

# Air quality at Heathrow Airport

Q1 2015

## 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. 1 shows the locations of these stations and eight other air quality monitoring sites operated by local authorities and DEFRA within 2km of the Airport.

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

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 main 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 exceedance. 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.

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/UK 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:

- Figures, graphs, and sections in this summary have been updated to incorporate Heathrow Air Quality Working Group requests for clarity and better presentation.
- Q1 data capture for all four HAL monitoring sites was >90% for all pollutants measured; except for NO<sub>2</sub> at Harlington where data capture was 89.58%.
- Monitoring data for Heathrow's four monitoring sites have been fully ratified for 2014; no changes to annual averages reported from the provisional end of year data.
- Annual average NO<sub>2</sub> remained below the EU/UK limit values at most monitoring sites for 2014 (see Fig. 1 and Table 1),
- For the second year running, Oxford Ave station remained below EU/UK limit values; however, data capture was <50%.
- There were 2 breaches of the daily average PM<sub>10</sub> limit value at all HAL monitoring stations in Q1 2015 (see Table 2 and 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 newer) to date in 2015 was just over 93%; the highest proportion recorded to date (see Fig. 5).
- The Heathrow Airport 2013 Air Quality Assessment was published in January 2015 which includes a full emissions inventory, concentration modelling, and comparisons of monitored and modelled data (available at: [http://www.heathrowairwatch.org.uk/documents/Heathrow\\_Airport\\_2013\\_Air\\_Quality\\_Assessment\\_Detailed\\_Emissions\\_Inventory.pdf](http://www.heathrowairwatch.org.uk/documents/Heathrow_Airport_2013_Air_Quality_Assessment_Detailed_Emissions_Inventory.pdf))

## Measured concentrations

### Locations of the air quality monitoring sites around Heathrow

The locations of air quality monitoring sites local to the airport are shown in Fig. 1, which also shows the annual average NO<sub>2</sub> concentrations measured at each site 2014 overlaid on modelled NO<sub>2</sub> concentrations for 2013. Table 1 provides a summary of each station within 2km of Heathrow's boundary as well as the type of source environment its measurements represent.

**Fig. 1. Measured 2014 annual average NO<sub>2</sub> values at monitoring sites around Heathrow showing and 2013 modelled concentrations (EU/UK annual average limit value of 40µg/m<sup>3</sup>)**



**Table 1. Summary of continuous monitoring sites**

Monitoring station	Owner	Source Type	2014 average NO <sub>2</sub> (µg/m <sup>3</sup> )
Heathrow LHR2	Heathrow Airport	Airport	46
Harlington	Heathrow Airport	Urban industrial	36
Green Gates	Heathrow Airport	Airport	35
Oaks Road	Heathrow Airport	Airport	33
Hillingdon	Defra	Urban background	57
Hayes	Hillingdon	Roadside	53
Harmondsworth	Hillingdon	Urban background	30
Oxford Ave	Hillingdon	Urban centre	32*
Sipson	Hillingdon	Urban background	37
Hatton Cross	Hounslow	Roadside	30
Cranford	Hounslow	Suburban	31
Colnbrook	Slough	Urban background	30

\*Annual average value taken prior to ratification of data; capture rate for NO<sub>2</sub> at Oxford Ave was <50% and could not be compared against local air quality limits.

**Nitrogen dioxide (NO<sub>2</sub>) monitoring trends (EU/UK annual average limit value of 40µg/m<sup>3</sup>)**

**Fig. 2. Measured annual average NO<sub>2</sub> concentrations around Heathrow since 1995 and annual air transport movements (ATMs)**

