

# Air quality at Heathrow Airport

Q3 2014

## Background

Heathrow Airport Ltd (HAL) has monitored air quality since 1993 at its site located near the northern runway (LHR2). It now monitors air quality at three other sites around the airport — Harlington, Longford (Green Gates) and Stanwell (Oaks Road). Fig. 4 shows the locations of these and other air quality monitoring sites within 2km of the Airport. The HAL-operated monitors (four NO<sub>x</sub>, three PM<sub>10</sub>, three PM<sub>2.5</sub> and one O<sub>3</sub>) were all replaced in 2013/14 with new equipment.

Large areas of London exceed the health-based air quality limit values set by the EU, due primarily to emissions from road traffic and from buildings. Every London borough has declared at least one Air Quality Management Area (AQMA).

Air quality management is a key priority for HAL and we will continue to work in partnership with our key stakeholders — especially local authorities and national government - to reduce emissions from all sources in the area in order to meet the EU limit values. The main pollutants of concern at Heathrow are measured at all these sites — oxides of nitrogen (NO<sub>x</sub> — made up of nitrogen dioxide and nitrous oxide) and particles (measured as PM<sub>10</sub> and PM<sub>2.5</sub>). In addition, ozone (O<sub>3</sub>) is measured at Harlington.

## Headlines

Key information for this quarter is:

- Running annual mean for NO<sub>2</sub> remained below the EU limit values at most monitoring sites in Q3 2014 (see Fig. 2).
- There were seven breaches of the daily average PM<sub>10</sub> limit value at LHR2 to Q3 2014 (see Fig 3). 35 exceedances are allowed per year before the limit value is breached.
- The number of aircraft movements made by more modern aircraft (CAEP4 and above) through Q3 2014 was just over 93% (see Fig. 5).
- Heathrow has replaced all of its air quality monitors in the last year.
- Heathrow has updated the Heathrow AirWatch website.

## Measured concentrations

### Local air quality

Located on the western edge of London and close to two busy motorways, the Great Western mainline and local industries, Heathrow Airport is within an area of high air pollution. Of the two pollutants of concern — nitrogen dioxide (NO<sub>2</sub>) and particles (measured as PM<sub>10</sub> and PM<sub>2.5</sub>) — NO<sub>2</sub> has the greatest extent of exceedence and large areas of London (and the rest of the UK) exceed the annual average EU limit value, due mainly to emissions from road traffic and from buildings. This pattern is repeated locally,

where the activities that take place at Heathrow Airport are just one source of air emissions in the local area.

### Nitrogen dioxide (NO<sub>2</sub>) monitoring results (EU annual average limit value of 40µg/m<sup>3</sup> to be met by 2010)

