

SWINDON BOROUGH COUNCIL

LOCAL AIR QUALITY UPDATING & SCREENING ASSESSMENT 2006

Compiled
APRIL 2006

Compiled in accordance with DEFRA Policy & Technical Guidance
documents LAQM.PG (03) & TG (03) (updated January 2006)

Swindon Borough Council

Updating & Screening Assessment Report

Contents:	Page No.
1. Executive Summary	2
2. An introduction to Air Quality Management	3
3. Current Air Pollution monitoring in Swindon	8
4. Consultation	9
5. Carbon Monoxide Assessment	10
6. Benzene Assessment	12
7. 1,3 Butadiene Assessment	16
8. Lead Assessment	18
9. Nitrogen Dioxide Assessment	20
10. Sulphur Dioxide Assessment	26
11. Particulate Matter Assessment	29
Appendix 1 – Nitrogen Dioxide monitoring data	36
Appendix 2 - Glossary of Terms	46
Kingshill Road Diffusion tube location map	

Local Air Quality Management – Updating & Screening Assessment, 2006

1. Executive Summary:

This report details the actions taken by Swindon Borough Council in support of the Local Air Quality Management regime, the structure for which was established by the Department of the Environment, Transport and the Regions (now superseded by DEFRA - Department for Environment, Food and Rural Affairs) in the late 1990's.

It is compiled in accordance with Policy and Technical guidance issued by DEFRA under the provisions of the Environment Act 1995, and focuses on the 7 recognised pollutants which Local Authorities are charged with 'managing' within their areas. This report follows previous Updating & Screening assessments prepared in 2000 & 2003, together with Progress reports prepared in 2004 & 2005, all of which have been submitted to, and accepted by, DEFRA.

SBC's previous reports have confirmed that there have been no exceedences, or likelihood of exceedences, of any of the objective standards occurring at any 'relevant location' within the Borough, i.e. locations where members of the public are likely to be regularly present and exposed over the averaging period of the objective.

This report again confirms the conclusion. The particular focus of attention for the past several years has been the impact of Nitrogen Dioxide levels upon a terrace of 14 properties standing close to the kerbside of *Kingshill Road*. It was reported in Swindon's 2005 Progress/Detailed Assessment Report that an improved level of data is now being obtained with the establishment of additional diffusion tube sites in *Kingshill Road* and triplicate tubes at the original site (Site 14).

As indicated at Appendix 1, the triplicate tubes have returned an average Annual Mean value of 39.5 ug/m³ for the year 2005, (representing 98.75% of the objective value) which, whilst falling marginally beneath the objective standard, nevertheless serves to highlight the continuing potential for the NO₂ standard to be exceeded in this locality.

Based upon this evidence, however, it is not intended to declare an Air Quality Management Area in the locality at the present time.

The objective standards for all other pollutants are considered to have been, or are predicted to be, achieved by the target dates.

SWINDON BOROUGH COUNCIL

2. Introduction to Air Quality Management:

This report is prepared in accordance with the requirements of the air quality Regulations 2000 and the air Quality (Amendment) Regulations 2002 and is compiled in accordance with the associated policy and technical guidance issued by the Department for Environment, Food & Rural Affairs (DEFRA).

The maintenance of good air quality is important with regard to sustainability principles and in particular those related to road transport policies. Air Quality is one of the Government’s key headline indicators used to assess progress towards UK sustainable development goals.

The process of structured local air quality review and assessment was initiated by the introduction of the Air Quality Regulations 1997 which determined which pollutants were to be assessed, the objective standards to be achieved, and the time scales for achievement. From this time Local Authorities across the UK began a programme of continual review and assessment of the prescribed pollutants, including the production of staged reports, with the ultimate objective of determining the need, or otherwise, for the designation of Air Quality Management Areas.

An AQMA formally designates the geographical zone in which is the objective standard for a particular pollutant is being exceeded. Such designation carries with it a duty to prepare an action plan formulated to improve the local air quality in the area.

