BARNET
LONDON BOROUGH

Review and Assessment of Air Quality
in the London Borough of Barnet

# Detailed Assessment

**March 2009**

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# EXECUTIVE SUMMARY

The Government's Air Quality Strategy states that poor air quality reduces life expectancy in the UK by an average of seven to eight months, with equivalent health costs estimated to be up to £20billion a year[1]. The main source of poor air quality in Barnet is traffic on the busiest roads in the Borough. Residents with existing cardiovascular and respiratory diseases are most sensitive to air pollution and may experience a worsening in symptoms when levels of air pollutants are high. The Council's air quality work fits into the "Strong and Healthy" and "Clean Green and Safe" corporate priorities.

The Council's air quality duties are statutory and come under Part IV of the Environment Act 1995. Local Authorities must assess the air quality in their areas against Air Quality Objectives. The whole Borough was declared an Air Quality Management Area in 2001 because the air quality objectives were expected to be exceeded for nitrogen dioxide (annual mean objective) and particulates (PM10) (annual mean objective).

This current report is a Detailed Assessment of air quality at Golders Green and Mill Hill Broadway bus stations. Previous work, including the 2006 Updating and Screening Assessment, had identified that these locations were at risk of exceeding the UK Air Quality Objective for nitrogen dioxide, measured as a one-hour mean. The role of the Detailed Assessment was to enable the Council to have the confidence to decide whether or not to declare additional Air Quality Management Areas for exceedence of the short term objective.

The Detailed Assessment consisted of automatic monitoring over a six month period between February and August 2008. This was supplemented by diffusion tube monitoring. The assessment has determined that there is a likelihood that the nitrogen dioxide one-hour mean objective is being exceeded at Golders Green bus station, but not at Mill Hill Broadway bus station.

The Council is now obliged by the Environment Act 1995 to take steps to designate an Air Quality Management Area for Golders Green Bus Station. It must also adapt its existing air quality Action Plan to include specific measures to target the bus station as a source of emissions. This is likely to include work with Transport for London who operate the bus station, as well as National Express Group who run the long-distance buses.

# 1. Introduction

## 1.1 Background to local air quality management in the London Borough of Barnet

Local authorities have an obligation under Part IV of the Environment Act 1995 to review and assess the air quality in their area "from time to time". The Air Quality Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002 prescribe air quality objectives for key pollutants to be achieved by a certain date. Local air quality management helps the UK meet its objectives under the EU Air Quality Framework and Daughter Directives. The following table shows the UK Air Quality Objectives.

| Pollutant | Air Quality Objective | | Date to be achieved |
|---|---|---|---|
| | Concentration | Measured as | |
| 1,3 butadiene | 2.25 μg/m$^3$ | running annual mean | 31.12.2003 |
| Benzene | 16.25 μg/m$^3$<br><br>5 μg/m$^3$ | running annual mean<br><br>annual mean | 31.12.2003<br><br>31.12.2010 |
| Carbon monoxide | 10 mg/m$^3$ | maximum daily running 8 hour mean | 31.12.2003 |
| lead | 0.5 μg/m$^3$<br><br>0.25 μg/m$^3$ | annual mean<br><br>annual mean | 31.12.2004<br><br>31.12.2008 |
| nitrogen dioxide | 200 μg/m$^3$ not to be exceeded more than 18 times per year<br><br>40 μg/m$^3$ | 1 hour mean<br><br>annual mean | 31.12.2005<br><br>31.12.2005 |
| Particles ($PM_{10}$) | 50 μg/m$^3$ not to be exceeded more than 35 times per year<br><br>40 μg/m$^3$ | 24-hour mean<br><br>annual mean | 31.12.2004<br><br>31.12.2004 |
| Particles ($PM_{2.5}$) | 25μg/m$^3$<br><br>15% cut | Annual mean<br><br>Urban background exposure reduction | 2020<br><br>2010-2020 |

| | | | |
|---|---|---|---|
| sulphur dioxide | 266μg/$m^3$ not to be exceeded more than 35 times per year | 15 minute mean | 31.12.2005 |
| | 350 μg/$m^3$ not to be exceeded more than 24 times per year | 1 hour mean | 31.12.2004 |
| | 125 μg/$m^3$ not to be exceeded more than 3 times per year | 24-hour mean | 31.12.2004 |

The first round of review and assessment culminated in April 2001, with the whole borough being designated an Air Quality Management Area (AQMA). This was declared because the air quality objectives were expected to be exceeded for nitrogen dioxide (annual mean) and particulates (PM10) (annual mean). The main source of the poor air quality is traffic on Barnet's busiest roads. In January 2003, the council put in place an action plan towards improving the poor air quality that makes the AQMA necessary. .

The second round of Review and Assessment started in 2003 with a new two-stage approach. The first stage is an Updating and Screening Assessment of Air Quality (USA). This is carried out on a three year cycle to establish whether a second stage, a Detailed Assessment, is needed. The aim is to identify whether there are any significant changes since the last round, for each of the pollutants. The USA in Barnet, completed in February 2004, concluded that a detailed assessment was not necessary.

The third round of Review and Assessment started in 2006 with a new Updating and Screening Assessment of air quality in Barnet. This highlighted that in the vicinity of two bus stations in the Borough – Golders Green and Mill Hill Broadway, there is risk of exceeding the one hour mean objective for nitrogen dioxide. LB Barnet was therefore obliged to proceed to a Detailed Assessment. The Detailed Assessment should conclude whether a further AQMA should be declared for exceedence of the one hour mean objective.

An interim Detailed Assessment was submitted to Defra and the GLA in May 2007, as part of the Council's annual progress report. This current report is the final Detailed Assessment of air quality for these bus stations. Further work will be required and is described in section 4.

The Local Air Quality Management process is continuous. The fourth round of Review and Assessment starts in 2009 with a new Updating and Screening Assessment of Air Quality.

# 2. Detailed Assessment for possible exceedence of nitrogen dioxide one hour mean at bus stations - Phase One

There were two phases to the Detailed Assessment. The first phase consisted of a diffusion tube study and the next involved automatic monitoring.