**Fig. 1. NO<sub>2</sub> annual average concentrations measured at selected sites around Heathrow Airport since 1995**

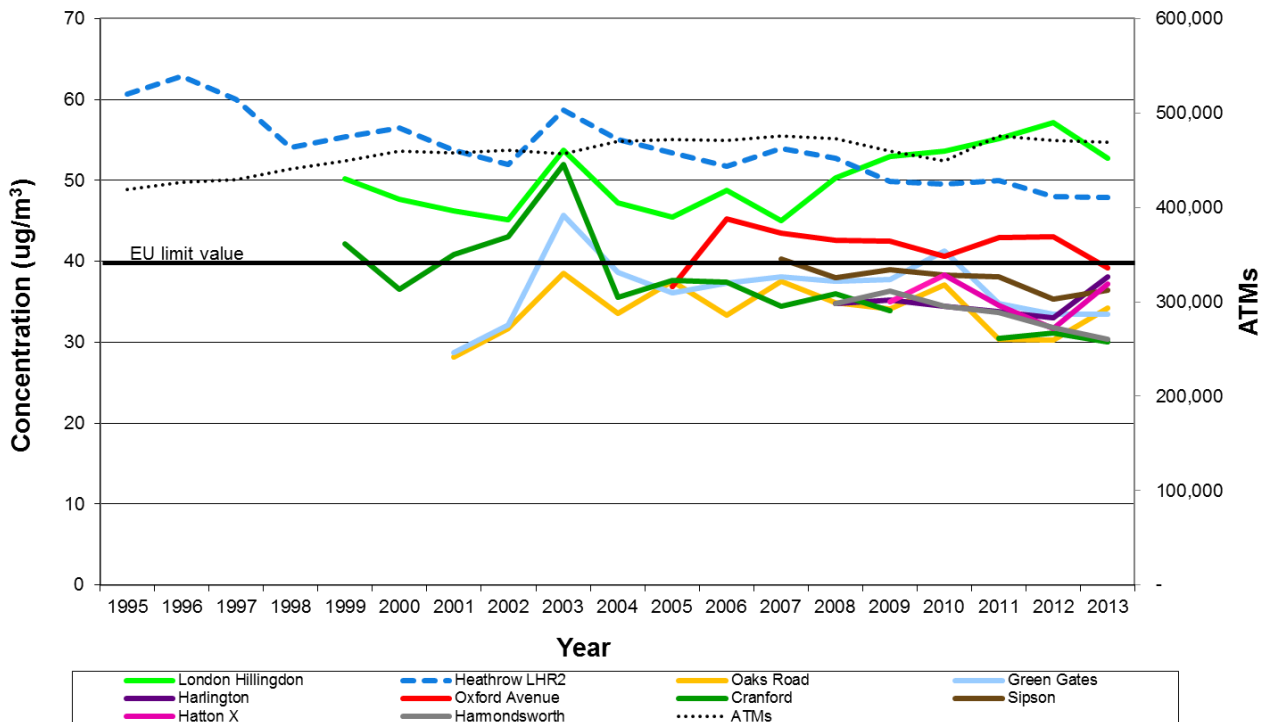


Fig. 1 presents annual average NO<sub>2</sub> measurements at sites either on or close to the airport. Key information is:

- Oxford Avenue (red) is approximately 200m northeast of the airport boundary. Concentrations have exceeded the limit value since installation in 2005 and fluctuate from year to year. They were 43µg/m<sup>3</sup> in 2012, but were 39µg/m<sup>3</sup> in 2013 – just below the EU limit value. However, as data capture at this site was below 90%, we plan to use the 2014 results to assess concentrations fully against the EU limit value. Airport emissions (including airport-related road traffic) are approximately 22.5% of measured NO<sub>x</sub> concentrations at this site, 25% is from non-airport traffic and 52% is from background sources.
- Two sites exceeded the limit value:
  - London Hillingdon (light green) is mainly affected by emissions from traffic on the M4. Concentrations have decreased in 2013 to approximately 53µg/m<sup>3</sup> (57µg/m<sup>3</sup> in 2012). Airport emissions (including airport-related road traffic) are approximately 16% of measured NO<sub>x</sub> concentrations at this site. A further 42% is from non-airport traffic and 42% is from background sources.

- LHR2 (blue dotted line), located near the northern runway, has shown a 20% fall in concentrations since 1993, even though air transport movements (ATMs) have increased by 10%. Concentrations of  $48\mu\text{g}/\text{m}^3$  were recorded in 2013, which is similar to 2012. Airport emissions (including airport-related road traffic) are approximately 48% of measured  $\text{NO}_x$  concentrations at this site. A further 19% is from non-airport traffic and 33% is from background sources. The EU limit values are not applicable at LHR2.

