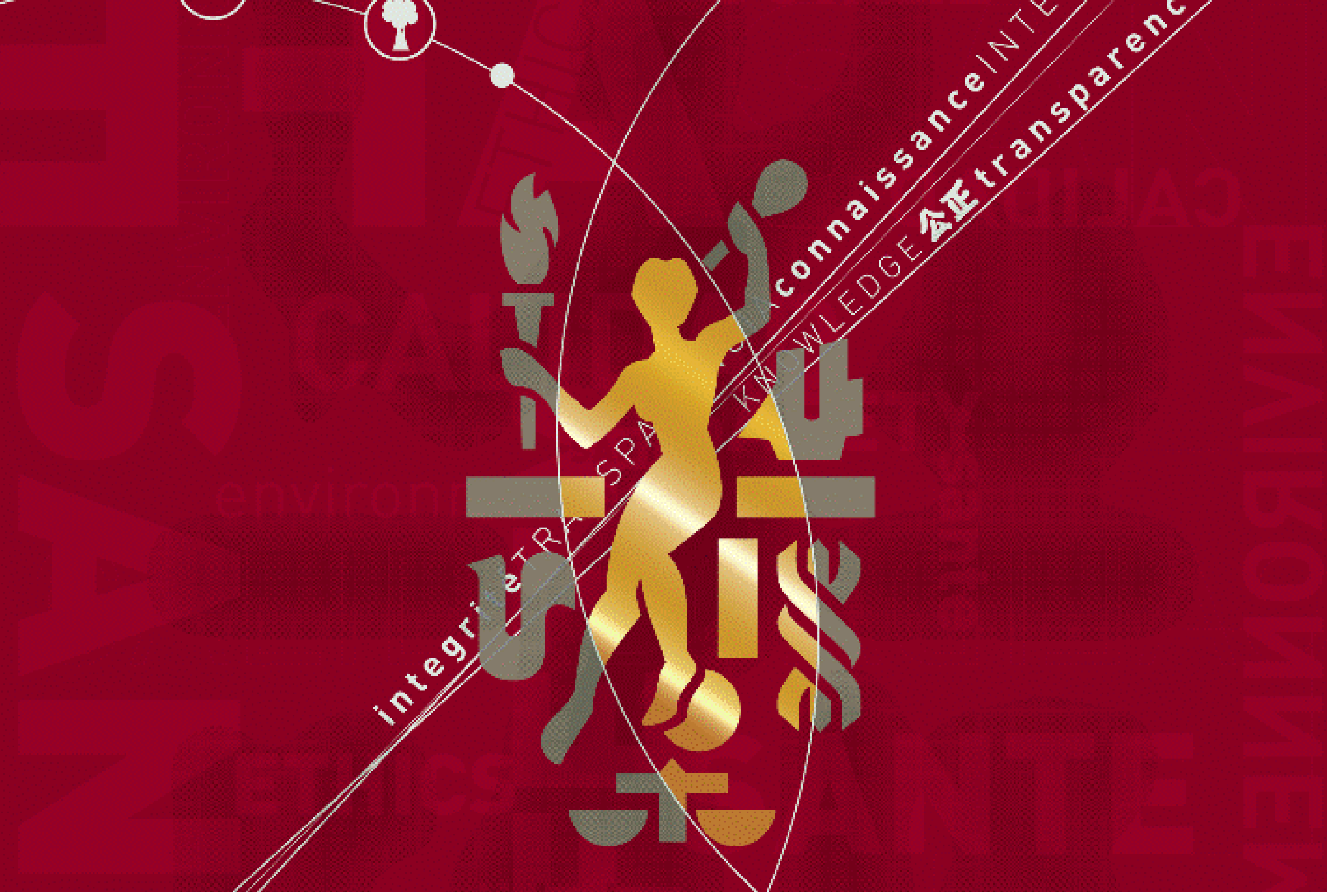

# LONDON WIDE ENVIRONMENT PROGRAMME

## Nitrogen Dioxide Diffusion Tube Annual Report 2006

**Report Ref: BV/AQ/AGG05401/PB/2494**

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London Borough of Brent
London Borough of Bexley
London Borough of Camden
London Borough of Croydon
Corporation of London
London Borough of Greenwich
London Borough of Harrow
London Borough of Hammersmith & Fulham
London Borough of Hillingdon
London Borough of Hounslow
Royal Borough of Kensington & Chelsea
London Borough of Newham
London Borough of Richmond Upon Thames
London Borough of Tower Hamlets
City of Westminster

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# CONTENTS

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# Executive Summary

Bureau Veritas and its predecessor has undertaken the London-Wide Environment Programme (LWEP) since 1986. The LWEP consists of the monitoring, analysis and reporting of key environmental indicators throughout the Greater London region. This report addresses one of these indicators – nitrogen dioxide ($NO_2$).

Nitrogen dioxide has been regarded as a one of the main pollutants that needs to be targeted due to high road traffic emission levels in London. London Boroughs have a statutory duty to regularly review and assess air quality. This process is coupled with the Greater London Authority's air quality management schemes that are outlined in the Mayor's strategy, and which takes an over-arching view on London-wide air quality issues. Subsequent air quality management schemes that are to be introduced indicate the necessity for nitrogen dioxide monitoring data on a city-wide scale in order to estimate the effect on a spatial and temporal basis. The LWEP is principally provided as a service for the London Boroughs.

In 2006, diffusion tubes were located at 284 monitoring sites spread over fifteen boroughs. Annual average $NO_2$ concentrations (January to December) that were above the 40 $\mu g/m^3$ Air Quality Objective where recorded at 30 urban background and 147 roadside sites; this is an decrease of 19% background sites and a reduction of 7% in roadside sites compared to the previous year. Results from the 2006 survey indicate an average decrease in annual mean $NO_2$ concentration at background sites, and an average decrease at roadside sites compared to 2005.

The geographical spread shows higher concentrations in central parts of London and a lower concentration further away from the city centre. A few hot spots are identified in boroughs on the outskirts of the city.

Long-term linear trend analysis continues to display a downward trend in annual mean $NO_2$ concentrations at urban background sites and an upward trend in roadside sites for the majority of participating Boroughs.

# 1 INTRODUCTION

In recent years, $NO_2$ diffusion tubes have proven to be a useful tool for local authorities in screening and baseline surveys, particularly with regards to the Review and Assessment of air quality for local air quality management (Part IV of the Environment Act 1995). Additionally, the Greater London Authority (GLA) has been given an important role to play in the air quality management of the City by virtue of the London Air Quality Strategy that must be taken into consideration by the local authorities when carrying out their statutory duties.

In year 2006 a total of fifteen London Boroughs participated in the nitrogen dioxide London-Wide Environment Programme:

- London Borough of Bexley
- London Borough of Brent
- London Borough of Camden
- Corporation of London
- London Borough of Croydon
- London Borough of Greenwich
- London Borough of Hammersmith & Fulham
- London Borough of Harrow
- London Borough of Hillingdon
- London Borough of Hounslow
- Royal Borough of Kensington & Chelsea
- London Borough of Newham
- London Borough of Richmond-upon-Thames
- City of Westminster
- London Borough of Tower Hamlets

## 1.1 Objectives

The overall objective of this report was to provide subscribing local authorities with an overview of the $NO_2$ concentrations recorded as part of the LWEP $NO_2$ Diffusion Tube Survey in 2006 and to view these results in the broader context of regulatory requirements and previous monitoring data.

This overall objective was met by:

- Outlining the reasons for undertaking the monitoring of ambient levels of $NO_2$;
- Outlining relevant existing and future legislative air quality requirements;
- Detailing the $NO_2$ sampling methods employed by Bureau Veritas in undertaking the LWEP $NO_2$ Diffusion Tube Survey, including the quality assurance and quality control procedures;
- Identifying the geographical spread of annual mean $NO_2$ concentration of participating boroughs at background and roadside sites within Greater London;
- Assessing the long-term trends in $NO_2$ concentrations recorded as part of the LWEP $NO_2$ Diffusion Tube Survey since 1986;
- Reporting the annual mean $NO_2$ concentrations at each site for all participating boroughs in 2006 and to place these results in the context of other results gathered since 1993;
- Undertaking analysis of the results to assess trends in pollution at background and roadside classes for each participating borough;
- Identifying the elevation in $NO_2$ concentrations at roadside sites when compared to background levels in each participating borough;
- Validation of nitrogen dioxide diffusion tube data through the analysis of results from tubes co-located at automatic analysers in London.

# 2 FORMATION, SOURCES AND EFFECTS OF $NO_2$

## 2.1 Formation of atmospheric nitrogen dioxide

$NO_2$ is generated naturally and by man-made activities. $NO_2$ can be emitted directly (known as primary $NO_2$) or can form during a series of chemical reactions in the atmosphere involving $NO_x$ (NO + $NO_2$) and ozone (referred to as secondary $NO_2$.) $NO_2$ can, in turn, act as a future source of oxygen in the formation of ozone under photochemical conditions. Due to the nature of the formation of $NO_2$ in the atmosphere, there is often an inverse relationship between concentrations of ozone and $NO_2$.

Combustion processes are the main anthropogenic source of $NO_x$ emissions. These include road transport, power generation, and various high-temperature industrial processes.

The concentration of $NO_2$ in the atmosphere at any given location is influenced by a number of factors. These include the magnitude and proximity of $NO_x$ emissions sources, the proportion of $NO_x$ directly emitted as $NO_2$, the chemistry leading to the generation and destruction of $NO_2$, and meteorological conditions that affect the dispersion and accumulation of $NO_2$. During the winter months, anti-cyclonic weather systems often result in stable, cold weather conditions, which along with oxidation by atmospheric oxygen often produce pollution episodes. The product of such conditions is thought to be responsible for the extremely high $NO_2$ concentrations recorded over London in December 1991, when levels peaked at over 803.5 $\mu g\ m^{-3}$ in the evening rush hour. During the summer, increased temperatures and solar radiation serve to increase the rate of photochemical reactions in the atmosphere. The higher the concentration of $NO_2$, the more oxygen is available for the production of ozone leading to a general decrease in occurrence of $NO_2$ when compared to the winter months.

## 2.2 Emission sources

Emissions inventories are an important means of quantifying emissions of $NO_x$ from different sources at different times. The greatest contributor of nitrogen oxides ($NO_x$) in the UK is road transport. Fossil-fuelled power stations contributed around a quarter of the total $NO_x$ in the same year, whilst the remainder came from a variety of sources including industry and domestic activity.

Estimates indicate that 49% of total UK NOx emissions were produced by road transport in 2000[1]. Heavy-duty vehicles currently emit 43% of NOx emissions from road transport. However, these estimates are based on limited emissions tests on these vehicles. There has been an approximate 34% reduction in $NO_x$ emission from road transport between 1990 and 2000 due to improvements in engine design, fitting of three-way catalysts and progressively stricter European vehicle emission standards for petrol cars. The contribution of road transport to $NO_x$ emissions in urban areas is generally higher than the national average. In London 68% of $NO_x$ emissions originate from road transport.

There is evidence that significant amounts of $NO_2$ are emitted directly from the tail pipe of diesel vehicles, with levels possibly as high as 25% of total $NO_X$ emissions.[2] Primary emissions of $NO_2$ will be particularly significant for slow-moving buses and large HGVs, as well as diesel vans and taxis in the centre of towns and cities. The contribution from increasing sale of diesel cars in the UK is expected to lead to a small increase (3%) [3] in future $NO_2$ concentrations in urban areas.

## 2.3 Health effects

Medical and epidemiological evidence suggests that nitrogen dioxide may have both acute and chronic effects on health.

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[1] Nitrogen Dioxide in the UK, AQEG, 2004
[2] Source: AQEG Nitrogen Dioxide in the United Kingdom 2004
[3] Source: AQEG Nitrogen Dioxide in the United Kingdom 2004

Experimental evidence has shown that $NO_2$ probably exerts its biological damage by oxidation, with the primary toxic effect occurring in the respiratory system. Susceptible groups include young children, asthmatics and people with chronic respiratory diseases. It has also been shown that individuals sensitive to allergens will show a significant response to high concentrations of $NO_2$. Whilst there have been recorded responses in the susceptible groups listed, it has been demonstrated that individuals not suffering from respiratory disease will be, by-and-large, unaffected by air pollution episodes.

At present, there are still uncertainties concerning the effects of $NO_2$ exposure over a longer time scale[4]; this is due to the wide range of modifying influences on the behaviour of a single pollutant. It is difficult statistically to separate the impacts on health of $NO_2$ from those of other pollutants. During the December 1991 episode, particles were also recorded at high levels. It is probable that a synergistic combination of pollutants gives rise to detrimental health effects, as opposed to individual pollutants acting alone. Research conducted at St Bartholomew's Hospital in London showed that exposure of asthmatics to high $SO_2$ and $NO_2$ levels in combination can increase the subject's response to airborne allergens. Many studies estimating the chronic effects of $NO_2$ use unquantified and indirect measures of exposure, though these studies do suggest that the effects of $NO_2$ exposure are significant.

[4] Defra (2006) Air Quality Strategy (Draft for Consultation)

# 3 POLICY FRAMEWORK

## 3.1 Standards and Objectives

Air quality standards relevant to $NO_2$ concentrations have undergone change, both nationally and on a European level. For Europe, the First Air Quality Daughter Directive (1999/30/EC) sets out limits for annual mean and hourly mean $NO_2$ concentrations and aims to achieve the objectives by 1st January 2010.

**Table 1 Air Quality Objectives for nitrogen dioxide in first Daughter Directive**

| | Concentration | Measured as | Achievement Date |
|---|---|---|---|
| **Hourly** | 200 $\mu$g $m^3$ not to be exceeded more than 18 times a year | 1 hour mean | 1 January 2010 |
| **Annual** | 40 $\mu$g $m^3$ | Annual mean | 1 January 2010 |

Air quality standards relevant to the UK are found in The Air Quality Strategy for England, Scotland, Wales and Northern Ireland[5] (AQS). The document was published in January 2000, superseding the earlier National Air Quality Strategy[6] (NAQS) published in March 1997. The Review (2006) of the AQS[7] proposes to maintain the framework for reducing air pollution at national and local levels from a wide range of emission sources. The AQS Review retains the two Air Quality Objectives (AQOs), one hourly and one annual (Table 2), in line with those set in the European Directive, although an earlier date for the objectives to be achieved (of 31st December 2005) had been set.

**Table 2 Air Quality Objectives for nitrogen dioxide in AQS**

| | Concentration | Measured as | Achievement Date |
|---|---|---|---|
| **Hourly** | 200 $\mu$g $m^3$ not to be exceeded more than 18 times a year | 1 hour mean | 31 December 2005 |
| **Annual** | 40 $\mu$g $m^3$ | Annual mean | 31 December 2005 |

The standards for the eight pollutants covered by the strategy are underpinned by recommendations made by the Government's Expert Panel on Air Quality Standards (EPAQS). The objective levels had been based on medical and scientific evidence of how each pollutant affects human health. Factors such as economic efficiency, practicability, technical feasibility and time-scale have also been taken into consideration by the government when setting the final objective values. Objectives for $NO_2$ are prescribed in the Regulations for the purpose of Local Air Quality Management (LAQM) and thus have direct relevance to the diffusion tube network in London.

[5] DETR (2000) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland - Working together for Clean Air"
[6] DoE (1997) The United Kingdom National Air Quality Strategy
[7] Defra (2006) Review of The Air Quality Stratgey for England, Scotland, Wales and Northern Ireland – Draft for Consultation

LAQM is at the heart of the AQS. Local authorities are charged with reviewing current air quality and assessing whether the relevant AQO will be achieved by the target date. Those authorities that concluded that one or more of the objectives were unlikely to be achieved, were obliged to declare Air Quality Management Areas (AQMAs) and draw up action plans of how to reduce air pollution. Most London boroughs declared AQMAs on the prediction that the annual mean AQO for $NO_2$ would not be met by the end of 2005, as was shown by the 2005 results.

### 3.2 The Greater London Authority

The Greater London Authority (GLA), created under the Greater London Authority Act 1999 assumed its responsibilities on 3 July 2000. It was created to give London its own decision making authority, which is in line with the Government's wider environmental, transport, economic and planning objectives.

As a result, the Mayor has significant decision-making abilities being charged, amongst other things, with the responsibility for the London-wide environment and a duty to promote the health of Londoners. The Mayor has a duty to develop an air quality management strategy, in consultation with the London Boroughs, to deliver improvements to air quality in London. The Strategy for London is required to include proposals and policies from the National AQS as well as any other proposals and policies that the Mayor considers appropriate. The Mayor's Air Quality Strategy was published in September 2003, and states that meeting targets for $NO_2$ is the primary concern of the strategy.

The strategy recognises that road traffic is the primary cause of air pollution in London and is consequently linked to other relevant strategies and measures taken by Transport for London (TfL), the Greater London Authority, and the London Development Agency (LDA). TfL in particular are instrumental in tackling this problem by traffic reduction measures, promote and adopting cleaner technologies such as alternative fuels. New schemes such as a congestion-charging zone around London and the anticipated Low Emission Zone are likely to lead to environmental benefits. In addition to road traffic, commercial and domestic space heating is another significant source of $NO_2$ though measures needed to reduce this emission source are yet uncertain.

Long-term monitoring of $NO_2$ by diffusion tubes with its geographical spread across London will assist in determining the effect of a number of these policies in the future. Recommendations in a review of the urban network for measurement of Black Smoke, $SO_2$ and $NO_2$ (2006) included the adoption of standardised operating methods, to make both equivalence demonstrable and cross-authority comparisons possible; and traceability to a reference method to facilitate central data collation[8]. The clear advantages of the LWEP $NO_2$ Programme are the existing adherence to the NETCEN guidelines and the centralised collection and analytical procedures recommended above.

[8] A Review of the UK urban network for measurement of Black Smoke, $SO_2$, and $NO_2$: Summary Report (2006)

# 4 $NO_2$ DIFFUSTION TUBE MONITORING

## 4.1 Diffusion tubes

Diffusion tubes are simple and inexpensive passive sampling devices that have become a widely used monitoring devices in the UK for measuring ambient $NO_2$ concentrations. The samplers are composed of an acrylic tube that can be sealed at both ends. One end of the tube contains two stainless steel mesh discs coated with triethanolamine (TEA) that adsorbs $NO_2$ to produce a nitrite salt that can be determined by colorimetry. Once the inlet cap is removed exposure begins, and a concentration gradient is established within the tube resulting in molecular diffusion takes place towards the TEA-coated grid. After exposure the total quantity of gas transferred along the tube is determined by chemical analysis, commonly ultra violet spectrometry.

There are a number of different diffusion tube preparation methods in use by laboratories in the UK. The difference relates to the way in which the metal grids are coated with TEA. The methods currently in use are 50% TEA in acetone, 50% TEA in water and 10% TEA in water.

## 4.2 Performance of diffusion tubes

$NO_2$ diffusion tubes are an indicative monitoring technique commonly exploited to investigate the temporal and spatial trends in $NO_2$ concentrations. These devices do not perform to the same accuracy as the automatic chemiluminescent analyser, which is identified by the EU as the reference method of measurement for nitrogen dioxide. Numerous studies have been undertaken to explore the factors affecting diffusion tube performance. These have focused on exposing diffusion tubes alongside chemiluminescence monitors. The results have observed that measurements by diffusion tubes over-estimate (positive bias) or underestimate (negative bias) the true ambient $NO_2$ concentrations. The various mechanisms[9] that have been proposed to explain the over- and under-estimation of $NO_2$ concentrations by diffusion tubes include:

*Over-estimation of ambient $NO_2$ concentrations*

- Higher wind speeds can generate turbulence in the entrance of the diffusion tube causing a shortening of the diffusion tube length.
- Reduced $NO_2$ photolysis in the tube by the blocking of UV light by the tube material.
- Interference effects of the secondary particulate compound peroxyacteyl nitrate (PAN).

*Under-estimation of ambient $NO_2$ concentrations*

- Insufficient extraction of nitrite from the grids
- Increased exposure time that is thought to cause the degradation of absorbed nitrite over time.

The factors[10] that have been suggested to influence diffusion tube performance are:

- The laboratory preparing and analysing the tubes
- The exposure interval – weekly, 2-weekly or monthly
- Time of year
- The exposure setting – sheltered or exposed
- The exposure location – roadside or background
- The tube preparation method
- The exposure concentration and $NO_2/NO_x$ ratio

[9] Air Quality Expert Group: Report on Nitrogen Dioxide in the United Kingdom, 2004,Appendix 1
[10] Compilation of Diffusion Tube Co-location Studies Carried out by Local Authorities, 2002, Air Quality Consultants

## 4.3 Bias adjustment factors

The fact that diffusion tube measurements exhibit a bias compared to the reference method needs to be taken into consideration when results are to be compared with air quality standards and objectives. DEFRA's Technical Guidance LAQM. TG(03) advises local authorities to examine the bias associated with their diffusion tubes and then apply an adjustment factor to the annual mean, if required, as part of their Review and Assessment of air quality. Co-location studies are recommended (for a minimum period of nine months) where diffusion tubes are exposed in triplicate concurrently with an automatic monitoring site.

In circumstances where local authorities do not have the opportunity to carry out a co-location study a default factor should be applied. Air Quality Consultants has established a spreadsheet on the Review and Assessment website[11] representing default bias correction factors complied from co-location studies carried out by local authorities at roadside and background sites throughout the UK. Default bias correction factors are available for a number of UK laboratories and the key tube preparation methods.

## 4.4 LWEP monitoring programme

A total of 284 monitoring sites were active in the LWEP diffusion tube programme during 2006. The locations of the diffusion tubes are chosen by each authority to reflect the likely exposure of the public to concentrations of nitrogen dioxide. All monitoring site have been classified as either roadside (0-20 m) or background (>20 m) depending on the distance from the road. The number of tubes exposed in each borough is at the discretion of each local authority involved in the monitoring programme. Nitrogen Dioxide concentrations in London are mainly attributable to road transport, which results in a strong bias towards roadside as the choice of site as opposed to background sites.

### 4.4.1 Diffusion tube preparation and analysis

The diffusion tubes employed in the LWEP programme are prepared and analysed by UKAS accredited Gradko International Ltd. Diffusion tubes are prepared using the 50% v/v triethanolamine with acetone method and analysed using UV spectrometry. The diffusion tubes are labelled, and kept refrigerated in plastic bags prior to and after exposure.

As results from the LWEP are incorporated into the UK Nitrogen Dioxide Diffusion Tube Survey, the tubes are exposed for a four-to five-week period, consistent with the National Survey. Adherence to the changeover dates is important to enable as valid an inter-comparison as possible between boroughs.

### 4.4.2 Quality assurance and quality control

The EU Daughter Directive sets data quality objectives for nitrogen dioxide along with other pollutants. Under the Directive, annual mean $NO_2$ concentration data derived from diffusion tube measurements must demonstrate an accuracy of $\pm$25 % to enable comparison with the Directive air quality standards for $NO_2$.

In order to ensure that $NO_2$ concentrations reported are of a high calibre, strict performance criteria need to be met through the execution of quality assurance and control procedures. As mentioned earlier, a number of factors have been identified as influencing the performance of diffusion tubes including the laboratory preparing and analysing the tubes and the tube preparation method. Quality assurance and control procedures are, therefore, an integral feature of any monitoring programme, ensuring that uncertainties in the data are minimised and allowing the best estimate of true concentrations to be determined.

[11] http://www.uwe.ac.uk/aqm/review/diffusiontube300905.xls

Gradko International Ltd conducts rigorous quality control and assurance procedures in order to maintain the highest degree of confidence in their laboratory measurements. These are discussed in more detail below.

*Workplace Analysis Scheme for Proficiency (WASP)*

Gradko International Ltd participates in the Health and Safety Laboratory WASP[12] $NO_2$ diffusion tube scheme on a monthly basis. This is a recognised performance-testing programme for laboratories undertaking $NO_2$ diffusion tube analysis as part of the UK $NO_2$ monitoring network. The scheme is designed to help laboratories meet the European Standard EN482[13]. The laboratory performance for each month of 2006 was rated 'good' which signifies a high level of accuracy for laboratory measurements.

*Network Field Inter-comparison Exercise*

Gradko International Ltd also takes part in the $NO_2$ Network Field Inter-comparison Exercise, operated by NETCEN, which complements the WASP scheme in assessing sampling and analytical performance of diffusion tubes under normal operating conditions. This involves the regular exposure of a triplet of tubes at an Automatic Urban Network site (AUN) site. These sites employ continuous chemiluminescent analysers to measure $NO_2$ concentrations. Of particular interest is the bias of the diffusion tube measurement relative to the automatic analyser that gives an indication of accuracy. NETCEN have established performance criterion for participating laboratories in line with the EU 1st Daughter Directive requirement for indicative monitoring techniques, as the 95% confidence interval of the annual mean bias which should not exceed ± 25%.

In conjunction with this, a measure of precision is determined by comparing the triplet co-located tube measurements commonly referred to as the coefficient of variation (CoV). This value is useful for assessing the uncertainty of results due to sampling and analytical techniques. The NETCEN performance criterion for precision is that the mean coefficient of variation for the full year should not exceed 10%.

The Field Inter-comparison Exercise has historically generated the bias and precision results for each laboratory on an annual basis. This changed in 2004 to results being reported on a monthly basis. This enables a full year's inter-comparison against the NETCEN performance criteria to be carried, as shown in Table 3. The results below indicate that Gradko International Ltd diffusion tubes are well within the performance targets set by NETCEN.

**Table 3 Summary of $NO_2$ Network Field Inter-comparison Results, 2006**

| Annual Mean Bias | | Precision | |
|---|---|---|---|
| NETCEN Performance Target | Gradko Annual Mean Bias | NETCEN Performance Target | GradkoPrecision |
| **±25%** | **- 11%** | **10%** | **4%** |

Gradko International Ltd perform blank exposures that serve as a quality control check on the tube preparation procedure**.** All results are blank subtracted before they are issued to the relevant Borough.

Bureau Veritas conduct an 'in-house' co-location study to establish an LWEP bias adjustment factor based on triplicate $NO_2$ diffusion tubes sampling concurrently located with a continuous analysers for a number of local authorities. This is discussed in more detail in Chapter 9.

[12] Health and Safety Executive, Workplace Analysis Scheme for Proficiency
[13] European Committee for Standardisation (CEN) Workplace Atmospheres, General requirements for the performance of procedures for the chemical measurement of chemical agents, EN482, Brussels, CEN 1994.

# 5 OVERVIEW OF RESULTS

## 5.1 Current year results

Table 4 shows summary statistics for the 284 diffusion tube sites operating in the 2006 LWEP Diffusion Tube Network.

Sites were excluded from analyses if data capture was calculated to fall below 75%. The effective number of sites operating throughout 2006 were 268.

Background concentrations elevate to a maximum of 57 µg $m^3$ and roadside concentrations to 128 µg $m^3$.

In 2006 a total number of 177 sites exceeded the 2005 annual concentration air quality objective, of which 83% were roadside monitoring sites.

At background sites, there was a decrease in the average annual mean $NO_2$ concentration of 5 % when compared to 2005. At roadside sites, there was a decrease of 6 %.

The number of sites failing to meet the 2005 air quality objective decreased by 10% in 2006 compared to the previous year.

**Table 4 Summary statistics for all qualifying LWEP diffusion tubes monitoring sites 2006**

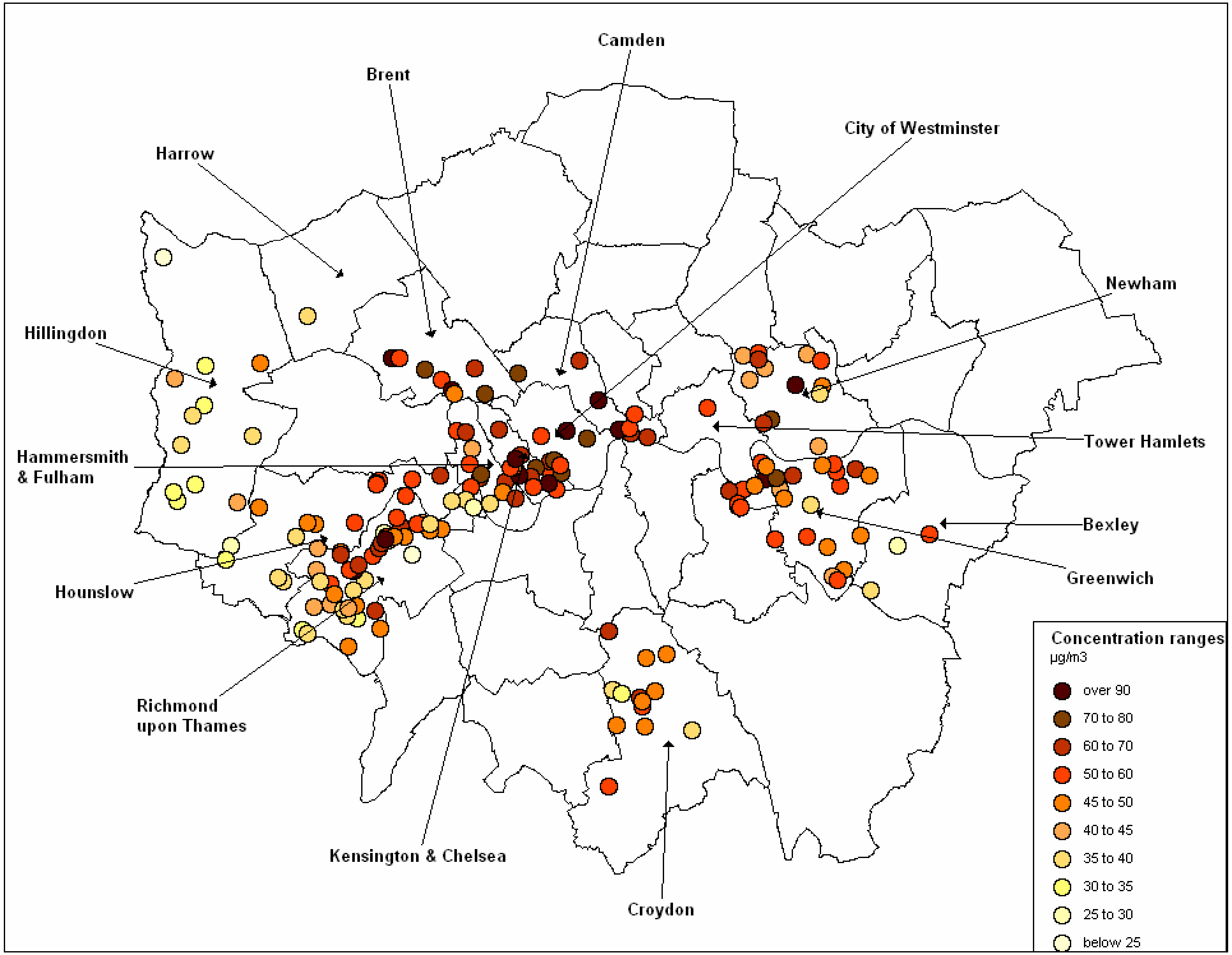
| Site Type | Number of Sites | Annual Mean $NO_2$ Concentration Ranges (µg/$m^3$) | Annual Mean $NO_2$ Concentration (µg/$m^3$) | Number of AQO Exceedances |
|---|---|---|---|---|
| Background | 84 | 19.0 – 70.4 | 36.9 | 30 |
| Roadside | 184 | 21.6 – 127.6 | 53.6 | 147 |

## 5.2 Geographical spread of nitrogen dioxide concentrations

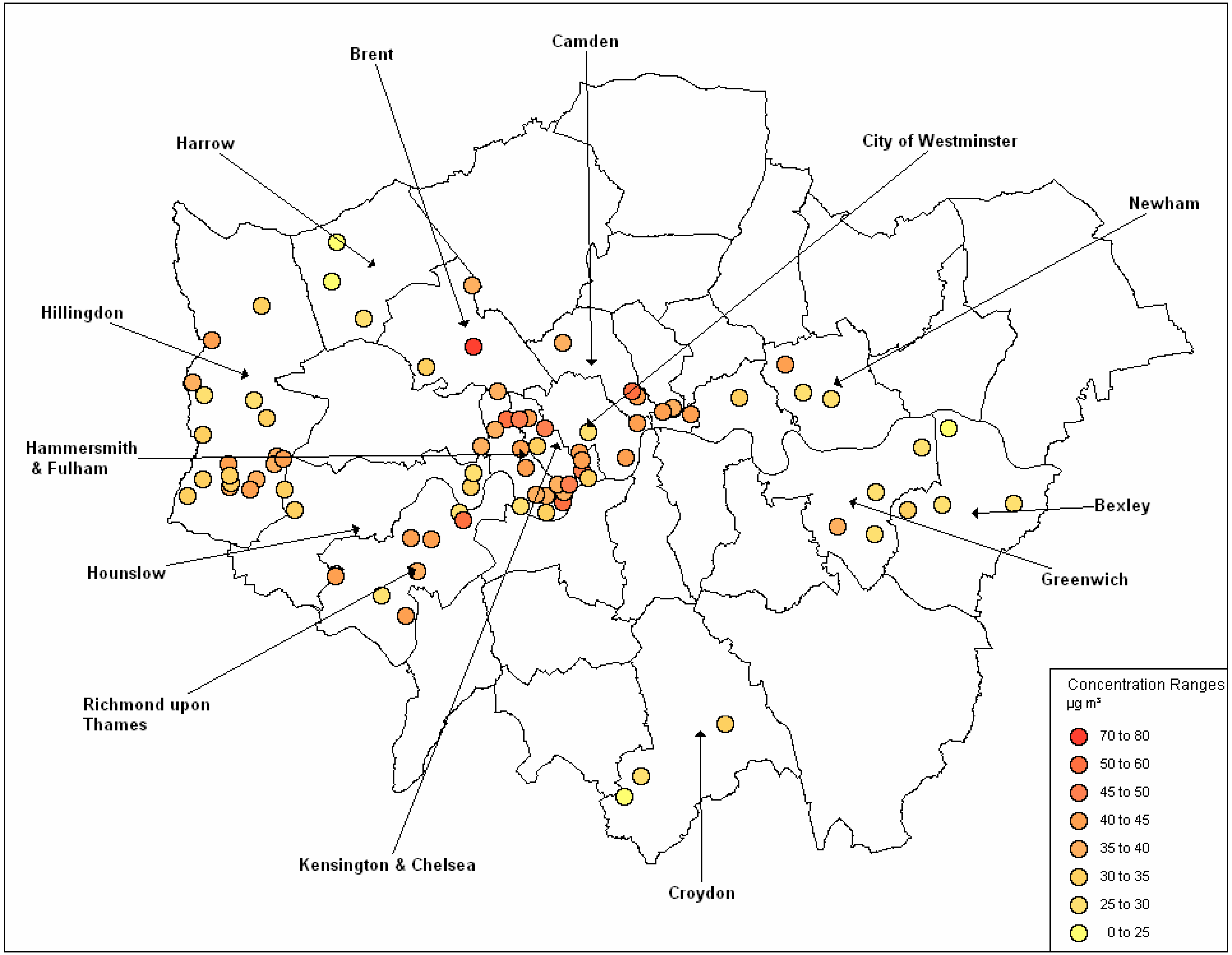
Maps 1 and 2 show the geographical spread of the annual mean concentrations for the nitrogen dioxide diffusion tube survey across London for 2006. The maps include data only from Boroughs that are part of the London Wide Environment Programme for nitrogen dioxide.

