_{10} times.

Date	Peak time	Hourly wind direction at peak time (degrees)
12/05/13	7 pm	232
13/05/13	7 pm	316*
15/05/13	7 pm	273
23/05/13	1 pm	255
	7 pm	270
	10 pm	262
24/05/13	8 am	230
	7 pm	142
29/05/13	5 pm	234
	9 pm	132
30/05/13	8 am	257
	8 pm	140
06/06/13	9 am	182
	9 pm	194

*Varied between 129 to 316 over broader peak period of 5 pm to 9 pm

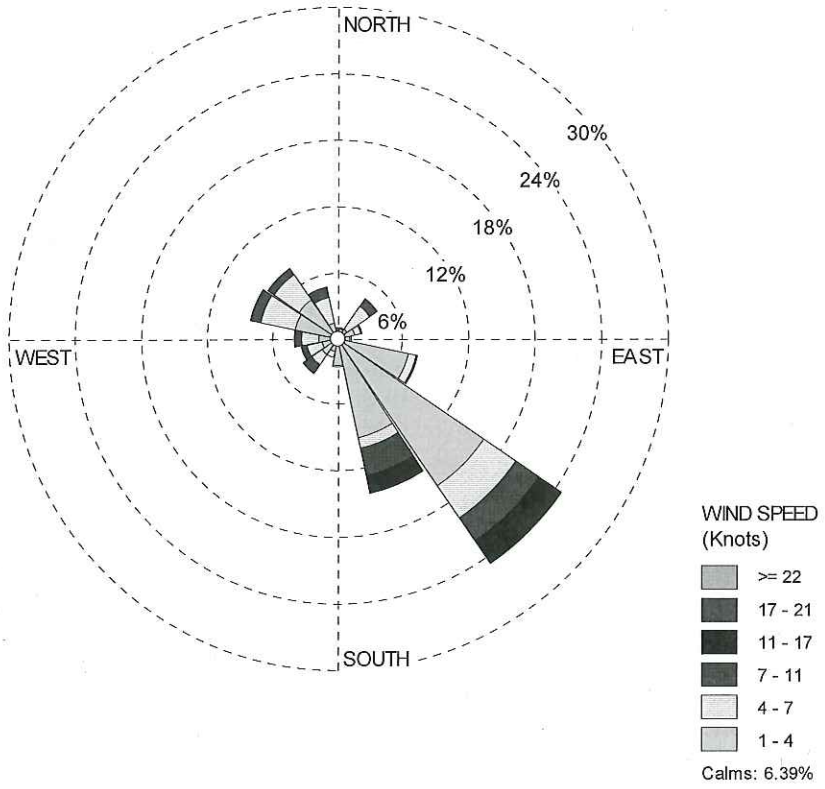

Figure 12. Windrose for 10 May 2013 to 8 June 2013 indicating predominant wind direction from south east and south east south.

5.5 Trend analysis of PM_{10} and meteorological data

Long-term statistical trend analysis provides no evidence for a worsening trend in PM_{10} levels in Hamilton airshed. The sudden increase in the number of PM_{10} exceedances in 2013 is therefore consistent with the occurrence of an exceptional event rather than the result of any worsening trend in air quality.

Over time, air quality may improve, get worse, or remain the same. Peak levels of PM_{10} in any given airshed vary from winter to winter depending on meteorological conditions and human responses. For example, higher PM_{10} and more exceedances might be expected during a colder winter if more wood is burned. Over the short term this inter-annual variability will mask any genuine underlying trend toward better or worse air quality. A reasonably long monitoring record is needed to confirm or exclude the possibility of any underlying trend.

Seasonal Mann Kendall test for monotonic trends is the preferred approach for detecting underlying trends in variable environmental time-series data sets, and may suggest presence of an underlying trend which is not evident from visual inspection of the PM_{10} record or summary statistics. This method generates probability (p) values that are used to assess the likelihood that the apparent relationship is genuine, or comes about fortuitously as a result of a random alignment of variables. The conventional threshold for deciding whether a relationship is likely to be genuine is at a probability value of $p<0.05$ or lower, which corresponds to a 95% confidence level and greater. A negative MK-Stat indicates a decreasing trend.