The exercise conducted in Swindon, reported in the Stage 3 review & assessment report of January 2001, determined that was that there was considered to be no likelihood of the objective standards for any of the designated pollutants (indicated below) being breached in any relevant locations within the Borough. The conclusion, and details of the assessment process, were vetted and accepted by DETR (now replaced by DEFRA).

<u>Pollutant</u>	<u>Major Source</u>	<u>Health Effects</u>
Benzene	Combustion of Petrol.	Human carcinogen which can cause Leukaemia.
1,3 Butadiene	Incomplete combustion of fuels containing carbon, e.g. Coal & Petrol.	Reduces the oxygen carrying capacity of blood; causes headaches, affects concentration and reflexes.

Carbon Monoxide	Road traffic accounts for about 75% of CO emissions in the UK.	High levels of exposure can retard foetal growth in pregnant women.
Lead	Now restricted to a variety of industrial activities.	It is a cumulative poison which reduces the ability of the body to produce Haemoglobin in the blood; can cause damage to the nervous system and affects the kidneys, gastrointestinal tract, joints and reproductive system. Severe poisoning can cause anaemia and impaired mental function.
Nitrogen Dioxide (NO ₂)	Road traffic, which accounted for 49% of emissions in 2000. Major roads carrying large volumes of high-speed traffic are a predominant source, as are conurbations with congested traffic. Power Stations & other industries.	Affects the efficiency of the lungs. Nitrogen Oxides also react with VOC's in the presence of sunlight to form low-level ozone.
Particulate Matter (PM ₁₀)	These are particles less than 10 microns in size which arise from many sources including incomplete combustion, ash and wind-blown dust.	Airway obstruction and Lung disease. Some of the particles (e.g. hydrocarbons) can penetrate deep into the lungs and may be carcinogenic.
Sulphur Dioxide (SO ₂)	Combustion of sulphur compounds which are a natural constituent of coal & oil. Main source is fossil fuelled power stations.	Affects the efficiency of the lungs. People with asthma & chronic lung diseases are more susceptible.

This further Updating & Screening Assessment report should therefore be read in conjunction with the earlier reports.

2.1 Objectives included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management:

Pollutant	Air Quality Objectives		Achievement Date
	Concentration	Measured As	
Benzene <i>All authorities</i>	16.25 ug/m ³	Running annual mean	31.12.2003
<i>Authorities in England & Wales only</i>	5 ug/m ³	Annual mean	31.12.2010
1,3 Butadiene	2.25 ug/m ³	Running annual mean	31.12.2003
Carbon Monoxide	10.0 mg/m ³	Maximum daily running 8-hour mean	31.12.2003
Lead	0.5 ug/m ³	Annual mean	31.12.2004
	0.25 ug/m ³	Annual mean	31.12.2008
Nitrogen Dioxide	200 ug/m ³ not to be exceeded more than 18 times per year	1-hour mean	31.12.2005
	40 ug/m ³	Annual mean	31.12.2005
Particles (PM₁₀) (gravimetric)	50 ug/m ³ not to be exceeded more than 35 times per year	24-hour mean	31.12.2004
	40 ug/m ³	Annual mean	31.12.2004
Sulphur Dioxide	350 ug/m ³ not to be exceeded more than 24 times per year	1-hour mean	31.12.2004
	125 ug/m ³ not to be exceeded more than 3 times per year	24-hour mean	31.12.2004

266 ug/m³ not to be exceeded more than 35 times per year

15-minute mean

31.12.2005

The new Particles objectives for England, Wales & Greater London, which are shown below, are not currently included in Regulations for the purpose of LAQM. Authorities therefore have no obligation to review and assess against them, but are encouraged to do so to assist with longer term planning and assessment of development proposals.