The higher $NO_2$ levels are concentrated around central parts of London while further away from the centre, the levels tend to decrease. Background sites predominantly are recorded an annual mean in the 30-40 µg/$m^3$ range uniformly spread throughout London. The highest background annual mean concentrations are clustered within central London. Annual mean $NO_2$ concentrations at roadside sites are predominantly recorded in the 50-60 µg/$m^3$ concentration range. The centre of London maintains the highest levels of roadside $NO_2$ reaching with annual means recording over 100 µg/$m^3$.

## Map 1 Annual Mean Roadside $NO_2$ Concentrations, 2006



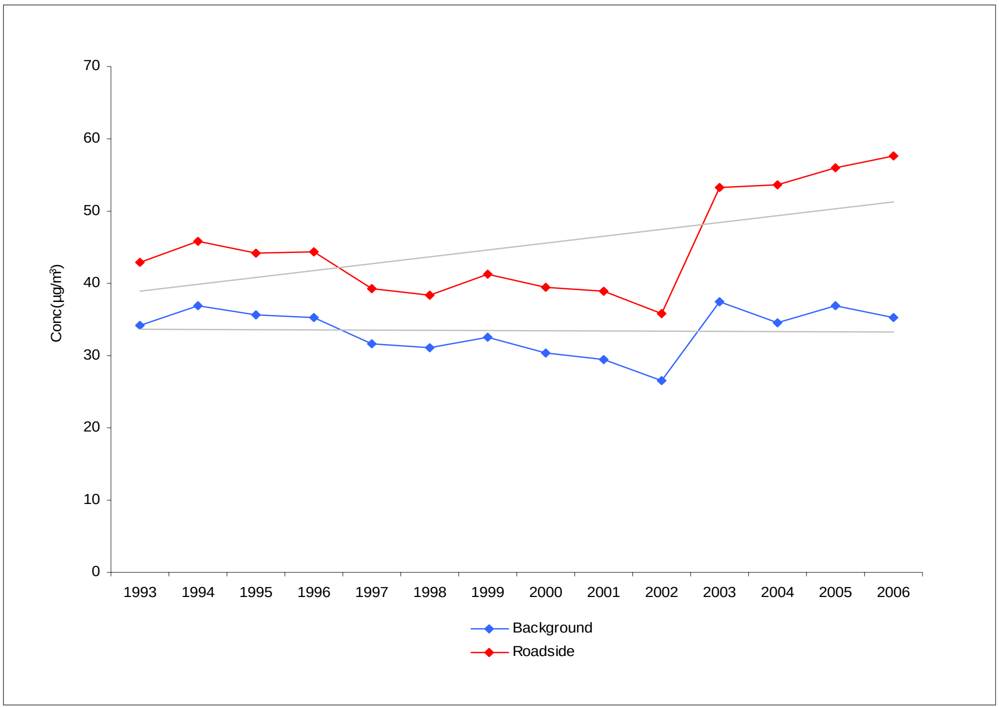
**Map 2 Annual Mean Background $NO_2$ Concentrations, 2006**



## 5.3 Long term trends

To establish long-term trends in annual mean $NO_2$ concentrations recorded at both background and roadside sites from 1986 to the present date have been utilised. The introduction of the UK Nitrogen Dioxide Diffusion Tube Survey in 1993 and the resultant increase in exposure time from 2 to 4 - 5 weeks showed a distinct change in long-term concentrations. The extension in exposure time had the effect of decreasing $NO_2$ concentrations. In order to strengthen the comparability and representation of long-term trends, data have been collated from diffusion tube sites over a complete data set from 1993 to the present year. Sites were included in the selection below if there six or more years continuous data records were available. This subsequently provides a much larger data set comprising of a total of fifty-four (previously fifty-six) sites covering both roadside and background locations. Overall, this improves the inter-year and site comparability of $NO_2$ concentrations over the past thirteen years.

**Figure 1 Long-term annual mean $NO_2$ concentrations at selection of background and roadside sites in London.**




Long-term background and roadside sites follow very similar trends, and indicate a gradual decline in annual mean $NO_2$ concentration between 1993 and 2002. In 2003 a distinct increase in annual $NO_2$ concentration is recorded at both site types, and was initially attributed to poor meteorological conditions; however, roadside concentrations continued to increase in subsequent years. Roadside $NO_2$ concentrations increased again in 2006 to reach their highest level over the monitoring period. Background sites however show a decrease over 2006 below to concentrations close to those recorded in 2004 although not to 2002 levels.

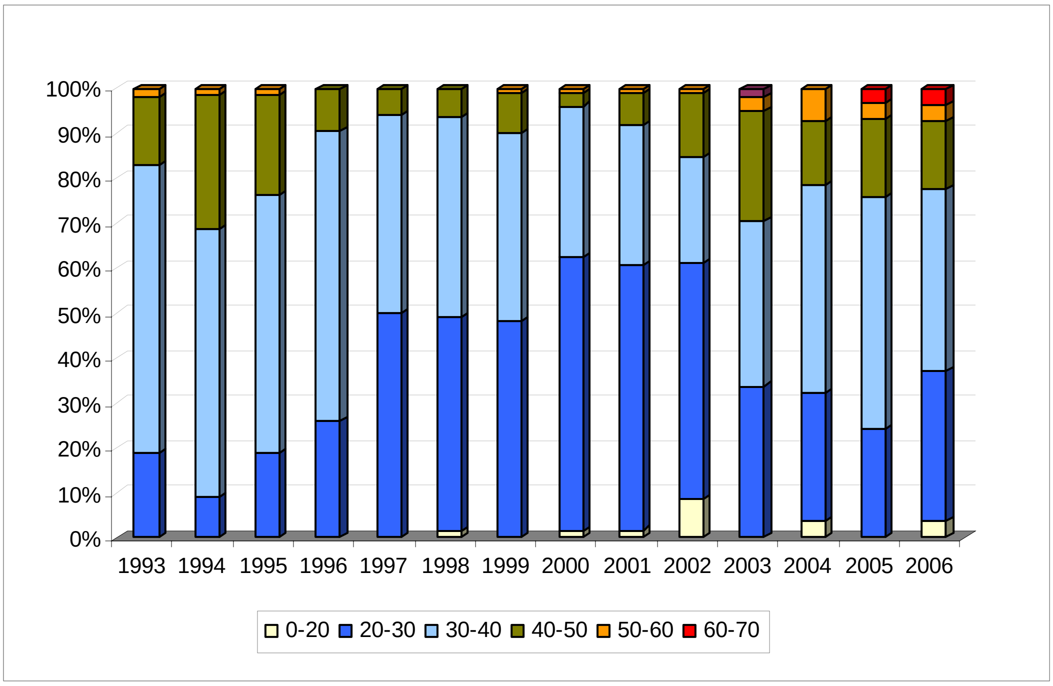



**Figure 2 Frequency Distribution of Annual Mean Background $NO_2$ Concentrations, 1993-2006**

In the early part of the programme the largest percentage of annual mean $NO_2$ concentrations was present in the 30-40 µg/m$^3$ banding. Approximately 5% of sites recorded concentration in the 50-60 µg/m$^3$ banding. From 1997 to 2002 there is a clear variation in the frequency of each banding. Annual mean $NO_2$ concentrations in the 50-60 µg/m$^3$ and 40-50 µg/m$^3$ banding reduce by approximately 50%. Annual mean $NO_2$ concentrations recorded in the 20-30 µg/m$^3$ range gradually increased over this period. In 1998 annual mean $NO_2$ concentrations were recorded in a new band: below 20 µg/m$^3$, and continue to be recorded in this banding over the next four years. In 2002 annual mean $NO_2$ concentrations illustrate a change in the proportion of each concentration banding.

The 0-20 µg m$^3$ banding disappeared in 2003, reappeared in 2004 then disappeared in 2005. The 20-30 µg/m$^3$ banding are the most frequently recorded concentrations at London sites until 2003. The 50-60 µg m$^3$ banding was introduced in 2003 and a concentration range of 60-70 µg/m$^3$ was been introduced in 2003 but did not reappear until 2005 when only a small percentage of annual mean concentrations fell within the range. Until 2004 the highest percentage of background annual $NO_2$ means were recorded in the 30-40 µg/m$^3$ concentration range. In 2004 and 2005, the highest percentage of results was recorded within the 30-40 µg/m$^3$ bandings.

In 2006, the 50-60 µg/m$^3$ and 60-70 µg m$^3$ bandings have remained constant compared with the previous year's levels and the 40-50 µg/m$^3$ banding has decreased in size. The 0-20 µg/m$^3$ band has re-appeared and a larger percentage of the results falling within the 20-30 µg m$^3$ range. In 2006, the highest percentage of results was recorded within the 30-40 µg/m$^3$ banding.

The frequency distributions for background sites indicate that in 2006 a greater proportion of $NO_2$ concentrations are associated with the lower to middle concentration bandings.

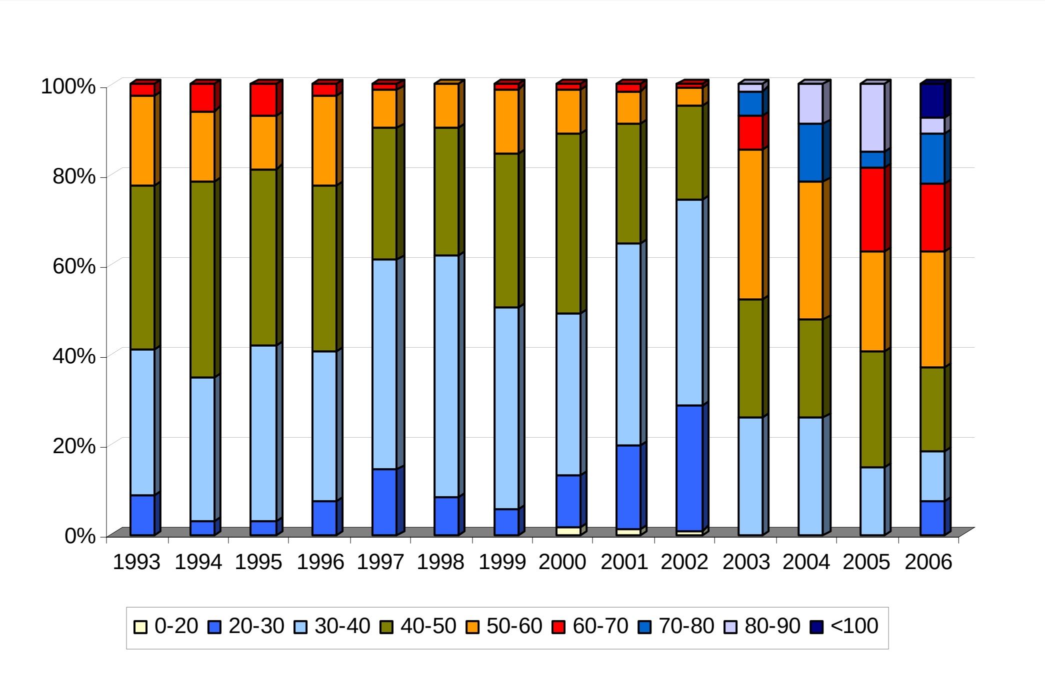



**Figure 3 Frequency Distribution of Annual Mean Roadside $NO_2$ Concentrations, 1993-2006**

Between 1993 and 1996 the highest percentage of annual mean $NO_2$ concentrations at roadside were present in the 40-50 µg/m$^3$ concentration banding. Approximately 10% of sites recorded concentrations over 60 µg/m$^3$ and a very low number showed concentration in the 20-30 µg/m$^3$ banding.

A reduction in the frequency of annual mean roadside $NO_2$ concentrations in the >60µg/m$^3$, 50-60 µg/m$^3$ and 40-50 µg/m$^3$ bands are apparent from 1997 onwards. An elevation in sites recording concentrations in the 30-40 µg/m$^3$ band occurs in 1997 remaining at this frequency over the next 5 years. Between 2000 and 2002 sites begin to record concentrations >20 µg/m$^3$. In 2002 roadside sites recording in the banding of 20 to 30 µg/m$^3$ show a sharp increase, whereas sites recording the higher bandings decline.

A distinct change in the proportion of each concentration banding takes place in 2003 reflecting the sizeable elevation in $NO_2$ levels. In 2003 concentration bands 70-80 µg m$^3$ and 80-90 µg m$^3$ were introduced. Between 2003 and 2005 no concentrations falling with the range 20-30 µg m$^3$ were recorded. In 2004 no concentrations were recorded in the 60-70 µg m$^3$ band and a higher percentage were recorded in the 50-60 µg/m$^3$ range. In 2005 the highest percentage results were recorded within the 40-50 µg m$^3$ band.

In 2006, the 20-30 µg m$^3$ band has re-appeared after an absence of three years. Recorded results falling into the 30-40 and the 40-50 µg/m$^3$ bands is virtually half of the 2005 levels. There are concentration results within the 60-70 µg/m$^3$ band have reduced compared with the previous year. The 70-80 µg m$^3$ band, introduced in 2003, has more than doubled in size, results within the 80-90 µg m$^3$ have significantly reduced. A new band for concentrations >100 µg m$^3$ has also appeared in 2006.

The frequency distributions for roadside sites indicate that in 2006 a greater proportion of $NO_2$ concentrations are associated with the middle to higher concentration bandings.

# 6 DATA ANALYSIS

## 6.1 Introduction

Prior to analysing the results, the entire year's data set for each local authority was validated for outliers and spurious results. Two screening procedures where adopted for this task. Firstly, monthly mean $NO_2$ concentrations recording under 5 µg/m$^3$ where removed. Secondly, only diffusion tube sites with at least nine months of validated monitoring data were then used for further analysis and reporting.

## 6.2 Data analysis

*2006 Mean Values*

Bar charts have been created showing the 2006 annual mean $NO_2$ concentration recorded at each site included in the LWEP survey. The sites were classified by the Local Authorities based on distance from the nearest major road into background or roadside types. Appendix 1 lists the $NO_2$ concentration for all the roadside and background sites in each borough. Sites that have exceeded the 40 µg/m$^3$ 2005 air quality objective have been highlighted, Sites that would have exceeded the 40 µg/m$^3$ 2005 air quality objective once a correction factor (accounting for the passive methodology and tendency to under or over estimate concentration) has been applied are also highlighted.

*Site Time Series*

Time series plots have been created for sites with over six years of continuous monitoring data. Each time series plot contains data for sites as grouped by their site class.

## 6.3 Analysis of results

*Trend Analysis by Site Class*

Monitoring sites with a minimum of six years continuous data were first identified. Individual concentrations are grouped by site class to provide an arithmetic mean for each site class. The mean annual class concentrations have been plotted and a simple linear trend model applied to assess whether concentrations have generally risen or fallen at background, and roadside locations within each Borough.

*Roadside Elevation*

Annual mean background concentrations were subtracted from annual mean roadside concentrations to calculate the elevation above background $NO_2$ concentration. This may provide an indication of the level of $NO_2$ being received at roadside locations from road transport sources.

Diffusion Tube sites were only included in the calculation of annual mean concentrations for each site class (roadside or background) if consistent and valid data were available. Any sites with 1 or more years of absent or invalid data were not used.

# 7 REPORTING OF RESULTS – PARTICIPATING BOROUGHS

## 7.1 London Borough of Bexley

### Annual Mean Values

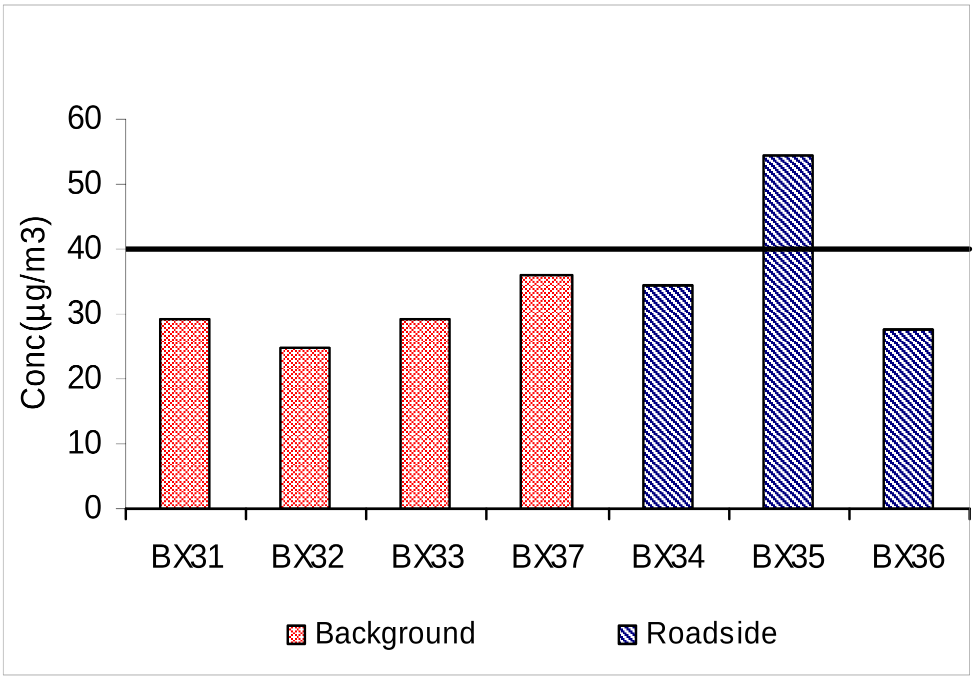



**Figure 4 Bexley Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Bexley exposed diffusion tubes at seven monitoring locations in 2006, with no changes in sites numbers compared to the previous year. The data capture for Bexley in 2006 was 92%. The annual mean $NO_2$ concentrations for all sites have been reported this year as the 75% data capture criterion was fulfilled. The results can be viewed in Appendix 1.

Background concentrations vary between 24.7 µg /m³ at site BX32 and 34.3 µg/m³ (BX37). The roadside concentrations reported vary between 27.7 µg /m³ (BX35) and 48.9 µg/m³ (BX34). The 2005 air quality objective was exceeded at one monitoring location site BX34; no change since the previous year.

## Time Series

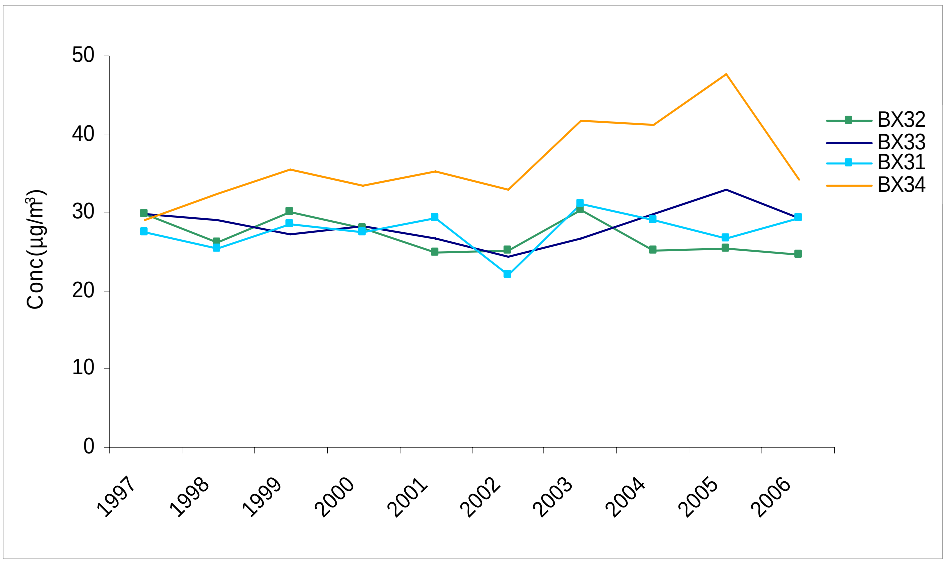



**Figure 5 Bexley Background and Roadside Time Series, 1997-2006**

Background concentrations are generally very similar throughout the period of monitoring. BX32 shows a reduction since the continued minor increases in annual mean $NO_2$ concentration between 2002 and 2005, BX33 shows a more marked reduction in the annual mean, where as BX31 indicates an increase in $NO_2$ levels compared to 2005.

Roadside site BX34 shows the greatest variation with a distinct decrease in 2002 followed by a marked increase in 2003 to a record high in 2005, concentrations at this site decreased in 2006 to pre 2003 levels. Sites BX35 and BX 36 were excluded from this comparison, despite having fulfilled the data capture criterion, due to incomplete data capture in 2004.

## Trend Analysis

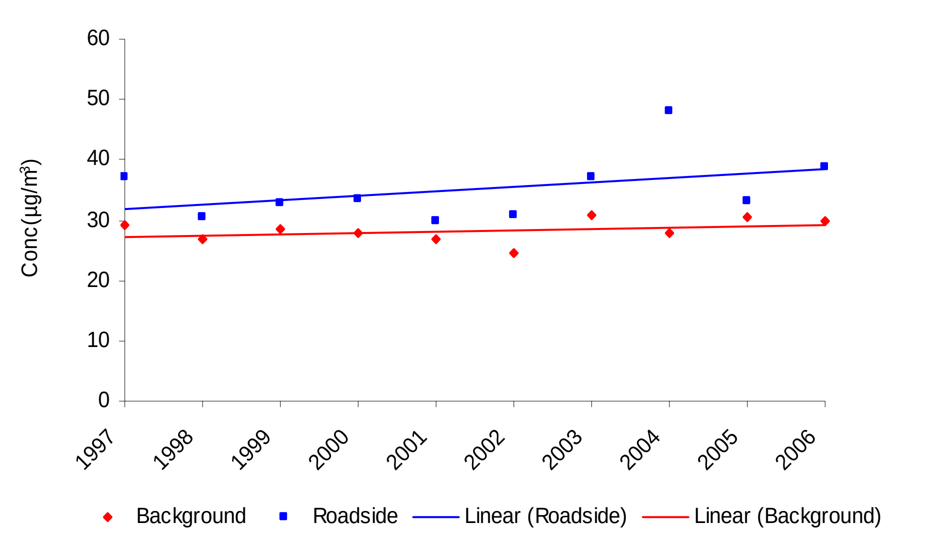



**Figure 6 Bexley Background and Roadside Trend Analysis, 1997-2006**

Long-term background annual mean $NO_2$ concentrations remain relatively constant at around 30 µg/m$^3$. Site BX32 was the first record since 2003 to exceed the Air Quality Objective. Long-term roadside annual mean $NO_2$ concentrations display an upward trend over this period, increasing by 4.9% since 1997, however, this does not fully reflect the significant increase during 2004 and fall during 2005.

## Roadside Elevation

**Table 5 Bexley Elevation Above Background $NO_2$ Concentration µg/m$^3$**

| 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|
| 8.0 | 3.7 | 4.3 | 5.5 | 3.0 | 6.2 | 6.5 | 20.2 | 2.6 | 9.0 |

The roadside elevation in $NO_2$ concentration drops by over 50% between 1997 and 2001, doubles in 2002 and continues to rise slightly in 2003. The roadside elevation concentration shows a marked increase 2004, reaching the highest level over the eight-year monitoring period. The reduction in the roadside elevations achieved during 2005 has been negated by the increase in 2006.

## 7.2 London Borough of Brent

### Annual Mean Values

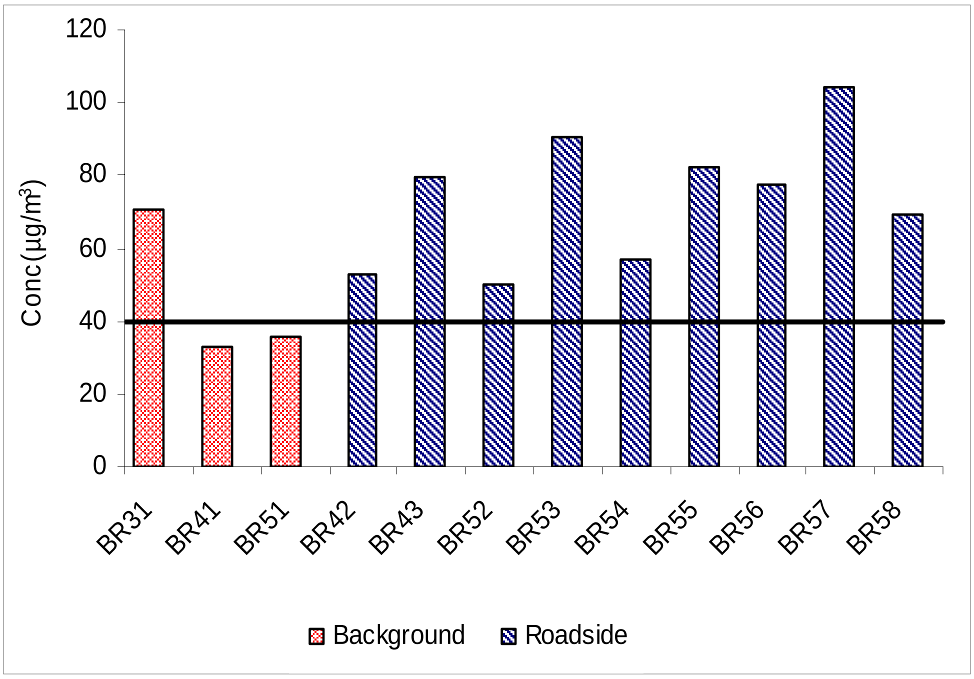



**Figure 7 Brent Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Brent exposed diffusion tubes at 12 monitoring location in 2006, with no change in site numbers compared to the previous year. The data capture for this year was 86%. Annual mean $NO_2$ concentration for all sites fulfilled the 75% data capture criterion.

Background concentrations vary between 32.9 µg /m³ at (BR41) and 70.4 µg/m³ (BR31). Roadside concentrations range between 52.8 µg /m³ (BR42) and 90.2 µg/m³ (BR53). The 2005 air quality objective was exceeded at 83% of the borough's monitoring sites; a small decrease compared with the 91% recorded in 2005.

## Time Series

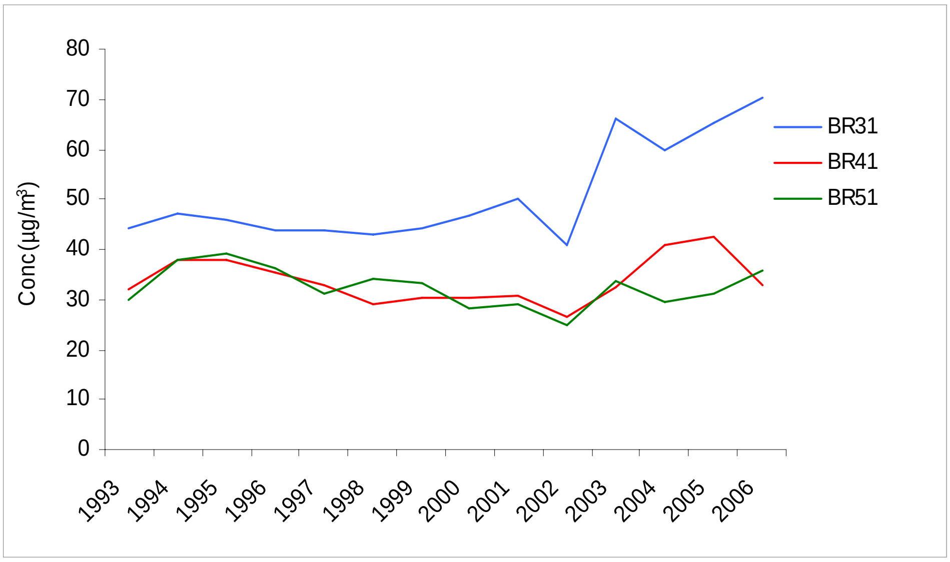



**Figure 8 Brent Background Time Series, 1993-2006**

The annual mean concentration monitored at BR31 is consistently greater than the concentrations monitored at the other background sites. Background concentrations at B41 and BR51 are generally very similar up to 2003. In 2005, there is a continued increase in the monitored concentration at BR41 and the noticeable decreases at BR51 and BR31 in 2004 appear to have been respites in the upward trend. Compared with previous year's results, annual mean $NO_2$ levels at background sites in 2006 increased by 0.3% and are 31.1% higher than 1993 levels.

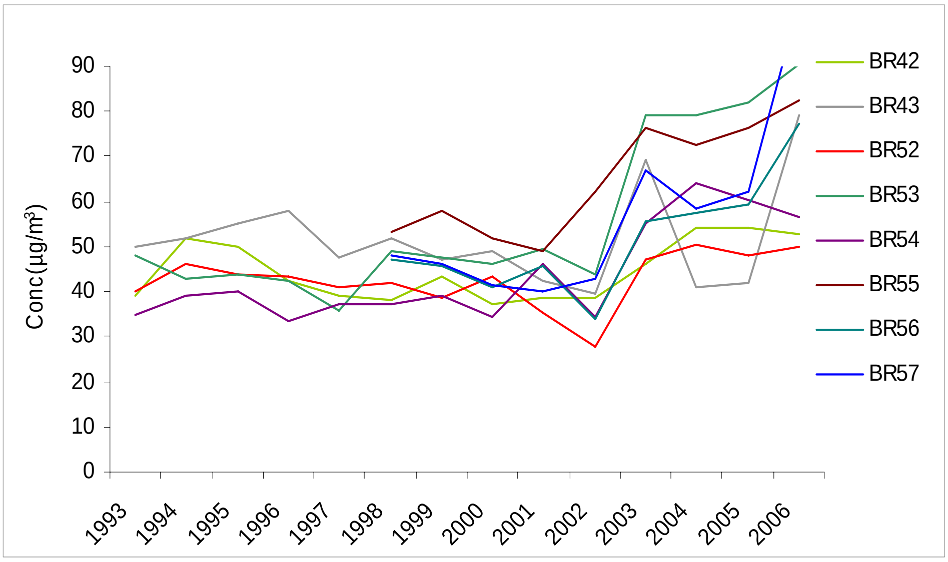



**Figure 9 Brent Roadside Time Series, 1993-2006**

Concentrations at roadside location fluctuate between 1993 and 2002 with no obvious trend. $NO_2$ concentrations increase at all sites in 2003. No obvious trend has emerged with concentrations. During 2004 - 2005 many sites continued to record increasing concentrations while others did not. In 2006, the concentrations decrease at the following roadside sites BR42 and BR54. Sites BR52, BR53 and BR55 concentrations have continued the increasing trend all recording annual $NO_2$ mean levels above the 2003 previous maximum. Sites BR43, BR56 and BR57 show the most significant increases in $NO_2$ concentration compared with both 2003 and 2005, Comparing the annual mean $NO_2$ mean levels at roadside sites between 2005 and 2006, there has been an overall increase of 19.8%.

