

# Hotspot modelling

[1] The Mayor’s Draft Air Quality Strategy (2009) identified Central London locations at risk of not meeting the EU limit value for daily mean PM10 in 2011, “hotspots”. These are shown in Figure 1:

- Marylebone Road
- Marble Arch
- Euston Road
- Tower Hill
- Victoria Embankment



This map shows modelled concentrations without the measures included in this Strategy. Other locations shown as exceeding the limit value are locations where exceedences are in the carriageway only, not on the pavement. These exceedences do not breach the requirements of the 2008 Air Quality Directive.

Figure 1. Figure 2.5 from the Mayor’s Draft Air Quality Strategy 2009

[2] The airTEXT forecasting and alerting system for London system calculates concentrations of NO<sub>2</sub>, PM<sub>10</sub> and ozone across Greater London each day, publishing contour plots of the predicted concentrations in terms of COMPEAP bands. The COMPEAP bands are quite broad so do not reveal much detail in the concentration e.g. Figure 2.

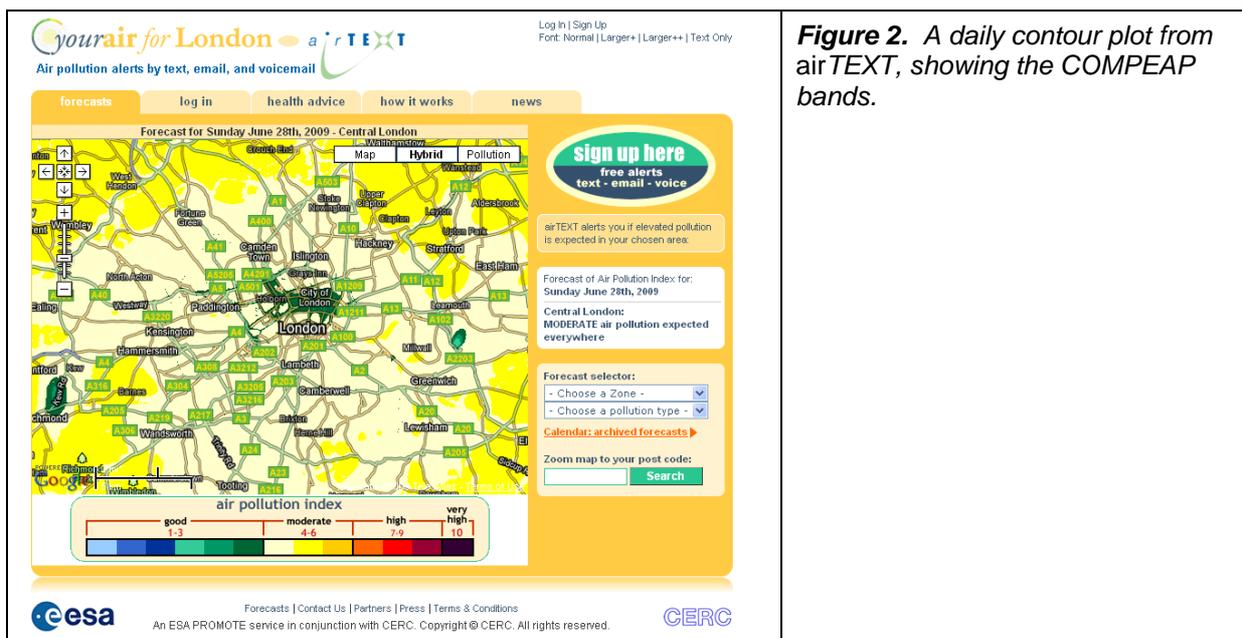
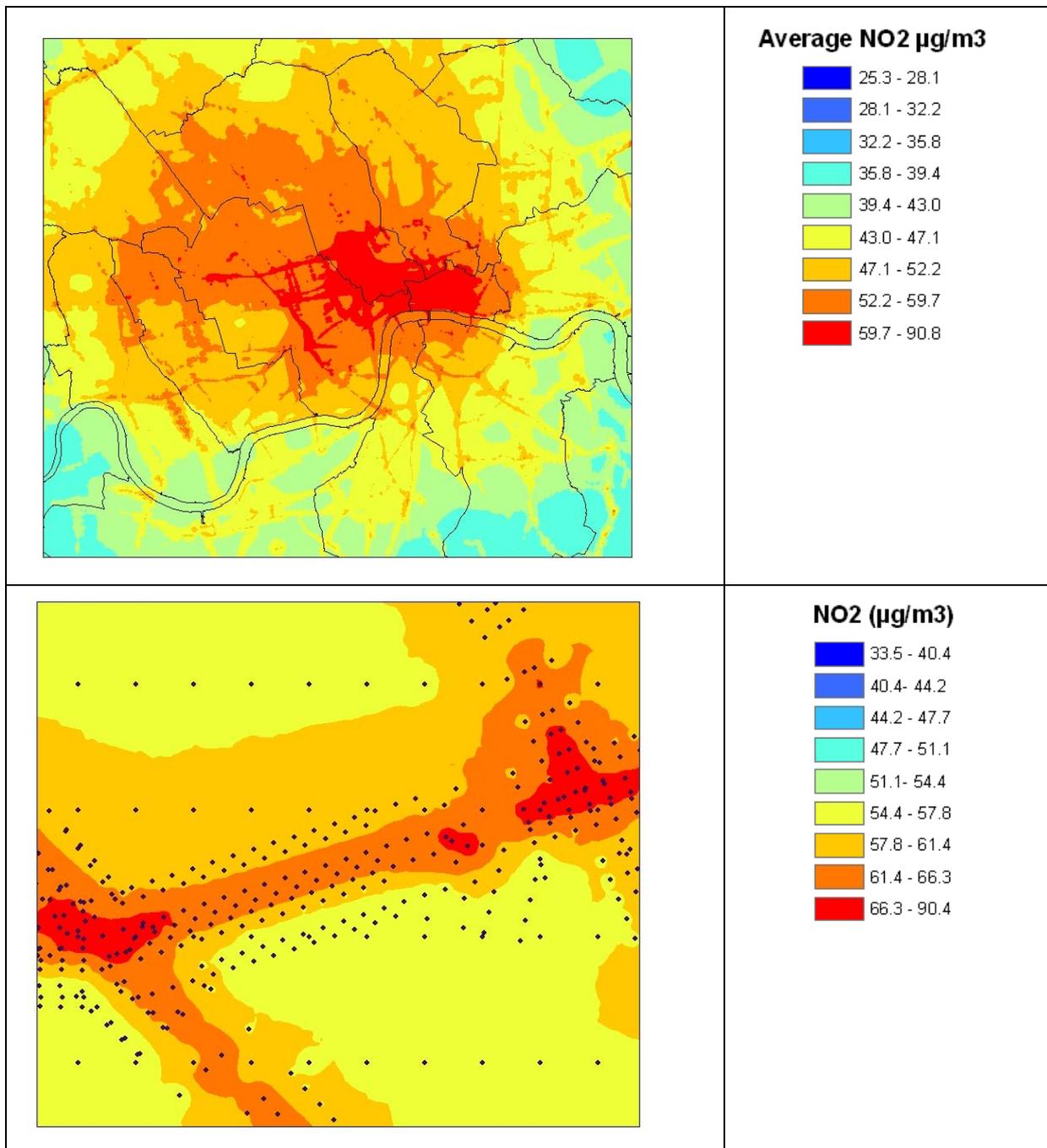