2.2 Proposed new Particles objectives for England, Wales and Greater London:

Region	Air Quality Objective		Achievement Date
	Concentration	Measured As	
Greater London	50 ug/m ³ not to be exceeded more than 10 times per year	24-hour mean	31.12.2010
	23 ug/m ³	Annual mean	31.12.2010
	20 ug/m ³	Annual mean	31.12.2015
Rest of England, Wales & Northern Ireland	50 ug/m ³ not to be exceeded more than 7 times per year.	24-Hour mean	31.12.2010
	20 ug/m ³	Annual mean	31.12.2010

As indicated earlier, the process of air quality assessment is a phased one, with the intention that Local Authorities should only undertake a level of assessment which is commensurate with the risk of an air quality objective being exceeded. The Updating and Screening Assessment (USA) process is based upon a checklist to identify those matters which have changed since the last exercise, to encompass new monitoring data, new objectives, new sources or significant changes to existing sources and other local changes which might affect air quality.

A Detailed Assessment is only required where the USA has identified a *risk* that an air quality objective will be exceeded at a location with relevant public exposure, with the aim of then determining with *reasonable certainty* whether or not the likely exceedence is likely to actually occur.

Likely exceedences of the objectives are to be assessed in relation to *'the quality of the air at locations which are situated outside buildings or other man-made structures, above or below ground, and where members of the public are regularly*

present'. Attention, therefore, is appropriately focused upon locations where exposure might reasonably occur over the averaging period of the objective. Exceedences are not to be considered where **relevant public exposure would not be realistic.**

It is also the intention that Authorities should produce, and submit to DEFRA, annual progress reports in 2007 & 2008 together with a further USA report due in 2009.

3. Current Air Pollution Monitoring in Swindon:

Continuous monitoring of Smoke & Sulphur Dioxide levels at a site in the Ferndale Road area of Swindon (Grid Ref: SU 4147 1858) has been undertaken since 1963. This study has confirmed the steady reduction in levels of these pollutants since the decline of the railway industry in this locality, the phasing out of coal burning steam locomotive power in the mid 1960's, and the progressive move away from coal as the staple fuel for home heating. The findings of the study are mirrored, generally, across the country.

In mid 2005 DEFRA took a decision to close down the national Smoke & Sulphur Dioxide monitoring network, effective from the end of the year, in recognition of the fact that (i) average SO₂ concentrations are now well below the minimum level for which the use of the net acidity method (upon which the monitoring technique was based) is recommended, and (ii) it can no longer be assumed that SO₂ is the main contributor to net acidity.

Local operating problems had caused a temporary de-commission of the equipment from early in 2005 and, in the light of this development, a decision was therefore subsequently taken not to re-commission the unit.

In 1993 Central Government established, in conjunction with local authorities, a national network of sites to monitor ambient Nitrogen Dioxide levels using the passive diffusion tube technique. Four sites were selected in Swindon to contribute to the National Database. Additionally, and progressively, a further 16 sites have since been established for local information purposes.

Results from these sources provide an invaluable data-base upon which to base further assessments, or the need for further monitoring, as necessary. No continuous, real-time monitoring of any of the pollutants is currently being undertaken by the Authority.

4. Consultation:

The Environment Act 1995 provides the statutory basis for consultation and liaison in respect of local air quality management. Authorities are expected to work closely with other local authorities, agencies, business and the local community to improve air quality.

Schedule 11 of the Act requires local authorities to consult

- the Secretary of State
- the Environment Agency
- the Highways Authority
- all neighbouring authorities
- any National Park authority
- other public authorities as appropriate
- bodies representing local business interests and other organisation as appropriate

For the purposes of the Act, authorities must consult on their:

- air quality review and assessment
- further air quality assessment in an AQMA; and
- preparation or revision of an AQMA action plan

Local authorities are also expected to consult on the declaration, amendment or revocation of any AQMAs (Not currently relevant to Swindon Borough Council).

Guidance indicates, however, that at this Updating and Screening stage it is at the discretion of the Authority as to how wide the consultation should be although authorities should still make assessments available to the public. Due to the timescales for undertaking the USA, no external consultation has taken place prior to submission to DEFRA. However, once comments have been received from DEFRA, comments will be invited from interested parties, including the Primary Care Trust and the public at large. It is intended to do this in both hard copy and electronic format.