## Trend Analysis

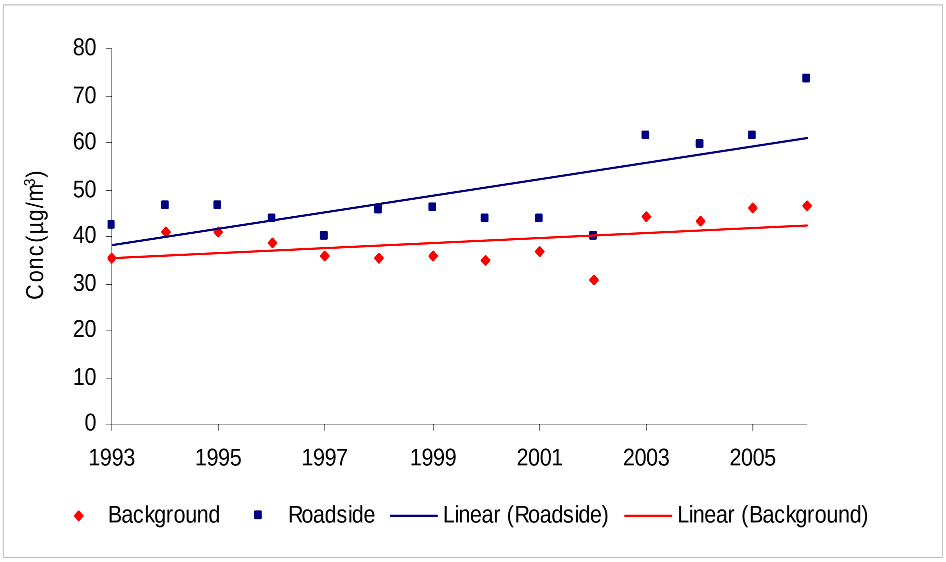



**Figure 10 Brent Background and Roadside Trend Analysis, 1993-2006**

Long-term background annual mean $NO_2$ concentrations remain approximately constant at just under 40 µg/m$^3$ from 1993 to 2002. Increasing in background concentrations can be traced to the meteorological conditions of 2003. Although the increments are smaller than between 2002-2003 there is still an upward trend. Long-term roadside annual mean $NO_2$ concentrations display an upward trend over this period, with a pronounced swing in 2006, increasing by 73.7% between 1993 and 2006.

## Roadside Elevation

**Table 6 Brent Elevation Above Background $NO_2$ Concentration µg/m$^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.6 | 5.5 | 4.2 | 10.4 | 10.1 | 8.5 | 7.3 | 9.2 | 11.9 | 16.4 | 18.2 | 27.2 |

The roadside elevation in $NO_2$ concentration remains virtually constant between 1994 and 1996. The concentration decreases in 1997 but then more than doubles to the 1998 level. The roadside elevation in $NO_2$ concentration falls until 2001 then begins to rise over the next five years reaching its highest value to date of 27.2 µg/m$^3$ in 2006.

## 7.3 London Borough of Camden

### Annual Mean Values

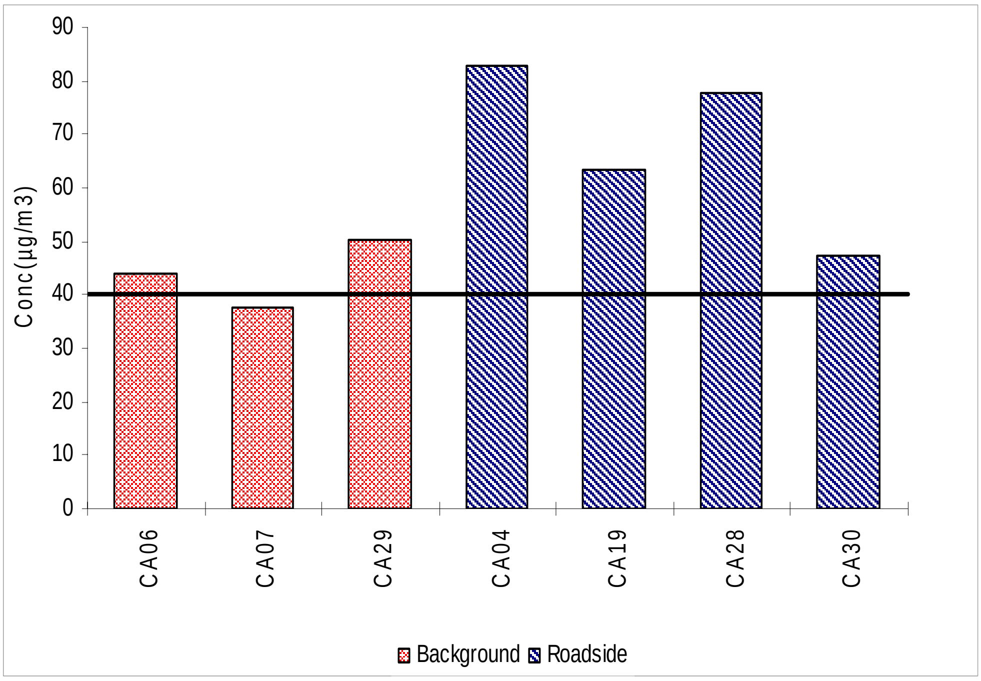



**Figure 11 Camden Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Camden exposed diffusion tubes at 7 monitoring locations in 2006, during the year. The data capture for this year was 82%. Data from all sites for November and December were excluded as the exposure dates did not correspond to the Netcen exposure periods. This level of data capture marks a regression from the 88% data capture in 2005.

Background concentrations vary between 37.7 µg /m³ (CA07) and 50.2 µg/m³ (CA29). Roadside concentrations range between 47.3 µg /m³ (CA30) and 80.3 µg/m³ (CA4). The 2005 air quality objective was exceeded at six of the seven sites representing 86% of the total number of sites, a cessation in reducing trend from the exceedances at 90% of sites recorded in 2003.

## Time Series

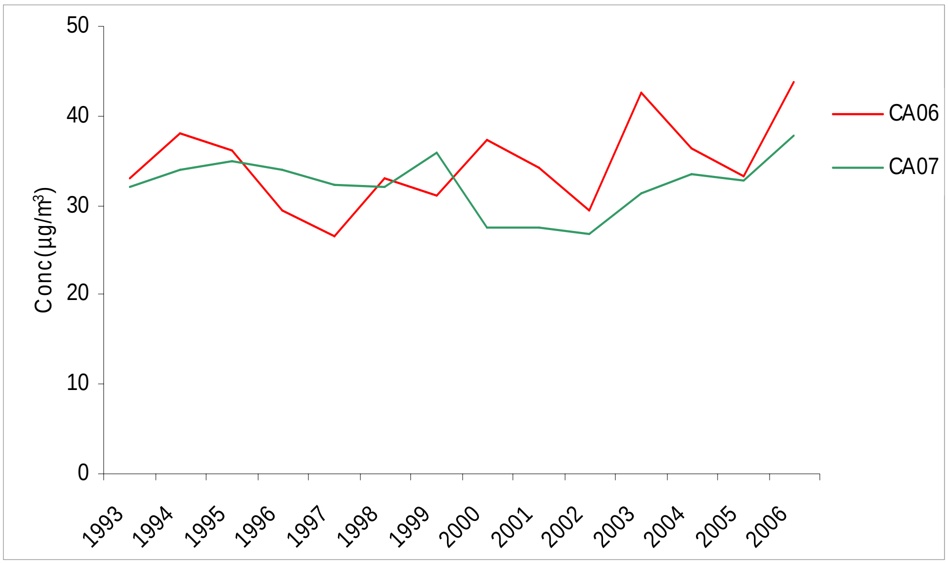



**Figure 12 Camden Background Time Series, 1993-2006**

CA07 maintains a stable level of $NO_2$ up to 1998 after which concentrations decrease until 2002. Concentrations continued to rise at this location between 2002 and 2004, decreased in 2005 before increasing substantially in 2006. Concentrations at site CA06 have fluctuated throughout the period and have increased following a two-year declining period. Comparing the mean of the concentrations monitored at background sites between 2005 and 2006, there has been an increase of 13.9%.

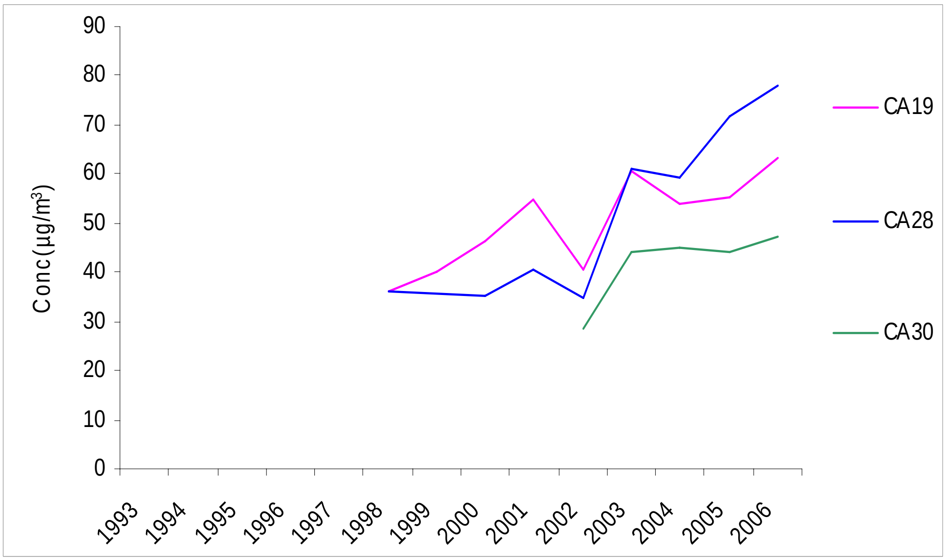



**Figure 13 Camden Roadside Time Series, 1996-2006**

Concentrations monitored at the roadside sites fluctuate between 1996 and 2002. The concentrations increase at all sites in 2003. In 2004, annual mean $NO_2$ concentrations show a minor elevation at all long term roadside sites except CA28. Results from CA10, CA11 and

CA15 have been removed as these sites were discontinued during 2004; CA04 has been excluded due to insufficient data capture in 2004 and 2005. Comparing the mean of the concentrations monitored at roadside sites between 2005 and 2006, there has been an increase of 8.1%.

## Trend Analysis

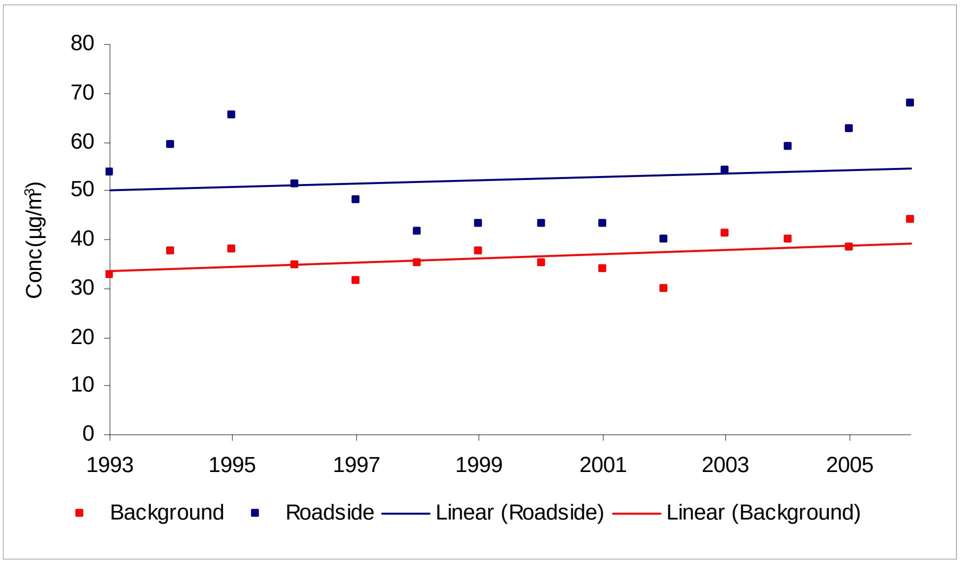



**Figure 14 Camden Background and Roadside Trend Analysis, 1993-2006**

Long-term background annual mean $NO_2$ concentrations display a positive trend with levels increasing by % between 1993 and 2005. Concentrations monitored at roadside sites generally indicate a negative trend until 2003. Between 1993 and 2003, roadside levels decreased but over the whole period (1993 – 2006) have increased by 34.4%.

## Roadside Elevation

**Table 7 Camden Elevation Above Background $NO_2$ Concentration $\mu g/m^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 27.3 | 16.6 | 16.5 | 6.3 | 5.5 | 8.1 | 9.1 | 6.3 | 13.4 | 19.0 | 24.2 | 24.0 |

A steady reduction in roadside elevation is apparent from 1996 to 2000. In 2003, concentrations doubled when compared with the previous year. Concentration levels continued to increase in 2005 to the second highest recorded before decreasing very slightly in 2006.

## 7.4 Corporation of City of London

### Annual Mean Values

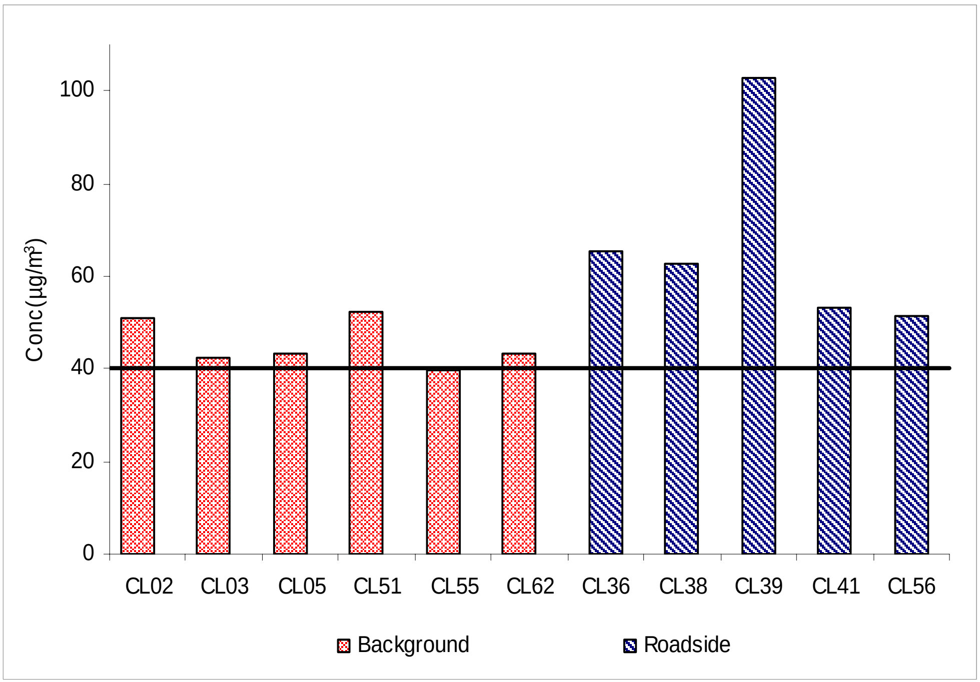



**Figure 15 Corporation of London Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Corporation of London exposed diffusion tubes 11 monitoring locations in 2006, with no change in site numbers compared to the previous year. The data capture for this year was 95%.

Background concentrations vary between 39.6 µg /m³ (CL55) and 52.2 µg/m³ (CL51). Roadside concentrations range between 51.2 µg /m³ (CL56) and 102.8 µg/m³ (CL39). The 2005 air quality objective was exceeded at ten monitoring sites, representing 91% of the total number of sites. This represents a stabilisation of exceedences compared with 2005.

## Time Series

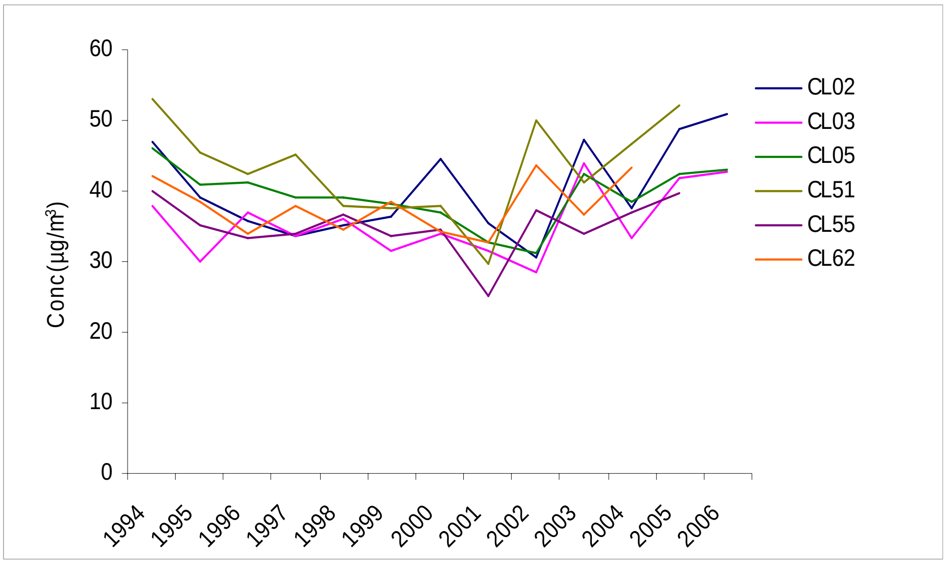



**Figure16 Corporation of London Background Time Series, 1994-2006**

Long-term background concentrations do not follow any particular trend prior to 2002. The graph shows that the annual concentration rose in 2003 at all sites. This was followed by a reduction in concentrations at all sites in 2004 followed by an increase in concentrations across all sites in 2005. Comparing the mean of the concentrations monitored at background sites between 1994 and 2006 there has been an increase of 3.6%, however between 2005 and 2006, there has been an increase 4.5%.

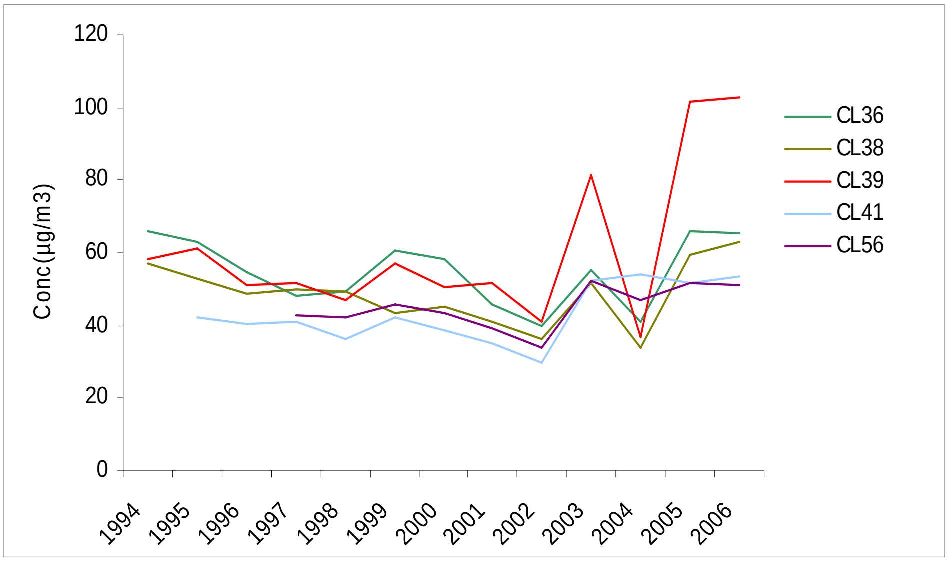



**Figure 17 Corporation of London Roadside Time Series, 1994-2006**

These observations are also applicable to the roadside concentrations. Concentrations fluctuate between decreases in 2002 and 2004 followed by increases in 2003 and 2005. All site except CL56 record an increase in mean annual concentrations during 2006. The peak concentration in 2006 at CL39 is particularly high at 102.8µg/m$^3$, this site frequently records the highest annual concentration. Site CL41 followed the same trend as the other sites until 2004; recording an increase, the highest concentration recorded in 2004, while other sites reported a decrease in annual $NO_2$ mean concentrations and again recording a decrease in 2005 in comparison to the other roadside sites increase. This site is in step with the other long term sites in 2006.

## Trend Analysis

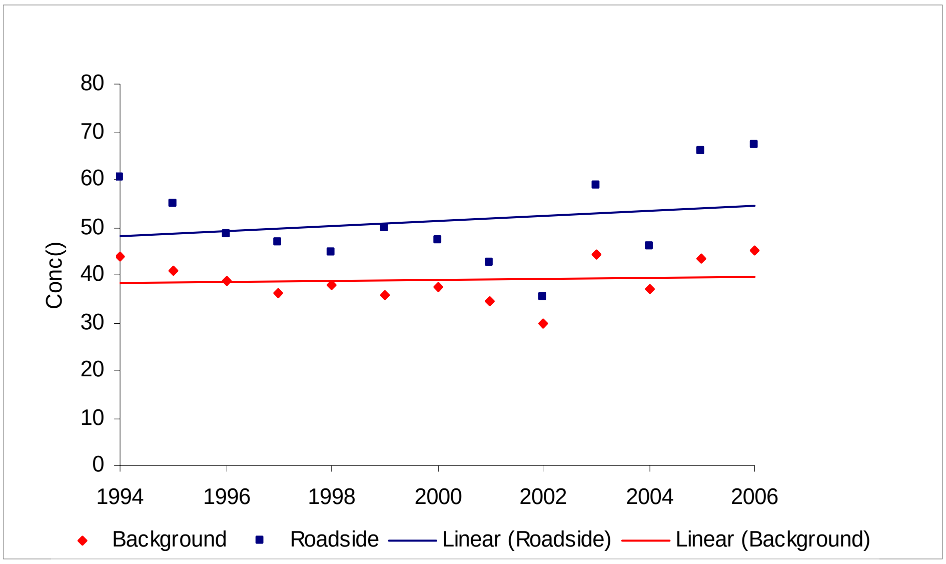



**Figure 18 Corporation of London Background and Roadside Trend Analysis, 1994-2006**

Background annual mean $NO_2$ concentrations continued to display a downward trend decreasing by 0.8% between 1994 and 2004, rises in 2005 and 2006 have shifted this trend to wards a positive one, increasing by 3.6. Roadside annual mean $NO_2$ concentrations cease to display a downward trend in the last two years increasing by 11.2% between 1994 and 2006.

## Roadside Elevation

**Table 8 Corporation of London Elevation Above Background $NO_2$ Concentration $\mu g/m^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13.9 | 9.8 | 10.6 | 6.8 | 13.9 | 9.5 | 8.0 | 5.7 | 14.4 | 9.0 | 22.7 | 21.8 |

The roadside elevation fluctuates over the eleven-year monitoring period peaking in 1994, 1999 and 2003. The roadside elevation concentration shows a marked reduction in 2004 before increasing to a record level of 22.7 $\mu g/m^3$ in 2005. An increase in background levels during 2006 rather than any change in roadside concentrations has reduced this elevation.

## 7.5 London Borough of Croydon

### Annual Mean Values

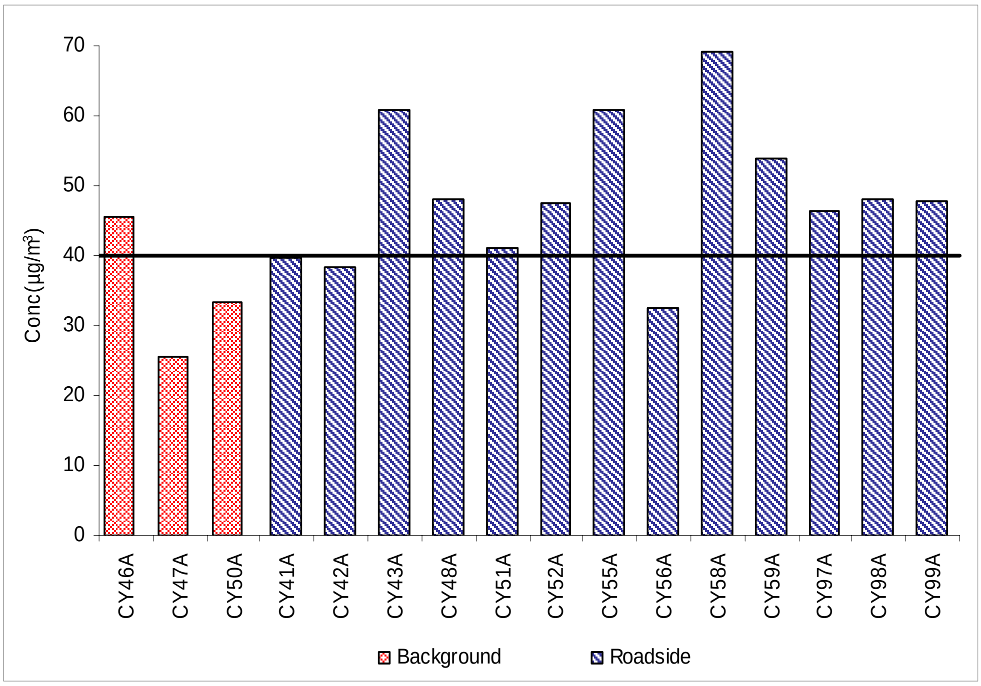



**Figure 19 Croydon Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Croydon exposed diffusion tubes at 16 monitoring locations in 2006 with no sites discontinued within the year. The data capture this year was 93%. The annual mean results for no sites have been excluded due to low data capture.

Background concentrations vary between 25.7 µg /m³ (CY47A) and 45.6 µg/m³ (CY46A). Roadside concentrations range between 32.5 µg /m³ (CY56A) and 69.2 µg/m³ (CY58A). The 2005 air quality objective was exceeded at six roadside sites, representing 37.5% of all monitoring sites. This is a decrease compared to last year where 75% of sites recording concentrations over 40 µg/m³.

## Time Series

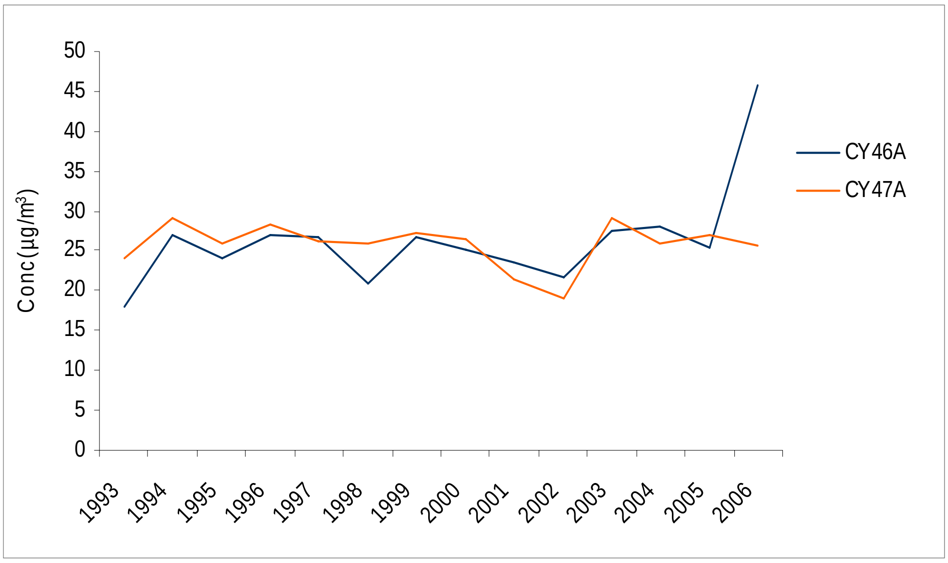



**Figure 20 Croydon Background Time Series, 1993-2006**

Background concentrations monitored at CY46A and CY47A are similar until 2006. Monitored concentrations increased in 2003 at both sites. When compared with 2004 concentrations, the monitored concentration in 2005 at CY47A slightly increased whereas the monitored concentration at CY46A showed a marked decrease. During 2006 CY46A recorded a significant increase in $NO_2$ concentration above the 2005 Objective. Comparing the mean of the concentrations monitored at background sites between 2005 and 2006, there has been an increase of 45%.

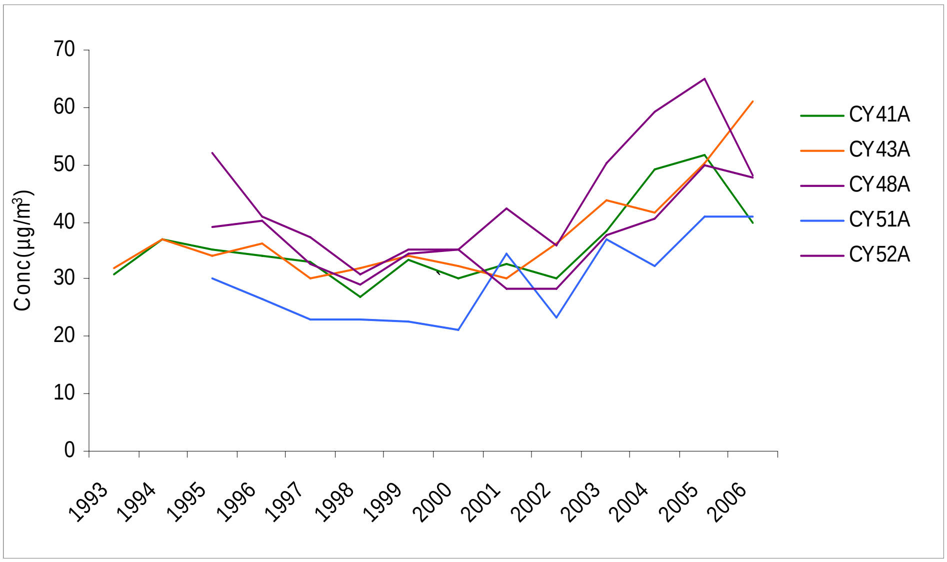



**Figure 21 Croydon Roadside Time Series, 1993-2006**

CY48A and CY51A follow similar trends prior to 2004. Concentrations monitored in 2005 vary however all sites monitoring concentrations were at higher levels compared with 2004. Location sites CY51A, CY41A and CY48A reaching new peak concentrations. Comparing the mean of the concentrations monitored at roadside sites between 2004 and 2005, there has been an increase of 4%. In 2006 all sites, except CY43A recorded a decrease in mean concentration compared with 2005.

## Trend Analysis

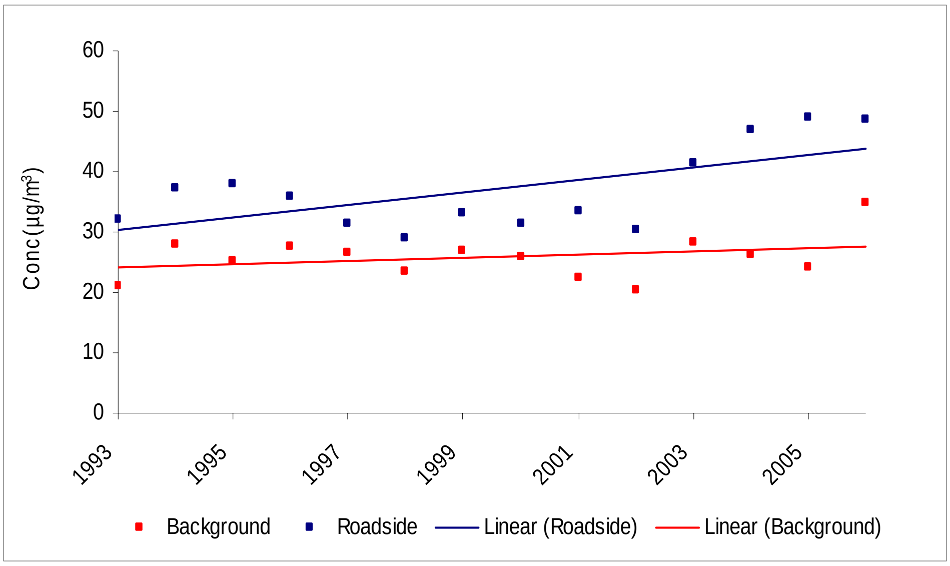



**Figure 22 Croydon Background and Roadside Trend Analysis, 1993-2006**

Long-term background annual mean $NO_2$ concentrations remain relatively constant at around 25 µg/m$^3$ from 1993 to 2004; with a larger increase in 2006. Long-term roadside annual mean $NO_2$ concentrations display a positive trend between 1993 and 2006.