## 2.1 Background

The 2006 Updating and Screening Assessment of air quality identified probable exceedences of the nitrogen dioxide one-hour mean UK Air Quality Objective at two bus stations in Barnet – Golders Green and Mill Hill Broadway-with relevant exposure at each. LB Barnet was therefore required by Defra and the Mayor of London to undertake a Detailed Assessment at each of these bus stations.

The requirements for the Detailed Assessment were as follows:

1. Confirm Relevant Exposure
2. Extend nitrogen dioxide diffusion tube monitoring to include further sites in the vicinity of the bus stations
3. Submit report including 12 months monitoring data
4. Conclude whether an Air Quality Management Area for the nitrogen dioxide one-hour mean objective would be required or not.

### 2.11 Relevant Exposure

The Air Quality Objectives apply to where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. This is known as relevant exposure. The government's air quality guidance states that the one-hour mean objective applies at the following locations:

- Building facades of residential properties, schools, hospitals, etc.
- Gardens of residential properties.
- Kerbside sites (e.g. pavements of busy shopping streets).
- Those parts of car parks, bus stations, and railway stations, etc. which are not fully enclosed, where the public may reasonable be expected to spend one hour or more.
- Any outdoor locations to which the public might reasonably expected to spend one hour or longer.

### 2.12 Monitoring

The monitoring consisted of nitrogen dioxide diffusion tubes. Air quality guidance suggests that if the annual mean is greater than 60µg/$m^3$, then a Local Authority could reliably make a decision that exceedences of the one hour mean are likely.

## 2.2 Golders Green Bus Station

### 2.2.1 Relevant Exposure

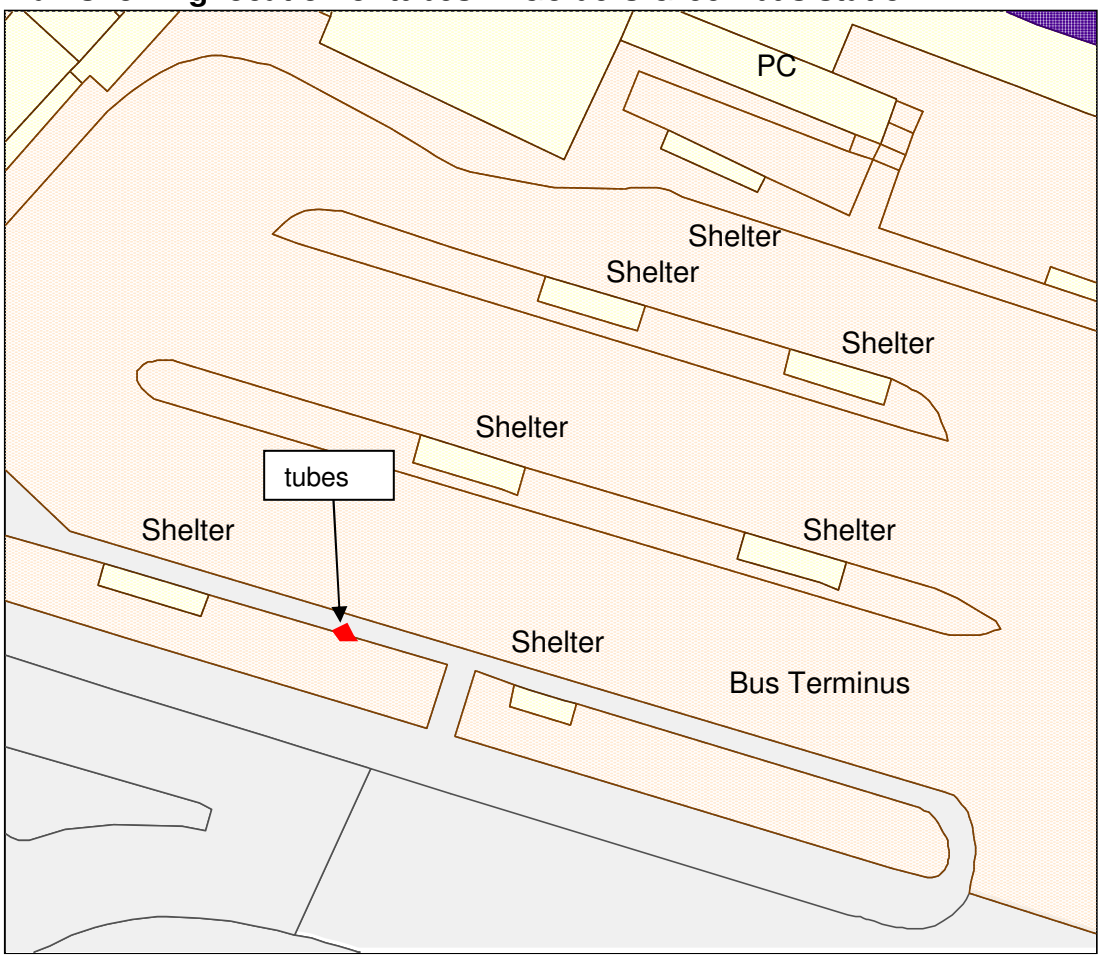
Golders Green Bus Station is one of the busiest in London. It is situated next to Golders Green Underground station on the Northern Line. The Transport for London Website[2] lists 25 local routes that serve this bus station. In addition the station is a major stop for the National Express coaches. It is the second stop out of London Victoria for routes including those to Scotland, the North of England and Stansted Airport. 30 long-distance routes are listed as serving this station.

Passengers often wait for a long distance bus for one hour or more. There are also residential building facades nearby. Therefore there is relevant exposure.

### 2.2.2 Monitoring

Diffusion tube monitoring started in October 2006 with three tubes in triplicate (on the same lamp post). There is also a tube on the pavement between the bus station and the busy North End Road. The results are presented in section 2.4.