Figure 2. A daily contour plot from airTEXT, showing the COMPEAP bands.

Underlying the contour maps published on the web site is a detailed data set. Figure 3a shows a plot of concentration across Central London generated from the daily *air*TEXT forecast with no additional data. Figure 3b shows a zoomed-in view of the same data for the area around the Marylebone Road monitor (between Edgware Road and Lisson Grove/Seymore Place). On Figure 3b the locations of the data points from which the contour plot was created are shown as dots.



**Figure 3a (upper)** A plot of maximum hourly NO<sub>2</sub> concentration plotted from *air*TEXT forecast data.  
**Figure 3b (lower)** A zoomed-in view around Marylebone Road of the contour plot of Figure 3a.

### **[3] Use of forecasting and nowcasting in managing hotspots**

A forecast of air quality for the day ahead or the next few hours (the latter very short term forecasts are sometimes referred to as nowcasting) could be used to warn if an exceedence is likely.

The same forecast could then be run with mitigation measures implemented e.g. local low emission zone, other traffic management measures, to assess whether implementing the action would avoid the occurrence of an exceedence.

Use of forecasting in such a mode would depend on having confidence in the accuracy of predictions.

### **[4] Hotspot forecasting trial**

A trial could be run to assess how accurate the forecasts are likely to be for this purpose.

#### **Possible outputs from a trial**

- (a) The most important comparison would be a time series comparison at AURN sites and the hotspot(s) comparing the monitored values with forecast values
- (b) Other receptors could be placed around the exact monitor location to investigate what the model predicts for near-field gradients i.e. how extensive is an exceedence likely to be when it is recorded at the monitor
- (c) Contour plots could supplement (b). As shown in [2] contour plots can already be generated but extra receptors would be added to ensure good resolution.

#### **The cases considered might include:**

- (i) Current *air*TEXT forecasts produced in the evening (before the day of the forecast) , with and without assimilation of AURN data
- (ii) Current *air*TEXT forecasts produced in the morning (on the day of the forecast) , with and without assimilation of AURN data
- (iii) *air*TEXT nowcasts produced during the day of the forecast, with and without assimilation of AURN data
- (iv) use of different met data available in near real time e.g. wind speed and wind direction recorded at the AURN site(s)

#### **Immediate improvements of the airTEXT forecasts set up for this new purpose**

The *air*TEXT forecasts calculate the area of a Borough predicted to exceed a threshold and therefore their performance at roadside locations is not critical and has not been actively improved. Ahead of a trial the current predictions at the AURN sites would be improved by:

- (1) Accurately locating the monitor, checking the traffic data local to the monitor, modelling queues and bus stops near to the monitor
- (2) Modelling street canyons where applicable. For a small number of sites, the street canyon heights can be estimated "by eye"

#### **IMPORTANT improvements to input data - subject to data availability**

- (A) Use of annual average fleet data derived from ANPR would improve the representation of the fleet and hence the emissions data
- (B) Use of annual traffic count data derived from ANPR would improve the representation of the diurnal and monthly variation of emissions and give insight into traffic patterns during special events
- (C) Use of near real time ANPR traffic count data would provide the best information on emissions and hence this would be the best possible input.