## Roadside Elevation

**Table 9 Croydon Elevation Above Background $NO_2$ Concentration µg/m$^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13.0 | 8.2 | 4.8 | 5.3 | 6.1 | 5.6 | 10.8 | 10.0 | 13.1 | 20.7 | 24.8 | 13.9 |

There has been much variation in the elevations above background $NO_2$ concentrations since 1994. The roadside elevation in $NO_2$ concentration rises by approximately fifty percent in 2001 and 2002 with further increases over the following two years. In 2005 the roadside elevation in $NO_2$ concentration reaches the highest level over the twelve year monitoring period. In 2006 the elevation fell to below 2004 levels.

## 7.6 London Borough of Greenwich

## Annual Mean Values

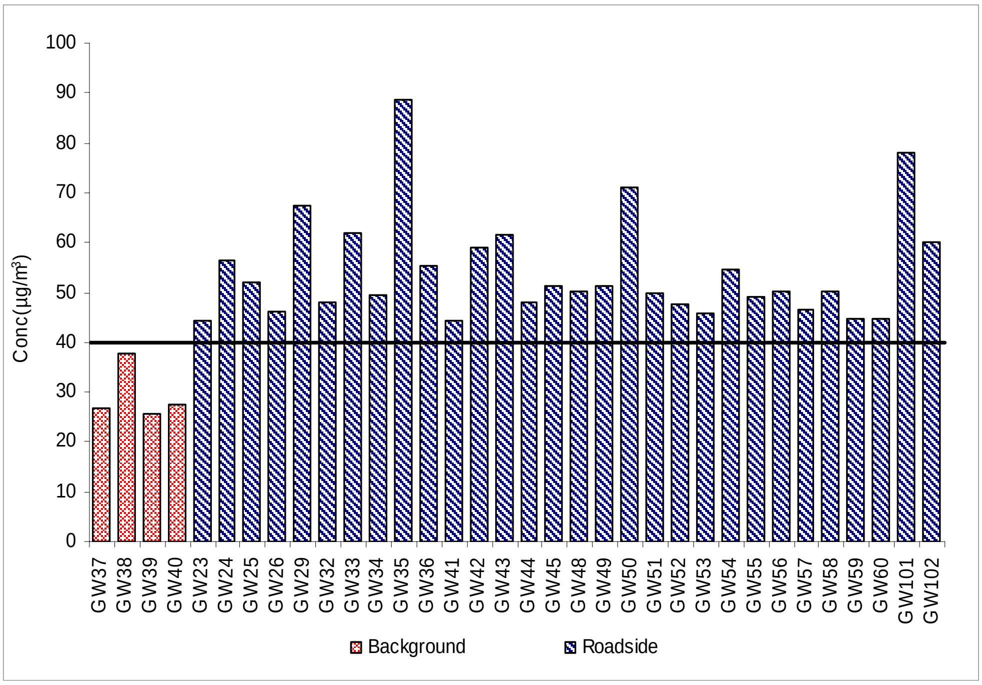



**Figure 23 Greenwich Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Greenwich exposed diffusion tubes at 35 monitoring location in 2006; with no change site number compared to the previous year. The data capture for this year was 95%. The annual mean $NO_2$ concentration for GW27 has not been reported due to low data capture.

Background concentrations vary between 25.6 µg /m³ (GW39) and 37.8 µg/m³ (GW38). Roadside concentrations ranged between 44.4 µg/m³ (GW23), and 88.8 µg/m³ (GW35). The 2005 air quality objective was exceeded at 29 monitoring sites, representing 82.9% of the total number of sites. This is a lower number of exceedances recorded in either 2003 or 2004.

## Time Series

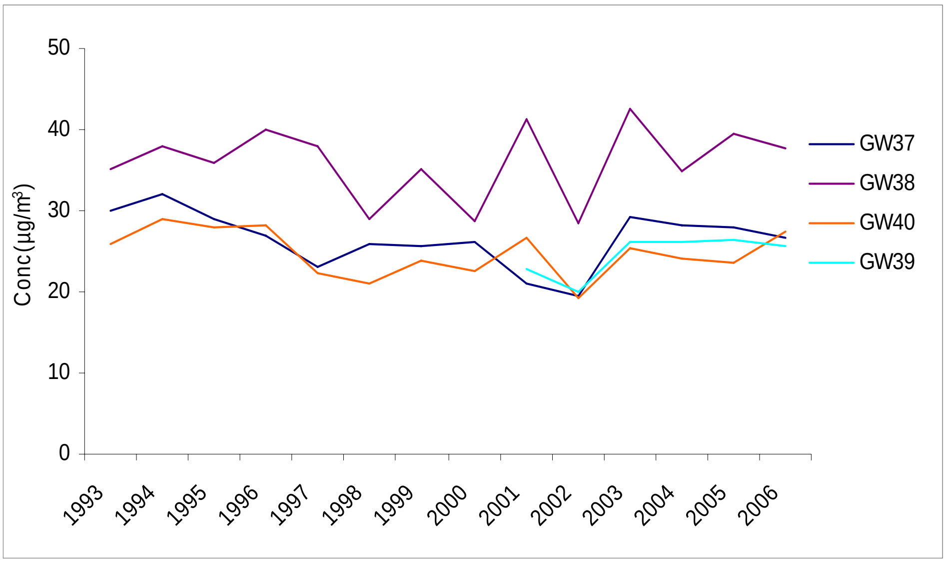



**Figure 24 Greenwich Background Time Series, 1993-2006**

Background site $NO_2$ concentrations fluctuate throughout the period 1993 – 2005. The concentrations monitored at GW37 are consistently higher than those monitored at GW38, GW39 and GW40, which are closely aligned. Comparing the mean of the concentrations monitored at background sites between 2005 and 2006, there has been no overall increase or decrease.

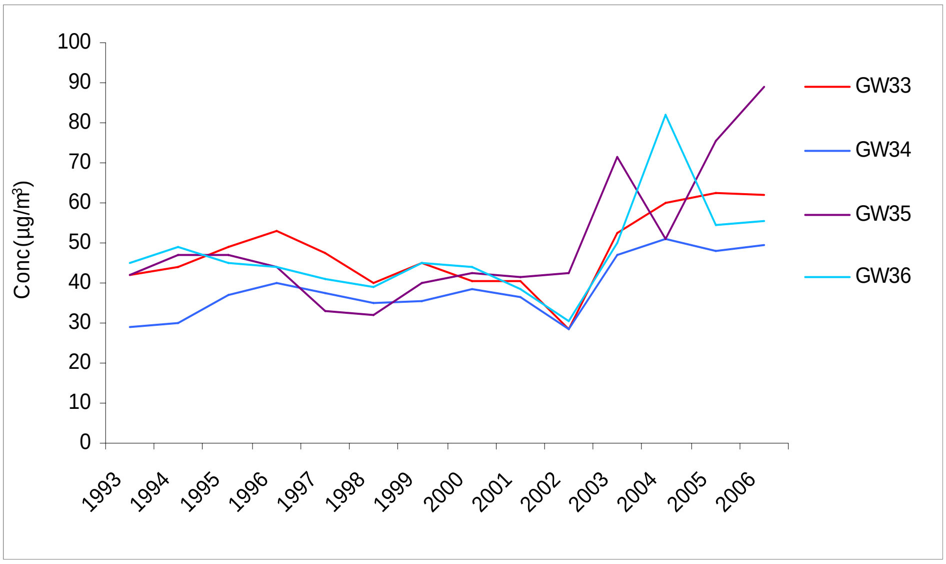



**Figure 25 Greenwich Roadside Time Series, 1993-2006**

Nitrogen Dioxide concentrations at Roadside sites have fluctuated throughout the period 1993 – 2002. There is a marked decrease in concentration at the majority of sites in 2002, the only exception being GW35. Annual mean $NO_2$ concentrations decrease at all sites in 2002, increase in 2003 and fall once more in 2004. Minor increases were recorded at all sites except GW33. Comparing the mean of the concentrations monitored at roadside sites between 2005 and 2006, there has been an increase of 0.8%.

## Trend Analysis

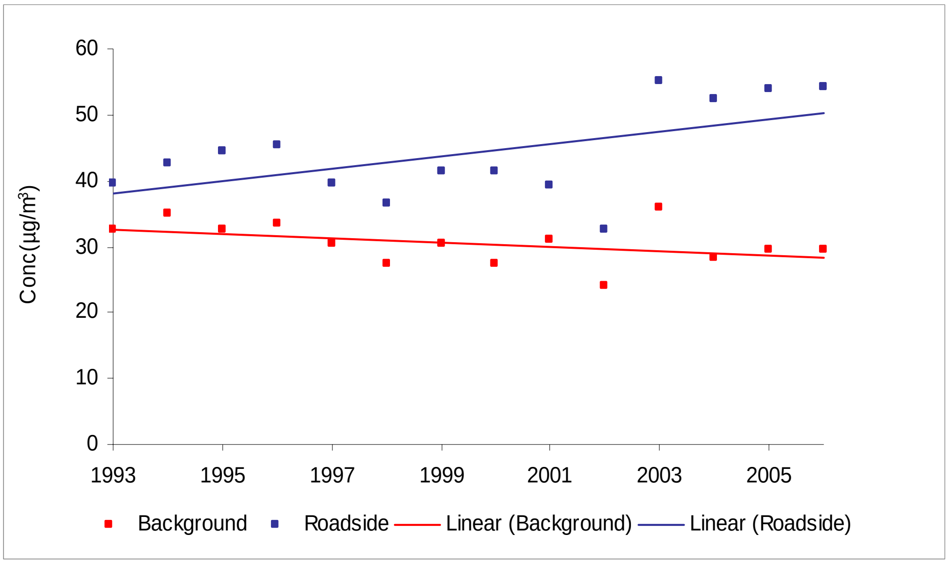



**Figure 26 Greenwich Background and Roadside Trend Analysis, 1993-2006**

Long-term background annual mean $NO_2$ concentrations display a decreasing trend of 9.6% between 1993 and 2006. Long-term roadside annual mean $NO_2$ concentrations show an increasing trend of 37.3% over the same period.

## Roadside Elevation

**Table 10 Greenwich Elevation Above Background $NO_2$ Concentration ($\mu g/m^3$)**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12.0 | 11.8 | 9.1 | 9.0 | 10.9 | 13.8 | 8.0 | 8.6 | 19.3 | 24.1 | 24.4 | 24.8 |

The elevation above background $NO_2$ concentration decreases between 1995 and 1998 and then rises to 2000. There is a marked decrease in 2001 after which, elevations rise to their highest value in 2006 although the magnitude of the increase has reduced between 2004 and 2006 than between 2002 and 2003.

## 7.7 London Borough of Hammersmith and Fulham

### Annual Mean Values

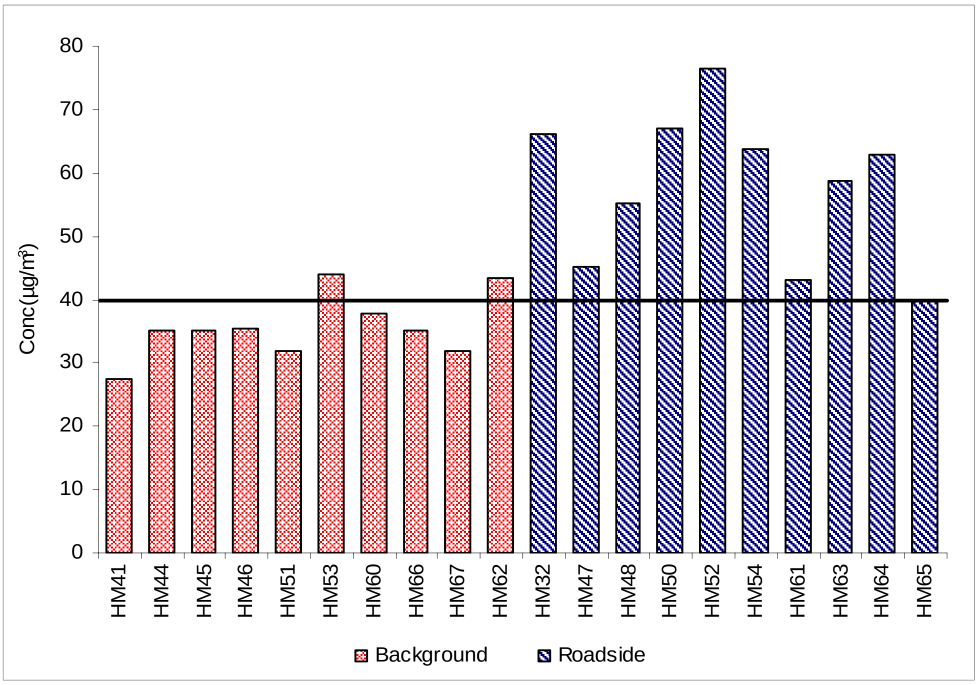



**Figure 27 Hammersmith and Fulham Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Hammersmith and Fulham exposed diffusion tubes at 20 monitoring locations in 2006, with no revision in site numbers compared to the previous three years. The data capture for this year was 95%.

Background concentrations vary between 27.6 µg /m³ (HM41) and 44.0 µg/m³ (HM53). Roadside concentrations range between 40 µg /m³ (HM65) and 76 µg/m³ (HM52). The 2005 air quality objective was exceeded at twelve monitoring sites representing 60% of the authority's sites, on the same as the previous year.

## Time Series

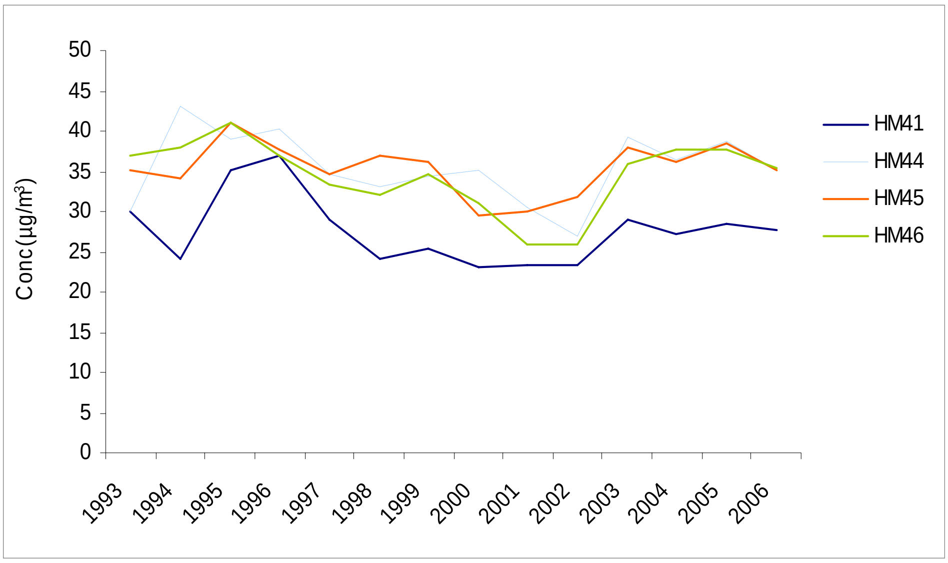



**Figure 28 Hammersmith and Fulham Background Time Series, 1993-2005**

The long-term data show annual mean background $NO_2$ level to be lowest at HM41. After peaking in 1996 the $NO_2$ concentration gradually decreases, remaining relatively constant from 2000 onwards. Annual mean $NO_2$ concentrations at HM44, HM45 and HM46 fluctuate over the ten-year monitoring period. Mean $NO_2$ levels decrease at HM44 and HM46 post 2000, whereas at HM45 a steady increase is evident. In 2003 all background diffusion tube sites experience a rise in annual mean $NO_2$ concentrations. In 2006, there is a decrease in all monitored concentrations. Comparing the mean of the concentrations monitored at background sites between 2005 and 2006, there has been an increase of 7.5%.


**Figure 29 Hammersmith and Fulham Roadside Time Series, 1993-2006**

HM32 records the highest roadside mean $NO_2$ concentration between 1993 and 2006, peaking in 1994, 1999, 2003 and 2005. The annual mean $NO_2$ concentration at HM48 remains fairly constant from 1997 to 1999. Between 2000 and 2001 a reduction in concentration takes place followed by a period of fluctuation. HM47 indicates a gradual decrease in $NO_2$ concentration between 1995 and 2002. HM32, HM47 and HM48 all record a marked increase in annual mean $NO_2$ concentration in 2003. Concentrations fall in 2004 at HM32 and HM48 but increase in 2005. In 2006, a small decrease is recorded at HM32, no change at HM48 and an increase in annual concentration is reported at HM47. Comparing the mean of the concentrations monitored at roadside sites between 2005 and 2006, there has been a decrease of 3.6%.

## Trend Analysis

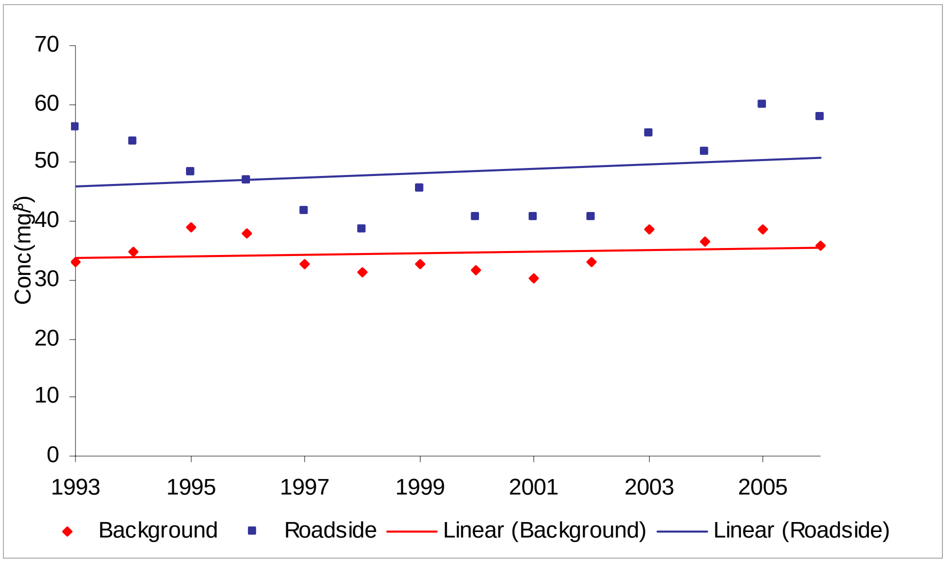



**Figure 30 Hammersmith and Fulham Background and Roadside Trend Analysis, 1993-2006**

Long-term background annual mean $NO_2$ concentrations display a slight positive trend 4% increase over the entire monitoring period. Long-term roadside annual mean $NO_2$ concentrations display a positive trend increasing by 9% between 1993 and 2006.

## Roadside Elevation

**Table 11 Hammersmith and Fulham Elevation Above Background $NO_2$ Concentration $\mu g/m^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9.5 | 8.9 | 8.9 | 7.2 | 12.9 | 8.8 | 10.4 | 7.6 | 16.2 | 15.3 | 21.3 | 22.1 |

The roadside elevation in $NO_2$ concentration decreases by more than 50% between 1994 and 1998. After 1998, the elevation fluctuates until 2003 and 2004 when concentrations show limited variability. In 2006 the roadside elevation exhibits a small increase in concentration, in comparison to 2005 results, to reach the highest concentration for the borough.

## 7.8 London Borough of Harrow

### Annual Mean Values

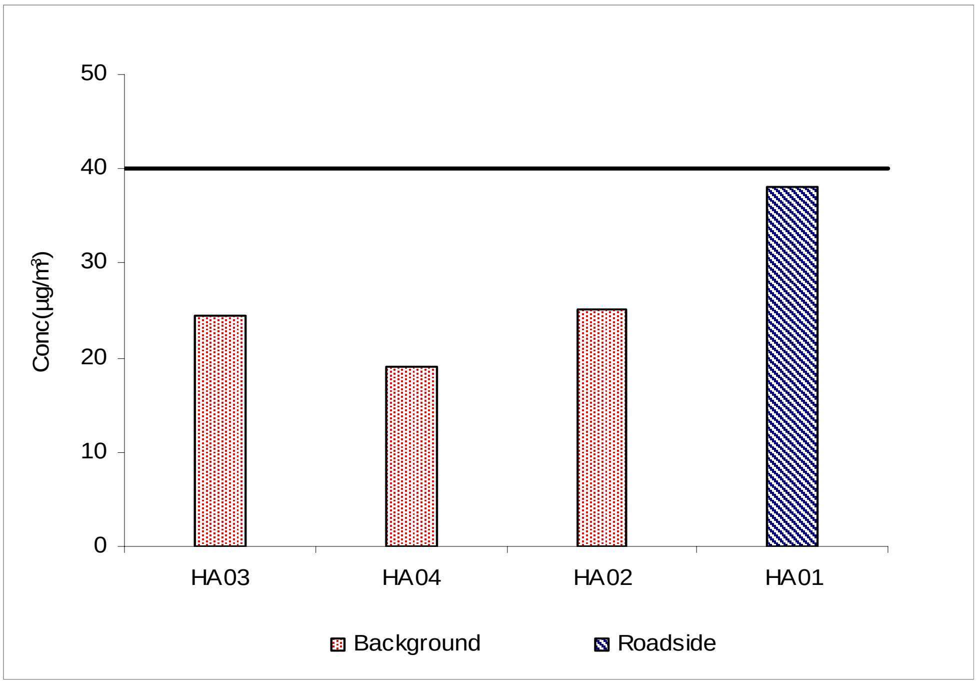



**Figure 31 Harrow Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Harrow exposed diffusion tubes at 4 monitoring locations in 2006, with no revisions to site numbers compared to the previous year. The data capture for this year was 92%. Background concentrations vary between 19 µg /m³ (HA04) and 25 µg/m³ (HA02). The roadside concentration is 38.0 µg/m³. The 2005 air quality objective was not exceeded in 2006, identical to the last two years.

## Time Series

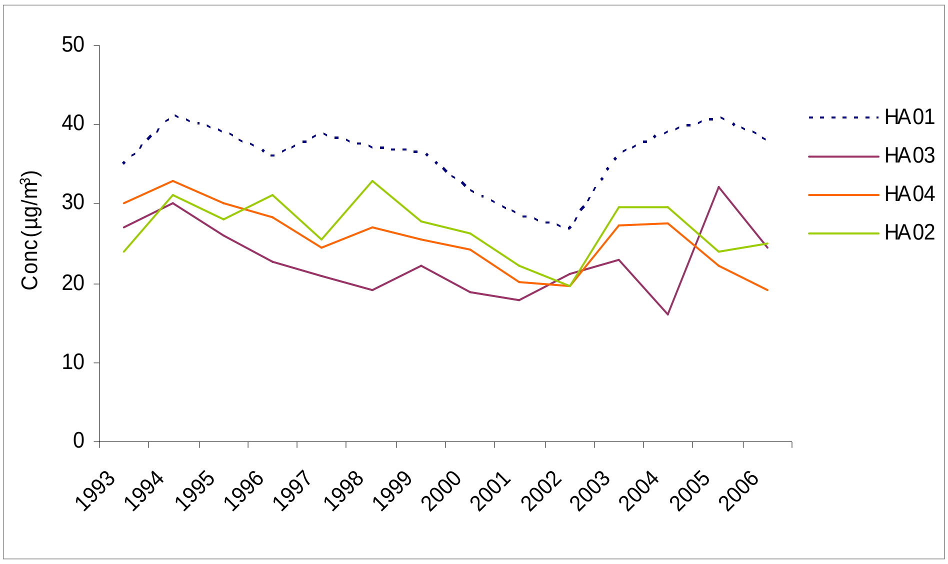



**Figure 32 Harrow Background and Roadside Time Series, 1993-2006**

Background concentrations at HA03 and HA04 follow a similar pattern. HA05 displays a negative trend with the mean $NO_2$ concentration showing a continual reduction from 1998 to 2002. In 2003 all background sites experience a rise in annual mean which continued in 2004. There is a marked increase in concentrations at HA03 in 2005, but a marked decrease at HA04 and HA05. An increase in concentration occurred in 2006 at site HA02 although HA03 and HA04 concentrations decreased. Comparing the mean of the concentrations monitored at background sites between 2005 and 2006, there has been a decrease of 12.4%.

At roadside site, HA01, indicates a gradual decrease in $NO_2$ concentration after 1994 with this becoming more apparent from 1999 onwards. A sharp rise in annual mean $NO_2$ concentration takes place in 2003. The concentration increased slightly in 2004, stabilised in 2005 and decreased in 2006. The concentration in 2006 decreased by 6.8% compared with 2005.

## Trend Analysis

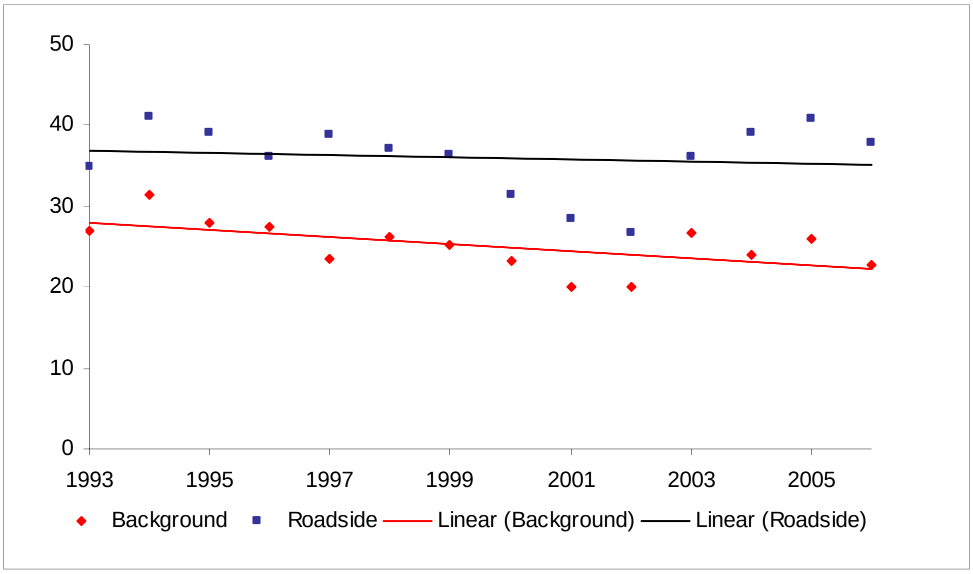



**Figure 33 Harrow Background and Roadside Trend Analysis, 1993-2006**

Long-term background and roadside annual mean $NO_2$ concentrations display a decreasing trend between 1993 and 2005. Background concentrations reduce by 12.4% and roadside concentrations reduce by 6.8% in 2006.

## Roadside Elevation

**Table 12 Harrow Elevation Above Background $NO_2$ Concentration $\mu g/m^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11.0 | 8.7 | 15.1 | 10.7 | 11.3 | 8.4 | 8.5 | 6.6 | 9.5 | 15.0 | 12.9 | 15.1 |

The roadside elevation in $NO_2$ concentration drops by almost 50% between 1997 and 1998, then gradually decreases during the succeeding four years to 2002. After 2002 there is a period of increase until 2005 when the elevation decreased before increasing again in 2006.

## 7.9 London Borough of Hillingdon

### Annual Mean Values

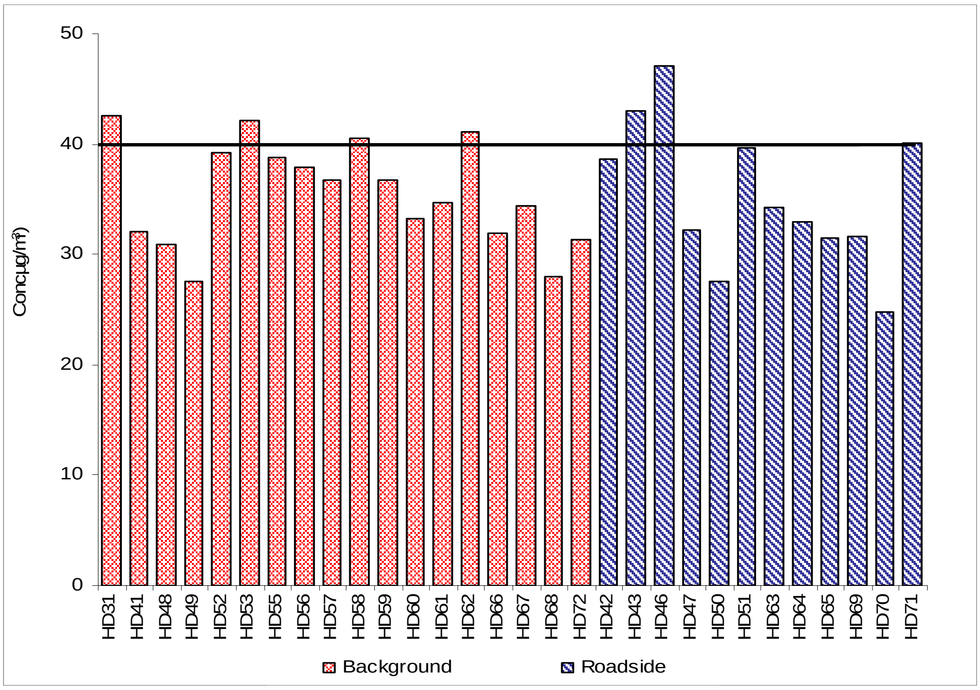



**Figure 34 Hillingdon Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Hillingdon exposed diffusion tubes at 38 monitoring locations in 2006, increasing the number of monitoring sites in December[14]. The data capture for the year 2006 was 94%. The annual mean $NO_2$ concentrations for all pre-existing monitoring sites have been reported as the 75% data capture criterion was fulfilled at these locations.

Background concentrations vary between 27.6 µg /m³ (HD49) and 42.6 µg/m³ (HD31). Roadside concentrations range between 24.7 µg /m³ (HD70) and 47.1 µg/m³ (HD46). The 2005 air quality objective was exceeded at seven monitoring sites representing over 23% of the total number of sites. This is a reduction compared to last year when 33% of sites recorded over 40 µg/m³.

[14] HD73, HD74, HD75, HD76, HD77, HD78, HD79 and HD80

## Time Series


**Figure 35 Hillingdon Background and Roadside Time Series, 1993-2006**

The background concentration monitored at HD31 continually varies between 1997 and 2005 as does the roadside concentration monitored at HD46. Roadside location HD46 replaces HD43 as the latter failed to meet the 75% data capture criterion. There is a marked increase in 2003 followed by a decrease in 2004 and a further increase at both sites in 2005 and 2006. When comparing the background concentration in 2006 with 2005, there has been an 8.1% decrease. When comparing the roadside concentration recorded in 2006 with 2005, there has been a 9.6% decrease.