**Plan showing location of tubes in Golders Green bus station**



**Photograph showing tubes adjacent to where passengers wait for buses**

## 2.3 Mill Hill Broadway Bus Station

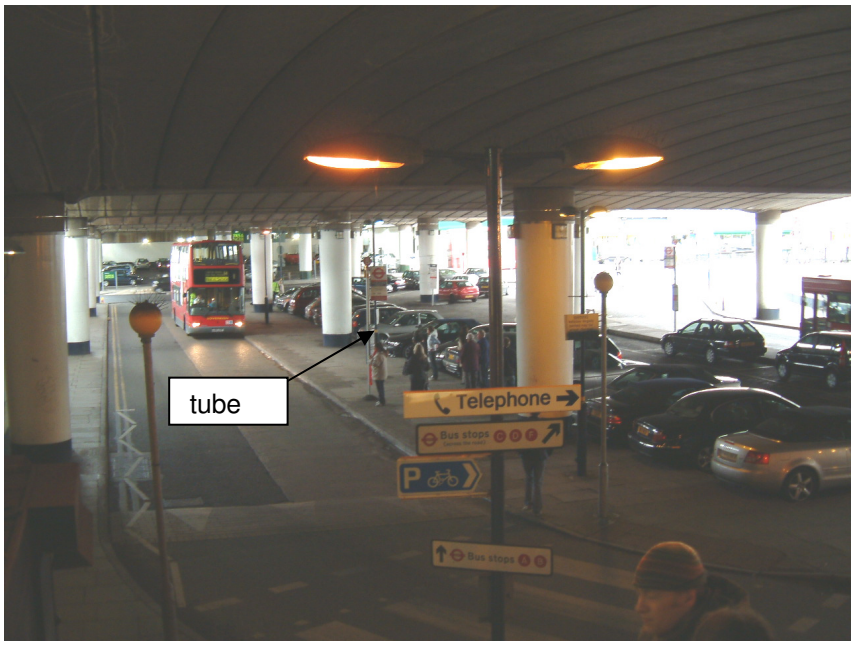
### 2.3.1 Relevant Exposure

This is a small bus station adjacent to Mill Hill Broadway train station. The M1 motorway passes over half of the bus station, however the bus station is considered to be not enclosed. It therefore falls within the Local Air Quality Management legislation. It is considered unlikely that people would wait for an hour for buses at this station as it is just serves local buses. The relevant exposure is residents who live within 20m of the bus station. The source of the pollution, however, is likely to come from both the bus station and the M1.

### 2.3.2 Monitoring

There is one diffusion tube within the bus station, and one at the façade of a parade of shops, above which is residential accommodation. Monitoring started in October 2006. Previous monitoring has been done at the kerbside (approx 1.5m away from the façade) as part of a Highways Agency study to monitor NO2 from the M1, and these results will also be reported.

**Photograph showing inside of Mill Hill Broadway bus station – tube is on bus stop in centre of station**



**Photograph showing how Mill Hill Broadway bus station is partially enclosed by M1 Motorway**

**Aerial photograph showing location of diffusion tube on façade of nearest residential properties**

## 2.4 Results

The following table presents the diffusion tube data for both bus stations.

Diffusion Tube Data

| Location | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Oct-06** | **Nov-06** | **Dec-06** | **Jan-07** | **Feb-07** | **Mar-07** | **Apr-07** | **May-07** | **Jun-07** | **Jul-07** | **Aug-07** | **Sep-07** |
| **Golders Green Bus Station** | | | | | | | | | | | | |
| Golders Green 1 | 78.7 | 73.4 | 71.1 | 73.7 | 93.2 | 83.2 | 82.6 | 80.9 | 86.4 | 75.7 | 100.3 | 74.0 |
| Golders Green 2 | 83.1 | 78.3 | 69.5 | No data | 90.4 | 72.6 | 83.7 | 89.9 | No data | 82.0 | 97.3 | 79.9 |
| Golders Green 3 | 71.7 | 89.5 | 71.2 | No data | 96.1 | 84.7 | No data | 78.9 | 82.3 | 76.3 | 94.1 | 77.3 |
| North End Road | 75.0 | 72.3 | 67.7 | 60.1 | 76.4 | 65.1 | 65.7 | 63.9 | 74.0 | 62.0 | 66.5 | 58.5 |
| | | | | | | | | | | | | |
| **Mill Hill Broadway Bus Station** | | | | | | | | | | | | |
| Inside Bus Station | 99.4 | 131.8 | 119.9 | No data | 234.3 | 99.4 | 100.3 | 117.6 | No data | No data | No data | 92.1 |
| Station Road | 53.2 | 57.0 | 54.1 | No data | 62.4 | 49.8 | 54.4 | 50.3 | 57.3 | 53.8 | 53.6 | 47.1 |

Notes: 1. Concentrations are in µg/$m^3$
2. The preparation method for the diffusion tubes is 50% TEA in acetone
3. The laboratory used for the supply and analysis of the tubes is Gradko

| Location | Annual Mean (µg/m$^3$) (non bias-adjusted) | Annual Mean (µg/m$^3$) (bias adjusted)[1] | |
|---|---|---|---|
| | | | |
| **Golders Green Bus Station** | | | |
| Golders Green 1 | 81.1 | 81.9 | 82.8 |
| Golders Green 2 | 82.7 | 83.5 | |
| Golders Green 3 | 82.2 | 83.0 | |
| North End Road | 67.3 | 67.9 | |
| | | | |
| **Mill Hill Broadway Bus Station** | | | |
| Inside Bus Station | 124.4 | 125.6 | |
| Station Road | 53.9 | 54.4 | |

Notes:
1. Bias adjustment factor for 2006, taken from 09/07 version of bias adjustment factor spreadsheet, Review and Assessment Helpdesk website, accessed 18.10.07 http://www.uwe.ac.uk/aqm/review/ Factor used is 1.01
2. Annual mean is calculated from Oct06 to Sep07

**Kerbside Station Road, Mill Hill Broadway annual mean result**

This study was funded by the Highways Agency. Results have been bias adjusted using a co-location factor supplied by the HA, from monitoring results at Broxbourne Council, Hertfordshire.

| Apr'04-Mar'05 | Apr' 05-Mar'06 |
|---|---|
| 64.39µg/m$^3$ | 58.98µg/m$^3$ |

## 2.5 Conclusion

Diffusion tube monitoring indicated that the one hour mean objective is being exceeded at Golders Green bus station, but is not being exceeded at Mill Hill Broadway Bus Station. Therefore it would be necessary to declare an Air Quality Management Area at Golders Green bus station.