5. Updating & screening assessment for Carbon Monoxide:

Objective standard:

10 mg/m³ as a maximum daily running 8-hour mean concentration, to be achieved by the end of 2003

The main threats to human health from exposure to carbon monoxide are the formation of carboxhaemoglobin, which substantially reduces the capacity of blood to carry oxygen and deliver it to the tissues, and blockage of important biochemical reactions in cells. People who have an existing disease which affects the delivery of oxygen to the heart or brain (e.g. coronary artery disease - angina) are likely to be at particular risk if these delivery systems are further impaired by carbon monoxide.

Carbon Monoxide is a gas formed by the incomplete combustion of carbon containing fuels. In general, the more efficient the combustion process, the lower the carbon monoxide emission, the main outdoor source of CO in the UK is currently road transport, which accounts for about 69% of UK emissions, mainly from petrol-engined vehicles.

The introduction of tighter European vehicle emissions and fuel quality standards will make a significant contribution towards reducing emissions of carbon monoxide. The phased introduction of BAT (Best Available Techniques) through the PPC regime of integrated permitting, being phased in until 2007, should also have an impact on reducing carbon monoxide emissions from industrial processes.

5.1 Information to be collated for the R & A:

- a) Monitoring data
- b) Very busy roads or junctions in built-up areas

5.2 Assessment:

- a) Monitoring data:
Requirement: Collate all Carbon Monoxide monitoring data

The authority is not currently monitoring Carbon Monoxide

- b) Very busy roads or junctions in built-up areas:
Requirement: Identify 'very busy' roads and junctions where 2003 background is expected to be above 1 mg/m³.

This criteria was examined at the 2003 USA. No roads or junctions were found to have traffic flows sufficient to warrant further assessment.

5.3 Conclusion:

The updating & screening assessment for Carbon Monoxide indicates that no exceedences of the objective standard (specified above), arising from industrial or road traffic sources are predicted to occur within the Swindon Borough Council area.

No detailed assessment for this pollutant is therefore considered necessary.

6. Updating & Screening Assessment for Benzene:

Objective standards:

16.25 ug/m³ measured as a running Annual mean, to be achieved by the end of 2003

5 ug/m³ measured as an Annual mean, to be achieved in England & Wales by the end of 2010

Benzene (C₆H₆) is a fat-soluble volatile toxic organic compound with a range of potential effects. Acute exposure to benzene at occupational levels can cause narcotic, anaesthetic or fatal consequences. Benzene is a proven genotoxic carcinogen, and ambient long-term exposure is implicated in the formation of a range of types of leukaemia in the general population.

Benzene has no significant natural sources, so that ambient exposure results primarily from petrol combustion in road transport emissions or evaporation of petrol (which contains benzene) from filling stations. Benzene is naturally broken down by chemical reactions in the atmosphere, although these reactions can take several days. As a result, outdoor benzene concentrations tend to closely follow road networks and traffic density patterns.

A number of policy measures already in place, or planned for future years, will continue to reduce emissions of Benzene. Since January 2000, EU legislation has reduced the maximum Benzene content of petrol to 1%, from a previous upper limit of 5%. The European Auto-Oil programme will further reduce emissions for cars and light-duty vehicles and emissions from the storage and distribution of petrol are controlled by vapour recovery systems. Benzene is continuously monitored at 5 National Network sites. No exceedences of the Air Quality standards were recorded at any of the sites during 2004.

Forecasts based upon National mapping suggest that the policy measures currently in place will achieve the 2003 objective at all urban background and roadside/kerbside locations. Whilst the 2010 objectives are expected to be met at all urban background, and roadside locations, there is the possibility for some remaining exceedences which will require additional measures at local level.

Guidance advised that there were no AQMAs declared from the first round of review and assessments in respect of the air quality objective for Benzene. There was therefore no requirement for authorities to consider road traffic emissions in their review of the 2003 objective, and only those authorities with relevant locations in the vicinity of major industrial processes that store, handle or emit benzene might possibly have needed to progress beyond the updating & screening stage for this pollutant. This advice is considered to still be appropriate.