## Trend Analysis

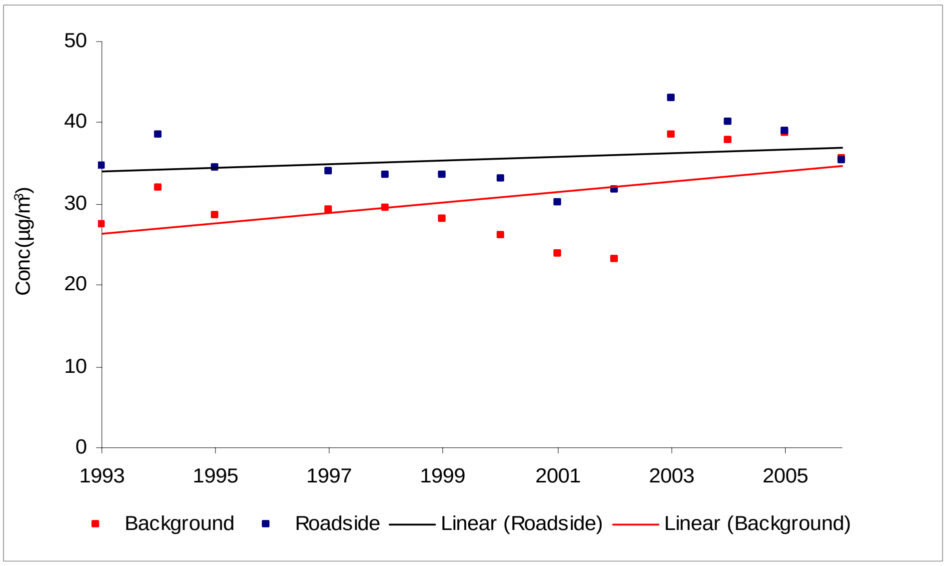



**Figure 36 Hillingdon Background and Roadside Trend Analysis, 1993-2006**

Long-term background annual mean $NO_2$ concentrations display a positive trend increasing by 31% from 1993 to 2006. Long-term roadside annual mean $NO_2$ concentrations display a positive trend increasing by 8% from 1993 to 2006.

## Roadside Elevation

**Table 13 Hillingdon Elevation Above Background $NO_2$ Concentration $\mu g/m^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.0 | | 4.8 | 4.0 | 5.4 | 7.1 | 6.3 | 8.4 | 4.5 | 2.2 | 0.3 | -0.3 |

The roadside elevation in $NO_2$ concentration varies throughout the period. The elevation increased by 191% in the period 2004 - 2005 to the concentration last recorded in 1994. In 2006 elevation became negative due to an increase in background concentrations.

## 7.10 London Borough of Hounslow

### Annual Mean Values

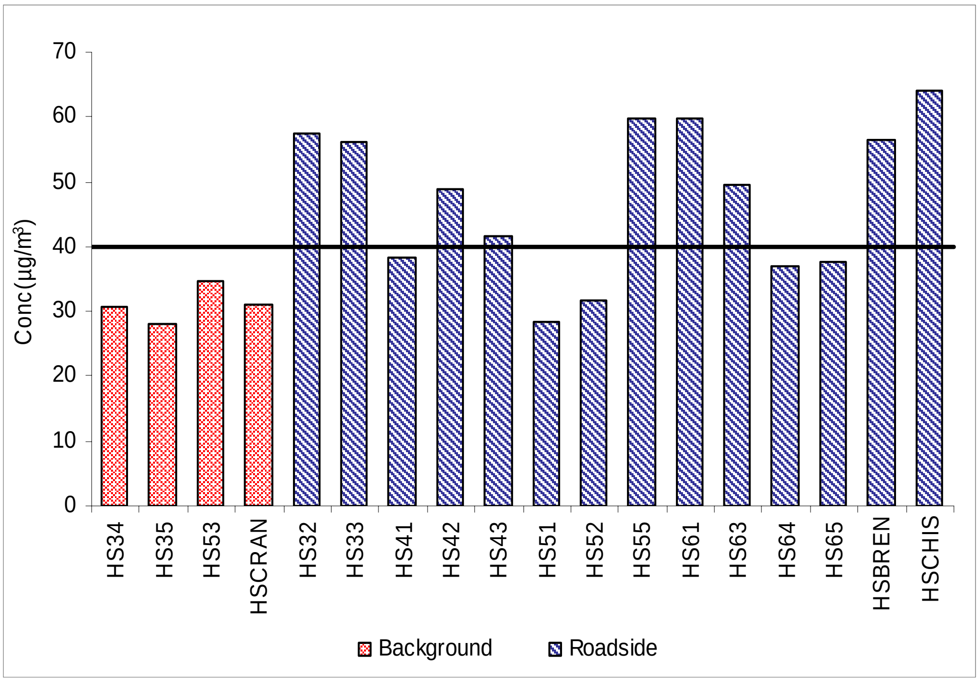



**Figure 37 Hounslow Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Hounslow exposed diffusion tubes at 21 monitoring location in 2005, with no revision in site numbers compared to the previous year. The data capture this year was 95%. Monitoring sites HS54, HS62 and HS66 have not been reported as the 75% data capture criterion was not fulfilled at these locations.

Background concentrations vary between 28.0 µg/m³ (HS35) and 34.8 µg/m³ (HS53). Roadside concentrations range between 28.3 µg/m³ (HS51) and 64 µg/m³ (HSCHIS). The 2005 air quality objective was exceeded at ten monitoring sites representing 50% of the total number of sites. This is the same as 2004 and 2005, and an improvement on 2003 where 60% of the site recorded over 40 µg/m³.

## Time Series

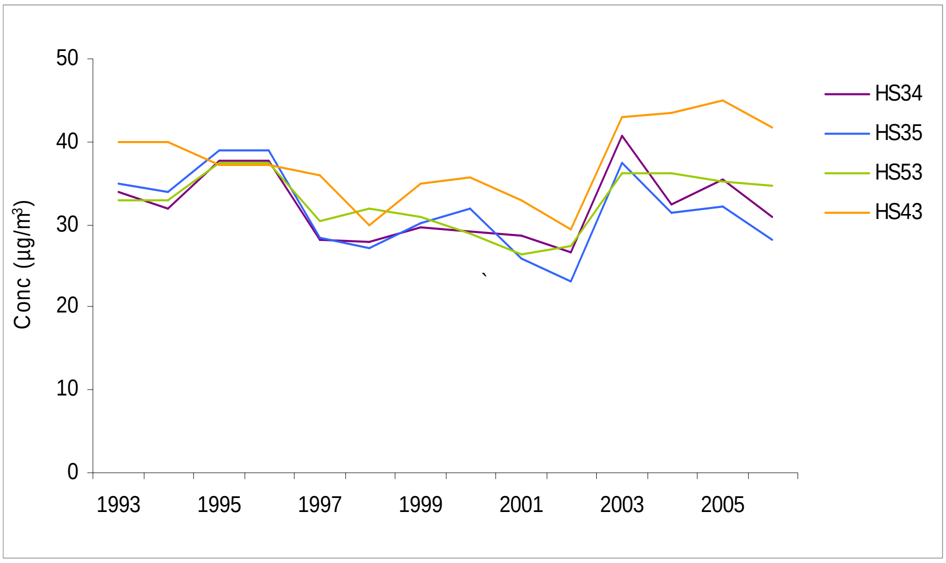



**Figure 38 Hounslow Background Time Series, 1993-2006**

The time series reveals HS53, HS43 and HS34 to follow an identical trend from 1993 to 1997. Following a small peak in 1998, HS53 reflects a gradual decrease in $NO_2$ concentration until 2001, after which the concentration rises slightly. $NO_2$ concentration at HS34 rise between 1997 and 1999 but then begins to steadily decrease. HS35 shows a similar trend, with $NO_2$ concentrations falling earlier in 2000. $NO_2$ concentrations at all sites show a minor rise from 1998 to 2000 and then begin to descend over the next two years. Since 2000 HS43 has consistently recorded the highest annual mean $NO_2$ concentration. Background concentrations increase between 2002 and 2003 at all locations. In 2004, a decrease in concentrations is monitored at HS35 and less so at HS53 continued in 2005. Concentrations at HS53 increased during 2005 while those at HS35 and HS34 decreased. Comparing the mean of background concentrations monitored in 2006 with 2005, there is a 6.2% reduction.

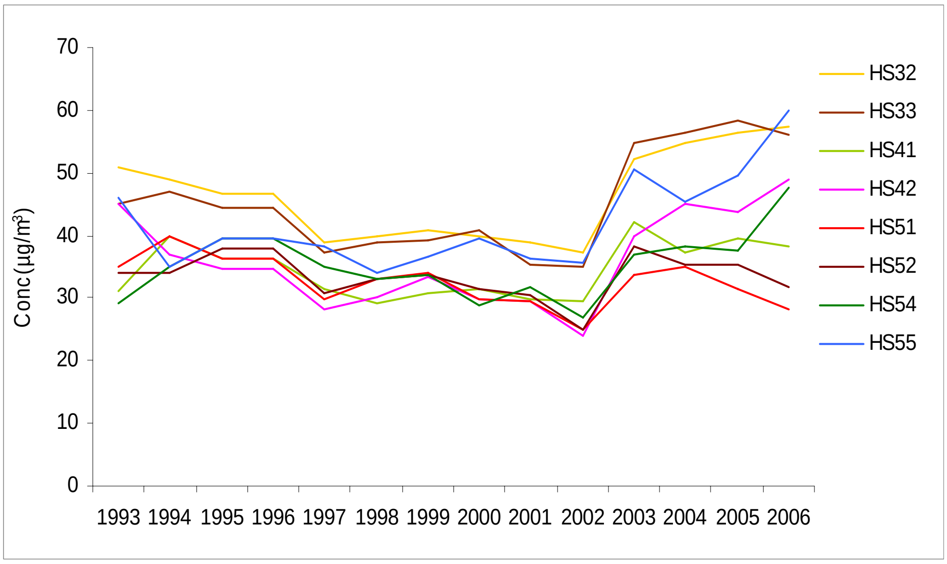



**Figure 39 Hounslow Roadside Series, 1993-2006**

HS32 and HS33 follow near identical trends with a gradual decrease in NO2 concentrations between 1994 and 2002. With the exception of HS55, the remaining sites reflect a similar rolling pattern peaking in 1996 and 1999, then falling sharply in 1997 and 2002. In 2003 all roadside sites experience a sharp elevation in annual mean $NO_2$ concentration. 50% of sites recorded their highest long-term concentrations in 2003. In 2004, annual mean $NO_2$ concentrations increased at seven roadside sites. During 2005 HS32, HS33, HS42 HS51, HS52 and HS54 show a decrease in concentration. Sites HS41 and HS55 experience significant increase in concentration compared with the previous year. In 2006, all sites except HS42, HS54 and HS55 have recorded a reduction in annual mean $NO_2$ concentrations. Comparing the mean of roadside concentrations monitored in 2006 with 2005, there is a increase of 0.2%.

## Trend Analysis

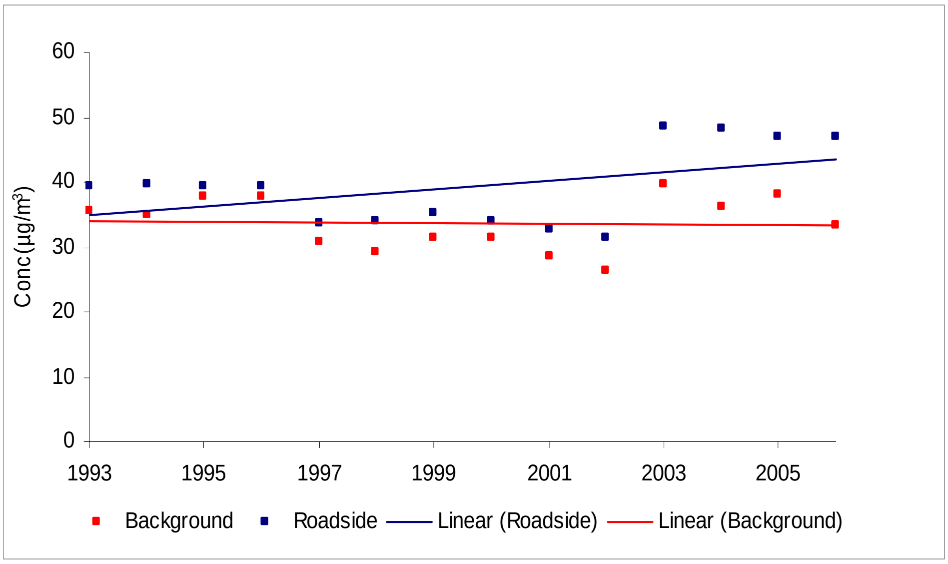



**Figure 40 Hounslow Background and Roadside Trend Analysis, 1993-2006**

Long-term background annual mean $NO_2$ concentrations show a decreasing trend. Between 1993 and 2006, concentrations have decreased by 4%. Long-term roadside annual mean $NO_2$ concentrations show a positive trend. Between 1993 and 2006, concentrations have increased by 25%.

## Roadside Elevation

**Table 14 Hounslow Elevation Above Background $NO_2$ Concentration $\mu g/m^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.6 | 1.6 | 2.9 | 4.6 | 3.9 | 2.6 | 4.3 | 5.1 | 11.5 | 12.0 | 11.9 | 13.7 |

The elevation above background $NO_2$ concentration increased dramatically in 2003 compared with all previous years. The elevation continued to increase in 2004 and 2006 although it did decreased slightly in 2005.

## 7.11 London Borough of Kensington and Chelsea

### Annual Mean Values

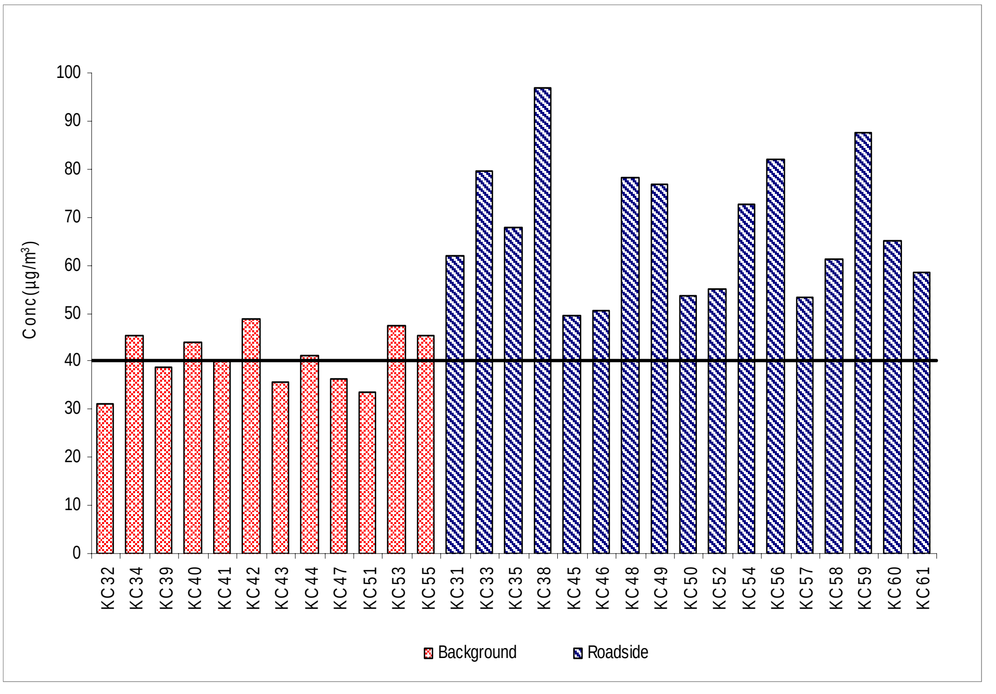



**Figure 41 Kensington and Chelsea Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Kensington and Chelsea exposed diffusion tubes at 31 monitoring locations in 2006, with two temporary sites discontinued[17]. The data capture for this year was 95%. Sites KC62 and KC63 have not been reported as they failed to meet the 75% data capture criterion.

Background concentrations vary between 31.1 µg/m³ (KC32) and 48.9 µg/m³ (KC42). Roadside concentrations range between 49.5 µg/m³ (KC45) and 96.9 µg/m³ (KC38). The 2005 air quality objective was exceeded at 24 monitoring sites representing 83% of the total number of sites. This is an increase compared to last year when 86% of monitoring sites recorded over 40 µg/m³.

[17] Temporary monitoring sites KC62 and KC63 for 5 months only.

## Time Series

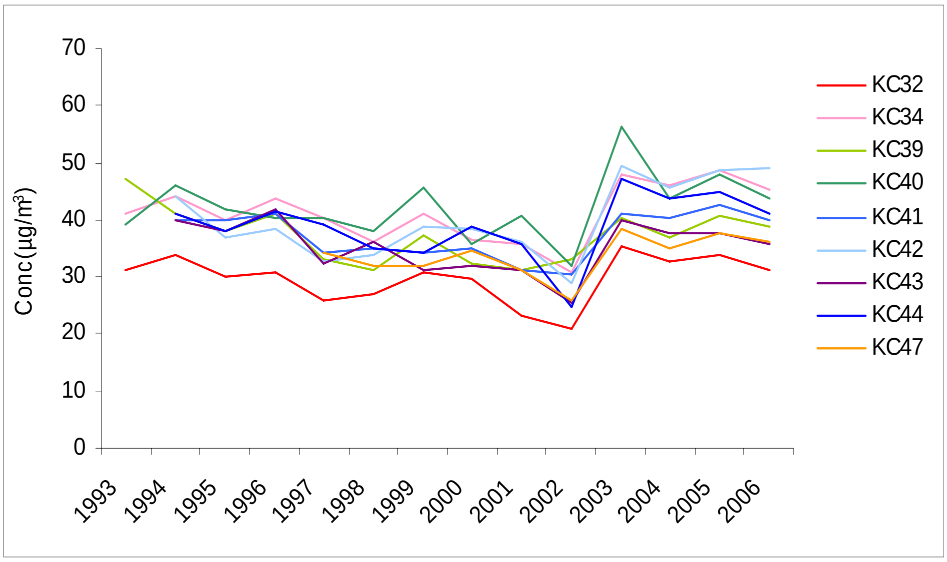



**Figure 42 Kensington and Chelsea Background Time Series, 1993-2006**

All background sites appear to follow a similar positive trend between 1993 and 2006. KC32 maintains the lowest annual mean $NO_2$ concentration over this monitoring period. From 2001 to 2002 all background sites except KC39 experience a decrease in annual mean $NO_2$concentration. An abrupt rise in $NO_2$ concentration takes place at all sites in 2003 with KC32, KC34 and KC40 recording their highest concentrations over the eleven-year monitoring period. Concentrations increase in 2005 at many sites except KC43 where there is a small decrease. The concentration at most sites is reduced in 2006 with the exception of KC40. There is a 5.3% decrease of annual mean $NO_2$ concentrations between 2005 and 2006.

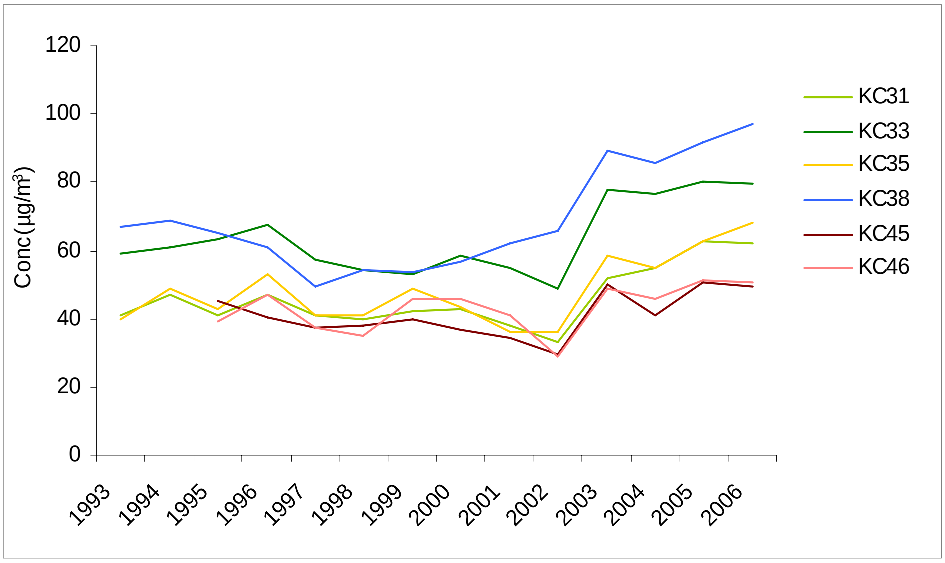



**Figure 43 Kensington and Chelsea Roadside Time Series, 1993-2006**

KC33 and KC38 clearly show the highest $NO_2$ concentrations between 1993 and 2003. KC38 is the only site to show a gradual increase in $NO_2$ concentration, taking place between 1997 and 2003. The $NO_2$ concentration at KC33 reveals a gradual reduction from 1997 to 2002. The $NO_2$ concentrations at the remaining sites fluctuate over the eleven-year monitoring period. Between 2002 and 2005 all roadside concentrations record an appreciable rise in $NO_2$ concentrations. In 2006 sites KC38 and KC35 record increase annual concentrations and make these sites the exceptions to a decrease in $NO_2$ mean annual concentrations experienced at all other long term sites.  Comparing the mean of the concentrations monitored at roadside sites between 2005 and 2006, there is an increase of 2.9%.

## Trend Analysis

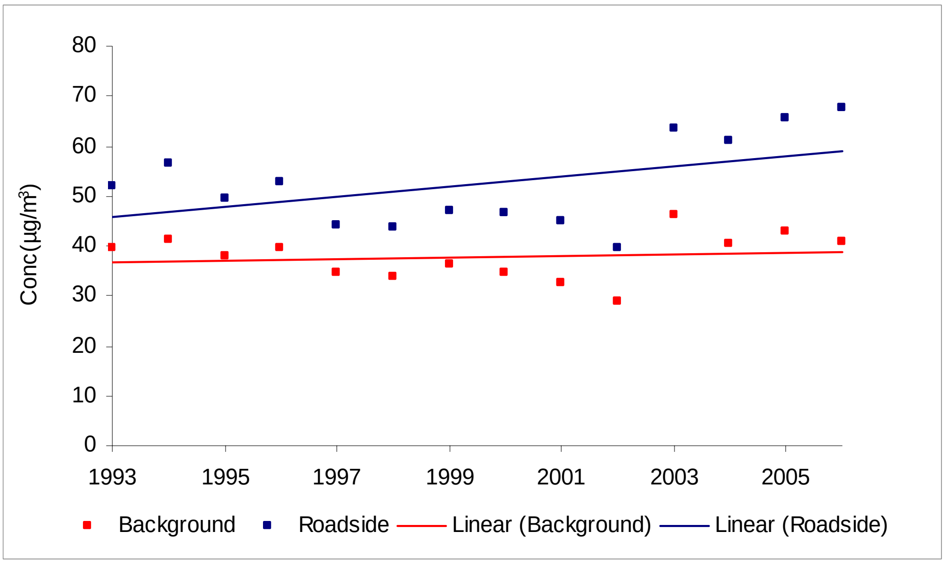



**Figure 44 Kensington and Chelsea Background and Roadside Trend Analysis, 1993-2006**

Long-term background annual mean $NO_2$ concentrations show a slightly positive trend. Between 1993 and 2005, concentrations have increased by 5%.  Long-term roadside annual mean $NO_2$ concentrations show a positive trend. Between 1993 and 2006, concentrations have increased by 29%.

## Roadside Elevation

**Table 15 Kensington and Chelsea Elevation Above Background $NO_2$ Concentration $\mu g/m^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11.5 | 12.9 | 9.2 | 9.9 | 11.0 | 11.9 | 12.2 | 10.6 | 17.3 | 20.4 | 22.8 | 27.0 |

The elevation above background concentration fluctuated between 9 - 11 µg/m3 between 1994 and 2002. However, in the period 2002 - 2003 this increased by 7 $\mu g/m^3$. The elevation continues to increase in 2004, 2005 and in 2006 reaching the highest long-term concentration.

## 7.12 London Borough of Newham

### Annual Mean Values

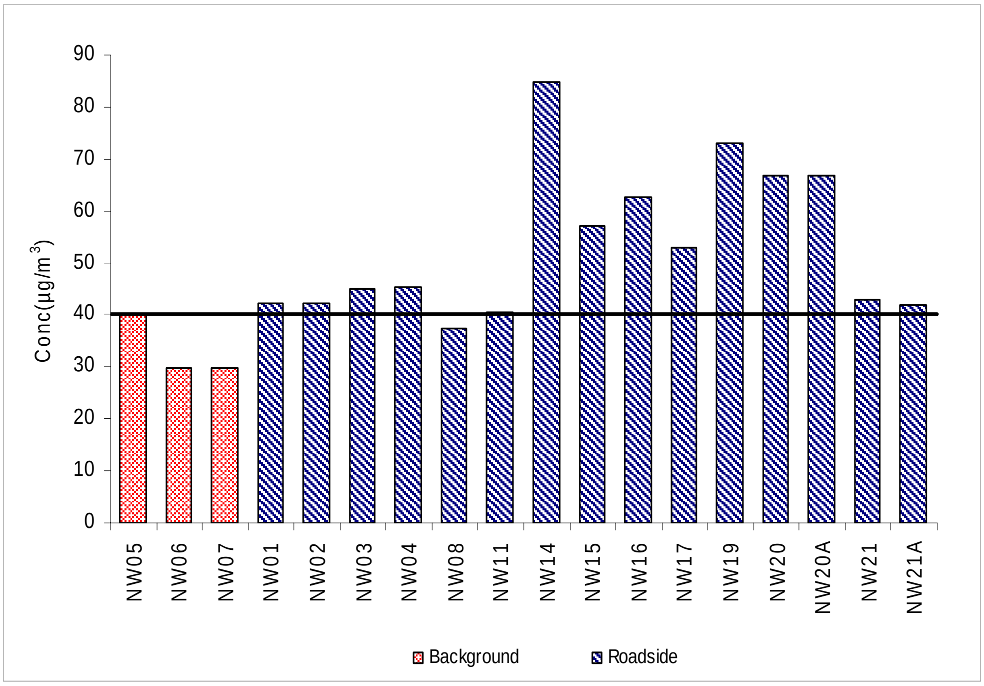



**Figure 45 Newham Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Newham exposed diffusion tubes at 22 monitoring locations in 2006, with no change to the number of sites compared to the previous year. The data capture this year was 80%. The annual mean concentrations for NW10, NW12, NW13, NW18 and NW22 have not been reported as these sites failed to meet the 75% criterion.

Background concentrations vary between 29.6 µg/m³ (NW06) and 40.2 µg/m³ (NW05). Roadside concentrations range between 40.4 µg/m³ (NW11) and 84.4 µg/m³ (NW14). The 2005 air quality objective was exceeded at 15 roadside and background monitoring sites representing 83% of the total number of sites. This represents an increase compared to last year when 77% of sites recorded over 40 µg/m³.

## Time Series


**Figure 46 Newham Background Time Series, 1996-2006**

NW05 and NW07 follow similar patterns, with annual mean $NO_2$ concentrations progressively decreasing between 2000 and 2002. From 1999 to 2006 NW05 records the highest $NO_2$ concentrations, except in 2005 (NW07). A noticeable increase in annual mean $NO_2$ concentration takes place in 2003 at sites NW05 and NW07. Site NW06 displays a comparable trend from 1997 to 2006 when NW06 follows the same trend as NW05 and NW07. In 2005, the annual mean concentrations increase steeply at all background sites except NW05, where the concentration only slightly increases. NW10 has been removed from the time series following insufficient data capture in 2006. Comparing the mean of the concentrations monitored at background sites between 2005 and 2006, there has been a decrease of 2.5%.

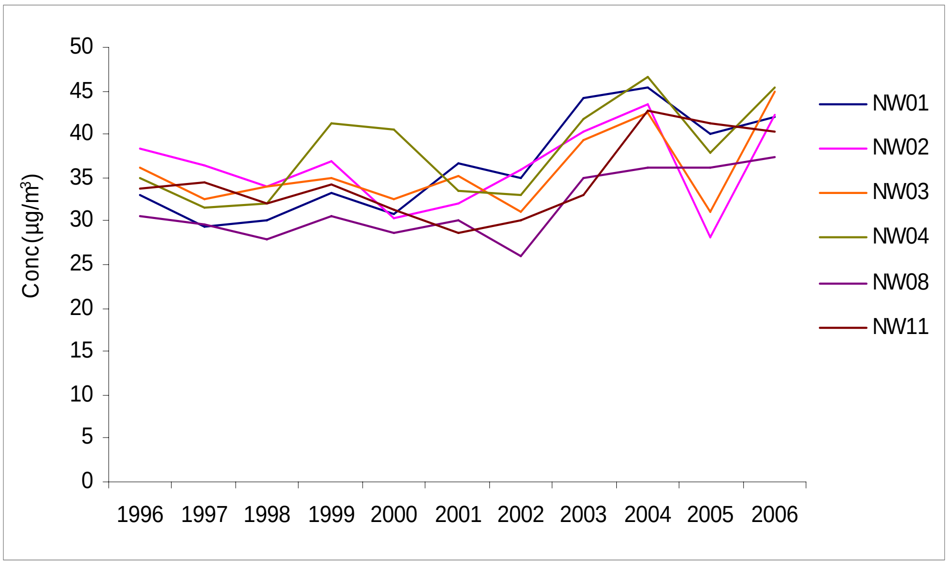



**Figure 47 Newham Roadside Time Series, 1996-2006**

Roadside site $NO_2$ concentrations appear to follow one another fairly closely until 2003. $NO_2$ levels appear to peak in 1999 and 2003. Annual mean concentrations show a distinct increase from 2002 to 2003 at all roadside sites. In 2005, annual mean concentrations decreased at all roadside locations except NW08 where the concentration increased. Sites NW01, NW02 and NW03 continue to follow the same trend, however, NW11 annual mean concentration decreased in 2006. Comparing the mean of the concentrations monitored at roadside sites between 2005 and 2006, there has been an increase of 12.1%.

## Trend Analysis

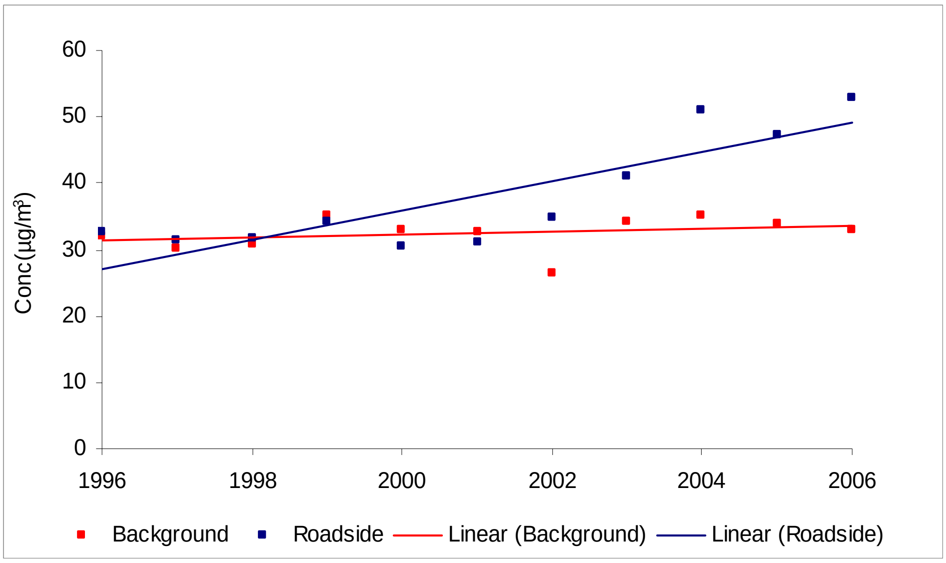



**Figure 48 Newham Background and Roadside Trend Analysis, 1996-2006**

Long-term background annual mean $NO_2$ concentrations show a positive trend. Between 1993 and 2006, concentrations have increased by 3%. Long-term roadside annual mean $NO_2$ concentrations show a positive trend. Between 1993 and 2006, concentrations have increased by 63%.

## Roadside Elevation

**Table 16 Newham Elevation Above Background $NO_2$ Concentration $\mu g/m^3$**

| 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 1.3 | 0.9 | -1.0 | -2.3 | -1.5 | 8.6 | 11.2 | 16.0 | 3 | 20 |

Between 1996 and 2001 the roadside elevation concentration is extremely low. Between 1999 and 2001 background concentrations rises above roadside concentrations. This pattern changes from 2002 onwards with the roadside elevation significantly increasing until 2005 when roadside elevation fell substantially. In 2006 the elevation resumed the upward trend increasing substantially to a record high.