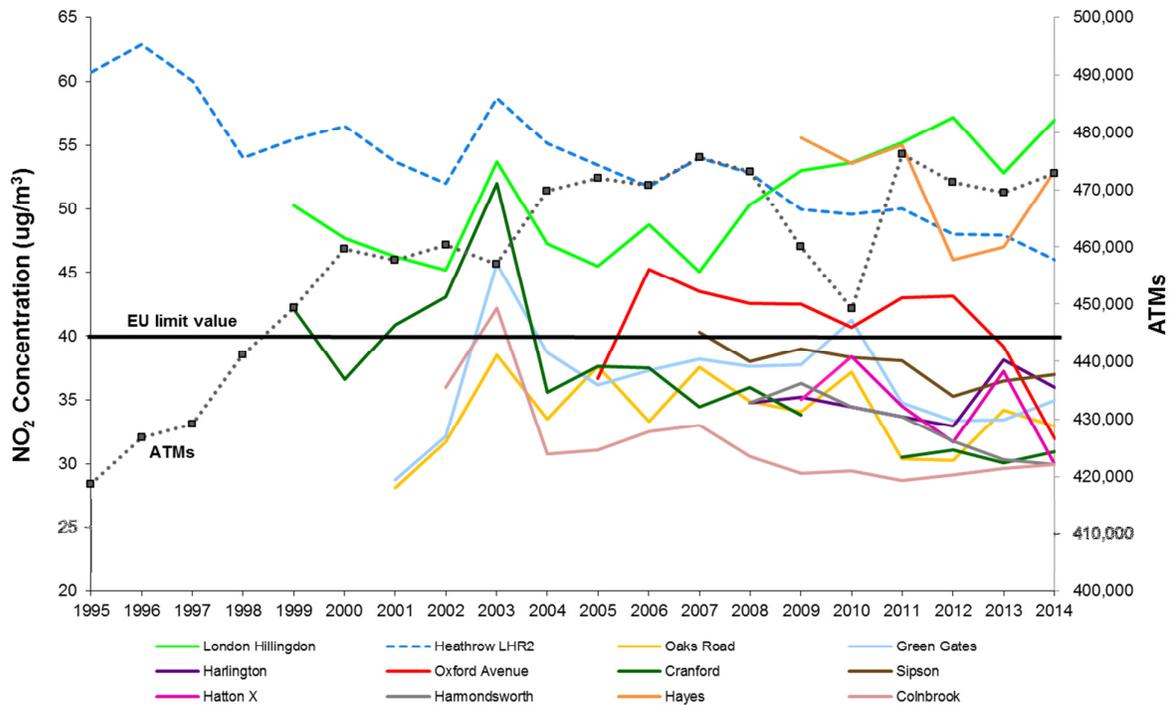


Fig. 2 presents annual average NO<sub>2</sub> measurement trends at sites either on or close to the airport. Key information is:

- Oxford Avenue (red) is approximately 200m northeast of the airport boundary. The annual concentration has continued to decrease to 32µg/m<sup>3</sup> in 2014; however, the data capture rate was well below the required 90% and the average NO<sub>2</sub> concentration from this site cannot be compared against limit values. Airport emissions (including airport-related road traffic) are approximately 22% of measured NO<sub>x</sub> concentrations at this site, 25% is from non-airport related traffic and 52% is from background sources.
- Two sites exceeded the limit value outside of Heathrow:
  - London Hillingdon (light green) is mainly affected by emissions from traffic on the M4. Concentrations have increased in 2014 to approximately 57µg/m<sup>3</sup>. All airport-related emissions 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.
  - Hayes (orange), located 1.9 km to the northeast of the airport, has seen an increase of 12.7% from 2013 to an annual average of 53µg/m<sup>3</sup> in 2014. Emissions at Hayes are also dominated by road traffic. Heathrow emissions (including airport-related traffic) represent less than 6% of total NO<sub>x</sub> measured at this site.
- LHR2 (blue dotted line), located on the airport next to the northern runway, has shown a 32% fall in concentrations since 1993, even though air transport movements (ATMs) have increased by over 11%. Annual average NO<sub>2</sub> was 46µg/m<sup>3</sup> in 2014, the lowest level measured since 1995. Airport emissions (including airport-related road traffic) are approximately 48% of measured NO<sub>x</sub> concentrations at this site. The EU limit values for ambient air quality are not applicable at LHR2 as members of the public do not have access to the site.

### Particles (2005 PM<sub>10</sub> EU/UK limit value of 50µg/m<sup>3</sup> [35 exceedances allowed])

PM<sub>10</sub> is measured at all four of HAL's monitoring sites and concentrations measured at LHR2 are historically the highest. The limit value for PM<sub>10</sub> is 50µg/m<sup>3</sup> averaged over 24 hours, not to be exceeded on more than 35 days per calendar year. Table 2 provides a summary of measured data from HAL's four monitoring sites.