6.1 Information to be collated for the R & A:

- a) Monitoring data outside an AQMA
- b) Monitoring data within an AQMA
- c) Very busy roads or junctions in built-up areas
- d) New industrial sources
- e) Industrial sources with substantially increased emissions or new relevant exposure
- f) Petrol stations
- g) Major fuel storage depots.

6.2 Assessment:

- a) Monitoring data outside an AQMA:
Requirement: Collate all benzene monitoring data.

The authority is not currently monitoring Benzene.

National network maps estimate that the annual mean background Benzene concentrations in 2010 in the Swindon Borough Council area will be between 0.3 & 0.5 ug/m³

- b) Monitoring data within an AQMA:

No Air Quality Management Areas have been declared within the Swindon Borough Council area.

- c) Very busy roads or junctions in built-up areas:
Requirement: Identify 'very busy' roads and junctions in areas where the 2010 background is expected to be above 2 ug/m³

- i.e. (i) Single carriageway roads with daily average traffic flows which exceed 80,000 vehicles per day.
- (ii) Dual carriageway (2 or 3 lane) roads with daily average traffic flows which exceed 120,000 vehicles per day.
- (iii) Motorways with daily average traffic flows which exceed 140,000 vehicles per day.

The 2010 background Benzene concentration in the Swindon area is expected to be below 2 ug/m³. Additionally an assessment by the highways department confirms that no roads or junctions within the S.B.C. area have traffic flows of these magnitudes.

- d) New industrial sources /
- e) Industrial sources with substantially increased emissions, or new relevant exposure:

There are no industrial processes of relevance for Benzene in the authority, or any of the neighbouring authorities. There has been no change in this position.

- f) Petrol Stations:

Requirement: Identify all petrol stations with an annual throughput of more than 2 million litres of petrol per annum and with a busy road nearby that have not been covered by previous review and assessment reports. (NOTE: a busy road can be taken to be one with more than 30,000 vehicles per day). Also determine whether there is relevant exposure within 10 metres of the pumps.

There are 26 licensed sites retailing petrol within the Swindon area. Records confirm that the following 16 sites currently have a throughput of more than 2 million litres per annum.

- 1) Asda Walmart, Thamesdown Drive, Abbey Meads
- 2) Abbots Cross, Meads Roundabout, Great Western Way
- 3) Asda Stores, Corton Crescent, West Swindon Centre
- 4) Chiseldon Service Station, Marlborough Road, Chiseldon
- 5) Dorcan Way Service Station, Dorcan Way, Swindon
- 6) Groundwell Service Station, Turnpike, A419
- 7) Sainsburys, Paddington Drive, Bridgemoor
- 8) Sainsburys, A420, Stratton
- 9) Kingshill Service Station, Kingshill Road, Swindon
- 10) Rodbourne Service Station, Rodbourne Road, Swindon
- 11) Roger Simpson, Swindon Road, Highworth
- 12) Marlborough Road Service Station, Swindon
- 13) Shell Oasis, Great Western Way, Swindon
- 14) South Marston Service Station, A420, South Marston
- 15) Tesco Service Station, Ocotal Way, Swindon
- 16) Total Service Station, Mead Way, Swindon

All of these stations have been assessed against the above standards and in no case is relevant exposure occurring within 10 metres of the pumps. No exceedence of the 2010 benzene objective is therefore predicted in the vicinity of any petrol station.

h) Major fuel storage depots:

There no major fuel storage depots within the area of the Authority, or the wider locality of neighbouring authorities, which will impact upon ambient Benzene concentrations in the district.

6.3 Conclusion:

The updating & screening assessment for Benzene indicates that no exceedences of the objective standards, (previously specified), arising from either industrial or road traffic sources are predicted to occur within the Swindon Borough Council area.

No detailed assessment for this pollutant is therefore considered necessary at present.

7. Updating & Screening Assessment for 1,3 Butadiene

Objective standard:

2.25 ug/m³ measured as a running Annual mean concentration, to be achieved by the end of 2003

The main source of 1,3 Butadiene in the UK is emissions from motor vehicle exhausts, 1,3 Butadiene is also an important industrial chemical and is handled in bulk at a small number of industrial premises.