## 7.13 London Borough of Richmond Upon Thames

### Annual Mean Values

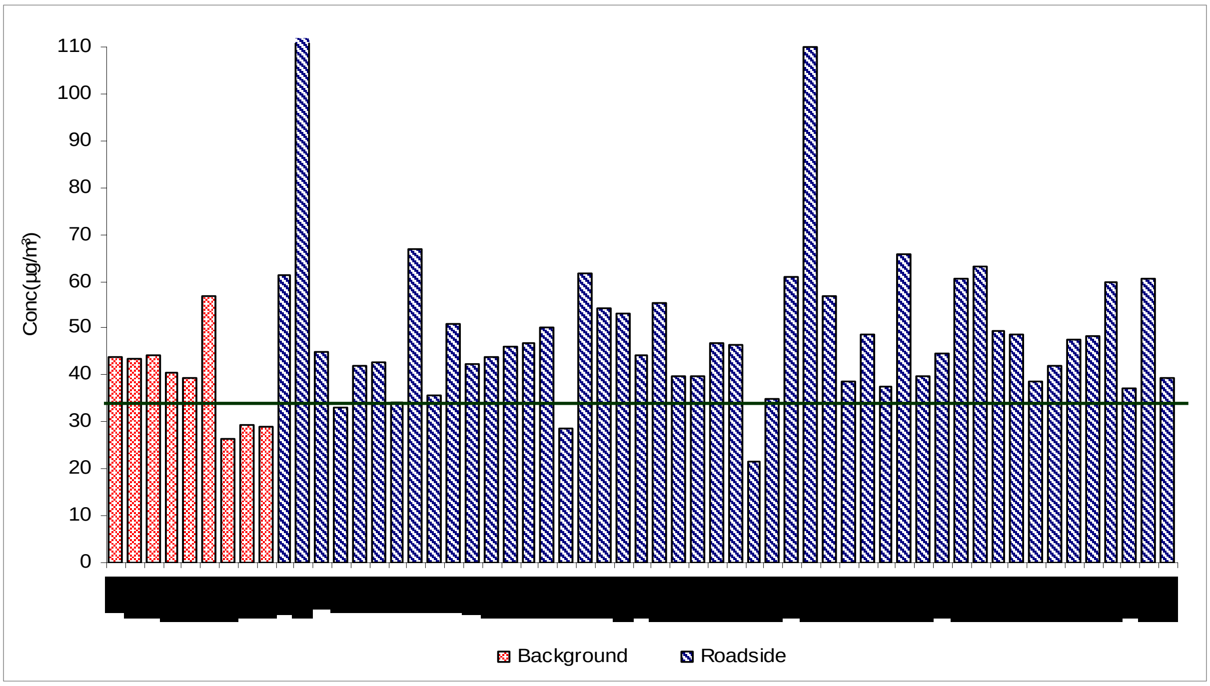



**Figure 49 Richmond upon Thames Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Richmond upon Thames exposed diffusion tubes at 57 monitoring locations in 2006, with no changes in site numbers compared to the previous year. The data capture for this year was 97%.

Background concentrations vary between 26.3 $\mu g/m^3$ (RM37) and 56.9 $\mu g/m^3$ (RM36). Roadside concentrations range between 111.7 $\mu g/m^3$ (RUT2) and 21.6 $\mu g/m^3$ (RM28). The 2005 air quality objective was exceeded at 39 diffusion tube sites representing 68% of monitoring locations. Compared with the previous year, this represents a decrease from 79% of sites failing to meet the 2005 Air Quality Objective.

## Time Series

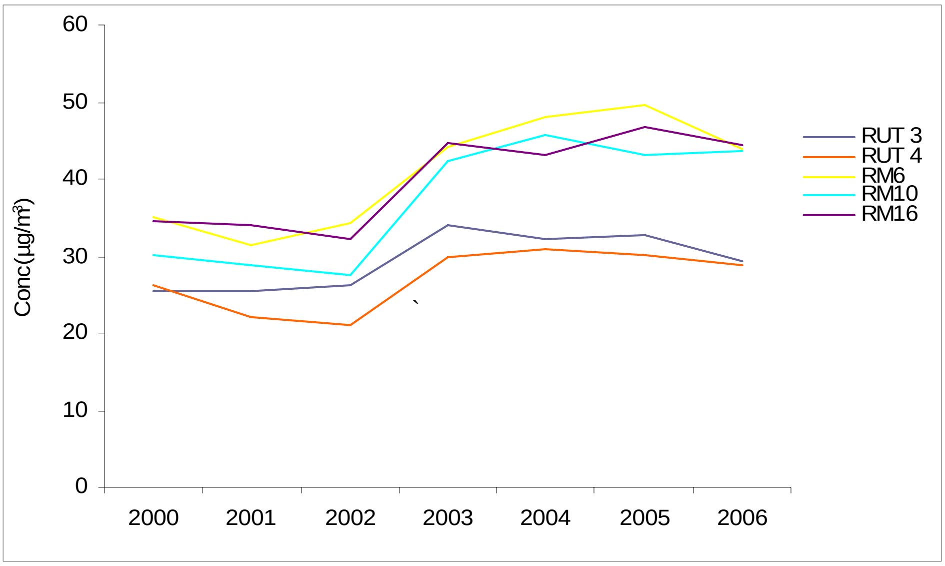



**Figure 50 Richmond Upon Thames Background Time Series, 2000-2006**

To include more monitoring sites data pre 2000 has been excluded. Background concentrations at RUT3 show a gradual reduction from 2000 to 2002. After a minor rise in 2002 $NO_2$ concentrations increase sharply in 2003. RUT4 shows gradual decrease in $NO_2$ concentration from 1996 to 2002. This trend is interrupted in 2003 by a distinct elevation in $NO_2$ concentration at all and reductions in concentration at sites RUT3 and RUT4 during 2005. In 2006, all sites except RM10 show reductions in NO2 concentrations.

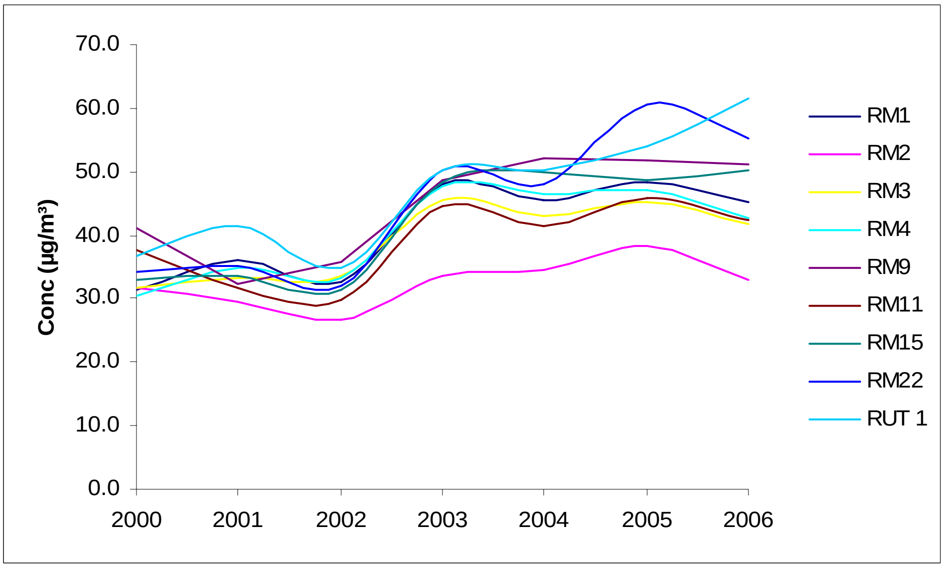



**Figure 51 Richmond Upon Thames Roadside Time Series, 2000-2006**

To show more detail only data from 200 is shown. Annual mean NO2 concentrations at most sites, excluding RM2, RM9 and RM11 increased between 2000 and 2001. All sites listed fluctuate slightly over the five years shown but follow a similar trend. A distinct increase in concentration takes place in 2003 followed by a small decrease until 2005 and the highest recorded for RM22. In 2006 all sites except RM4 and RM15 record reductions in the annual $NO_2$ concentration.

## Trend Analysis

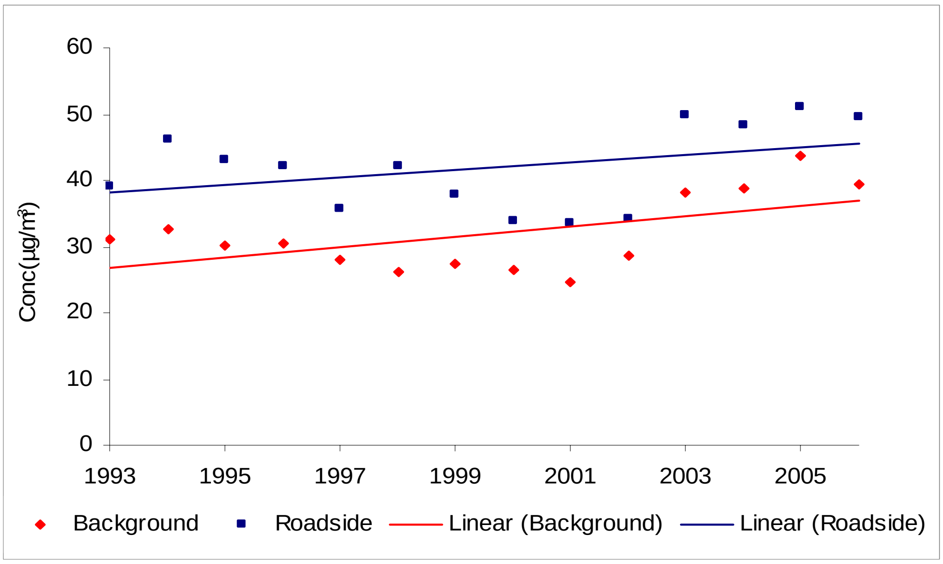



**Figure 52 Richmond Upon Thames Background and Roadside Trend Analysis, 1993-2006**

Long-term background annual mean $NO_2$ concentrations show a positive trend. Between 1993 and 2006, concentrations have increased by 26.6%. Long-term roadside annual mean $NO_2$ concentrations show a positive trend increasing by 27% between 1993 and 2006.

## Roadside Elevation

**Table 17 Richmond Upon Thames Elevation Above Background $NO_2$ Concentration $\mu g/m^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13.0 | 11.7 | 7.9 | 16.0 | 10.4 | 7.7 | 8.8 | 5.7 | 11.5 | 9.4 | 7.3 | 10.3 |

The roadside elevation concentration fluctuates between 1993 and 2002, showing a sharp peak in 1998 at 16 $\mu g/m^3$ then falling sharply over the next four years. In 2003 there is an approximate two-fold increase in the $NO_2$ elevation above background concentration. The following years, 2004 and 2005 show a trend of declining concentrations. In 2006 there is a reversal of this decline.

## 7.14 London Borough of Westminster

### Annual Mean Values

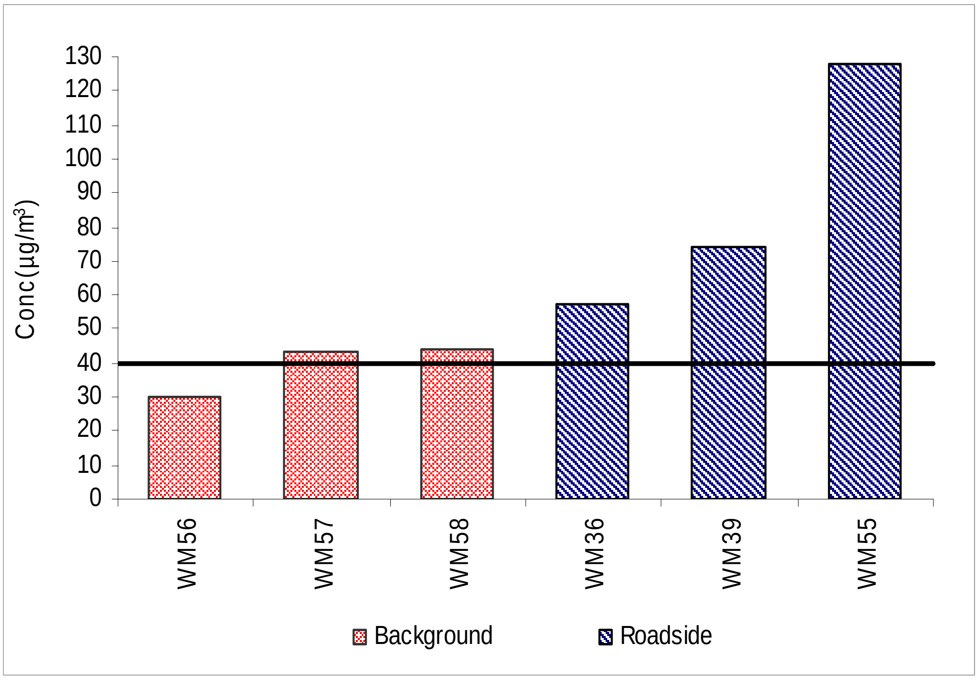



**Figure 53 Westminster Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Westminster exposed diffusion tubes at 8 monitoring locations in 2006 with no changes in the number of monitoring sites. The data capture for this year was 90%. The annual means for WM40 and WM48 have not been reported due to the low data capture for these locations.

Background concentrations vary between 29.7 µg/m³ (WM56) and 44.2 µg/m³ (WM58). Roadside concentrations range between 57.5 µg/m³ (WM36) and 127.6 µg/m³ (WM55). The 2005 air quality objective was exceeded at six monitoring sites representing 83% of the total number of sites. This is a decrease compared to 2005 when 87% of the sites recorded over 40 µg/m³.

## Time Series

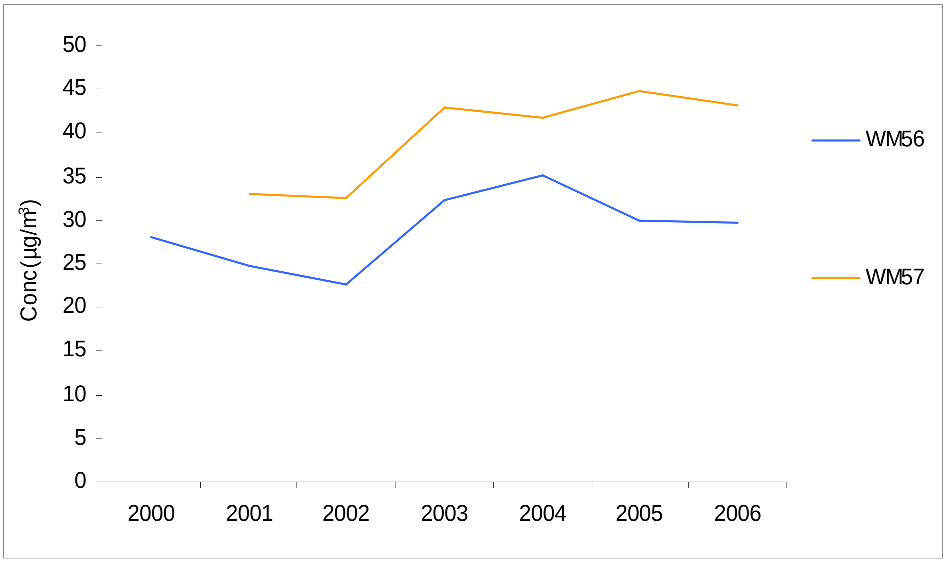



**Figure 54 Westminster Background Time Series, 1993-2006**

Discontinued and ineligible sites have been removed from the time series. A fluctuation in $NO_2$ concentration can be seen in the background sites. Both background locations experience a noticeable increase in annual mean $NO_2$ concentration in 2003 and 2004. In 2005 concentrations continue to increase at site WM57. Both sites record a reduction in annual $NO_2$ concentration in 2006. Comparing the mean of the concentrations monitored at these background sites between 2005 and 2006, there has been a decrease of 6%.

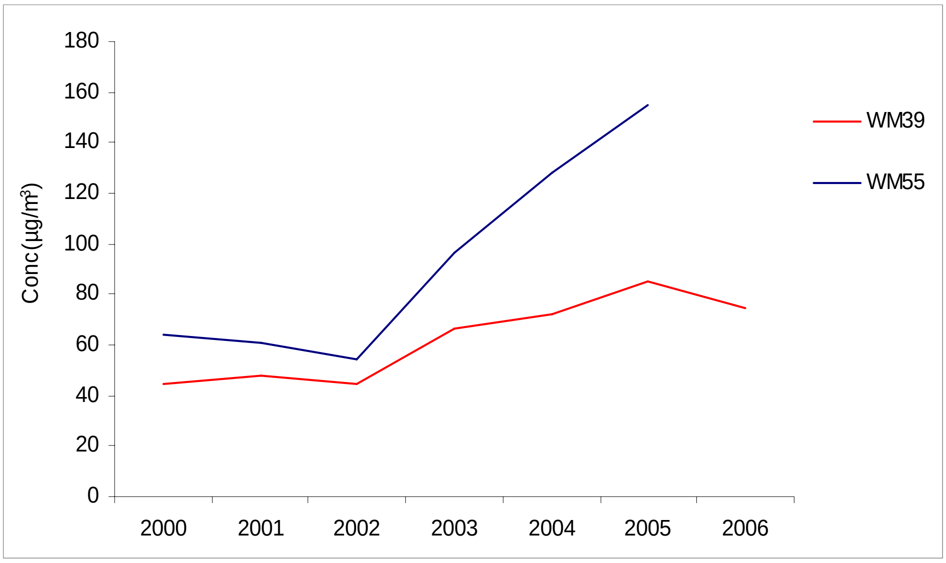



**Figure 55 Westminster Roadside Time Series, 1993-2006**

Discontinued and ineligible Roadside sites have been removed from the Time Series. Site WM39 displayed a rolling trend in annual mean $NO_2$ concentration. Between 2002 and 2006 the $NO_2$ concentration rises by 21%. WM55 has been a continuously sampled location for a minimum of six years and has been included since 2005. Between 2002 and 2005 an upward trend has been recorded at WM55; the first reduction occurs in 2006. Comparing the mean of the concentrations monitored at roadside sites between 2005 and 2006, there has been a decrease of 13.2%.

## Trend Analysis

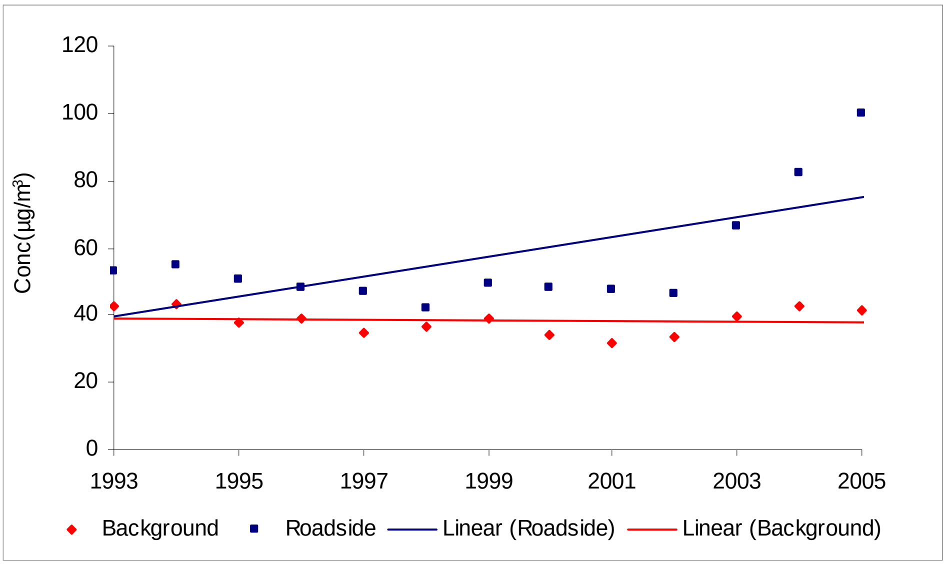



**Figure 56 Westminster Background and Roadside Trend Analysis, 1993-2006**

Long-term background annual mean $NO_2$ concentrations show a decreasing trend. Between 1993 and 2006, concentrations have, overall, decreased by 7.9%. Long-term roadside annual mean $NO_2$ concentrations show a positive trend. Between 1993 and 2004, roadside concentrations decreased but the subsequent upward trend has resulted with an increase between 1993 and 2006 of 63.2%.

## Roadside Elevation

**Table 18 Westminster Elevation Above Background $NO_2$ Concentration $\mu g/m^3$**

| 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12.3 | 9.1 | 12.4 | 5.6 | 10.8 | 14.2 | 15.8 | 12.8 | 26.6 | 39.8 | 70.8 | 47.4 |

The elevation above background $NO_2$ concentration fluctuates between 1993 and 2002 around 10µg/m$^3$. The lowest concentration is recorded in 1998 where a drop of just over 50% takes place. In 2003 there is a two-fold increase in roadside elevation concentration. Concentrations increase in 2005 reaching the highest level of the period due, in part to the smaller number of locations and the limited number of concentrations recorded at WM55. The elevation in 2006 is more modest and marks a return to the steady upward trend previously seen.

## 7.15 London Borough of Tower Hamlets

### Annual Mean Values

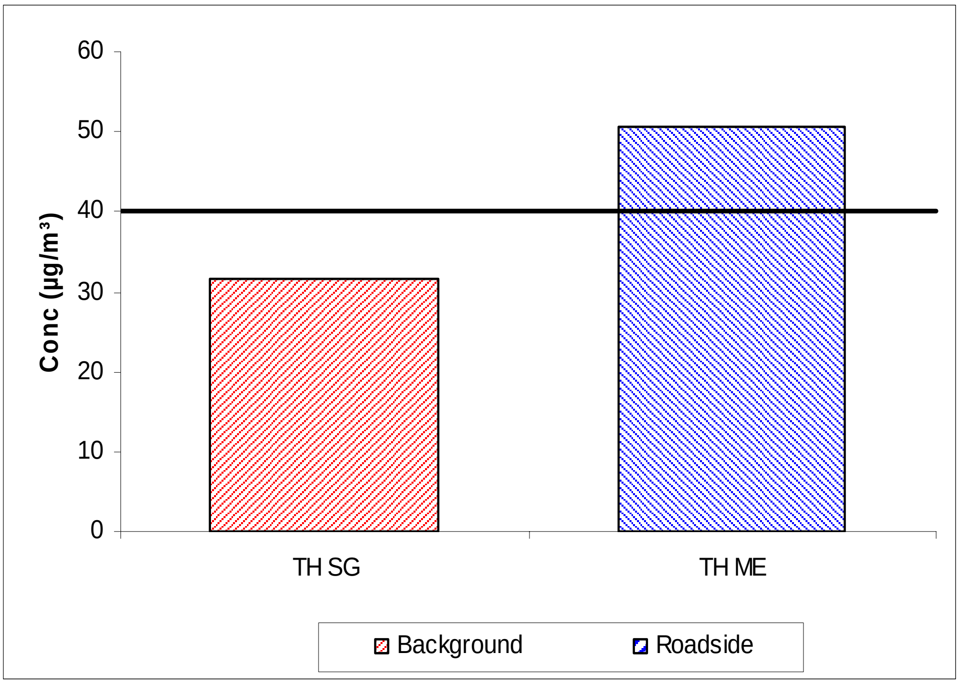



**Figure 57 Tower Hamlets Background and Roadside Annual Mean $NO_2$ Concentrations, 2006**

Tower Hamlets exposed two diffusion tubes in 2006, with no revision to the locations or numbers compared to the previous two years. Data capture for this year was 100%.

Background concentration at THSG was 31.6 µg/m³. Roadside concentration at site THME was 50.6 µg/m³. The air quality objective was exceeded at site THME, a significant change from the previous year when neither site exceeded the Objective.

## Time Series

**Table 19 Tower Hamlets Background and Roadside Time Series**

| Site Code | Site Type | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|
| TH SG | Background | 36.1 | 36.1 | 17.6 | 31.6 |
| TH ME | Roadside | 46.8 | 53.2 | 31.9 | 50.6 |

The Background concentration at THSG shows a constant reduction between 2003 and 2005 but significantly increase in 2006. The overall change in concentration between 2003 and 2006 is a reduction of 12.5%. Roadside site THME concentrations increased between 2003 and 2004 and the site has since recorded a lower concentration in 2005 than in the previous two years. Between 2005 and 2006, the annual mean concentration increased by 58%, however, over the entire monitoring period the increase is 8.1%.

## Roadside Elevation

**Table 20 Tower Hamlets Elevation above Background $NO_2$ Concentrations µg/m³**

| 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|
| 10.7 | 17.1 | 14.2 | 19 |

The roadside elevation fluctuates over the three years Tower Hamlets have been participating. It increased by 6.5 µg/m³ between 2003 and 2004 to a concentration 17.1 µg/m³, and decreased in 2005. The elevation increased to the highest level recorded.

# 8 DIFFUSION TUBE CO-LOCATION STUDY

This section examines the results of triplicate diffusion tubes that have been co-located with a continuous NOx analyser operated at eight London authorities who participate in the LWEP nitrogen dioxide monitoring network. The mean bias correction factor derived from this study is intended to aid those local authorities that do not have the facilities to allow the calculation of their own correction factor. The study additionally aims to show compliance with EU Daughter Directive data quality objectives.

## 8.1 Co-location monitoring sites

Fifteen monitoring sites have been selected for this co-location study all of which operate as part of the Automatic Urban and Rural Network (AURN) or London Air Quality Network (LAQN). These sites are operated on behalf of DEFRA by Central Management and Coordination Units (CMCU) which are either Kings ERG (responsible for LAQN) or Bureau Veritas (responsible for AURN). The sites are summarised in Table 22. Recognised QA/QC procedures for calibration and data ratification of the continuous monitoring data are performed by NETCEN.

Triplicate diffusion tube $NO_2$ results associated with each monitoring site were averaged, and the annual mean $NO_2$ concentration compared to the equivalent concentration measured by the co-located continuous NOx analyser over the twelve-month period. Monthly continuous $NO_2$ data for each monitoring site has been retrieved from the Air Quality Archive.[18] Continuous analyser monthly mean results containing less than 75% data capture have been omitted to ensure a comparative and robust data set.

**Table 21 Co-location monitoring sites details**

| Monitoring Site Name | Network | CMCU | Site Classification |
|---|---|---|---|
| Brent 1, Kingsbury | AURN | Bureau Veritas | Urban Background |
| Bloomsbury, AURN | AURN | Bureau Veritas | Urban Center |
| Croydon, London Road | LAQN | Kings ERG | Roadside |
| Croydon, George Street | LAQN | Kings ERG | Roadside |
| Greenwich 4, Eltham | LAQN | Kings ERG | Suburban |
| Greenwich 5, Trafalgar Road | LAQN | Kings ERG | Roadside |
| Greenwich 7, Blackheath | AURN | Bureau Veritas | Roadside |
| Hillingdon 1, South Ruislip | LAQN | Kings ERG | Roadside |
| Hillingdon, AURN | AURN | Bureau Veritas | Suburban |
| Hillingdon 2, Hospital | AURN | Bureau Veritas | Roadside |
| Hounslow 1, Brentford | LAQN | Kings ERG | Roadside |
| Hounslow 2, Cranford Avenue | LAQN | Kings ERG | Suburban |
| Hounslow, Chiswick High Street | LAQN | Kings ERG | Roadside |
| Kensington 2, Cromwell Road | AURN | Bureau Veritas | Roadside |
| Richmond 2, Barnes Wetland Centre | LAQN | Kings ERG | Suburban |

18 http://www.airquality.co.uk/archive/index.php

## 8.2 Results

**Table 22 Bias adjustment factor and %bias of LWEP Co-location Study 2006**

| | Diffusion Tube | Continuous Analyser | Correction Factor (A) | % Bias based on continuous monitor (B) |
|---|---|---|---|---|
| London Cromwell Road 2 | 72.7 | 81.9 | 1.13 | -11 |
| London Brent | 35.8 | 30.9 | 0.86 | 16 |
| Bloomsbury | 50.2 | 56.0 | 1.12 | -10 |
| Croydon, London Road | 60.9 | 63.9 | 1.05 | -5 |
| Croydon, George Street | 48.0 | 53.3 | 1.11 | -10 |
| Hounslow, Chiswick High Road | 64.0 | 67.8 | 1.06 | -6 |
| Hounslow, Brentford | 55.1 | 52.8 | 0.96 | 5 |
| Hounslow, Cranfield | 31.1 | 37.4 | 1.20 | -17 |
| London Hillingdon | 42.6 | 49.2 | 1.15 | -13 |
| London Hillingdon, South Ruislip | 47.1 | 41.4 | 0.88 | 14 |
| London Hillingdon Hospital | 39.7 | 37.7 | 0.95 | 5 |
| Greenwich, Eltham | 25.6 | 29.6 | 1.15 | -13 |
| Greenwich, Trafalgar Road | 46.4 | 57.4 | 1.24 | -19 |
| Greenwich, Blackheath | 50.1 | 46.3 | 0.93 | 8 |
| Richmond Barnes Westland | 26.3 | 28.7 | 1.09 | -8 |
| | | **Overall % Bias** | | -4 |
| | | **Mean Bias Adjustment Factor** | **1.06** | |

The bias adjustment factor ranges between 0.86 and 1.24 for the fifteen monitoring sites participating in the co-location study. The bias adjustment factor varies at background and roadside sites. The 2006 LWEP mean bias adjustment factor is calculated at 1.06. (This is the less than the 1.18 identified on the Air Quality Consultant spread sheet as the default value for Gradko diffusion tube prepared with 50% TEA with acetone method for 2006). The percentage bias figures show that diffusion tubes under-read or over read $NO_2$ concentrations between 5 and 24% when compared to the reference method of the continuous NOx analyser. The overall percentage bias for 2005 is -4, representing a slight deterioration in the relationship between the two monitoring techniques compared to the previous year.

The variation in the mean bias adjustment factors over the past four years can is shown in Table 24. As can be seen in Table 24 the mean % bias and bias adjustment factor results for 2003, 2004, 2005 and 2006 are clearly lower than those calculated in the preceding years. Gradko Internationally Ltd has been contacted with regards to the recent reduction in bias adjustment factors. The laboratory has guaranteed that no modifications have taken place with any of their preparation or analytical procedures during this year.

**Table 23 Mean correction factor and %bias from LWEP Studies 2001-2006.**

| Year | Mean Bias Adjustment Factors | Mean % Bias |
|---|---|---|
| 2001 | 1.37 | -26 |
| 2002 | 1.35 | -26 |
| 2003 | 1.11 | -10 |
| 2004 | 1.10 | -9 |
| 2005 | 1.03 | -3 |
| 2006 | 1.06 | -4 |

When the mean bias adjustment factor of 1.06 is applied to the raw diffusion tube $NO_2$, the number of sites showing exceedances increases. $NO_2$ concentrations above 37.75 $\mu g/m^3$ will exceed the 2005 Air Quality Objective; monitoring sites reporting $NO_2$ concentrations in excess of this concentration are highlighted in Appendix 1.

## 9 CONCLUSION

In 2006, annual mean $NO_2$ concentration at background monitoring sites experienced a 5 % decrease compared to 2005, the roadside sites showed a 6% decrease. A total of 177 qualifying monitoring sites exceeded the 2005 Air Quality Objective of 40 µg/m$^3$, representing 66 % of diffusion tube monitoring sites, a reduction of 1 % compared with the previous year. The long-term trend analysis continues to indicate a very slight decrease in concentrations of $NO_2$ over time at background sites whereas roadside sites reveal an increase. A summary of the results for background and roadside sites is as follows:

- The annual mean background $NO_2$ concentration was 36.9 µg/m$^3$ with results predominantly recorded in the 20-40 µg/m$^3$ concentration ranges.
- 30 qualifying background sites exceeded the 2005 air quality objective; this is a decrease of 13.5 % compared to the previous year.
- The annual mean roadside $NO_2$ concentration was 53.9 µg/m$^3$ with results predominantly recorded in the 40-60 µg/m$^3$ concentration ranges.
- 147 qualifying roadside sites exceeded the 2005 air quality objective, this is a 7 % decrease compared to the previous year.

Analysis of the roadside elevation is intended to provide an indication of the contribution of road traffic to total $NO_2$ concentrations. Contribution from road traffic to annual average $NO_2$ concentrations has increased in ten boroughs.

The LWEP co-location study extension includes the results from eight local authorities where triplicate diffusion tubes are concurrently situated with an automatic analyser. The results showed that the diffusion tubes used in this air quality programme under-read by 4%. This is well within the criterion of ±25% set by the NETCEN inter-comparison exercise. The mean bias adjustment factor derived from the LWEP collocation study for 2006 was calculated as 1.06. If the LWEP bias adjustment factor is applied to the raw diffusion tube results reported in this report, the number of sites showing exceedances increases to 38 background sites and 160 roadside sites.