# 3. Detailed Assessment Phase Two

## 3.1 Background

Following recommendations from Defra and the GLA, it was decided to do automatic monitoring at the bus stations to allow Barnet to make a firmer decision on whether or not to declare an AQMA. A continuous monitor was installed for six months at each of the bus stations between February and August 2008. For further information on QA/QC and ratification see appendix 1. Additional diffusion tubes were also installed in the bus station and vicinity, including triplicate tubes at the monitors.

## 3.2 Golders Green Bus Station

### 3.2.1 Location of monitoring station

The monitor was located in a position representing where passengers wait for long distance buses.

### 3.2.1 Results

This table shows the hourly results over the six month period.

**Golders Green Bus Station**

| | NO2 ppb | NO2 ug/m3 |
|---|---|---|
| **Minimum** | 0.3 | 0.6 |
| **Average** | 38.9 | 74.3 |
| **Standard Dev** | 21.5 | 41.1 |
| **Median** | 35.5 | 67.8 |
| **Maximum** | 185.9 | 355.0 |
| **Data Capture** | 99.1 | 99.1 |
| **Exceedences** | | 42.0 |

## 3.3 Mill Hill Broadway Bus Station

### 3.3.1 Location of monitoring station


The monitor was located to represent relevant exposure which in this case is residential properties above the parade of shops. The bus station is to the right of the picture, underneath the elevated section of road (M1 motorway).

### 3.3.2 Monitoring

The table below presents the hourly results:

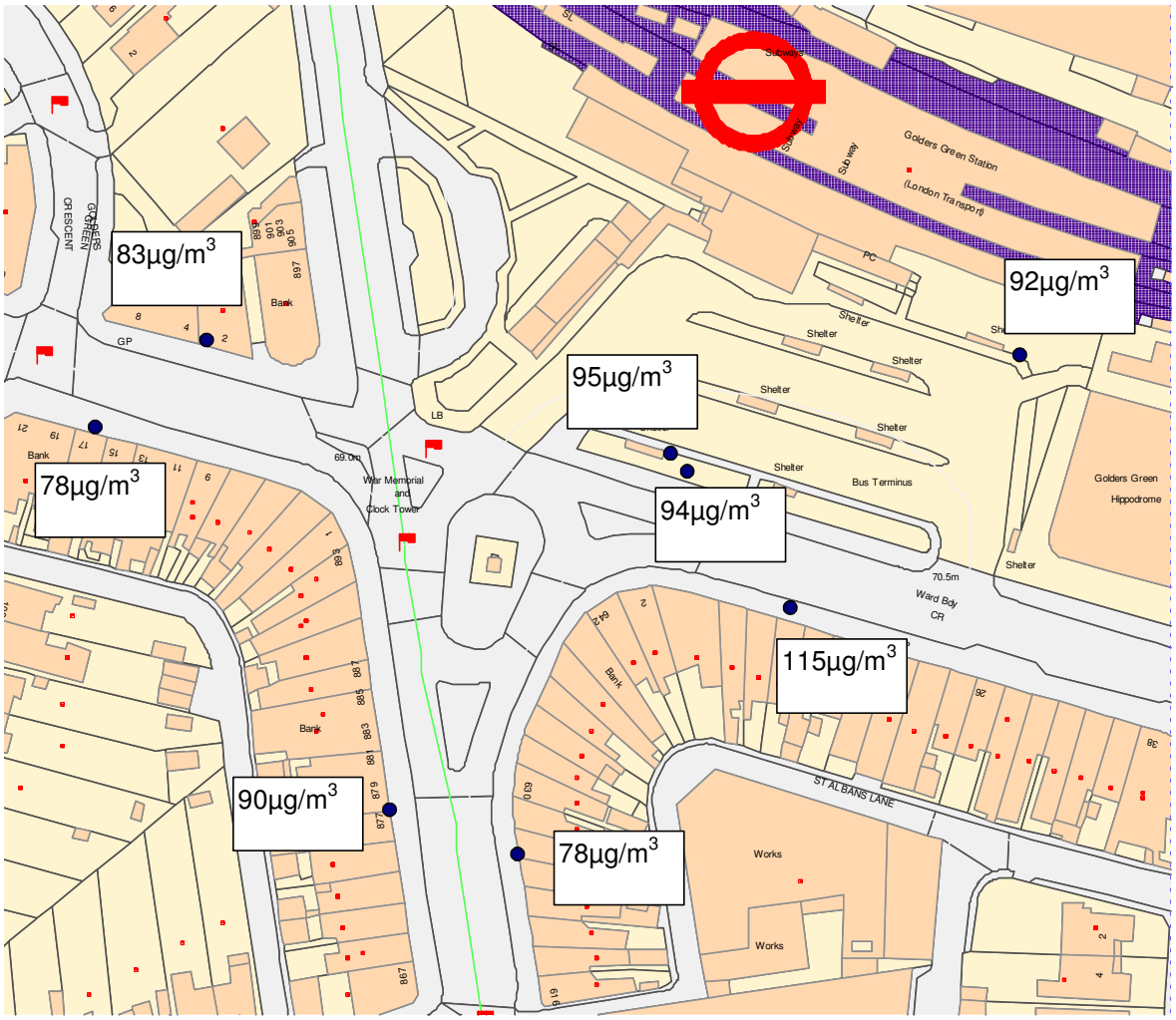
| Mill Hill Broadway Bus Station | NO2 ppb | NO2 ug/m3 |
|---|---|---|
| **Minimum** | 0.4 | 0.8 |
| **Average** | 26.6 | 50.9 |
| **Standard Dev** | 14.6 | 28.0 |
| **Median** | 25.0 | 47.8 |
| **Maximum** | 132.1 | 252.3 |
| **Data Capture** | 95.5 | 95.5 |
| **Exceedences** | | **1** |

## 3.4 Conclusions

The monitoring results from the automatic stations show that the one hour mean nitrogen dioxide objective was exceeded 42 times over the six months at Golders Green Bus Station. It was exceeded once over the six months at Mill Hill Broadway Bus Station. This data corroborates the phase one diffusion tube study and provides firm evidence to back up the declaration of an air quality management area for Golders Green bus station.

