

# UK Particulate Matter Pollution Climate Reference Dataset for 2011 for the Annex to the MCERTS Performance Standards for Ambient Air Quality Monitoring Systems

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## Background

This report is provided as an update to the Annex to the MCERTS Performance Standards for Ambient Air Quality Monitoring Systems: Requirements of the UK Competent Authority for the Equivalence Testing and Certification of Automated Continuous and Manual Discontinuous Methods that Monitor Particulate Matter in Ambient Air. It provides updated data on the range of geometric mean PM<sub>10</sub> and PM<sub>2.5</sub> concentrations in the UK to ensure that the information on Particulate Matter (PM) Pollution Climate is based on the latest ratified data from 2011. It also provides updated low and high thresholds for semi-volatile PM and wind speed, temperature and dew point.

## Geometric mean concentrations

As described in the original report (Green and Fuller 2012), the PM datasets do not fit to a normal distribution. This results in the arithmetic mean being positively skewed due to episodes of high concentrations. Instead the geometric mean is used, this summary statistic is an appropriate measure for air pollution concentrations that tend to follow a log normal distribution (Kelly, Anderson et al. 2011). The range of geometric mean concentrations for each site type in the UK originally reported is shown in Table 1.

Site Type	Geometric Mean PM <sub>10</sub> Range (µg m <sup>-3</sup> )	Geometric Mean PM <sub>2.5</sub> Range (µg m <sup>-3</sup> )
Background (urban or suburban)	11.9 – 25.7	8.4 - 18.1
Traffic	10.9 – 42.3	7.7 - 29.8
Rural	4.3 – 18.1	3.0 - 12.8
Industrial	13.8 – 24.6	9.7 - 17.4

Table 1: Range of geometric mean concentrations for each site type in the UK calculated using PM<sub>10</sub> data 1st January 2007 - 31st December 2009, with this data factored to estimate the PM<sub>2.5</sub> geometric mean ranges.

The PM<sub>10</sub> geometric mean range has been updated using ratified measurements from 2010 and 2011, the updated range is shown in Table 2 with changes shown in red.

Widespread measurements of PM<sub>2.5</sub> were only available from 2009 onwards, the geometric mean range in the original report therefore used PM<sub>10</sub> measurements factored by 0.7 (based on the mean PM<sub>10</sub>:PM<sub>2.5</sub> ratio) to provide an estimate of the PM<sub>2.5</sub> geometric mean range between January 2007 and 31st December 2009. With widespread PM<sub>2.5</sub> measurements available from 2010 and 2011; these have been used to update the initial estimated range; the updated range is also shown in Table 2; again changes are highlighted in red.

Site Type	Geometric Mean PM <sub>10</sub> Range (µg m <sup>-3</sup> )	Geometric Mean PM <sub>2.5</sub> Range (µg m <sup>-3</sup> )
Background (urban or suburban)	<b>11.1 – 27.5</b>	<b>5.9 – 19.2</b>
Traffic	10.9 – 42.3	7.7 - 29.8
Rural	4.3 – 18.1	<b>2.4 - 12.8</b>
Industrial	13.8 – <b>25.8</b>	<b>5.9 - 17.4</b>

Table 2: Range of PM<sub>10</sub> and PM<sub>2.5</sub> geometric mean concentrations for each site type in the UK calculated using measurements between 1st January 2007 and 31st December 2011. Changes to results from the 2007-2009 are shown in red.

## High and low thresholds for semi-volatile PM and meteorological conditions

For the semi volatile PM<sub>10</sub> measurements and meteorological parameters a threshold and a percentage of daily means either above the high threshold or below the low threshold were originally set for data available up to 31<sup>st</sup> December 2009; this is shown in Table 3. Measurements of wind speed, ambient temperature and ambient dew point were taken from the 30 sites in the UK Meteorological Office's Regional Basic Synoptic Network (RBSN). Measurements of semi volatile PM<sub>10</sub> as measured by the FDMS were taken from the AURN.

Threshold	Semi-volatile PM (or PM <sub>2.5</sub> nitrate) ( $\mu\text{g m}^{-3}$ )		Wind speed (m/s)							Ambient Temperature ( $^{\circ}\text{C}$ )		Ambient Dew Point ( $^{\circ}\text{C}$ )			
	Threshold	%	Threshold								%	Threshold	%	Threshold	%
			10m		5m		2.5m								
			Urban	Rural	Urban	Rural	Urban	Rural							
Low	3.2	5	2.9	6.0	0.7	5.1	0.3	4.2	10	6.6	10	3.7	10		
High	6.3	5	5.2	12.4	1.2	10.6	0.6	8.8	10	13.6	10	10.6	10		

Table 3: Low and high thresholds for semi volatile PM and meteorological conditions up to 31<sup>st</sup> December 2009

This data has now been updated to include measurements of both semi volatile PM<sub>10</sub> and meteorological parameters available up to the 31<sup>st</sup> December 2011; this is shown in Table 4. Changes between Table 3 and Table 4 are highlighted in red.

Threshold	Semi-volatile PM (or PM <sub>2.5</sub> nitrate) ( $\mu\text{g m}^{-3}$ )		Wind speed (m/s)							Ambient Temperature ( $^{\circ}\text{C}$ )		Ambient Dew Point ( $^{\circ}\text{C}$ )			
	Threshold	%	Threshold								%	Threshold	%	Threshold	%
			10m		5m		2.5m								
			Urban	Rural	Urban	Rural	Urban	Rural							
Low	2.8	5	2.9	6.0	0.7	5.2	0.3	4.2	10	6.5	10	3.5	10		
High	6.8	5	5.1	12.3	1.1	10.6	0.5	8.8	10	13.5	10	10.6	10		

Table 4: Low and high thresholds for semi volatile PM and meteorological conditions up to 31<sup>st</sup> December 2011

## **References**

Green, D. and G. Fuller (2012). Characterising the PM climate in the UK for Equivalence Testing. Lonson, King's College London Environmental Research Group.

Kelly, F., H. R. Anderson, et al. (2011). The Impact of the Congestion Charging Scheme on Air Quality in London. Boston, MA, Health Effects Institute.