## Appendix 1 Monthly and Annual Mean $NO_2$ Concentrations All Sites, 2006

Site Code = Site exceeding 2005 AQO
Site Code = Site likely to exceed the 2005 AQO if the 1.06 bias adjustment factor is applied
Annual Mean = Value not reported data capture <9 months
* = No monitoring data

| Borough | Site Code | Class | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Conc. µg m³ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bexley | BX31 | B | 37.0 | 32.8 | * | 27.4 | 23.5 | 27.3 | 32.9 | 22.3 | 27.0 | 30.4 | 31.0 | 31.4 | **29** |
| | BX32 | B | 30.7 | 28.3 | 21.3 | 24.0 | 21.2 | 24.7 | 20.1 | 25.1 | 22.5 | 26.7 | 26.2 | 25.4 | **25** |
| | BX33 | B | 35.2 | 34.8 | 25.4 | 28.1 | 23.7 | 24.9 | 35.9 | 24.9 | 25.1 | 32.8 | 30.8 | 29.9 | **29** |
| | BX37 | B | 38.8 | * | 42.9 | 35.2 | 25.3 | 29.9 | 39.4 | 27.6 | 32.8 | 29.7 | 36.8 | 38.5 | **34** |
| | BX34 | R | 12.1 | 0.7 | 38.5 | 42.2 | 37.6 | 46.7 | 56.8 | 32.7 | 29.7 | 32.4 | * | 31.8 | **55** |
| | BX35 | R | 54.4 | 45.5 | 43.7 | 48.9 | 48.1 | * | 70.0 | 58.2 | 61.4 | 60.4 | 59.5 | 50.3 | **28** |
| | BX36 | R | 33.3 | 16.8 | * | 24.7 | 25.7 | 29.4 | 30.9 | 29.7 | 27.3 | 28.6 | * | 30.1 | **36** |
| Brent | BRT31 | B | * | * | * | 65.2 | 55.5 | 62.9 | 96.1 | 51.4 | 79.8 | 74.0 | 75.9 | 72.8 | **70** |
| | BRT41 | B | 70.5 | 35.2 | 26.5 | 23.7 | 24.6 | 19.9 | 30.2 | 24.3 | 30.3 | 34.8 | 39.6 | 35.0 | **33** |
| | BRT42 | R | 112.7 | 47.9 | 42.8 | 50.1 | 41.5 | 46.2 | 57.1 | 38.9 | 46.5 | 48.4 | 53.8 | 47.5 | **53** |
| | BRT43 | R | 150.0 | 65.5 | 63.1 | * | 62.4 | 35.6 | 94.8 | 65.8 | 85.1 | 81.8 | 85.8 | 82.0 | **79** |
| | BRT51 | B | 74.9 | 33.5 | 35.7 | 28.5 | 24.3 | * | 26.8 | 24.5 | 27.5 | 33.2 | 50.0 | 34.9 | **36** |
| | BRT52 | R | * | 62.1 | 39.0 | * | * | 43.8 | 47.9 | * | 52.1 | 51.8 | 49.8 | 54.9 | **50** |
| | BRT53 | R | 163.5 | 77.3 | 74.5 | 76.9 | 83.7 | 75.4 | 106.1 | 86.3 | 101.3 | 87.9 | 73.3 | 76.7 | **90** |
| | BRT54 | R | * | 52.9 | 25.6 | 60.5 | * | 24.0 | 95.9 | 51.7 | 63.1 | 61.4 | 65.5 | 66.0 | **57** |
| | BRT55 | R | 151.0 | 82.1 | 67.5 | 77.3 | 74.7 | 91.9 | 62.9 | 80.5 | 75.5 | 74.9 | 80.1 | 69.3 | **82** |
| | BRT56 | R | 130.5 | 70.8 | 63.2 | 75.5 | 64.9 | 68.1 | 85.4 | 56.0 | 88.9 | 71.4 | 77.7 | 73.3 | **77** |
| | BRT57 | R | 132.8 | * | * | * | * | * | 76.1 | * | 94.4 | 97.6 | 115.8 | 109.1 | **104** |
| | BRT58 | R | 3.0 | 68.5 | 68.0 | * | 66.1 | * | 84.9 | 53.5 | 66.5 | 71.0 | 78.5 | 67.2 | **69** |

| Borough | Site Code | Class | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Conc. µg m³ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Camden | CA 6 | B | 53.7 | 54.4 | 58.7 | 43.1 | 33.9 | 34.2 | 40.7 | 34.8 | 38.4 | 46.6 | * | * | **44** |
| | CA 19 | R | 75.0 | 67.3 | 41.5 | 63.4 | 70.1 | 74.3 | 27.7 | 58.8 | 82.2 | 72.9 | * | * | **63** |
| | CA 28 | R | 73.0 | 80.0 | 66.3 | 80.4 | 69.2 | 91.4 | 89.2 | 71.3 | 86.2 | 72.7 | * | * | **78** |
| | CA 29 | B | 55.2 | 55.5 | 46.5 | 57.4 | 44.1 | 46.7 | 50.9 | 46.9 | 50.5 | 48.2 | * | * | **50** |
| | CA 30 | R | 55.8 | 51.0 | 44.3 | 41.3 | 39.3 | 48.4 | 54.5 | 41.5 | 51.3 | 46.0 | * | * | **47** |
| | CA 4 | R | 70.0 | 74.1 | 74.6 | 78.8 | * | 95.8 | 104.0 | 71.5 | 93.7 | 84.4 | * | * | **83** |
| | CA 7 | B | 42.4 | 41.2 | 29.7 | 33.6 | 27.2 | 26.0 | 82.9 | 22.9 | 34.8 | 36.8 | * | * | **38** |
| City of London | CL 02 | B | 57.6 | 63.1 | 49.8 | 53.2 | 47.2 | 42.9 | 35.9 | 47.1 | 44.6 | 53.3 | 59.0 | 55.8 | **51** |
| | CL 03 | B | 51.0 | 46.1 | * | 44.2 | 36.7 | 39.2 | 44.3 | 36.8 | 40.8 | 32.8 | 50.8 | 45.7 | **43** |
| | CL 05 | B | 52.1 | 49.6 | 37.5 | 40.0 | 40.3 | 38.8 | 41.3 | 40.2 | 36.5 | 41.2 | 52.8 | 46.9 | **43** |
| | CL 36 | R | 58.4 | 71.0 | 59.7 | 71.2 | 62.0 | 66.6 | * | 40.7 | 72.9 | 72.0 | 82.9 | 62.5 | **65** |
| | CL 38 | R | 61.1 | 67.4 | 58.7 | 68.3 | 57.7 | 66.5 | 69.3 | * | 55.8 | 61.6 | 65.7 | 58.2 | **63** |
| | CL 39 | R | 105.3 | 121.9 | 91.7 | 113.3 | * | 114.5 | 111.3 | 114.1 | 102.6 | 85.6 | 96.6 | 73.6 | **103** |
| | CL 41 | R | 55.6 | 60.1 | 52.8 | 57.6 | 48.4 | * | 67.0 | 42.6 | 53.7 | 30.6 | 65.5 | 52.8 | **53** |
| | CL 51 | B | 57.4 | 53.1 | 42.3 | 55.8 | 42.2 | 47.0 | * | 74.2 | 49.4 | 50.7 | 49.3 | 52.5 | **52** |
| | CL 55 | B | 46.0 | 45.7 | 33.6 | 39.5 | 35.0 | 34.9 | 39.3 | 34.7 | 37.0 | 38.8 | 46.9 | 44.2 | **40** |
| | CL 56 | R | 52.8 | 61.1 | 54.8 | 52.6 | 46.9 | 51.0 | 49.5 | 43.7 | 48.0 | 48.0 | 54.7 | 51.2 | **51** |
| | CL 62 | B | 47.0 | 50.6 | 42.9 | 44.3 | 43.0 | 41.7 | 46.1 | 34.1 | 38.8 | 42.5 | 48.3 | 40.6 | **43** |
| Croydon | CY 41A | R | 65.2 | 56.3 | 48.6 | 48.8 | 45.1 | 51.9 | 55.0 | 47.6 | 57.2 | 51.8 | 52.8 | 46.9 | **52** |
| | CY 42A | R | 47.5 | 47.9 | 39.5 | 37.9 | * | * | 37.4 | * | 33.7 | 34.8 | 35.4 | 31.2 | **38** |
| | CY 43A | R | 58.5 | 49.0 | 41.9 | 49.1 | 46.8 | 49.2 | 38.5 | 47.9 | 43.6 | * | 43.4 | 34.5 | **46** |
| | CY 46A | B | 33.3 | 33.6 | 23.1 | 23.9 | 22.9 | 22.1 | 24.9 | 0.7 | 18.3 | 21.5 | 23.7 | 26.9 | **25** |
| | CY 47A | B | 37.0 | 33.9 | 28.0 | 24.6 | 20.9 | 20.5 | 25.3 | 17.7 | 23.3 | 22.9 | 25.4 | 28.1 | **26** |
| | CY 48A | R | 60.8 | 65.1 | 58.0 | 65.8 | 67.5 | 61.8 | 13.5 | 14.5 | 13.1 | 15.0 | 73.9 | 67.5 | **48** |
| | CY 50A | B | 29.2 | 26.1 | 18.4 | 18.3 | 12.6 | 15.4 | 53.9 | 59.3 | 65.4 | 64.1 | 18.0 | 18.9 | **33** |
| | CY 51A | R | 44.2 | 42.1 | 37.4 | 31.3 | * | 39.3 | 28.7 | 43.0 | 41.0 | 37.8 | 48.0 | 44.6 | **40** |
| | CY 52A | R | 57.8 | 56.1 | 40.5 | 49.3 | 41.8 | 44.5 | 46.1 | 46.0 | 47.1 | 40.8 | 56.8 | 44.2 | **48** |
| | CY 55 | R | 73.5 | 64.4 | 53.5 | 61.7 | 50.0 | 67.5 | 71.0 | 64.6 | 60.9 | 57.9 | 56.4 | 49.0 | **61** |
| | CY 56A | R | 42.9 | 41.8 | 28.5 | 34.9 | 26.7 | 27.1 | 29.9 | 27.0 | 30.3 | * | 35.9 | * | **33** |
| | CY 58A | R | 77.4 | 60.5 | 57.3 | 66.0 | 64.9 | 68.8 | 74.5 | * | 77.0 | 74.2 | 72.2 | 67.9 | **69** |
| | CY 59A | R | 63.4 | 57.6 | 47.4 | 50.4 | 50.9 | * | 40.0 | 1.5 | 60.7 | 61.7 | 53.5 | 53.6 | **54** |
| | CY 97A | R | 45.9 | 50.5 | 39.3 | 51.1 | 50.3 | 45.4 | 49.3 | 43.8 | 49.1 | 38.2 | 47.9 | 44.1 | **46** |
| | CY 98A | R | 56.1 | 42.5 | 39.1 | 49.1 | 46.6 | 50.8 | 53.0 | 55.9 | 44.4 | 41.9 | 50.4 | 46.7 | **48** |
| | CY 99A | R | 54.9 | 55.7 | 42.2 | 46.2 | 40.9 | 40.8 | * | * | 46.4 | 50.1 | 49.7 | 50.6 | **48** |

| Borough | Site Code | Class | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Conc. µg m³ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Greenwich | GW 101 | R | | 73.7 | 69.1 | 75.4 | 76.6 | 83.2 | 32.8 | 90.6 | 89.9 | 89.9 | 94.5 | 83.1 | **78** |
| | GW 102 | R | 78.8 | 8.9 | 45.5 | 72.4 | 61.2 | 69.5 | 72.9 | 68.7 | 61.0 | 61.0 | 61.5 | 59.0 | **60** |
| | GW 23 | R | 54.5 | 56.5 | 38.3 | 42.9 | 37.8 | 53.8 | 37.3 | 40.0 | 43.8 | 40.8 | 47.4 | 39.9 | **44** |
| | GW 24 | R | 66.3 | 59.5 | 52.4 | 57.3 | 47.5 | 70.0 | 65.3 | 53.1 | 52.3 | 54.5 | 51.5 | 48.6 | **57** |
| | GW 25 | R | 57.8 | 51.0 | 46.6 | 54.9 | 49.2 | 58.5 | 56.4 | 46.4 | 55.3 | 54.1 | 54.7 | 39.8 | **52** |
| | GW 26 | R | 61.6 | 47.0 | 35.6 | 43.0 | 40.6 | 45.5 | * | 36.9 | 62.4 | 49.0 | 43.8 | 44.0 | **46** |
| | GW 27 | R | 62.7 | 69.1 | 57.1 | 59.1 | 0.1 | * | 41.3 | 50.9 | 59.5 | 60.2 | * | * | **57** |
| | GW 29 | R | 68.7 | 64.5 | 66.8 | 67.2 | 62.5 | 72.8 | 72.5 | 63.2 | 70.5 | 67.0 | 69.1 | 64.4 | **67** |
| | GW 32 | R | 58.2 | 49.5 | 46.7 | 50.7 | 51.9 | 52.6 | 56.4 | 49.1 | 54.1 | 48.7 | 28.6 | 28.0 | **48** |
| | GW 33 | R | 61.4 | 64.0 | 56.0 | 65.7 | 59.5 | 56.1 | 76.1 | 60.3 | 64.7 | 61.9 | 65.1 | 51.3 | **62** |
| | GW 34 | R | 56.5 | 57.5 | 40.3 | 44.9 | 46.4 | 39.6 | 51.8 | 49.7 | 51.7 | 52.5 | 54.0 | * | **50** |
| | GW 35 | R | 87.0 | * | * | 93.6 | 88.8 | 98.5 | 96.2 | 87.3 | 100.4 | 82.8 | 84.1 | 69.2 | **89** |
| | GW 36 | R | 63.5 | 50.7 | * | 53.8 | 52.6 | 51.0 | 55.0 | 47.3 | 57.2 | 53.8 | 63.3 | 60.6 | **55** |
| | GW 37 | B | 28.7 | 38.3 | 23.4 | 26.4 | 24.1 | 24.7 | 23.8 | 21.8 | 23.2 | 26.8 | 32.2 | 27.7 | **27** |
| | GW 38 | B | 42.5 | 37.2 | 29.6 | 36.8 | 37.2 | 41.9 | * | * | 36.9 | 42.7 | 39.1 | 34.4 | **38** |
| | GW 39 | B | 32.5 | 32.7 | 21.4 | 26.2 | 18.0 | 28.8 | 25.3 | 20.0 | 23.7 | 23.8 | 27.7 | 27.5 | **26** |
| | GW 40 | B | 28.6 | 30.0 | 19.5 | 21.6 | 17.9 | 17.4 | 22.5 | 20.0 | 20.4 | 22.8 | 60.8 | 47.7 | **27** |
| | GW 41 | R | 48.8 | * | * | 41.6 | 40.3 | 41.9 | 50.8 | 41.2 | 47.1 | 47.3 | 45.1 | 40.3 | **44** |
| | GW 42 | R | 71.9 | 76.4 | 49.3 | 61.3 | 52.5 | 56.7 | 60.8 | 54.5 | 61.4 | 56.6 | 55.2 | 50.9 | **59** |
| | GW 43 | R | 65.9 | 68.8 | 55.4 | 62.4 | 52.6 | 58.2 | 76.1 | 52.5 | 60.2 | 62.6 | 62.2 | 59.7 | **61** |
| | GW 44 | R | 52.0 | 57.2 | 42.1 | 53.7 | 45.1 | 54.0 | 49.9 | 44.9 | 49.7 | 44.0 | 46.2 | 36.2 | **48** |
| | GW 45 | R | 61.5 | 54.4 | 42.4 | 45.3 | 48.5 | 41.0 | 47.4 | 52.8 | 54.3 | 55.1 | 58.6 | 55.1 | **51** |
| | GW 48 | R | 52.7 | 54.3 | 47.8 | 50.1 | 42.3 | 45.5 | 48.2 | 47.5 | 48.8 | 52.8 | 54.8 | 58.0 | **50** |
| | GW 49 | R | 56.1 | 48.8 | 44.3 | 50.5 | 45.9 | 46.7 | 55.1 | 48.1 | 52.8 | 56.0 | 58.4 | 52.5 | **51** |
| | GW 50 | R | 66.8 | 66.9 | 70.4 | 70.3 | 73.7 | 49.0 | 72.8 | 72.8 | 71.2 | 72.9 | 87.2 | 77.6 | **71** |
| | GW 51 | R | 49.0 | 49.1 | * | 40.2 | 44.3 | 45.6 | 44.9 | 49.4 | 80.9 | 41.6 | 56.0 | 45.5 | **50** |
| | GW 52 | R | 56.1 | 53.5 | 42.8 | 49.7 | 44.0 | 47.3 | 57.7 | 40.4 | 49.9 | 45.7 | 43.1 | 41.4 | **48** |
| | GW 53 | R | 51.0 | 51.5 | 39.6 | 41.3 | 41.8 | 45.3 | 48.6 | 40.8 | 44.7 | 48.1 | 49.4 | 48.4 | **46** |
| | GW 54 | R | 60.8 | 60.5 | 46.6 | 47.8 | 47.2 | 63.0 | 61.9 | 47.1 | 49.4 | 59.9 | 56.4 | 56.1 | **55** |
| | GW 55 | R | 59.4 | 54.6 | 41.7 | 49.5 | 45.2 | 59.8 | 62.1 | 44.7 | 47.0 | 48.2 | 39.4 | 38.6 | **49** |
| | GW 56 | R | 51.8 | * | * | 51.5 | 42.7 | * | 54.1 | 52.1 | 43.6 | 51.9 | 50.2 | 52.5 | **50** |
| | GW 57 | R | 50.9 | 54.0 | 41.3 | 44.9 | 40.1 | 59.8 | 44.0 | 38.6 | 45.9 | 43.3 | 47.3 | 46.7 | **46** |
| | GW 58 | R | 55.1 | 51.5 | 44.7 | 48.4 | 47.3 | 47.3 | 55.3 | 45.4 | 49.7 | 51.3 | 55.0 | * | **50** |
| | GW59 | R | 53.5 | 47.7 | 39.6 | 41.3 | 40.7 | 40.7 | 54.5 | 38.4 | 46.0 | 46.2 | 45.5 | 40.3 | **45** |
| | GW60 | R | 54.5 | 48.7 | 41.6 | 49.2 | 39.8 | 39.8 | 44.5 | 47.0 | 38.6 | 41.5 | 46.9 | 42.5 | **45** |

| Borough | Site Code | Class | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Conc. µg m³ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hammersmith & Fulham Hammersmith & Fulham | HF 41 | B | 36.7 | 33.9 | 22.3 | 23.1 | 20.1 | 23.2 | 51.4 | 19.2 | 22.2 | 27.1 | 24.9 | 26.9 | **28** |
| | HF 44 | B | 49.6 | 43.6 | 33.4 | 31.8 | 28.3 | 31.5 | 31.4 | 27.7 | 33.1 | 38.7 | 38.5 | 33.8 | **35** |
| | HF 45 | B | 47.5 | 43.4 | 36.6 | 29.8 | 28.3 | 29.0 | 35.5 | 30.7 | 33.2 | 32.5 | 39.0 | 36.6 | **35** |
| | HF 46 | B | 46.3 | 44.9 | 31.9 | 34.5 | 29.9 | 39.1 | 33.3 | 27.7 | 33.2 | 29.5 | 36.8 | 37.2 | **35** |
| | HF 51 | B | 59.5 | 56.4 | 44.2 | 48.5 | 49.1 | 86.7 | 55.6 | 52.5 | 49.9 | 49.0 | 56.6 | 48.3 | **55** |
| | HF 53 | B | 51.7 | 48.7 | 38.5 | 37.8 | 34.4 | 76.8 | 33.9 | 36.6 | 40.0 | 43.0 | 45.5 | 41.6 | **44** |
| | HF 60 | B | 44.6 | 52.4 | 33.4 | 32.5 | 33.6 | 47.0 | 33.0 | 23.2 | 36.2 | 40.7 | 43.4 | 34.7 | **38** |
| | HF 66 | B | 44.6 | 44.9 | 33.3 | 33.9 | 24.6 | * | * | 28.7 | 28.9 | 36.9 | 38.7 | 37.3 | **35** |
| | HF 67 | B | 51.5 | 42.5 | 24.7 | 29.9 | 28.3 | 22.5 | 30.2 | 25.6 | 25.7 | 33.6 | 34.4 | 33.8 | **32** |
| | HF 62 | B | 49.5 | 48.5 | 35.3 | 33.8 | 29.5 | 66.2 | 31.3 | 28.8 | 73.2 | 38.2 | 45.9 | 40.4 | **43** |
| | HF 63 | R | 67.9 | 66.9 | 50.6 | 56.4 | 55.4 | 57.6 | 71.0 | 58.9 | 52.4 | 53.8 | 62.1 | 51.8 | **59** |
| | HF 32 | R | * | 73.1 | 66.4 | 47.7 | 62.8 | 78.6 | 82.4 | 61.1 | 51.1 | 77.7 | 66.8 | 61.0 | **66** |
| | HF 47 | R | 49.4 | 46.6 | 37.5 | 38.4 | 36.5 | 34.6 | 48.9 | 40.3 | 67.2 | 46.8 | 49.1 | 47.0 | **45** |
| | HF 48 | R | 60.2 | 57.6 | 45.5 | 39.6 | 41.8 | 73.5 | 50.9 | 32.4 | 96.7 | 51.7 | 59.5 | 52.8 | **55** |
| | HF 50 | R | * | 70.6 | 60.2 | 62.0 | 60.9 | 50.5 | 86.4 | 63.2 | 73.2 | 80.2 | 70.3 | 59.9 | **67** |
| | HF 52 | R | 82.6 | 74.2 | 75.6 | 56.9 | 81.2 | 34.2 | 103.6 | 82.7 | 36.9 | 103.1 | 94.0 | 91.7 | **76** |
| | HF 54 | R | 83.3 | 76.4 | 53.1 | 68.3 | 52.1 | 30.7 | 84.3 | 79.8 | 35.1 | 76.5 | 70.3 | 55.5 | **64** |
| | HF 61 | R | 57.2 | 56.0 | 35.0 | 42.8 | 37.5 | 30.2 | 43.9 | 39.2 | 43.5 | 44.7 | * | 44.2 | **43** |
| | HF 64 | R | 73.7 | 69.8 | 51.3 | 63.3 | 52.4 | 41.2 | 71.0 | 59.8 | 65.4 | 61.8 | 77.9 | 66.7 | **63** |
| | HF 65 | R | 58.6 | 51.8 | 36.7 | 34.6 | 34.5 | 27.8 | 39.5 | 35.1 | 30.6 | 47.7 | 41.8 | 38.2 | **40** |
| Harrow | HA 01 | R | 42.5 | 38.8 | 32.7 | 43.4 | 31.8 | 35.9 | 33.7 | 37.2 | 40.3 | 37.9 | 48.6 | 33.0 | **38** |
| | HA 03 | B | 35.9 | 21.5 | 0.3 | 25.3 | 21.3 | 26.4 | 27.3 | 24.5 | 25.1 | 20.0 | 17.8 | 3.4 | **24** |
| | HA 04 | B | 29.7 | 24.2 | 18.1 | 18.0 | 15.4 | 16.9 | 17.8 | 13.5 | 15.4 | * | * | 21.2 | **19** |
| | HA 02 | B | 31.2 | 27.3 | 22.6 | 23.6 | 19.2 | 21.5 | 24.2 | 18.3 | 25.2 | 28.2 | 33.4 | 25.9 | **25** |
| Hillingdon | HD 31 | B | 43.2 | 40.5 | 42.1 | 38.9 | 35.1 | 46.0 | 52.0 | 33.0 | 47.0 | 29.6 | 55.7 | 48.4 | **43** |
| | HD 41 | B | 39.8 | 36.1 | 30.0 | 26.3 | 26.5 | * | * | 21.9 | 32.7 | 35.6 | 36.3 | 35.0 | **32** |
| | HD 42 | R | 42.6 | 51.1 | 34.2 | 31.3 | 24.3 | 30.6 | 35.6 | 31.4 | 43.1 | 45.0 | 50.1 | 43.4 | **39** |
| | HD 43 | R | 39.9 | 51.5 | 38.4 | 28.7 | 43.6 | 53.0 | * | 44.8 | 46.7 | 42.9 | 47.6 | 36.2 | **43** |
| | HD 46 | R | 53.1 | 52.1 | 41.9 | 41.0 | 36.4 | 43.3 | 49.9 | 37.9 | 50.0 | 50.8 | 60.5 | 48.0 | **47** |
| | HD 47 | R | 42.0 | * | 31.9 | * | 29.3 | 23.1 | 34.4 | 22.1 | 32.3 | * | 40.5 | 34.0 | **32** |
| | HD 48 | B | 34.5 | 32.2 | 29.4 | 28.8 | 25.5 | 30.0 | 34.1 | 22.4 | 35.0 | 30.6 | 36.7 | 31.7 | **31** |
| | HD 49 | B | 35.2 | 30.6 | 26.0 | 25.7 | 18.1 | 15.8 | 24.6 | 21.0 | 30.0 | 32.8 | 39.9 | 31.6 | **28** |
| | HD 50 | R | 47.0 | 42.7 | 32.9 | * | 31.9 | 30.8 | 38.0 | 33.8 | 46.0 | 48.0 | * | 46.0 | **40** |
| | HD 51 | R | 41.5 | * | * | 38.0 | 32.8 | 32.5 | 38.3 | 30.9 | 31.9 | 31.0 | 50.3 | 41.5 | **37** |
| | HD 52 | B | 47.8 | 43.2 | * | * | 27.2 | 37.4 | 40.7 | 34.5 | 44.2 | 30.4 | 48.2 | 38.4 | **39** |
| | HD 53 | B | 41.1 | 42.8 | 37.1 | 37.1 | 40.0 | 38.0 | 42.0 | 33.7 | 46.3 | 46.2 | 56.0 | 45.8 | **42** |

| Borough | Site Code | Class | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Conc. µg m³ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hillingdon | HD 55 | B | 48.3 | 47.3 | 36.2 | 34.0 | 28.4 | 31.0 | 36.1 | 31.9 | 38.1 | 37.0 | 53.2 | 44.3 | **39** |
| | HD 56 | B | 44.7 | 44.6 | 38.7 | 37.1 | 30.3 | 31.4 | 33.6 | * | 38.1 | 40.4 | 47.2 | 30.4 | **38** |
| | HD 57 | B | 38.1 | 45.1 | 33.0 | 33.5 | 26.3 | 33.2 | 35.1 | 26.9 | 38.8 | 36.4 | 49.4 | 45.5 | **37** |
| | HD 58 | B | 47.4 | 46.5 | 43.9 | 38.7 | 25.3 | 30.1 | 34.5 | 34.2 | 39.6 | 38.9 | 59.2 | 48.9 | **41** |
| | HD 59 | B | 44.9 | 42.7 | 34.5 | 29.1 | 31.7 | 28.2 | 31.9 | 29.0 | 33.6 | 44.1 | 48.3 | 43.7 | **37** |
| | HD 60 | B | 41.3 | 37.3 | 33.4 | 27.7 | * | 28.1 | 31.9 | 18.4 | 32.8 | 40.5 | 39.9 | 34.4 | **33** |
| | HD 61 | B | 40.5 | 40.6 | 34.9 | 29.2 | 41.8 | 31.6 | 33.5 | 30.0 | 34.2 | 28.6 | 42.6 | 28.9 | **35** |
| | HD 62 | B | 42.0 | 43.4 | 37.8 | 28.0 | 0.6 | 42.2 | 55.3 | 30.2 | 50.5 | 29.2 | 55.6 | 38.7 | **41** |
| | HD 63 | R | 44.0 | 41.1 | 27.8 | 31.5 | 26.8 | 24.2 | 36.5 | 25.7 | 36.3 | 36.9 | 46.3 | 33.2 | **34** |
| | HD 64 | R | 36.7 | 38.5 | 29.0 | 31.2 | 27.4 | 31.5 | 36.9 | 26.5 | 27.5 | 35.7 | 42.4 | 32.3 | **33** |
| | HD 65 | R | 36.6 | 30.7 | 30.2 | 30.0 | 26.9 | 27.8 | * | 26.3 | 34.5 | 27.9 | 42.3 | 33.1 | **31** |
| | HD 66 | B | 39.5 | 36.5 | 29.4 | 29.3 | 19.5 | 31.4 | 32.9 | 24.3 | 32.5 | 43.1 | 31.9 | 32.3 | **32** |
| | HD67 | B | 41.3 | 39.6 | 42.4 | 30.5 | 26.2 | 31.4 | 35.6 | 22.7 | 38.0 | 35.4 | 39.3 | 29.9 | **34** |
| | HD68 | B | 37.0 | 33.7 | 23.9 | 25.1 | 21.3 | 18.8 | 27.4 | 19.8 | 31.1 | 34.7 | 35.8 | * | **28** |
| | HD69 | R | * | 31.4 | 27.3 | 31.2 | 29.2 | 28.6 | 35.4 | 29.9 | 37.1 | 27.2 | 38.6 | * | **32** |
| | HD70 | R | 31.0 | 31.0 | 18.9 | 22.1 | 18.8 | 24.1 | 22.7 | 20.0 | * | 24.2 | 32.0 | 27.1 | **25** |
| | HD71 | R | 44.3 | 47.2 | 34.2 | 42.1 | 34.3 | 36.5 | 35.1 | 30.0 | 48.0 | 36.0 | 49.9 | 43.3 | **40** |
| | HD72 | B | 37.6 | 36.7 | 29.9 | 27.5 | 22.9 | 24.4 | 32.5 | 24.4 | 32.4 | 33.8 | 43.1 | 31.0 | **31** |
| Hounslow | HS32 | R | 56.7 | 58.1 | 46.8 | 54.1 | 57.3 | 65.9 | 68.9 | 40.1 | 63.0 | 56.4 | 72.5 | 49.3 | **57** |
| | HS33 | R | 50.1 | 56.7 | 46.1 | 61.5 | 54.6 | 52.0 | 62.6 | 49.6 | 61.2 | 54.1 | 75.4 | 50.3 | **56** |
| | HS34 | B | 38.6 | 41.9 | 25.4 | 29.5 | 25.2 | 34.6 | 33.3 | 17.9 | 28.6 | 33.5 | * | * | **31** |
| | HS35 | B | * | 33.8 | 27.2 | 27.7 | 24.4 | 31.2 | 28.9 | 17.9 | 33.1 | 27.8 | * | * | **28** |
| | HS41 | R | 50.0 | 51.8 | 30.7 | 44.1 | 31.0 | 40.2 | 38.7 | 27.7 | 35.6 | 36.8 | 30.7 | 40.8 | **38** |
| | HS42 | R | 71.2 | 44.4 | 22.0 | 35.0 | 38.4 | 38.0 | 48.4 | * | 44.4 | 91.5 | 56.5 | 48.0 | **49** |
| | HS43 | R | 48.9 | 52.0 | 38.4 | 48.4 | 40.8 | 38.3 | 39.3 | 33.6 | 41.3 | 38.1 | 38.7 | 43.0 | **42** |
| | HS51 | R | 38.9 | 37.1 | 27.8 | 32.7 | 25.8 | 22.0 | 25.5 | 20.8 | 22.9 | 30.3 | 10.5 | 44.7 | **28** |
| | HS52 | R | 39.6 | 43.5 | 28.2 | 33.9 | 26.3 | 29.2 | 31.5 | 24.7 | 29.4 | 28.3 | 29.5 | 36.7 | **32** |
| | HS53 | B | 40.8 | 42.3 | 30.1 | 38.8 | 28.7 | 28.7 | 31.2 | 28.3 | 32.0 | 34.6 | 34.7 | 47.4 | **35** |
| | HS54 | R | * | 41.5 | 6.9 | * | 30.0 | * | * | 23.6 | 37.5 | * | 15.6 | 47.6 | **29** |
| | HS55 | R | * | 57.8 | 39.3 | 49.7 | 40.2 | 47.8 | 52.2 | 36.3 | 48.8 | 47.7 | 44.6 | 57.9 | **47** |
| | HS61 | R | 60.0 | 65.9 | 58.5 | 64.4 | 51.4 | 71.8 | 72.6 | 41.6 | 59.8 | 61.8 | 57.1 | 53.5 | **60** |