## 3.5 Additional Diffusion Tube Monitoring at Golders Green Station

In order to get a better picture of the air quality over a wider area, diffusion tubes were installed in the area over the period of the automatic monitoring study.






The results on the plan above are shown as an annual mean. The annual mean gives an indication of whether or not the hourly mean is being exceeded. It is currently accepted that only if the annual mean average concentration is above 60µg/m$^3$, then the hourly mean may be exceeded[3].

The diffusion tubes were adjusted for bias using a local co-location factor derived from triplicate tubes at the automatic monitor within the bus station. These triplicate tubes were first checked for precision and accuracy. Further information on this and the annualisation of the data is available in appendix 2.

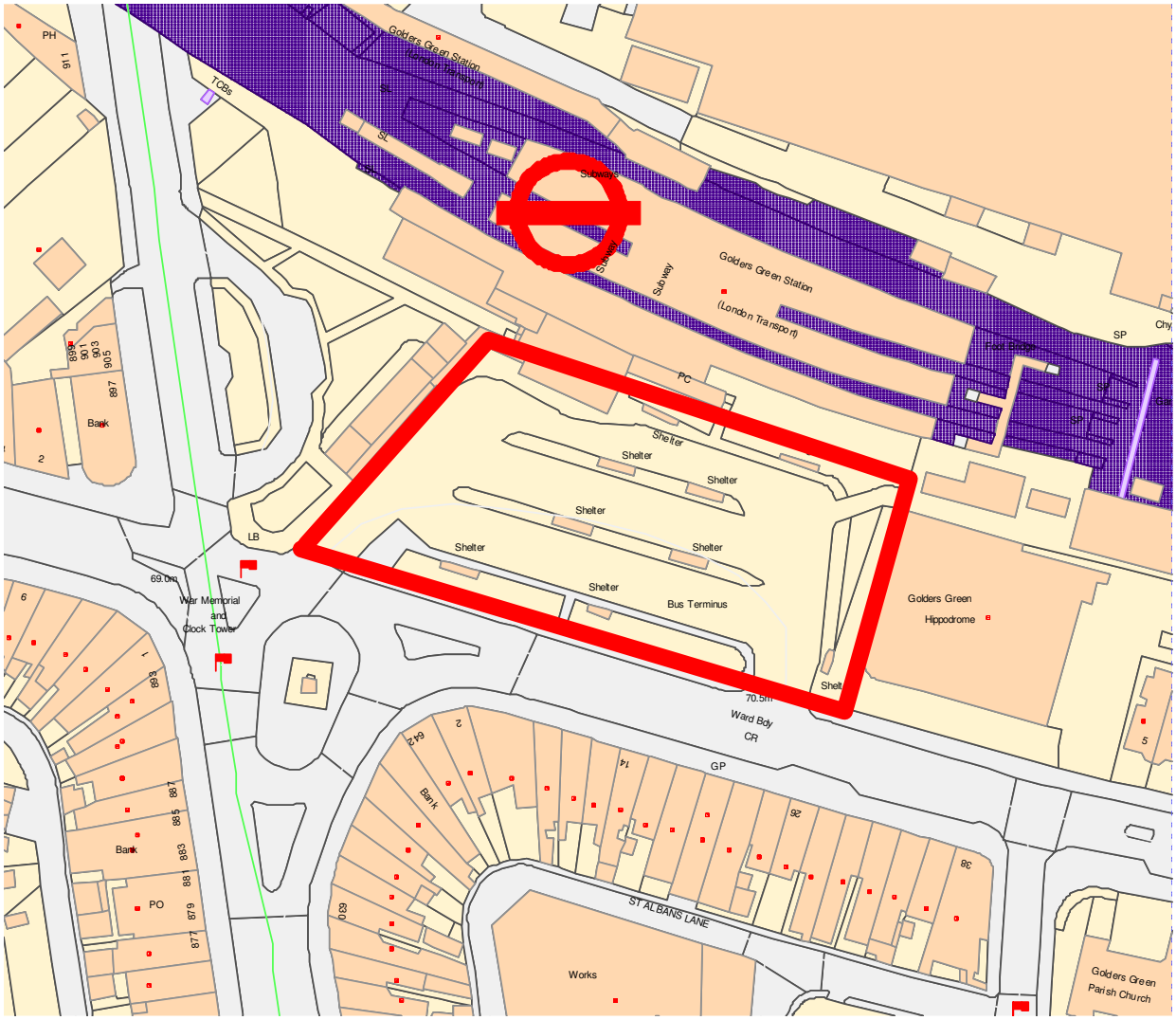
The results indicate that the area exceeding the hourly mean objective stretches to an area wider than the bus station itself.

# 4. Further work and recommendations

## 4.1 Delineating the boundary of the Air Quality Management Area

There are several options for delineating the boundaries of the proposed air quality management area. The Council will be consulting on the declaration of the AQMA and what the delineation should be. Option Two is the Council's preferred option.