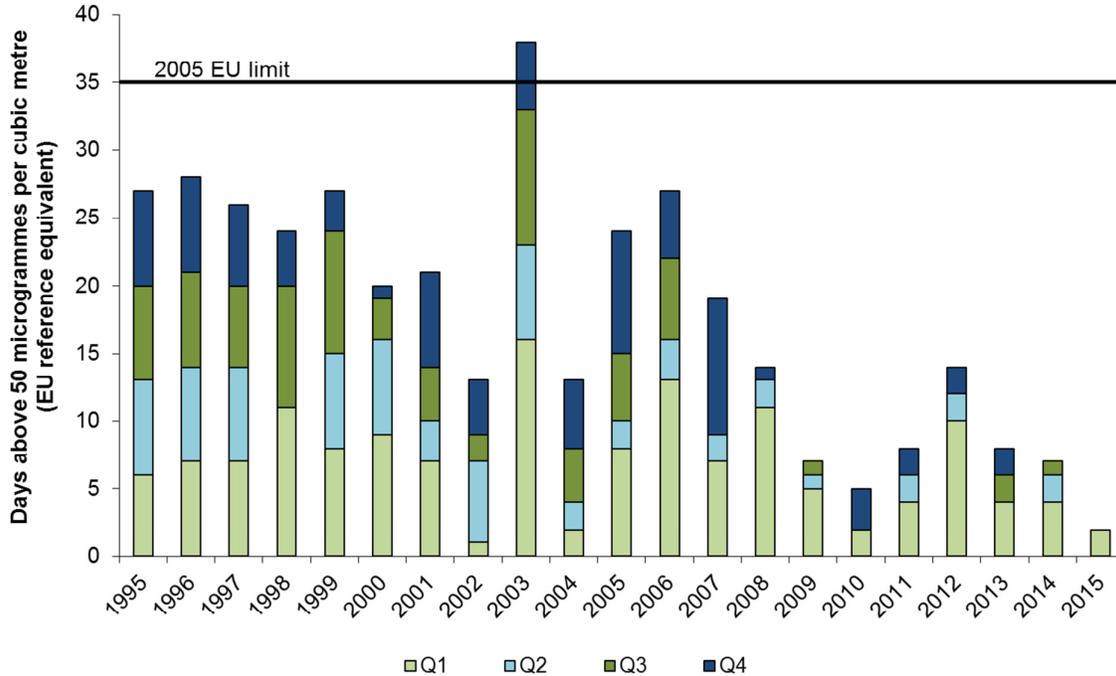
**Table 2. Daily PM<sub>10</sub> exceedances at HAL monitoring sites**

Monitoring station	2014 PM <sub>10</sub> exceedances (days)	2015 PM <sub>10</sub> exceedances to date (days)
Heathrow LHR2	7	2
Harlington	5	2
Green Gates	7	2
Oaks Road	9	2

Seven exceedances of the 50 µg/m<sup>3</sup> 24-hour mean for PM<sub>10</sub> were recorded at LHR2 in 2014, and two have occurred through Q1 2015. The EU/UK limit value for PM<sub>10</sub> has been met at the LHR2 site since 2003, when unfavourable weather conditions produced 38 breaches and affected sites throughout the UK. Daily exceedances at LHR2 since 1995

are presented in Fig. 3. All monitored sites remain well below the annual average limit value of  $40\mu\text{g}/\text{m}^3$  for  $\text{PM}_{10}$ .

**Fig. 3.  $\text{PM}_{10}$  at LHR2 since 1995 – Comparison with the 2005 EU limit value (number of days above  $50\mu\text{g}/\text{m}^3$ )**



### 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  $\text{NO}_x$ . Engine models which were certified on or after 1 January 2008 must meet the CAEP6 standard for  $\text{NO}_x$ . CAEP8 is the latest standard and is required for engine models which were certified on or after 1 January 2014.

Fig. 4 shows the proportion aircraft movements at Heathrow based on their relationship to the CAEP  $\text{NO}_x$  emissions standards. The number of movements 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) in Q1 2015 rose to its highest point ever; 93.5%, while CAEP8 only movements increased to just under 16%. The trend is expected to continue as airlines proceed in replacing their older, higher emission aircraft and Heathrow's  $\text{NO}_x$  emission landing charges encourage their use at our Airport.

**Fig.4. Total aircraft movements since 2005 by CAEP standard**