| Borough | Site Code | Class | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Conc. µg m³ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hounslow | HS62 | R | * | * | * | 39.7 | * | 38.6 | 44.4 | 28.3 | * | 41.7 | 48.0 | 56.1 | 42 |
| | HS63 | R | 65.6 | 64.1 | 45.0 | 56.2 | 44.6 | 37.1 | 57.6 | 47.4 | 62.4 | 50.1 | 22.1 | 41.0 | 49 |
| | HS64 | R | 48.9 | 44.2 | 36.4 | 36.9 | 32.1 | 32.3 | 36.4 | 26.8 | 36.7 | 38.4 | 36.8 | * | 37 |
| | HS65 | R | 51.1 | 40.9 | 36.4 | 36.7 | 33.1 | 33.8 | 39.4 | 27.3 | 32.8 | 39.0 | 40.9 | 40.2 | 38 |
| | HS66 | R | 51.4 | 45.5 | 34.4 | 40.0 | 33.9 | * | * | 23.6 | 36.5 | * | * | 30.9 | 37 |
| | HSBREN | R | 54.9 | 57.6 | 50.1 | 59.9 | 49.9 | 53.8 | 57.7 | 45.5 | 47.5 | 49.5 | 50.2 | 101.8 | 57 |
| | HSCHIS | R | 71.8 | 63.3 | 54.3 | 59.3 | 60.8 | 68.9 | 70.9 | 47.8 | 77.8 | 71.0 | 64.6 | 58.0 | 64 |
| | HSCRAN | B | 45.8 | 35.5 | 29.9 | 28.5 | 23.9 | 26.2 | 28.7 | 19.6 | 29.5 | 34.1 | 36.2 | 35.7 | 31 |
| Kensington & Chelsea | KC 31 | R | 70.8 | 75.7 | 60.9 | 60.6 | 51.7 | 76.0 | 68.5 | 59.1 | 60.6 | 61.7 | 59.8 | 39.9 | 62 |
| | KC 32 | B | 36.7 | 34.2 | 28.8 | 28.7 | 26.1 | 27.8 | 27.7 | 25.3 | 29.0 | 36.0 | 37.5 | 34.8 | 31 |
| | KC 33 | R | 72.0 | 83.8 | 70.0 | 67.1 | * | 80.6 | 96.1 | 79.3 | 92.1 | 78.1 | 89.9 | 65.1 | 79 |
| | KC 34 | B | 54.0 | 54.2 | * | 40.5 | 37.1 | 45.0 | 49.5 | 37.7 | 41.3 | * | 49.8 | 45.7 | 45 |
| | KC 35 | R | * | 69.9 | 57.8 | 58.6 | 69.5 | 66.3 | 80.7 | 54.6 | 81.5 | 67.0 | 78.2 | 63.7 | 68 |
| | KC 38 | R | 85.6 | 98.1 | 81.4 | 90.8 | 98.2 | 105.2 | 103.3 | 90.5 | 113.5 | 99.5 | 109.4 | 87.1 | 97 |
| | KC 39 | B | 49.3 | 45.3 | 33.8 | 38.0 | 32.5 | 38.5 | 35.8 | 35.5 | 35.5 | 40.1 | 44.2 | 37.9 | 39 |
| | KC 40 | B | 54.4 | 55.8 | 42.8 | 36.0 | 34.9 | 44.8 | 48.5 | 37.9 | 43.6 | 29.6 | 50.6 | 48.3 | 44 |
| | KC 41 | B | 47.4 | 48.6 | 37.2 | 36.5 | 33.1 | 37.7 | 35.1 | 36.8 | 37.8 | 44.0 | 42.9 | 43.7 | 40 |
| | KC 42 | B | 56.0 | * | 72.7 | * | 41.8 | 44.0 | 40.6 | 39.2 | 46.0 | 47.1 | 54.1 | 47.8 | 49 |
| | KC 43 | B | * | 47.3 | 30.2 | 35.6 | 29.4 | 35.8 | 37.9 | 31.6 | 35.4 | 34.6 | 34.4 | 40.5 | 36 |
| | KC 44 | B | 49.0 | 48.8 | 43.1 | 39.8 | 38.3 | 35.1 | 37.9 | 35.7 | 36.0 | 42.9 | 49.3 | 39.0 | 41 |
| | KC 45 | R | 55.2 | 50.7 | 48.3 | 42.6 | 45.0 | 54.0 | 54.1 | 42.1 | 60.1 | 46.0 | 52.0 | 44.5 | 50 |
| | KC 46 | R | 52.1 | 53.2 | 51.8 | 46.2 | 46.3 | 51.0 | 54.6 | 43.8 | 54.4 | 52.8 | 51.1 | 47.5 | 50 |
| | KC 47 | B | 44.0 | 42.2 | 31.7 | * | 29.0 | * | * | 27.7 | 36.0 | 39.4 | 40.3 | * | 36 |
| | KC 48 | R | 71.4 | 80.4 | 73.4 | 75.2 | 75.6 | 85.1 | 95.4 | 75.3 | 81.6 | 70.9 | 82.3 | 72.6 | 78 |
| | KC 49 | R | 85.7 | 92.4 | 80.2 | 78.4 | 72.4 | 93.0 | 64.8 | 65.6 | 73.1 | 75.2 | 72.3 | 67.2 | 77 |
| | KC 50 | R | 56.0 | 54.6 | 47.2 | 47.5 | 59.1 | 61.7 | 67.2 | 40.4 | 52.9 | 50.1 | 56.0 | 52.0 | 54 |
| | KC 51 | B | 40.3 | 41.0 | 30.0 | 35.0 | 28.8 | 30.0 | 30.6 | 29.3 | 32.2 | 34.2 | 38.2 | 33.8 | 34 |
| | KC 52 | R | 58.8 | 56.9 | 44.7 | 51.9 | 51.0 | 56.1 | 68.3 | 51.1 | 56.4 | 61.3 | 57.6 | 47.3 | 55 |
| | KC 53 | B | 48.5 | 52.7 | 46.0 | 44.5 | 41.6 | 50.2 | 54.5 | 40.4 | 45.9 | 50.5 | 53.4 | 39.4 | 47 |
| | KC 54 | R | 69.6 | 76.1 | 69.9 | 76.9 | 69.1 | 60.6 | 86.7 | 65.7 | 77.5 | 73.2 | 83.3 | 64.3 | 73 |
| | KC 55 | B | 53.0 | 54.3 | * | 40.8 | 41.5 | 43.9 | 49.6 | 37.0 | 33.6 | 51.4 | 48.3 | 46.0 | 45 |
| | KC 56 | R | 80.6 | 79.7 | 71.1 | 76.0 | 83.0 | 87.4 | 96.2 | 72.4 | 86.3 | 95.9 | 84.9 | 70.4 | 82 |
| | KC 57 | R | 57.2 | 64.5 | 44.8 | 54.1 | 48.2 | 59.9 | 55.7 | * | 50.7 | 53.8 | 57.8 | 41.0 | 53 |

| Borough | Site Code | Class | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Conc. µg m³ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kensington & Chelsea | KC 58 | R | 57.5 | 68.6 | 62.5 | 63.5 | 60.1 | 62.0 | * | 63.2 | 61.9 | 60.8 | 65.3 | 47.8 | 61 |
| | KC 59 | R | 85.6 | 99.0 | 81.4 | 86.9 | 83.6 | 93.1 | 88.4 | 94.7 | 89.7 | 78.9 | 100.1 | 68.4 | 87 |
| | KC 60 | R | 62.8 | 68.0 | 61.6 | 63.9 | 57.8 | 64.9 | * | 57.2 | 71.5 | 69.4 | 77.8 | 60.4 | 65 |
| | KC 61 | R | 58.5 | 56.7 | 58.3 | 66.5 | 58.4 | * | * | 55.6 | 56.1 | 59.0 | 68.4 | 47.5 | 58 |
| Newham | NH1 | R | 48.4 | 40.6 | 36.4 | 45.6 | 36.5 | 39.7 | 50.8 | 40.7 | 41.7 | 41.2 | * | 41.1 | 42 |
| | NH2 | R | 42.8 | 41.6 | 37.2 | 38.7 | 38.1 | 39.1 | 47.9 | 36.5 | 46.5 | 44.0 | 49.5 | 45.1 | 42 |
| | NH3 | R | 51.1 | 49.7 | 39.9 | 42.0 | 39.1 | * | 54.7 | * | 42.2 | 34.2 | 52.9 | 42.8 | 45 |
| | NH4 | R | 50.7 | 52.5 | 38.7 | 47.7 | 39.0 | 41.8 | 50.4 | 42.0 | 47.4 | 43.1 | 47.0 | 43.8 | 45 |
| | NH5 | B | 44.4 | 46.1 | 28.9 | 43.4 | * | * | 36.5 | 43.4 | 43.6 | 35.8 | 50.0 | 29.8 | 40 |
| | NH6 | B | * | 28.5 | 22.9 | 26.9 | 37.4 | * | 33.5 | 23.0 | 28.9 | 26.4 | 39.3 | 29.5 | 30 |
| | NH7 | B | 34.9 | 34.4 | 24.4 | 23.1 | 27.5 | 33.3 | 43.3 | 25.5 | 26.1 | 22.3 | 33.8 | * | 30 |
| | NH8 | R | 43.3 | 37.0 | 28.7 | 35.8 | 32.5 | 41.3 | 53.2 | 31.2 | 35.4 | 37.5 | 41.1 | 32.7 | 37 |
| | NH10 | B | 36.3 | 53.6 | * | * | 66.0 | * | * | * | * | * | * | 32.9 | 47 |
| | NH11 | R | 42.2 | 51.6 | 32.1 | 39.7 | 30.3 | 38.8 | 45.7 | 39.8 | 40.2 | 40.8 | * | 42.9 | 40 |
| | NH12 | R | 45.0 | * | 36.8 | * | 35.1 | * | * | 77.8 | 40.4 | 41.8 | * | 40.7 | 45 |
| | NH13 | R | 48.7 | * | * | * | 43.3 | * | * | * | * | * | 49.5 | * | 47 |
| | NH14 | R | 83.1 | 86.8 | 61.4 | 70.5 | 78.4 | 77.6 | 97.1 | 87.5 | 98.5 | 91.7 | 100.3 | * | 85 |
| | NH15 | R | 59.0 | 64.4 | 48.0 | * | 53.1 | 53.7 | * | 62.0 | 61.3 | * | 52.9 | 59.7 | 57 |
| | NH16 | R | 68.9 | 61.4 | 58.6 | 58.6 | 57.4 | 67.0 | * | 61.8 | 70.4 | 64.6 | 72.5 | 47.7 | 63 |
| | NH17 | R | 54.0 | 60.5 | 43.3 | 49.7 | 46.3 | 53.9 | 60.7 | 47.7 | 53.1 | 53.9 | 60.8 | 50.5 | 53 |
| | NH18 | R | 48.6 | * | 35.2 | * | * | * | * | * | * | * | 58.9 | 47.7 | 48 |
| | NH19 | R | 66.5 | 68.3 | 59.5 | * | 58.5 | 67.9 | 100.1 | 64.0 | 87.5 | 72.8 | 85.0 | 71.8 | 73 |
| | NH20 | R | 63.8 | 67.7 | 55.4 | 70.5 | 57.4 | * | * | * | 75.6 | 63.4 | 77.9 | 68.7 | 67 |
| | NH20a | R | 62.0 | 68.5 | * | 69.4 | 58.5 | 60.0 | 97.2 | * | 52.6 | 62.6 | 72.3 | 66.7 | 67 |
| | NH21 | R | 48.5 | 42.0 | 37.1 | 41.5 | 35.1 | 41.2 | 49.7 | 41.5 | 45.2 | 41.6 | 49.5 | 40.5 | 43 |
| | NH21a | R | 46.7 | 47.3 | 33.4 | 32.5 | 37.4 | 44.5 | 49.6 | 39.9 | 44.5 | 43.4 | 42.0 | 41.8 | 42 |
| | NH22 | B | * | * | 24.3 | * | 14.2 | 30.9 | * | 10.8 | 19.9 | 16.8 | 29.3 | 19.8 | 21 |
| Richmond | RM01 | R | 50.8 | 51.7 | 34.8 | 45.6 | 39.1 | 47.5 | 47.5 | 43.5 | 50.1 | 50.6 | 27.3 | 52.3 | 45 |
| | RM02 | R | 42.7 | 41.4 | 29.2 | 31.9 | 28.3 | 32.4 | 32.4 | 29.0 | 29.4 | 36.0 | 26.0 | 38.4 | 33 |
| | RM03 | R | 49.1 | 49.5 | 35.2 | 39.4 | 37.7 | 42.6 | 42.6 | 40.3 | 42.4 | 39.1 | 42.5 | 41.4 | 42 |
| | RM04 | R | 52.9 | 50.8 | 38.7 | 41.9 | 37.4 | 44.4 | 44.4 | 37.7 | 46.7 | 44.5 | 26.4 | 47.1 | 43 |

| Borough | Site Code | Class | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Conc. $\mu g\ m^3$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Richmond | RM05 | R | 43.6 | 43.0 | 30.4 | 33.7 | 25.1 | 35.9 | 35.9 | 32.7 | 33.0 | 36.7 | 27.1 | 33.9 | **34** |
| | RM06 | B | 49.7 | 52.0 | 42.4 | 36.9 | 40.4 | 48.7 | 48.7 | * | 42.2 | 46.1 | 39.1 | 36.3 | **44** |
| | RM07 | R | 88.2 | 75.8 | 57.5 | 64.6 | 59.7 | 77.7 | 77.7 | 59.4 | 67.1 | 61.0 | 50.2 | 65.0 | **67** |
| | RM08 | R | 42.3 | 46.6 | 33.9 | 33.5 | 29.7 | 30.9 | 30.9 | 30.4 | 38.6 | 37.0 | 37.0 | 39.6 | **36** |
| | RM09 | R | 60.0 | 60.5 | 47.4 | 46.4 | 40.3 | 51.4 | 51.4 | 32.0 | 60.3 | 58.0 | 47.9 | 57.0 | **51** |
| | RM10 | B | 52.9 | 57.9 | 38.3 | 39.6 | 39.1 | 47.8 | 47.8 | 41.9 | 36.4 | 45.8 | 35.1 | 40.7 | **44** |
| | RM11 | R | 53.1 | 45.1 | 37.0 | 41.1 | 38.4 | 46.2 | 46.2 | 33.4 | 42.2 | 43.1 | 36.3 | 46.0 | **42** |
| | RM12 | R | 56.2 | 59.9 | 39.2 | 43.8 | 40.1 | 40.5 | 40.5 | 38.3 | 47.2 | 42.3 | 31.0 | 48.8 | **44** |
| | RM13 | R | 59.8 | 52.3 | 40.9 | 42.4 | 43.6 | 45.2 | 45.2 | 40.3 | 45.2 | 51.3 | 43.3 | 45.4 | **46** |
| | RM14 | R | 57.8 | 59.4 | 40.5 | 39.5 | 39.0 | 4.2 | 4.2 | 37.0 | 54.9 | 52.5 | * | 41.1 | **47** |
| | RM15 | R | 64.7 | 57.1 | 40.9 | 52.0 | 47.3 | 49.3 | 49.3 | 46.0 | 55.9 | * | 37.4 | 53.7 | **50** |
| | RM16 | B | 48.5 | 51.4 | 38.9 | 45.0 | 35.9 | 36.6 | 36.6 | 43.0 | 46.5 | 44.2 | 51.7 | 53.5 | **44** |
| | RM17 | R | 40.6 | 35.7 | 25.0 | 28.1 | 23.3 | 25.5 | 25.5 | 23.6 | 28.7 | 29.2 | 30.2 | 27.4 | **29** |
| | RM18 | R | 75.8 | 73.8 | 50.9 | 65.0 | 56.1 | 69.4 | 69.4 | 55.6 | 65.0 | 63.4 | 34.1 | * | **62** |
| | RM19 | R | 60.5 | 59.4 | 47.0 | 56.4 | 53.0 | 54.5 | 54.5 | 52.4 | 52.2 | 54.0 | 50.8 | 55.1 | **54** |
| | RM20 | R | 59.5 | 50.8 | 44.2 | 55.3 | 47.8 | 52.8 | 52.8 | 42.6 | 61.6 | 56.6 | 60.6 | 53.2 | **53** |
| | RM21 | R | 55.5 | 55.4 | 41.2 | 50.0 | 40.5 | 45.7 | 45.7 | 39.2 | 38.0 | 43.7 | 31.9 | 44.2 | **44** |
| | RM22 | R | 70.6 | 62.8 | 55.6 | 50.4 | 47.0 | 53.2 | 53.2 | 34.7 | 62.1 | 59.6 | 46.1 | 67.0 | **55** |
| | RM23 | R | 48.2 | 49.6 | 33.6 | 39.3 | 33.1 | 40.0 | 40.0 | 31.0 | 44.4 | 42.2 | 38.0 | 39.7 | **40** |
| | RM24 | R | 50.1 | 47.4 | 34.5 | 40.6 | 36.9 | 39.8 | 39.8 | 31.4 | 42.3 | 44.0 | 33.9 | 37.2 | **40** |
| | RM25 | R | 52.8 | 52.9 | * | 34.2 | 41.1 | 54.9 | 54.9 | 46.8 | 53.3 | 53.8 | 31.6 | 38.0 | **47** |
| | RM26 | R | 56.4 | 58.4 | 43.0 | 46.3 | 40.3 | 44.7 | 44.7 | 41.6 | 48.0 | 44.8 | 44.5 | 45.1 | **46** |
| | RM27 | B | 51.8 | 48.3 | 38.3 | 28.1 | 36.1 | 45.8 | 45.8 | 28.8 | 44.8 | 41.6 | 37.0 | 41.6 | **41** |
| | RM28 | R | 31.9 | 29.4 | 18.9 | 22.1 | 16.5 | 18.9 | 18.9 | 17.7 | 20.4 | 21.0 | 20.9 | 22.6 | **22** |
| | RM29 | B | 52.0 | 43.3 | 34.1 | 0.4 | 31.8 | 37.7 | 37.7 | 29.3 | * | 44.8 | 43.2 | 41.7 | **40** |
| | RM30 | R | 35.5 | 43.0 | 30.6 | 33.5 | 30.0 | 36.3 | 36.3 | 29.3 | 40.7 | 37.9 | 34.1 | 33.2 | **35** |
| | RM31 | R | 70.2 | 64.2 | * | 55.8 | 56.0 | * | * | 47.0 | 61.1 | 64.6 | 65.6 | 63.6 | **61** |
| | RM32 | R | 118.5 | 103.8 | 101.2 | 87.8 | 106.3 | 119.0 | 119.0 | * | 116.2 | 135.0 | 102.5 | 100.6 | **110** |
| | RM33 | R | 66.7 | 71.5 | 56.2 | 54.6 | 49.0 | 59.8 | 59.8 | 59.0 | 55.1 | * | 47.5 | 48.2 | **57** |
| | RM34 | R | 46.1 | 47.6 | 31.2 | 39.4 | 35.1 | 39.5 | 39.5 | 33.5 | 42.4 | 43.5 | 29.0 | 38.5 | **39** |
| | RM35 | R | 50.8 | 37.8 | 46.1 | 44.0 | 48.4 | 50.8 | 50.8 | 53.7 | 52.7 | 53.9 | 47.5 | 49.7 | **49** |
| | RM36 | B | 80.7 | * | 50.5 | 59.0 | 51.8 | 66.4 | 66.4 | 49.4 | 55.0 | 56.8 | 45.2 | 44.7 | **57** |

| Borough | Site Code | Class | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Conc. µg $m^3$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Richmond | RM37 | R | 39.2 | 35.9 | 21..39 | 22.3 | 20.3 | 22.9 | 22.9 | 20.1 | 26.3 | 27.2 | 25.0 | 27.3 | **26** |
| | RM38 | R | 45.0 | 43.6 | 32.0 | 36.5 | 29.9 | 35.9 | 35.9 | 33.2 | 40.8 | 39.5 | 36.8 | 40.6 | **37** |
| | RM39 | R | 73.3 | 70.7 | 57.9 | 66.4 | 64.3 | 74.1 | 74.1 | 65.8 | 66.9 | 56.5 | 52.1 | * | **66** |
| | RM40 | R | 52.5 | 51.0 | 36.0 | 32.9 | 35.2 | 37.3 | 37.3 | 37.3 | 40.3 | 42.0 | 34.1 | 39.5 | **40** |
| | RM41 | R | 51.6 | 56.1 | 37.0 | 49.0 | 40.4 | 41.4 | 41.4 | 41.3 | 42.5 | 41.9 | 46.4 | 44.2 | **44** |
| | RM42 | R | 72.8 | 69.9 | 58.5 | 73.6 | 55.6 | 73.3 | 73.3 | 49.2 | 56.1 | 57.3 | 38.8 | 48.7 | **61** |
| | RM43 | R | 78.4 | 64.4 | 55.9 | 65.0 | 58.1 | 73.8 | 73.8 | 62.5 | 65.8 | 62.9 | 48.9 | 47.7 | **63** |
| | RM44 | R | 59.8 | 57.7 | 41.3 | 48.7 | 48.8 | 45.7 | 45.7 | 47.8 | 43.1 | 49.0 | 58.0 | 46.5 | **49** |
| | RM45 | R | 64.6 | 66.6 | 47.9 | 44.7 | 38.8 | 47.8 | 47.8 | 37.6 | 50.2 | 50.3 | 45.2 | 44.5 | **49** |
| | RM46 | R | 44.3 | 41.5 | 31.5 | 34.1 | 31.1 | 38.4 | 38.4 | 33.2 | 38.6 | 38.8 | 43.8 | 50.3 | **39** |
| | RM47 | R | 53.8 | 62.9 | 35.1 | 43.7 | 28.2 | 42.4 | 42.4 | 40.9 | 38.6 | 42.3 | 34.5 | 41.1 | **42** |
| | RM48 | R | 57.0 | 58.7 | 44.3 | 47.0 | 48.3 | 47.8 | 47.8 | 38.0 | * | 50.6 | 35.9 | 46.4 | **47** |
| | RM49 | R | 60.4 | 61.9 | 43.4 | 48.6 | 38.2 | 51.5 | 51.5 | 39.4 | 49.2 | 49.9 | 43.5 | 40.3 | **48** |
| | RM50 | R | 67.1 | 71.7 | 9.5 | 63.6 | 63.2 | * | * | 66.5 | 60.6 | 72.5 | 65.6 | 58.5 | **60** |
| | RM51 | R | 47.7 | 46.6 | 29.9 | 34.7 | 33.3 | 35.8 | 35.8 | 30.0 | 40.5 | 39.7 | 34.3 | 37.4 | **37** |
| | RM52 | R | 64.3 | 60.6 | 53.1 | 60.3 | 57.1 | 65.9 | 65.9 | 59.5 | 58.5 | 61.4 | 63.1 | 56.5 | **61** |
| | RM53 | R | 51.1 | 52.0 | 40.0 | 41.9 | 39.9 | 42.0 | 42.0 | 28.6 | 31.0 | 32.6 | 35.7 | 33.7 | **39** |
| | RUT01 | R | 63.3 | 54.1 | * | 57.8 | 62.2 | 61.1 | 61.1 | 51.2 | 77.9 | 69.6 | 57.4 | 60.0 | **61** |
| | RUT02 | B | 109.7 | 118.4 | 97.6 | 111.0 | 113.1 | 126.6 | 126.6 | 126.8 | 111.4 | 108.8 | 84.6 | 105.6 | **112** |
| | RUT03 | B | 42.3 | 40.9 | 27.6 | 31.3 | 25.6 | 20.5 | 20.5 | 22.2 | 29.3 | 30.1 | 26.0 | 34.9 | **29** |
| | RUT04 | B | 37.5 | 37.0 | 26.2 | 27.3 | 24.0 | 22.1 | 22.1 | 29.6 | 29.3 | 26.8 | 28.8 | 36.7 | **29** |
| Tower Hamlets | TH ME | R | 38.6 | 63.1 | 29.5 | 47.1 | 49.0 | 59.7 | 64.3 | 41.8 | 55.1 | 55.6 | 54.5 | 49.0 | **51** |
| | TH SG | B | 37.6 | 37.6 | 27.1 | 26.9 | 27.3 | 24.7 | 30.7 | 30.2 | 31.2 | 34.8 | 37.2 | 33.6 | **32** |
| Westminster | WM 36 | R | 68.6 | 64.2 | * | 60.4 | 52.4 | 65.4 | 75.5 | 55.2 | 65.8 | 36.3 | 44.4 | 44.7 | **58** |
| | WM 39 | R | 89.9 | 50.6 | 69.0 | 87.3 | 80.4 | 85.6 | 104.2 | 87.0 | * | 40.1 | 63.7 | 60.7 | **74** |
| | WM 55 | R | 130.8 | 44.4 | 138.1 | 125.0 | 163.9 | 120.3 | 190.1 | 135.7 | 148.7 | 57.1 | 118.1 | 158.9 | **128** |
| | WM 40 | B | * | 142.6 | 28.2 | 34.9 | 29.7 | 31.2 | 32.4 | * | * | 170.2 | * | 42.4 | **64** |
| | WM 48 | B | 44.3 | * | * | * | 29.8 | 31.7 | 42.5 | 35.9 | * | 32.2 | 38.8 | 40.8 | **37** |
| | WM 56 | B | 37.3 | 37.1 | 23.1 | 31.2 | 21.8 | 29.6 | 33.0 | 25.9 | 30.6 | 27.5 | 30.4 | 29.1 | **30** |
| | WM 57 | B | 47.4 | 54.6 | 37.6 | 41.7 | 23.6 | 32.9 | 38.1 | 36.6 | 37.0 | 75.0 | 45.2 | 49.3 | **43** |
| | WM 58 | B | 53.2 | 56.8 | 42.6 | 52.4 | 26.4 | 38.5 | 52.8 | 46.7 | 46.7 | 39.5 | 35.3 | 40.8 | **44** |

## Appendix 2 Co-location Sites Triplicate Diffusion Tube Monthly Mean $NO_2$ Concentrations 2006

| Co-Location Site | Diffusion Tube Code | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Mean Conc. (µg/m3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kensington 2, Cromwell Road | KC54 | 69.6 | 76.1 | 69.9 | 76.9 | 69.1 | 60.6 | 86.7 | 65.7 | 77.5 | 73.2 | 83.3 | 64.3 | 76 |
| Brent 1, Kingsbury | BR51 | 74.9 | 33.5 | 35.7 | 28.5 | 24.3 | * | 26.8 | 24.5 | 27.5 | 33.2 | 50.0 | 34.9 | 36 |
| Bloomsbury, AURN | CA29 | 55.2 | 55.5 | 46.5 | 57.4 | 44.1 | 46.7 | 50.9 | 46.9 | 50.5 | 48.2 | * | * | 50 |
| Croydon, London Road | CY55A | 73.5 | 64.4 | 53.5 | 61.7 | 50.0 | 67.5 | 71.0 | 64.6 | 60.9 | 57.9 | 56.4 | 49.0 | 61 |
| Croydon, George Street | CY98A | 56.1 | 42.5 | 39.1 | 49.1 | 46.6 | 50.8 | 53.0 | 55.9 | 44.4 | 41.9 | 50.4 | 46.7 | 48 |
| Hounslow 4, Chiswick High Road | HSCHIS | 71.8 | 63.3 | 54.3 | 59.3 | 60.8 | 68.9 | 70.9 | 47.8 | 77.8 | 71.0 | 64.6 | 58.0 | 64 |
| Hounslow 1, Brentford | HSBREN | 54.9 | 57.6 | 50.1 | 59.9 | 49.9 | 53.8 | 57.7 | 45.5 | 47.5 | 49.5 | 50.2 | 101.8 | 57 |
| Hounslow, Cranford | HSCRAN | 45.8 | 35.5 | 29.9 | 28.5 | 23.9 | 26.2 | 28.7 | 19.6 | 29.5 | 34.1 | 36.2 | 35.7 | 31 |
| Hillingdon, AURN | HDN31 | 43.2 | 40.5 | 42.1 | 38.9 | 35.1 | 46.0 | 52.0 | 33.0 | 47.0 | 29.6 | 55.7 | 48.4 | 43 |
| Hillingdon 1, South Ruslip | HDN46 | 53.1 | 52.1 | 41.9 | 41.0 | 36.4 | 43.3 | 49.9 | 37.9 | 50.0 | 50.8 | 60.5 | 48.0 | 47 |
| Hillingdon 2, Hospital | HDN50 | 47.0 | 42.7 | 32.9 | * | 31.9 | 30.8 | 38.0 | 33.8 | 46.0 | 48.0 | * | 46.0 | 40 |
| Greenwich 4, Eltham Road | GNW39 | 32.5 | 32.7 | 21.4 | 26.2 | 18.0 | 28.8 | 25.3 | 20.0 | 23.7 | 23.8 | 27.7 | 27.5 | 26 |
| Greenwich 5, Trafalgar Road | GNW57 | 50.9 | 54.0 | 41.3 | 44.9 | 40.1 | 59.8 | 44.0 | 38.6 | 45.9 | 43.3 | 47.3 | 46.7 | 46 |
| Greenwich 7, Blackheath | GNW58 | 55.1 | 51.5 | 44.7 | 48.4 | 47.3 | 47.3 | 55.3 | 45.4 | 49.7 | 51.3 | 55.0 | * | 50 |
| Richmond 2, Barnes Wetland Center | RMD37 | 39.2 | 35.9 | 21.4 | 22.3 | 20.3 | 22.9 | 22.9 | 20.1 | 26.3 | 27.2 | 25.0 | 27.3 | 26 |

* No data recorded for this month or exposure period outside Netcen calendar

## Appendix 3 Co-location Sites Triplicate Automatic Analyser Monthly $NO_2$ Concentrations 2006

| Co-Location Site | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Mean Conc. (µg/m$^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kensington 2, Cromwell Road | 87.7 | 84.5 | 87.4 | 76.6 | 82.6 | 74.2 | 81.0 | 69.4 | 83.7 | 81.3 | 97.2 | 77.8 | 82 |
| Brent 1, Kingsbury | * | 41.0 | 31.0 | 34.2 | 29.6 | 20.6 | 22.8 | 20.3 | 27.8 | 34.4 | 40.5 | 37.1 | 31 |
| Bloomsbury, AURN | * | 67.4 | 60.1 | 63.4 | 50.1 | 56.2 | 54.6 | 50.7 | 50.8 | 51.9 | 57.6 | 53.5 | 53 |
| Croydon, London Road | 79.5 | 79.0 | 65.0 | 69.9 | 54.4 | 70.5 | * | 51.6 | 55.6 | 57.1 | 56.9 | * | 64 |
| Croydon, George Street | 60.9 | 59.4 | 53.8 | 58.9 | 48.6 | 53.1 | 48.3 | 49.3 | 48.3 | 48.4 | 57.5 | * | 53 |
| Hounslow 4, Chiswick High Road | 76.1 | 69.0 | 55.8 | 66.1 | 63.5 | 72.4 | 77.3 | 52.5 | 68.9 | 70.6 | 75.3 | 66.3 | 68 |
| Hounslow 1, Brentford | 59.4 | 65.4 | 51.2 | 57.2 | 54.2 | * | * | 41.7 | 45.9 | 44.5 | 58.1 | 49.9 | 53 |
| Hounslow, Cranford | 40.0 | 42.6 | 36.1 | 32.9 | 30.1 | 29.9 | * | 29.9 | 42.6 | 46.5 | 42.6 | 38.4 | 37 |
| Hillingdon, AURN | * | 44.5 | 51.7 | 44.4 | 53.4 | 45.7 | 53.6 | 30.5 | 51.5 | 51.0 | 59.5 | 55.3 | 49 |
| Hillingdon 1, South Ruslip | 49.6 | 47.3 | 40.4 | 46.6 | 41.8 | 41.0 | * | 29.7 | 37.7 | 37.3 | 43.8 | 39.8 | 41 |
| Hillingdon 2, Hospital | 42.8 | 37.6 | 30.2 | 31.5 | 31.3 | * | * | 24.3 | 35.2 | 41.9 | 51.0 | 51.3 | 38 |
| Greenwich 4, Eltham Road | 35.7 | 39.3 | 28.7 | 29.9 | 23.2 | 27.8 | 30.2 | 23.2 | 25.1 | 28.2 | 31.5 | 32.0 | 30 |
| Greenwich 5, Trafalgar Road | 62.2 | 72.2 | 72.7 | 78.6 | * | * | 52.9 | 38.3 | 43.2 | 50.3 | 53.9 | 50.0 | 57 |
| Greenwich 7, Blackheath | 49.4 | 51.2 | 44.6 | 44.8 | 44.0 | 46.7 | 48.9 | 35.5 | 48.0 | 42.0 | 54.0 | 46.7 | 46 |
| Richmond 2, Barnes Wetland Center | 35.1 | 41.5 | 30.3 | 27.2 | 21.7 | 23.0 | 24.0 | 18.6 | 23.5 | 32.3 | 34.8 | 32.5 | 29 |

* Data not recorded for the month