**Fig. 2.  $\text{NO}_2$  running annual average concentrations at selected sites since 1995**

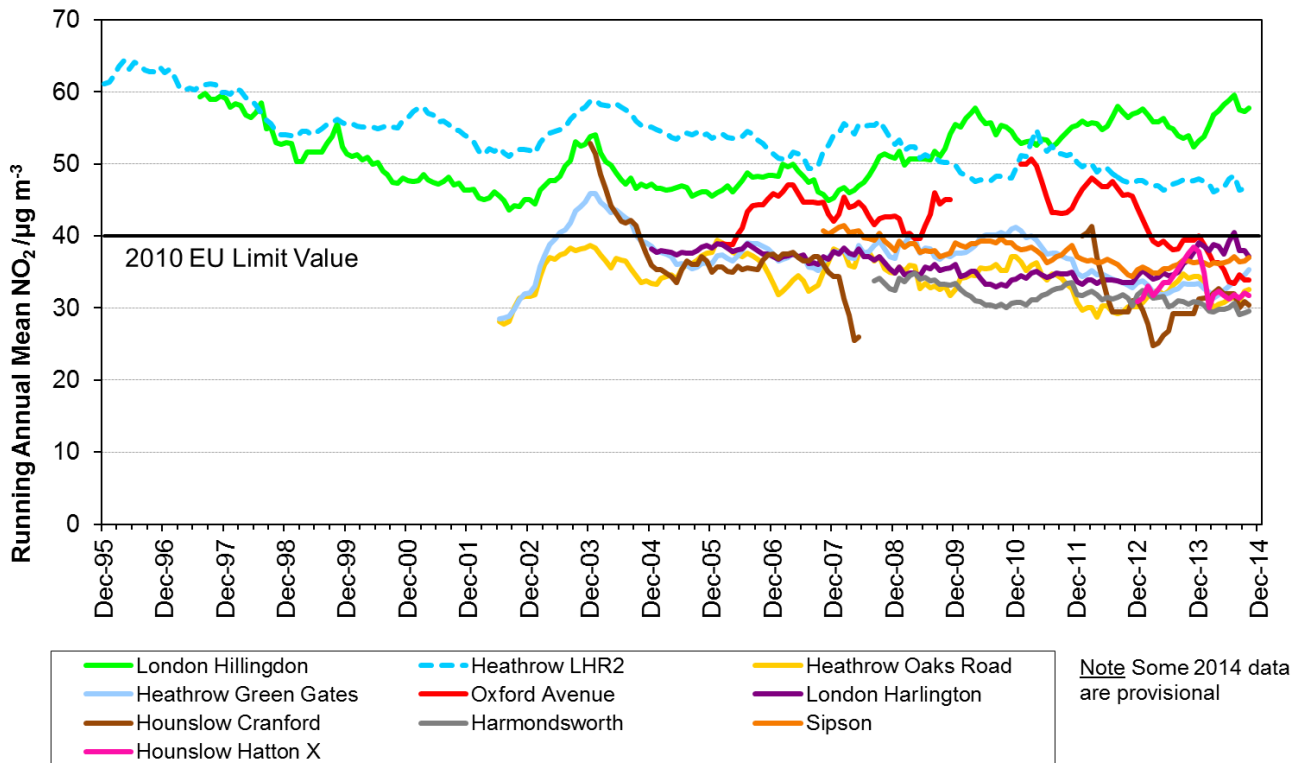


Fig. 2 shows the  $\text{NO}_2$  monitoring data expressed as running annual means, which allows us to track changes throughout the year for informational purposes only. It should be noted that the running annual mean cannot be compared against the 2010 EU limit for regulatory compliance.