The increasing numbers of vehicles equipped with 3-way catalysts will significantly reduce emissions of this pollutant in future years. Recently agreed further reductions in vehicle emissions and improvements to fuel quality, including those as part of the Auto-Oil programme, are expected to further reduce emissions from vehicle exhausts. These measures are expected to deliver the air quality objective by the end of 2003, and no further measures are thought to be needed.

Concentrations of 1,3 Butadiene are continuously measured at 5 National Network sites. No exceedences of the Air Quality standard were recorded at any of the sites in 2004.

There have been no AQMA's declared from the first round of reviews and assessments in respect of the air quality objective for 1,3 Butadiene. Studies at national level suggest that there was always little likelihood of the objective for 1,3 Butadiene being exceeded by 2003.

7.1 Information to be collated for the R & A:

- a) Monitoring data
- b) New industrial sources
- c) Industrial sources with substantially increased emissions, or new relevant exposure

7.2 Assessment:

- a) Monitoring data
Requirement: Collate all 1,3-Butadiene monitoring data

The authority is not currently monitoring 1,3-Butadiene.

- b) New industrial sources /
- c) Industrial sources with substantially increased emissions, or new relevant exposure

There are no industrial processes of relevance for 1,3 Butadiene in the authority, or any of the neighbouring authorities.

7.3 Conclusion:

The updating & screening assessment for 1,3 Butadiene indicates that no exceedences of the objective standard, (previously specified), arising from either industrial or road traffic sources are predicted to occur within the Swindon Borough Council area.

No detailed assessment for this pollutant is therefore considered necessary at present.

8. Updating & Screening Assessment for Lead

Objective standards:

0.5 ug/m³ measured as an Annual mean, to be achieved by the end of 2004

0.25 ug/m³ measured as an Annual mean, to be achieved by the end of 2008

The agreement reached between the European Parliament and the Environment Council on the Directive on the Quality of Petrol and Diesel Fuels (part of the Auto-Oil programme) has led to a ban on sales of leaded petrol in the UK, effective from 1st January 2000. Emissions of lead are now restricted to a variety of industrial activities such as battery manufacture, pigments in paints and glazes, alloys, radiation shielding, tank lining and piping.

Measured lead-in-air concentrations for all background and kerbside UK national network sites are well below the objectives for 2004 & 2008.

Detailed assessments of the potential impact of lead emissions from industrial sources have been undertaken by Government, including a 12 month monitoring survey in the vicinity of 30 key UK industrial sites. Results generally indicate no exceedences of the 2004 or 2008 objectives, although locations in close proximity to non-ferrous metal productions and foundry processes were deemed at risk and further monitoring is occurring.

There have been no AQMAs declared from the first round of review and assessments in respect of the 2004 or 2008 air quality objectives for Lead. Only those authorities with relevant locations in the vicinity of major industrial processes that emit significant quantities of lead will need to progress beyond the updating & screening stage for this pollutant.

8.1 Information to be collated for the R & A:

- a) Monitoring data
- b) New industrial sources
- c) Industrial sources with substantially increased emissions, or new relevant exposure

8.2 Assessment:

- a) Monitoring data
Requirement: Collate all lead monitoring data.

The authority is not currently monitoring Lead.

- b) New industrial sources /
- c) Industrial sources with substantially increased emissions, or new relevant exposure

There are no industrial processes of relevance for Lead in the authority, or any of the neighbouring authorities.

8.3 Conclusion:

The updating & screening assessment for Lead indicates that no exceedences of the objective standards, (previously specified), arising from either industrial or road traffic sources are predicted to occur within the Swindon Borough Council area.

No detailed assessment for this pollutant is therefore considered necessary at present.