Seasonal Mann Kendall tests of the Peachgrove Rd PM_{10} data produced p-values greater than 0.05 and therefore the tests provide no evidence that PM_{10} concentrations in Hamilton have been getting either better or worse over the winter seasons for the period 2006 to 2012 or for the period 2006 to 2013.

5.6 $PM_{2.5}$ to PM_{10} ratios

The $PM_{2.5}$ to PM_{10} ratios demonstrate that the eight exceedances were due to dust produced by roadworks located nearby Council's air quality monitoring station. In particular:

- Low concentrations of $PM_{2.5}$ on days when PM_{10} exceedances occurred indicate that emissions from solid fuel home fires were a minor source and that dust arising from activities such as roadworks was a more major contributing source.
- Matching up the timing of specific roadwork stages with the timing of PM_{10} exceedances provides additional evidence that the roadworks contributed to the exceedances.

PM_{10} refers to particulate matter that ranges in size from 10 microns in diameter down to sub-micron sized particles (refer to Figure 13). Sources of PM_{10} will include combustion sources such as vehicle emissions, domestic woodburner emissions, industrial boiler emissions, sea salt, geological dust and pollen. $PM_{2.5}$ refers to particulate matter that ranges in size from 2.5 microns in diameter down to sub-micron sized particles. Sources of $PM_{2.5}$ are mainly combustion related. Dust from roadworks (geological origin) will be expected to contain a broad range of coarse particle sizes ranging typically from around 100 microns down to around 2.5 microns. Co-located monitoring of PM_{10} to $PM_{2.5}$ provides information regarding how much particulate is within the 2.5 or less micron range and how much is in the coarser range of 2.5 to 10 microns. This helps in determining the likely sources of particulate.

Comparisons of $PM_{2.5}$ to PM_{10} concentrations measured in Auckland[2] indicates that PM_{10} from combustion related sources such as vehicles and woodburners consists mainly of the fine particulate fraction (2.5 microns in diameter or less) at approximately 60 to 100% of PM_{10} whereas geological dust/soil was comprised of only about 7% $PM_{2.5}$.

To understand the contribution of road works to the recent exceedances, Waikato Regional Council started monitoring $PM_{2.5}$ at Peachgrove Road monitoring station from 16 May 2013 (soon after PM_{10} exceedances began). On the days there were PM_{10} exceedances there was a comparatively low proportion of $PM_{2.5}$ (refer to Figure 14).

[2] Wilton et al., Source identification and apportionment of PM_{10} and $PM_{2.5}$ in Hastings and Auckland – Niwa Client Report CHC2007-137, November 2007.

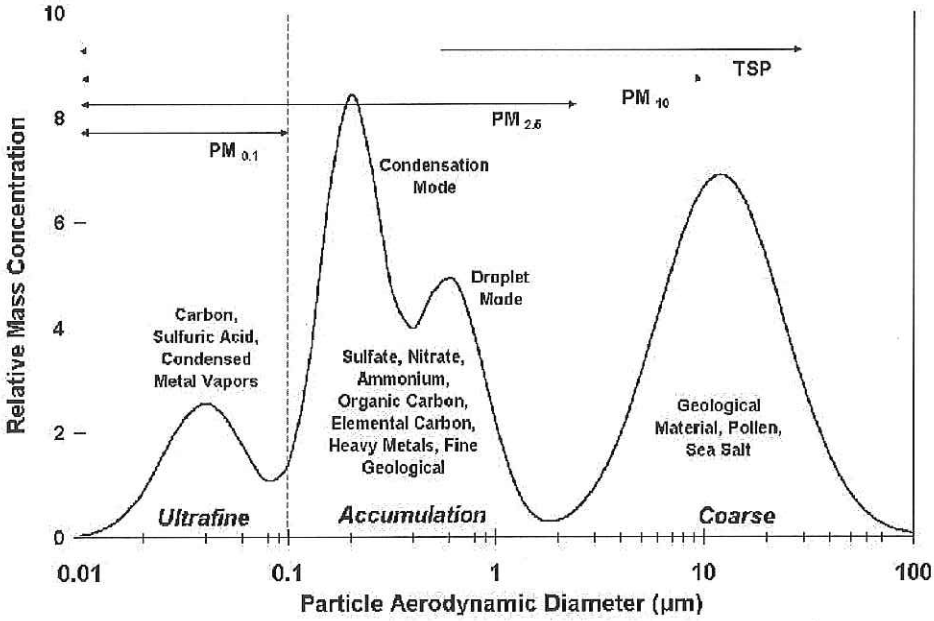

Figure 13. Comparison of particulate size ranges and sources[3].