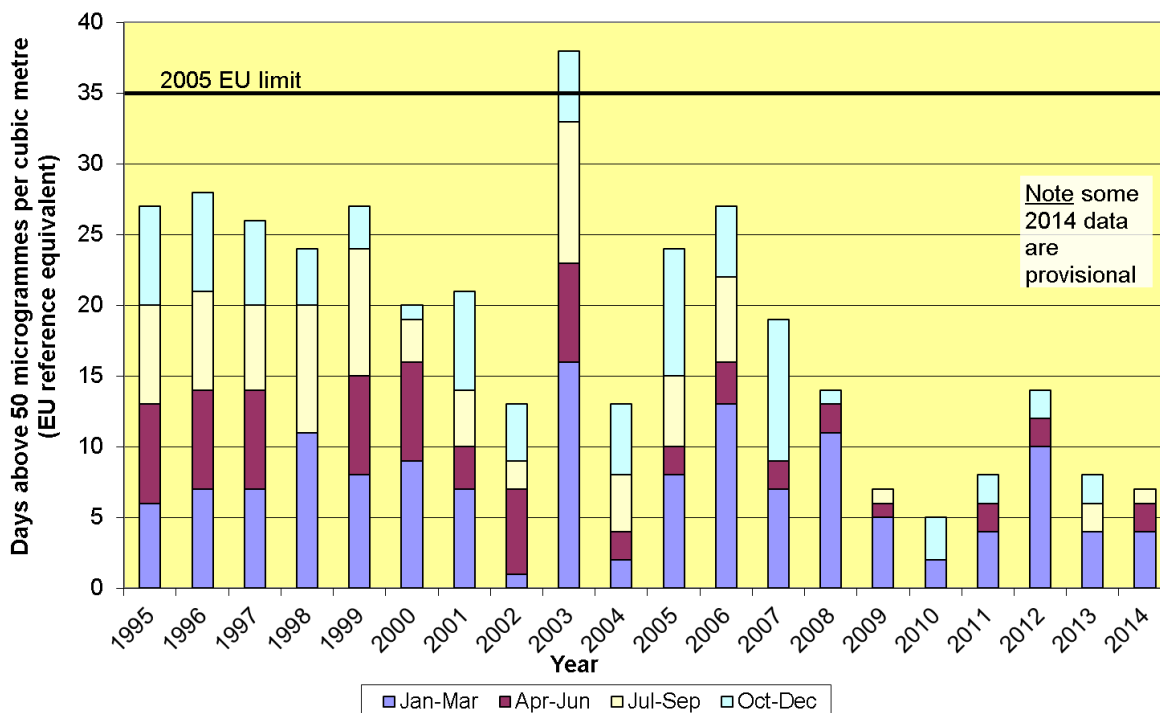
Most sites, including LHR2, Oaks Road, Green Gates, Cranford, Harmondsworth and Sipson, show a trend of decreasing  $\text{NO}_2$  concentrations over the last ten years. The notable exception is Hillingdon, close to the M4 motorway, where concentrations fell from 1997 to about 1996 but have since been generally increasing.

**Particles (2005  $\text{PM}_{10}$  EU limit value of  $50\mu\text{g}/\text{m}^3$  [35 exceedences allowed]) (2020  $\text{PM}_{2.5}$  EU target of  $25\mu\text{g}/\text{m}^3$ )**

$\text{PM}_{10}$  is measured at all four of HAL's monitoring sites and concentrations measured at LHR2 are generally the highest. The EU limit value for  $\text{PM}_{10}$  is  $50\mu\text{g}/\text{m}^3$  averaged over 24 hours, not to be exceeded more than 35 times a calendar year. Results are presented in Fig. 3.

Eight exceedances of the 50 µg/m<sup>3</sup> 24-hour mean for PM<sub>10</sub> were recorded at LHR2 in 2013, and seven have occurred so far to Q3 2014. The EU limit value for PM<sub>10</sub> has been met at the LHR2 site since 2003, when unfavourable weather conditions produced 38 breaches at LHR2 and affected sites throughout the UK. All monitored sites remain well below the annual average EU limit value of 40µg/m<sup>3</sup> for PM<sub>10</sub>.

**Fig. 3. PM<sub>10</sub> at LHR2 since 1995 – Comparison with the 2005 EU limit value (number of days above 50µg/m<sup>3</sup>)**