9. Updating & Screening Assessment for Nitrogen Dioxide

Objective standards

200 ug/m³ measured as a 1-hour mean, not to be exceeded more than 18 times per year, to be achieved by the end of 2005

40 ug/m³ measured as an Annual mean, to be achieved by the end of 2005

All combustion processes in air produce Nitrogen Oxides (NO_x). Nitrogen Dioxide (NO₂) and nitric oxide (NO) are both oxides of nitrogen which together are referred to as NO_x. It is NO₂ which is subject to health based air quality standards.

Urban concentrations of NO_x have shown a downward trend since the early 1990's, associated mainly with reduced emissions from road traffic. However, while the NO₂ concentration also declined, its decrease was not so marked as that of nitric oxide, so that the ratio NO₂/NO_x showed an increase.

Road transport, however, is the largest source of NO_x emissions in the UK, contributing 49% of total emissions in 2000. An analysis of the roadside NO₂ concentrations has shown the contribution of road transport to NO₂ emissions in urban areas, which are generally higher than the national average.

NO_x emissions are generally in the form of NO, but there is evidence for significant amounts of NO₂ emitted directly from the tailpipe of diesel vehicles, especially when slow moving, with levels possibly as high as 25% of total NO_x emissions in mass terms. These primary emissions have a significant impact on roadside NO₂ concentrations in areas where there is considerable diesel vehicle activity.

The concentration of NO₂ at a given location is determined by a combination of emissions, meteorology and chemistry. In addition to primary emissions sources, secondary NO₂ is formed in a rapid chemical reaction between primary NO and Ozone (O₃). The availability of O₃ close to the emission source is a key factor determining the concentration of NO₂. Also, meteorological processes operating on scales from a few metres to hundreds of kilometres play an important role in controlling dispersion and accumulation of NO₂ and the availability of O₃.

Episodes when hourly mean NO₂ concentrations exceed 200 ug/m³ can be classified into two types. Winter episodes are associated with poor dispersion of primary NO_x emissions. Summer episodes are characterised by the elevated secondary NO₂ concentrations associated with regional scale photochemical oxidant episodes.

Widespread exceedences of 40 ug/m³ NO₂ as an annual mean remain, despite a decade of decreasing NO_x emissions. Annual mean NO₂ concentrations show significantly smaller downward trends than NO_x concentrations because of both limitations on chemical production and increased emissions of NO₂. With current national policies some exceedences of the annual mean objectives and limit values for NO₂ will remain in the years 2005 & 2010. If future traffic flows exceed

expectations, or emission control technologies fail to deliver anticipated reductions, continued exceedences will be more widespread.

9.1 Information to be collated for the R & A:

- a) Monitoring data outside an AQMA
- b) Monitoring data within an AQMA
- c) Narrow congested streets with residential properties close to the kerb
- d) Junctions
- e) Busy streets where people may spend 1 hour or more close to traffic
- f) Roads with high flows of buses and/or HGV's
- g) New roads constructed or proposed since the previous round of R & A
- h) Roads with significantly changed traffic flows, or new relevant exposure
- i) Bus Stations
- j) New industrial sources
- k) Industrial sources with substantially increased emissions, or new relevant exposure
- l) Aircraft

9.2 Assessment:

- a) Monitoring data outside an AQMA
Requirement: Collate all nitrogen dioxide monitoring data. Both continuous (chemiluminescent) and diffusion tube data should be included.

Included at Appendix 1 are the results of Swindon's continuous passive diffusion tube monitoring programme since the year 2000. The programme now comprises a total of 20 individual sites.

As indicated in the 2005 Progress Report, a 'relevant location' (comprising a terrace of 14 residential properties set just 1 metre from the kerbside) in Kingshill Road, Swindon was considered to be at risk of failing the annual mean objective standard and has therefore been the subject of detailed assessment for the past 18 months.

The more robust monitoring data obtained during this time has confirmed, however, that whilst the measured (bias corrected) value for the year 2005 came very close to the objective standard, no exceedence occurred. Monitoring, however, continues to facilitate re-assessment as necessary.

No other sites, which represent 'relevant locations', have been found to be at risk of failing the objective standards or been subject to detailed assessment.