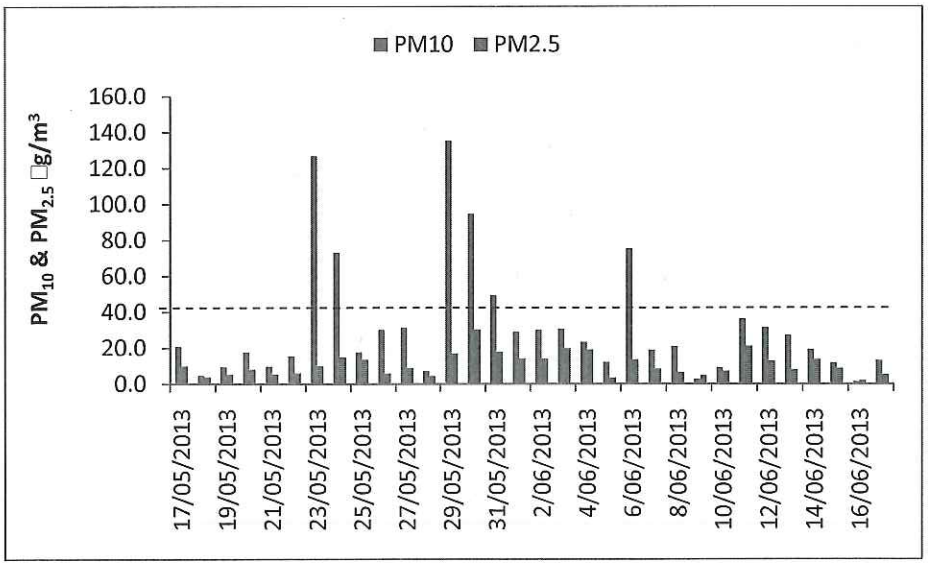

Figure 14. Comparison of $PM_{2.5}$ to PM_{10} concentrations over period when PM_{10} exceedances occurred.

Average proportion of $PM_{2.5}$ to PM_{10} on exceedance days = 18%
Average proportion of $PM_{2.5}$ to PM_{10} on non-exceedance days = 59%

While the evidence is based on only five exceedances for which both $PM_{2.5}$ and PM_{10} data was available, it indicates that the coarser particulate fraction or dust is a significant contributing factor on the days when exceedances have occurred rather than combustion/ woodburner emissions. It is important to note that these results are indicative only as $PM_{2.5}$ was measured using a BAM instrument while PM_{10} was measured using a TEOM. Despite

[3] http://cpcbenvis.nic.in/

this, it is considered that the difference in ratios on the days that exceedances occurred is large enough to outweigh any differences expected to arise from instrumental variation.

Further support for dust as the main source contribution rather than combustion emissions from wood burners or even vehicle emissions during traffic congestion is provided by actual observations made. Site visits by Council staff to the Peachgrove Road and Ruakura Road intersection at around the time of night that peak concentrations were occurring (6 to 9 pm) have not identified any excessive woodsmoke from woodburners (either visually or by smell). Airborne dust has been observed around 80 metres south south east of the monitoring station as vehicles travelled along Ruakura Road (specifically on the evening of the highest exceedance – 29 May). While vehicle congestion was noted at peak rush hour, vehicle congestion was not apparent later in the evening at the times when peak emissions were occurring. It was noted that later in the evening traffic was flowing more freely through this intersection and therefore the increased speed of vehicles may have been contributing to greater levels of road dust being re-suspended in the air.

Most references suggest that the deposition of large airborne particles appears within 100 metres from the source. There are some disagreements in the minimal distance due to wind conditions, local topography, and vegetation; however the majority of the reports agree that the deposition of dust from unpaved roads - which also can be applied to road construction sites - will take place within 50 metres to 100 metres from the source[4]. The "Methodology for Estimating Fugitive Windblown and Mechanically Re-suspended Road Dust Emissions"[5] suggests that particles of more than 10 microns in size and greater will largely deposit within 50 metres of their source. Particles smaller than 10 microns are likely to remain suspended and travel a considerable distance.