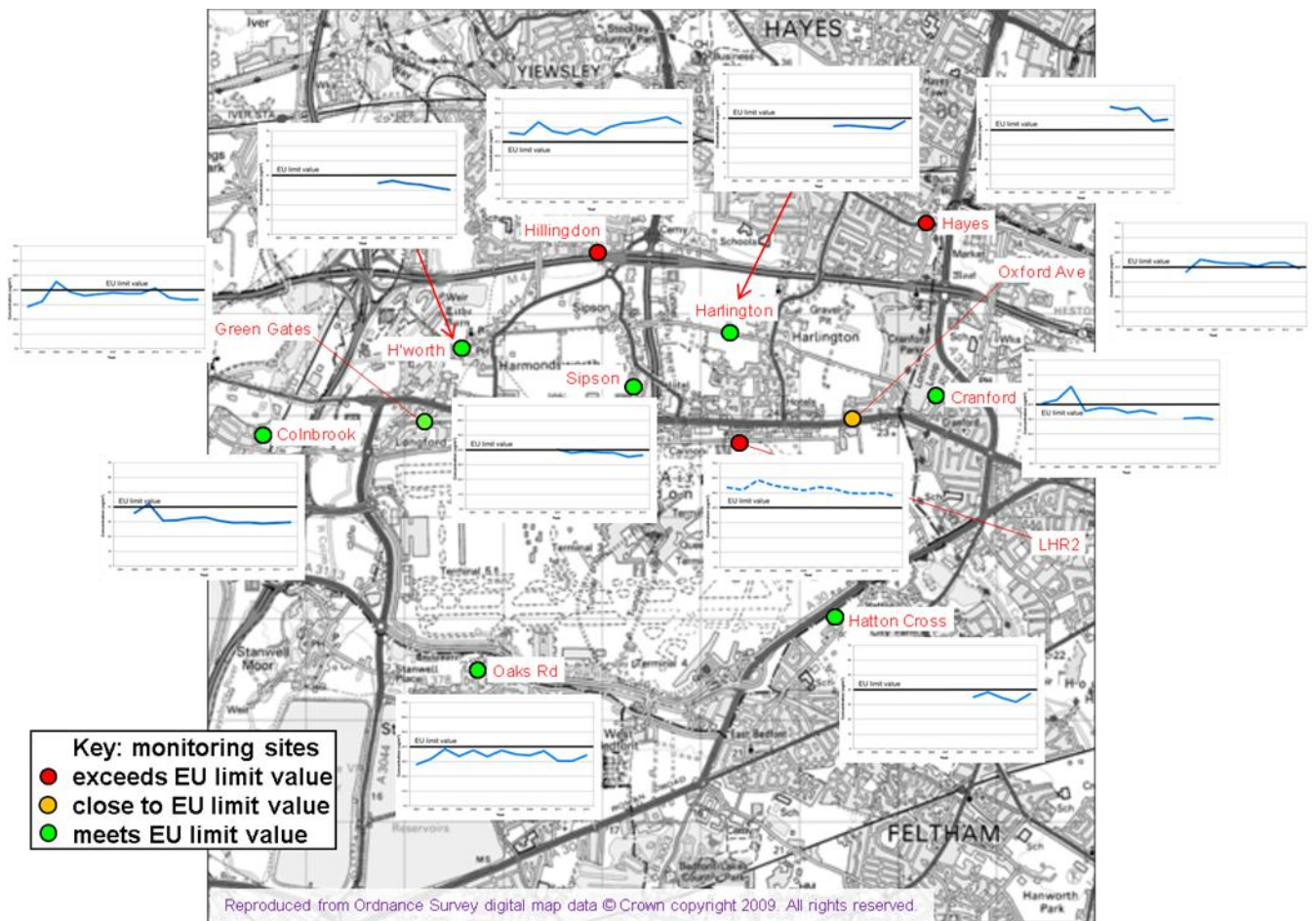


### Locations of the air quality monitoring sites at Heathrow and their individual NO<sub>2</sub> monitoring history.

The locations of air quality monitoring sites local to the airport are shown in Fig. 4, which also shows the trend in NO<sub>2</sub> concentrations measured at each site since 2001.

The only site not previously mentioned is Hayes, to the northeast of Heathrow. Direct airport emissions are estimated to be approximately 4% of measured NO<sub>x</sub> concentrations, 2% is from airport-related road traffic, 37% from non-airport traffic and 57% from background sources in 2013.

