Addendum

Table 1 summarises elevated periods of particulate with relevant meteorology during the monitoring period 22 December 2017 – 21 January 2018.

Figure 1 and **Figure 2** present wind direction and wind speed respectively for 9 January 2017.

Please note that full meteorological monitoring (at Site 2) did not commence until 22 December 2017. Meteorological parameters reported in Table 1 for 19 December 2017 are indicative only from an ultrasonic met instrument associated with the nephelometers at these sites.

Table 1 Summary Elevated Particulate Levels 22 Dec 2017 – 21 Jan 2018

Site	Location	Date	Time[1]	Conc ($\mu g/m^3$)	Wind Dir	Wind Speed (km/hr)	Comment
Suggested PM_{10} trigger threshold for dust nuisance = 150 $\mu g/m^3$ as a 1-hour average							
3	South (east)	19/12/17	10:00-11:00	225	North-westerly	30	(Indicative met)
3	South (east)	19/12/17	11:00-12:00	182	North-westerly	26	(Indicative met)
1	East	19/12/17	15:00-16:00	185	Southerly	50	Strong southerly wind change (Indicative met)
$PM_{2.5}$ monitoring guideline = 25 $\mu g/m^3$ as a 24-hour average							
4	Background	9/1/18	0:00-24:00	27	Refer Fig 1	Refer Fig 2	No rainfall measured (at Site 2) on 9 Jan 2017

Notes

[1] New Zealand standard time (NZST) – add one hour to get to New Zealand daylight savings time