The Peachgrove Rd monitoring station is located 80 metres from the intersection where roadworks were taking place. It is therefore quite possible that particles smaller than 10 microns could have been transported as far as the monitoring station while larger particle sizes where deposited closer to the intersection.

A comparison of PM_{10} exceedances in relation to timing of specific roadwork stages occurring at the Ruakura Rd and Peachgrove Rd intersection is provided in Figure 15. The timing of these roadworks stages occur either just prior to exceedances or at around the same time as exceedances.

[4] Watson, J.G. *et al.*, Effectiveness Demonstration of Fugitive Dust Control Methods for Public Unpaved Roads and Unpaved Shoulders on Paved Roads. Desert Research Institute Document No. 685-5200.1F1, December 31, 1996.

[5] Countess, R., Methodology for Estimating Fugitive Windblown and Mechanically Resuspended Road Dust Emissions Applicable for Regional Scale Air Quality Modelling. Westlake Village, CA, April 2001.

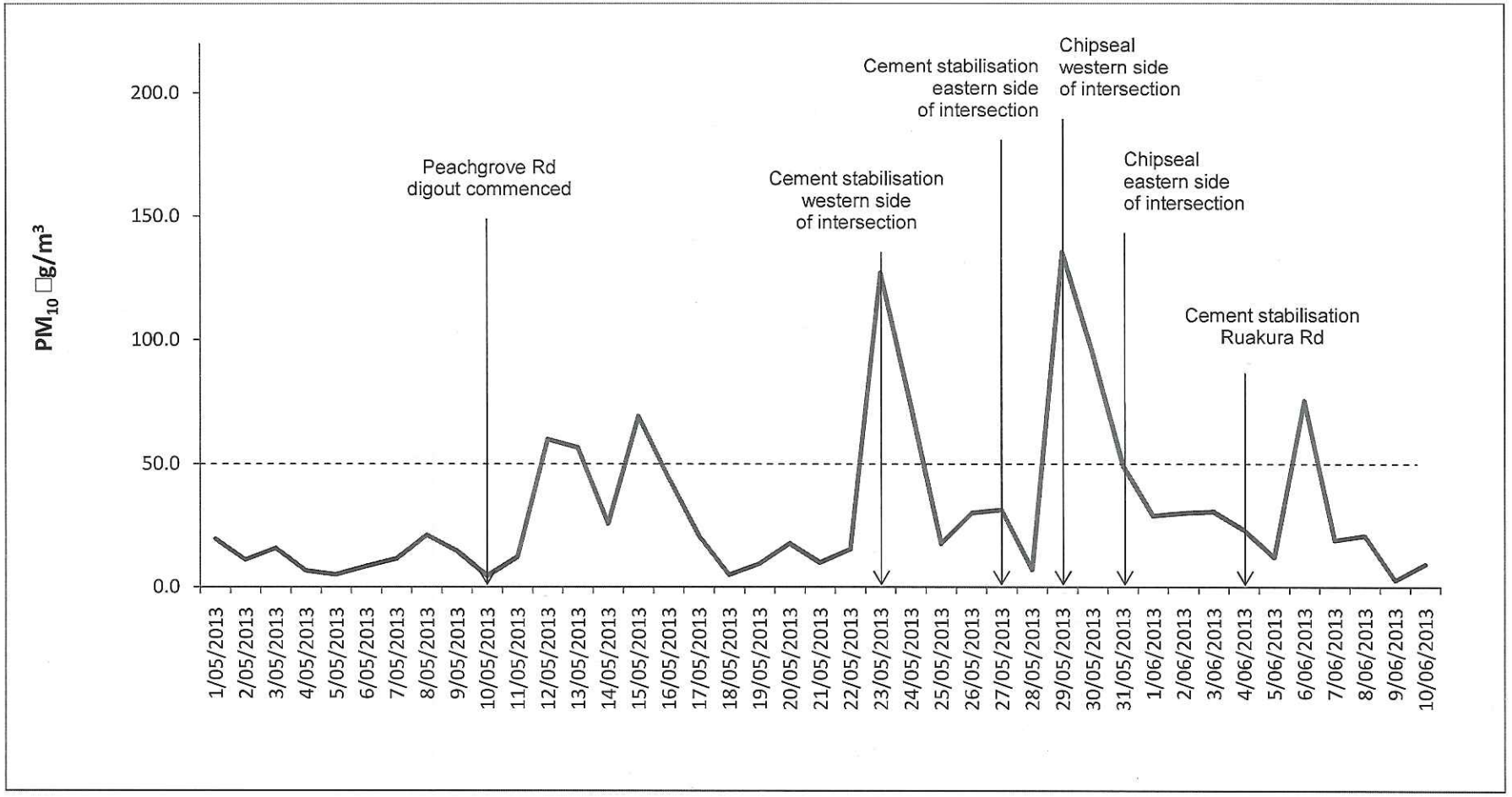

Figure 15. PM_{10} exceedances in relation to timing of specific roadwork stages occurring at the Ruakura Rd and Peachgrove Rd intersection.

6 Email confirmation from Hamilton City Council regarding dust management

From: Martin Mould
Sent: Wednesday, 31 July 2013 5:22 PM
To: Gareth Cartwright
Cc: Jason Cargo; Chris Allen
Subject: RE: Roadworks and exceedances

Gareth

The Road works carried out complied with the approved Construction Management Plan and designation conditions that specifies what treatment is required, this represents best practice. Dust control measures where applied when deemed necessary. There have been no dust complaints from this section of work.
Below is excerpt from the Construction Management Plan

Construction Management Plan

4. Current Plan in implementation to be retained.

5. (a) Notification to the Territorial Authority by Engineer / Principal (internal communication). Notification to network utility operators by Engineer / Principal. Notification to property owners and occupiers will be carried out by Downer's stakeholder liaison team – this will be by letter drop primarily, with follow up phone calls as necessary. Downer operate a Project Facebook page which provides up to date information regarding FAQs, progress and the likes.

   (b) Downer maintain the 0508 RING ROAD (0508 7464 7623). This is the point of contact for all enquiries from the public.

   (c) All enquiries from the public are logged into the database (Darzin). This tracks the status of the enquiry, whether it requires further action from the Project Team (and what that action was), or simply the nature of requests for information.