**Fig. 4. NO<sub>2</sub> monitoring sites and annual mean measurements since 2001**

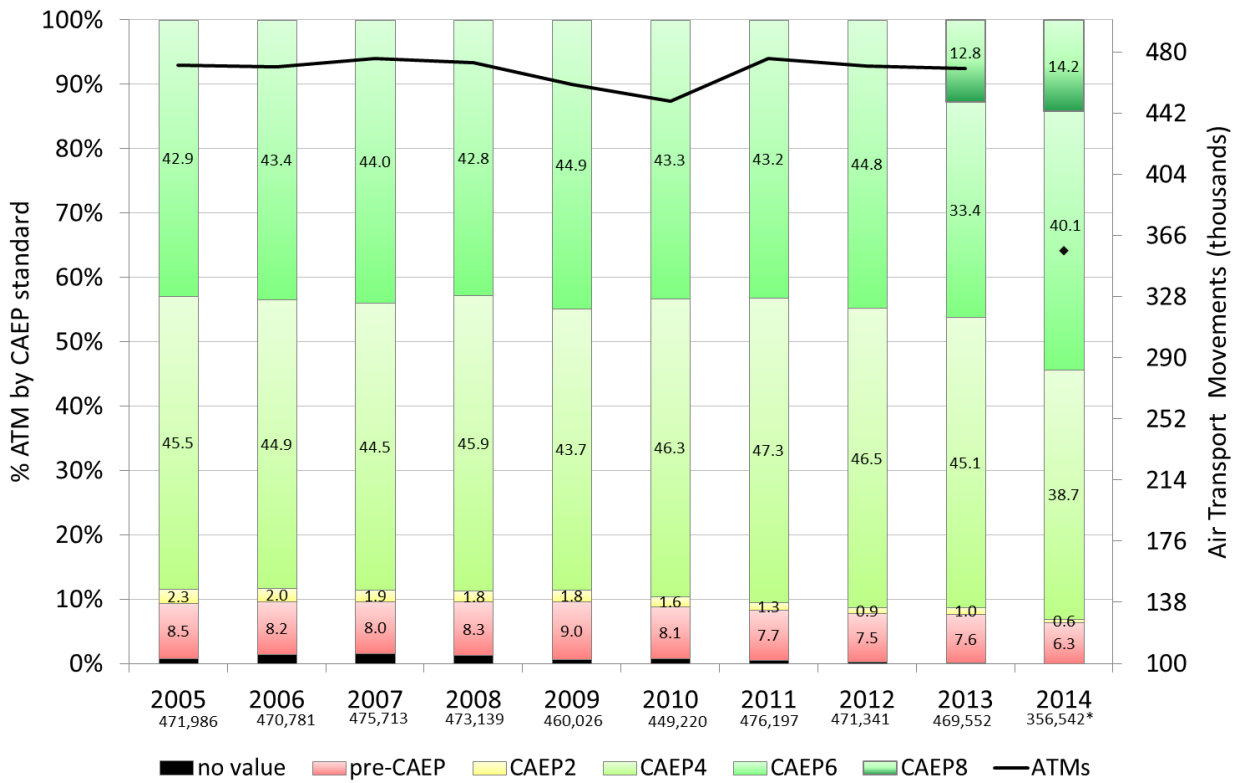


### CAEP value of air transport movements

Through its Committee on Aviation Environmental Protection (CAEP), the International Civil Aviation Organization (ICAO) sets new emissions standards for aircraft engines – including for NO<sub>x</sub>. Engine models which were certified on or after 1 January 2008 must meet the CAEP6 standard for NO<sub>x</sub>. CAEP8 is the latest standard and is required for engine models which were certified on or after 1 January 2014.

Fig. 5 shows the proportion air transport movements (ATMs) at Heathrow based on their relationship to the CAEP NO<sub>x</sub> emissions standards. The number of ATMs each year is presented below each bar as well as on the chart itself. The relative proportion of flights made by newer, cleaner aircraft (those defined as CAEP4 or better) through Q3 2014 rose to its highest point ever; just over 93%. The trend is expected to continue as airlines proceed in replacing their older, higher emission aircraft and Heathrow's NO<sub>x</sub> emission landing charges encourage their use at our Airport.

**Fig. 5. CAEP compliance of ATMs (air transport movements) since 2005**



\* Note: 2014 year to date ATM data are provisional