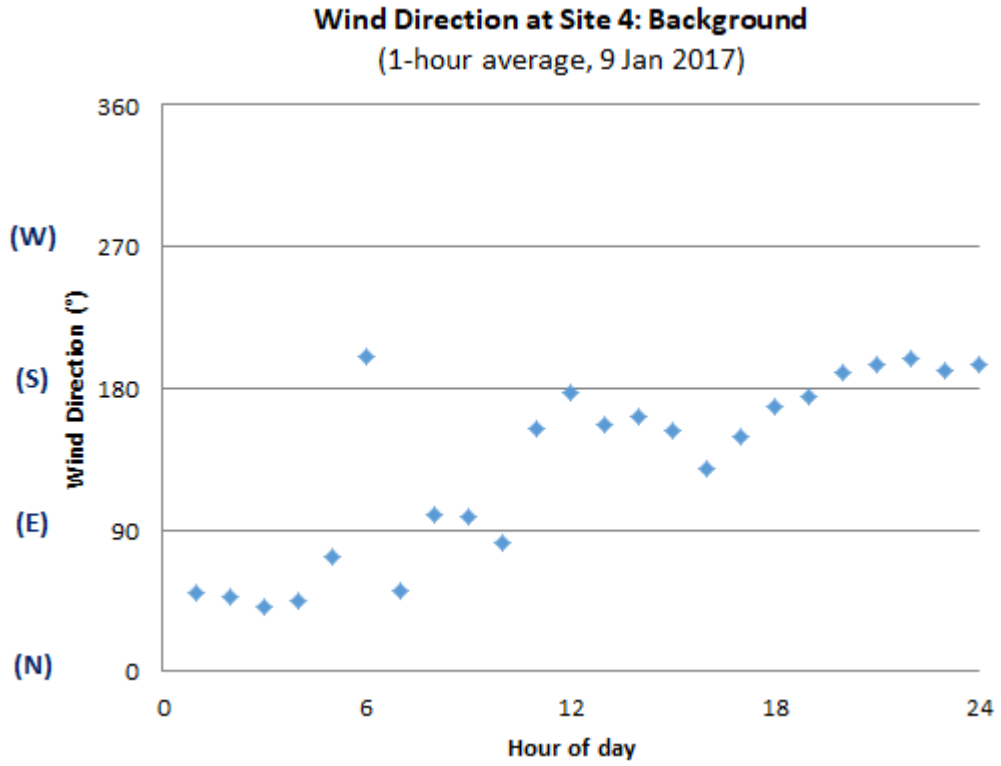

Figure 1 Wind direction at Site 4: Background for 9 January 2017

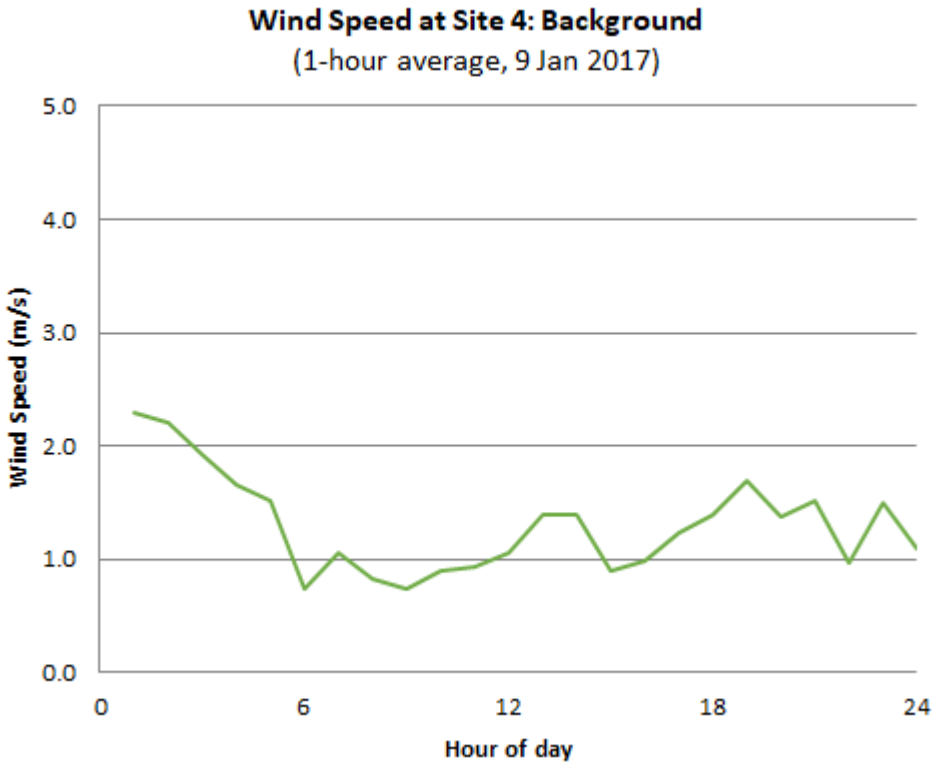

Figure 2 Wind speed at Site 4: Background for 9 January 2017

Questions and answers

1. What is an exceedance?

When we measure a concentration on our instruments around Yaldhurst that is higher than assessment criteria, we refer to this as an "exceedance".

The concentrations noted in Table 1 above are measurements taken and averaged over the relevant time period (i.e. one hour or 24 hour averages). Each of the nephelometers used in this study makes a reading every second, we average these readings to produce one minute concentrations. We then use these 1 minute concentrations to plot the 1 hour average and 24 hour average graphs (which can be seen on our website).

To calculate an average 1 hour concentration we add each minute of data between the start of the hour and the end of the hour and divide this by the number of minutes of data (e.g. 60 minutes). For example at Site 1 between 15:00 and 16:00 (3 and 4 pm) on 19 December 2017, the average concentration was 185 µg/m^3.

The ongoing monitoring data generate running or continual 1 hour average and 24 hour average plots. For reporting purposes, we calculate a separate 1 hour average for each hour of the day and then average these 1 hour averages for each 24 hour day (starting at one minute past midnight and finishing at midnight).

2. What is the suggested PM_{10} trigger threshold for dust nuisance?

In 2016, the Ministry for the Environment published a document titled "Good practice guide for assessing and managing dust". This document includes a section on setting trigger levels for proactive on-site dust management and suggests a dust nuisance trigger level of 150 µg/m^3 as a 1-hour average.

NOTE: while we have adopted the Ministry's suggested trigger threshold of 150 µg/m^3 it is important to note that there are site specific factors which mean that an appropriate trigger level could be higher or lower (to indicate actual dust nuisance). For more information on this, please refer to the good practice guide for assessing and managing dust on the Ministry for the Environment website.

3. Why do the 24 hour PM_{10} website graphs sometimes show values above the national environmental standard and why are these 'exceedances' not listed in Table 1 above?

The data for the website PM_{10} graphs comes from nephelometers. While these instruments are very useful for identifying short term issues over minutes or hours, they are not as accurate as (more expensive) reference instruments.

The regulations relating to the PM_{10} national environmental standard mandate that only reference instruments may be used (for direct comparison with this standard). We are operating two reference instruments (beta-attenuation monitors or BAM's) around Yaldhurst. Neither of these reference instruments reported concentrations above the PM_{10} national environmental standard so no exceedances were reported in this monitoring period.