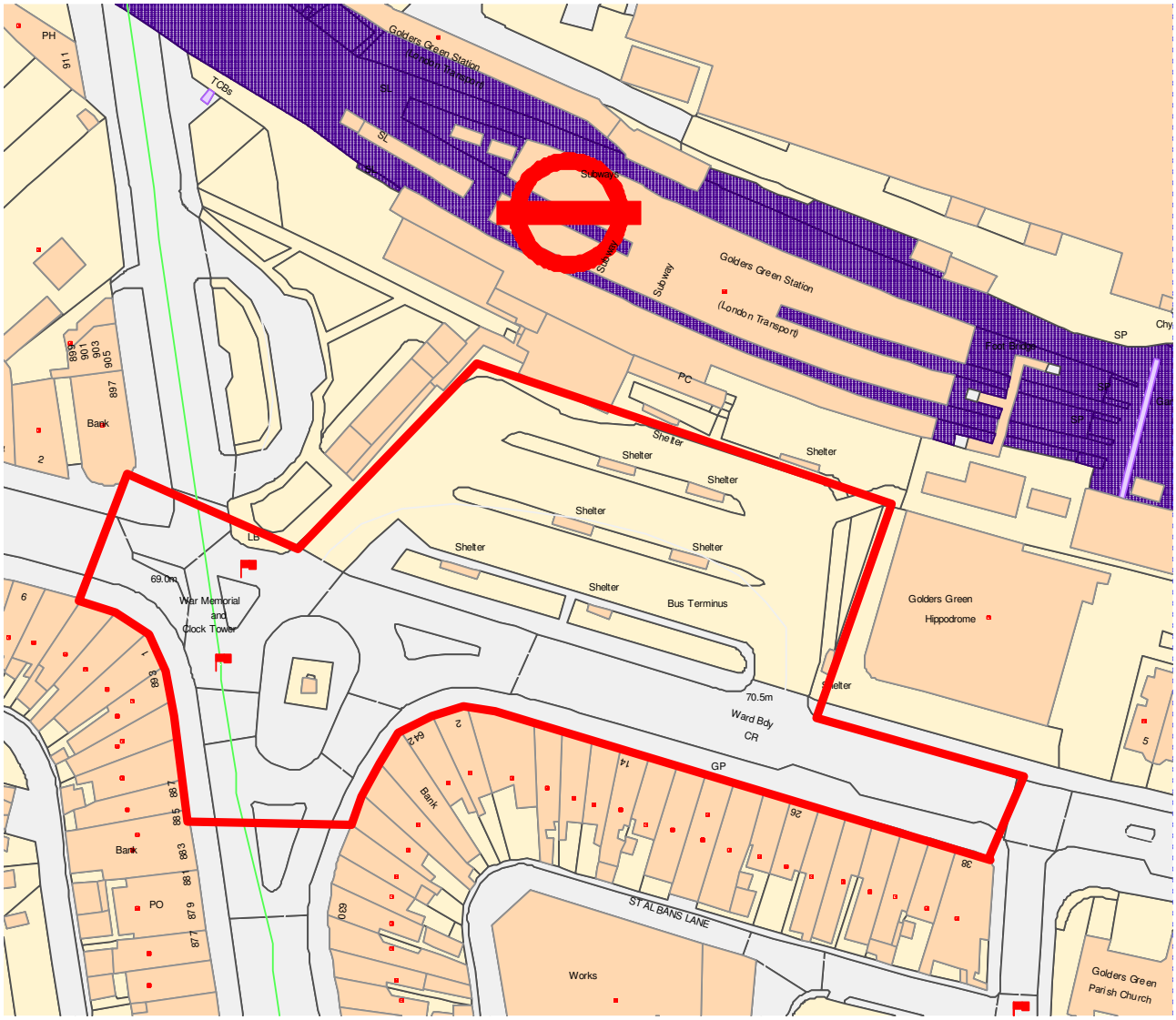
### Option One






This option delineates the bus station only. The benefits are that it highlights the source of the pollutants. The disadvantages are that it excludes some areas of exceedence of this objective.