   (d) The programming and sequencing is being developed currently and will be finalised when final construction drawings are issued. The key areas being looked into are – traffic (vehicular and pedestrian), access, noise and vibration and overall site appearance.

   (e) Materials will predominantly be brought to site as they are required (aggregates, concrete and the like). materials that we receive ahead of time (pipes etc) will be stored in a lay-down area to the south of the proposed intersection of Wairere Drive and Ruakura Rd. This lay-down area will be fenced off from the public.

   (f) Dust and silt mitigation on carriageways will be maintained by removal of spilled or tracked spoil from carriageways by sucker truck. This truck is committed 100% to the Project works and is backed up as required by hired in sweeper trucks. Dust is suppressed by light application of water from water cart as required.

Martin Mould
City Development Manager | City Development Unit

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www.hamilton.co.nz

2 August 2013

Chris McLay
Group Manager – Resource use
Waikato Regional Council
Private Bag 3038
Waikato Mail Centre
Hamilton 3240

Dear Mr McLay

SUBJECT: Request for review of Hamilton's polluted air shed status

Hamilton City Council are supportive of the letter that you are writing to the Minister for the Environment requesting a review of Hamilton's polluted air shed status following a series of PM_{10} exceedences in May and June this year.

It is our understanding that this review is based on the premise that the excedeences were a one off event, most likely related to certain activities being undertaken as part of a roading project immediately beside the monitoring station overlaying the early winter season use of wood fires. Furthermore, it appears to be clear that this type of event would be highly unlikely to reoccur in this way in the future. This is supported by no further exceedences being recorded since the specific road work activity was completed.

Given the temporary nature of the exceedences, Hamilton City Council proposes that we work closely with you and other leading organisations in the city proactively to ensure air quality issues such as PM_{10} emissions are minimised and/or mitigated.

The model for how this could be done is already in place with the way we are working together on our Sustainable Hamilton and Social Well-Being Strategies as well as the work our Eco Design Advisor is doing to reduce the number of inefficiently heated homes in the city.

Yours faithfully

Chris Allen
General Manager, City Infrastructure

Blair Bowcott
General Manager, Performance

Copy to: Bob Laing (CEO of Waikato Regional Council)