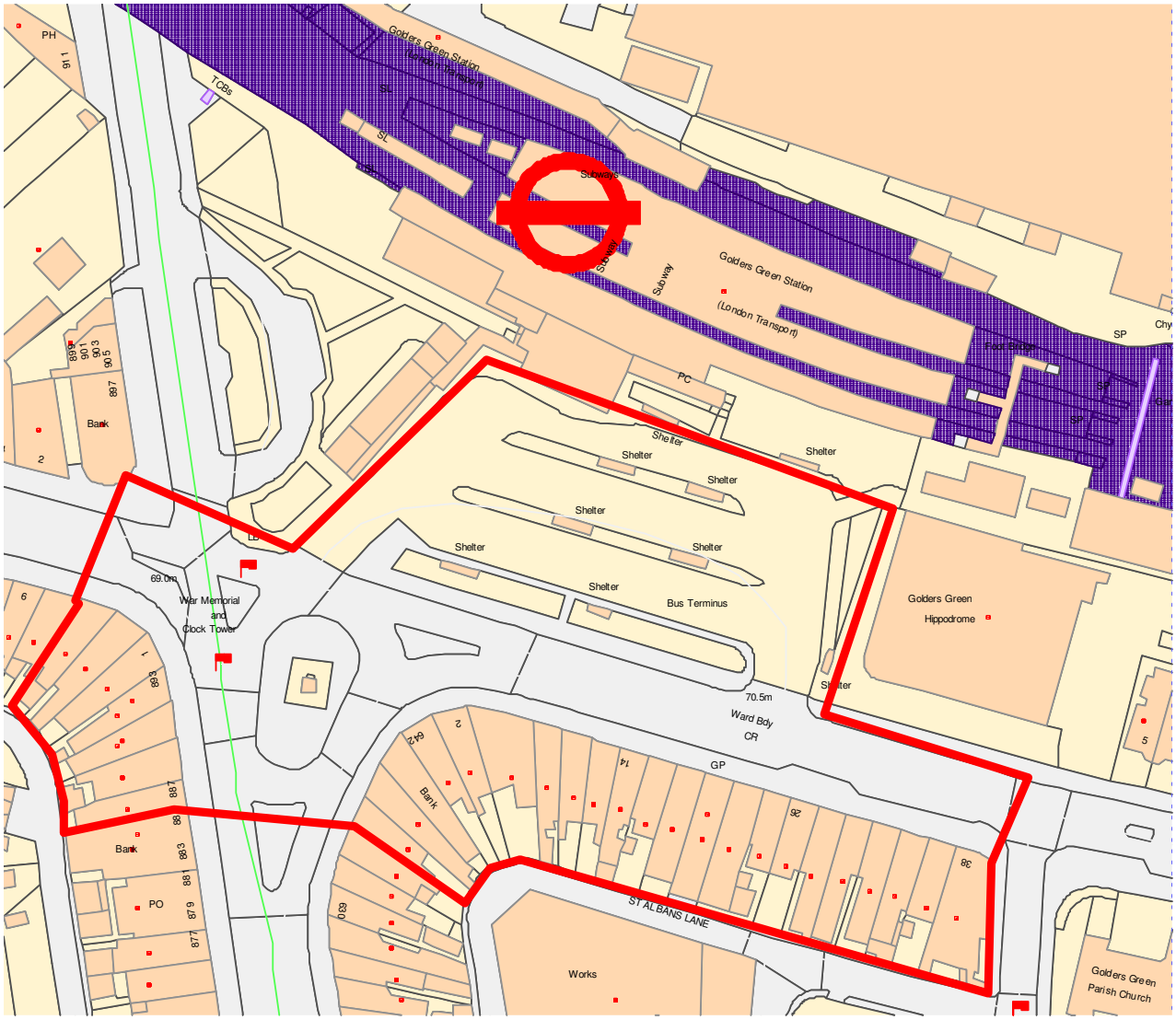
## Option Two






This option includes the bus station as well as the facades of the residential buildings where the objective is being exceeded. The benefits are that it illustrates the fact that the area of exceedence is not confined to the bus station itself.

## Option Three






This option is the same as option two only it includes the entire properties that fall into the exceedence area.

## 4.2 Next steps in the Review and Assessment Process

Once an Air Quality Management Area has been declared, a local authority is obliged by the Environment Act 1995 to produce an air quality action plan within 12-18 months. The London Borough of Barnet already has an air quality action plan, so this will need to be adapted to include specific measures that will target the bus station as a source of emissions. This is likely to include work with Transport for London who operate the bus station, as well as National Express Group who run the long-distance buses.

It must also carry out a Further Assessment of air quality within 12 months of declaring the AQMA. The Council has already commissioned a consultant to carry out a detailed modelling study of the bus station and immediate area. The aim is to confirm the geographical area that exceeds the air quality objective and undertake source apportionment. This will inform both the Further Assessment and the development of the action plan.

## 5. References

1. Local Air Quality Management Policy Guidance (PG09). February 2009.

2. Transport for London website.
http://journeyplanner.tfl.gov.uk/user/XSLT_SEL_STT_REQUEST (accessed 12/03/09)

3. AEA Energy and Environment. *Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective.* May 2008

# Appendix One

## QA/QC and data ratification for the automatic monitoring data

It was important that the monitored results could be relied on. The equipment was installed and data was supplied by the Transport Research Laboratory (TRL). TRL supplied the following information:

*Daily Data Checking*

All new monitoring sites are established within TRL's central data communication and logging facility (currently employing Enview2000) which has been externally audited by the Environment Agency. TRL's internal QA/QC procedures require all data to be backed up on a secure server and all documentation associated with each site to be uniquely identified and securely stored to provide an audit trail.

Daily data inspections are undertaken during office hours using the facilities of the Data Management System. Initial observations of the Management System indicate whether the site has been contacted during its nominated 'poll time' overnight. If this has not been successful a manual poll of the site may be required. If this is not successful further investigation of the communications integrity will be required to establish contact with the site modem and data logger.

Three day plots of recorded data are viewed for the requested site, and these are inspected and assessed for continuity, validity, minimum and maximum values, date and time, power failures and general integrity. All anomalies are recorded on the Daily Check sheet, as required. Any anomalies or queries arising from daily inspection of data, or system operation, are brought to the attention of the Project Manager who will evaluate the situation, and initialise any necessary action. In the event the PM not being available, contact will be made with the next available senior person within the monitoring team. Any issues identified with equipment operation will be referred to the client for attention within 24 hours (excluding weekends).

On a weekly basis, data are examined using summary statistics and outlier analysis to establish data validity. In the event that unusual data episodes are recorded, these would be routinely examined over longer data periods to establish their impact on trends, but would also be cross referenced with data peaks and troughs recorded at other national monitoring stations. In addition, integrity and validity of data logger clock times are checked, and any significant errors recorded in the Data Management System logbook.

All site data recorded through the Data Management System is archived on TRL's Network. The data is backed up daily, and the TRL IT Department maintains these data within their long-term and secure archives. This secures all data in the event of any system failure.

*Data calibration and ratification*

Data is ratified as per AURN recommended procedures. The calibration and ratification process for automatic gas analysers corrects the raw dataset for any drift in the zero baseline and the upper range of the instrument. This is done using a Microsoft Excel-based calibration and ratification file which incorporates the zero and span check information from the calibration visits. The zero reading recorded during the calibration visits is used to adjust any offset of the baseline of the data. The difference between the span value obtained between one calibration visit and the next visit is used to calculate a factor. This change is assumed to occur at the same rate over the period between calibrations and as such the factor is used as a linear data scaler. This effectively results in the start of the period having no factor applied and the end of the period being scaled with the full factor with a sliding scale of the factor in-between. After applying the calibration factors, it is essential to screen the data, by visual examination, to see if they contain any unusual measurements or outliers. Errors in the data may occur as a result of equipment failure, human error, power failures, interference or other disturbances. Data validation and ratification is an important step in the monitoring process. Ratification involves considerable knowledge of pollutant behaviour and dispersion, instrumentation characteristics, field experience and judgement.

Appendix Two. Nitrogen Dioxide Diffusion Tube Data

## Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
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| Diffusion Tubes Measurements | | | | | | | | | | Automatic Method | | Data Quality Check | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Period | Start Date dd/mm/yyyy | End Date dd/mm/yyyy | Tube 1 $\mu gm^{-3}$ | Tube 2 $\mu gm^{-3}$ | Tube 3 $\mu gm^{-3}$ | Triplicate Mean | Standard Deviation | Coefficient of Variation (CV) | 95% CI of mean | Period Mean | Data Capture (% DC) | Tubes Precision Check | Automatic Monitor Data |
| 1 | 26/02/2008 | 03/04/2008 | 69.5 | 62.6 | 70.0 | 67 | 4.1 | 6 | 10.2 | 66.47 | 99 | Good | Good |
| 2 | 03/04/2008 | 02/05/2008 | 75.4 | 75.8 | 73.8 | 75 | 1.0 | 1 | 2.6 | 68.41 | 99 | Good | Good |
| 3 | 02/05/2008 | 27/05/2008 | 91.0 | 86.2 | 99.0 | 92 | 6.5 | 7 | 16.1 | 87.13 | 99 | Good | Good |
| 4 | 27/05/2008 | 02/07/2008 | 69.6 | 71.3 | 69.8 | 70 | 0.9 | 1 | 2.3 | 65.19 | 99 | Good | Good |
| 5 | 02/07/2008 | 28/07/2008 | 73.6 | 79.8 | 74.5 | 76 | 3.4 | 4 | 8.4 | 70 | 99 | Good | Good |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| | | | | | | | | | | | Overall survey --> | Good precision | Good Overall DC |

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

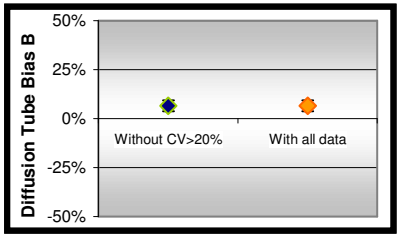
(Check average CV & DC from Accuracy calculations)

| Site Name/ ID: | Golders Green Bus Station |
|---|---|

| Precision | 5 out of 5 periods have a CV smaller than 20% |
|---|---|

| Accuracy (with 95% confidence interval) without periods with CV larger than 20% | |
|---|---|
| Bias calculated using 5 periods of data | |
| Bias factor A | 0.94 (0.91 - 0.96) |
| Bias B | 6% (4% - 9%) |
| Diffusion Tubes Mean: | 76 $\mu gm^{-3}$ |
| Mean CV (Precision): | 4 |
| Automatic Mean: | 71 $\mu gm^{-3}$ |
| Data Capture for periods used: | 99% |
| Adjusted Tubes Mean: | 72 (69 - 73) $\mu gm^{-3}$ |

| Accuracy (with 95% confidence interval) WITH ALL DATA | |
|---|---|
| Bias calculated using 5 periods of data | |
| Bias factor A | 0.94 (0.91 - 0.96) |
| Bias B | 6% (4% - 9%) |
| Diffusion Tubes Mean: | 76 $\mu gm^{-3}$ |
| Mean CV (Precision): | 4 |
| Automatic Mean: | 71 $\mu gm^{-3}$ |
| Data Capture for periods used: | 99% |
| Adjusted Tubes Mean: | 72 (69 - 73) $\mu gm^{-3}$ |

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Version 03 - November 2006

# Adjustment of SINGLE Tubes

AEA Energy & Environment
From the AEA group

| Diffusion Tube Measurements | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site Name/ID | Periods | | | | | | | | | | | | | Raw Mean | Valid periods |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | | |
| Britannia Building Society, 12 North End Road | | | 86.8 | #### | 72.5 | #### | | | | | | | | 92.6 | 4 |
| 624 Finchley Road | | | 54.7 | 68.5 | | 63.1 | 65.7 | | | | | | | 63.0 | 4 |
| Alliance and Leicester, 877 Finchley Road | | | 70.1 | 73.3 | 63.7 | | 83.4 | | | | | | | 72.6 | 4 |
| Flightcentre, 17 Golders Green Road | | | 61.3 | 66.0 | 66.0 | 58.9 | | | | | | | | 63.0 | 4 |
| Lloyds TSB, 2B Golders Green Road | | | 68.9 | 68.6 | | 63.8 | | | | | | | | 67.1 | 3 |
| Rear of Golders Green Bus Station | | | 70.0 | 75.0 | 61.8 | 71.5 | 91.8 | | | | | | | 74.0 | 5 |
| North End Road, by Bus Station | | | 70.7 | 76.4 | 92.5 | 67.4 | 72.7 | | | | | | | 75.9 | 5 |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
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| Adjusted measurement (95% confidence interval) with all the data 5 periods used in this calcuations | |
|---|---|
| Bias Factor A | 0.94 (0.91 - 0.96) |
| Bias B | 6% (4% - 9%) |
| Tube Precision: 4 | Automatic DC: 99% |
| Adjusted with 95% CI | 87 ( 84 - 89 ) |
| Adjusted with 95% CI | 59 ( 57 - 60 ) |
| Adjusted with 95% CI | 68 ( 66 - 70 ) |
| Adjusted with 95% CI | 59 ( 57 - 61 ) |
| Adjusted with 95% CI | 63 ( 61 - 64 ) |
| Adjusted with 95% CI | 70 ( 67 - 71 ) |
| Adjusted with 95% CI | 71 ( 69 - 73 ) |
| Adjusted with 95% CI | #VALUE! |
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***The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.***

**Annualisation of data**

The diffusion tubes were in place at the same time as the automatic monitoring station over a period of five months. In order to get a best estimate of the annual mean the guidance in TG(03) was used. This allows the estimation of the annual mean for the previous year, i.e. 2007 at these locations.

| Long Term Site | Annual Mean 2007 (µg/m$^3$) | Period Mean 2008 (March to June inclusive) (µg/m3) | Ratio |
|---|---|---|---|
| Barnet Two (Chalgrove School) | 36 | 27.3 | 1.319 |
| Harrow One (Stanmore Background) | 28 | 21.2 | 1.321 |
| Average Ratio | | | 1.320 |

A ratio was derived from two nearby background automatic monitoring stations. This ratio was then applied to the period mean concentration of each diffusion tube to give the results in the table below.

| Diffusion Tube Location | Period Mean (µg/m3) | Annual Mean (µg/m3) |
|---|---|---|
| Britannia Building Society, 12 North End Road | 87 | 115 |
| 624 Finchley Road | 59 | 78 |
| Alliance and Leicester, 877 Finchley Road | 68 | 90 |
| Flightcentre, 17 Golders Green Road | 59 | 78 |
| Lloyds TSB, 2B Golders Green Road | 63 | 83 |
| rear of Golders Green bus station | 70 | 92 |
| North End Road by bus station | 71 | 94 |
| Triplicate tubes at automatic monitor | 72 | 95 |