National maps indicate that the estimated annual mean background NO₂ values for the Swindon area are in the band 20 > 30 ug/m³ in the centre of the conurbation and 15 > 20 ug/m³ on the periphery. It is anticipated that values in the zone of higher concentration will have reduced by 2010.

- b) Monitoring data within an AQMA:

No Air Quality Management Areas have been declared within the Swindon district.

- c) Narrow congested streets with residential properties close to the kerb:

Requirement: Check for any new relevant exposure that may have occurred since the previous round of Review & Assessment was completed.

Since the Review & Assessment exercise conducted in 2003 further consideration has been given to Devizes Road in the Old Town area (A4361), which remains an arterial road, linking the east and west zones of Swindon. Traffic volumes remain considerable with standing traffic at certain times. The potential for exceedence of the objective standard is therefore recognised. Consequently monitoring, utilising the Passive Diffusion technique, is now being undertaken (effective from June 2006) for the purpose of screening actual NO₂ levels in the locality.

Additionally, the location has been processed in accordance with the DMRB (Version 1.02) model, as follows:

Devizes Road:

Grid Ref: 415500 / 183500

Estimated 2005 background NO_x value = 31.0 ug/m³

Estimated 2005 background NO₂ value = 21.6 ug/m³

Distance from road centre to house façade = 9.0m

Projected AADT flow = 21606 vehicles/day

Annual average speed = 32 km/h

Vehicle mix: 94% LDV; 6% HDV

Initial DMRB prediction: 30.1 ug/m³ Annual Mean

This compares closely with the modelled prediction undertaken at the 2003 Review & Assessment (32.3 ug/m³)

A length of this road (approx 85 metres) at its northerly end was assessed as being a 'street canyon' in 2003, and consequently the NO₂ road traffic component was doubled (in accordance with Technical Guidance) to produce a final prediction of 38.9 ug/m³

Current modelling as a 'street canyon' predicts a figure of 38.6 ug/m3 - No Exceedence

- d) **Junctions:**
 Requirement: Identify 'busy' junctions with traffic flows exceeding 10,000 vehicles/day and where there is relevant exposure within 10 metres of the kerb

The Newport Street/Devizes Road/Croft Road junction, and the Westcott Place/Kingshill Road/Wootton Bassett Road junction were considered at the 2003 review & assessment stage. In accordance with Technical Guidance, NO₂ values were predicted using the DMRB (Version 1.01). No Exceedences were predicted to occur at these locations.

These junctions have now been re-processed using the DMRB (Version 1.02) as follows:

Newport Street/Devizes Road/Croft Road

Grid ref: 415500 /183500

Estimated 2005 background Nox value = 31.0 ug/m3

Estimated 2005 background NO₂ value = 21.6 ug/m3

Distance from road centre to house façade = 5m

Projected AADT = 40907 vehicles/day (figure computed as per technical guidance - $22875 + 28082 + 16604 \times 2/3$)

Annual average speed = 10 km/h

Vehicle mix: 94% LDV; 6% HDV

DMRB prediction: 35.1 ug/m3 Annual Mean - No Exceedence.

Westcott Place/Kingshill Road/Wootton Bassett Road

Grid ref: 414500 / 184500

Estimated 2005 background NO_x value = 30.6 ug/m3

Estimated 2005 background NO₂ value = 21.4 ug/m3

Distance from road centre to house façade = 5m

Projected AADT = 44267 vehicles/day (figure computed as per technical guidance - $16318 + 22485 + 27598 \times 2/3$)

Annual average speed = 10 km/h

Vehicle mix: 94% LDV; 6% HDV

DMRB prediction: 35.2 ug/m3 Annual Mean - No Exceedence.

- e) Busy streets where people may spend 1 hour or more close to traffic:
Requirement: Identify all busy streets(10,000+ vehicles/day) where members of the public may be exposed within 5 metres of the kerb for 1 hour or more.

These types of location were considered at the 2003 Review & Assessment, using local knowledge. No exceedences of the 1-hour objective standard were predicted to exist. No new locations have been determined.

- f) Roads with high flows of buses and/or HGV's
Requirement: Identify all roads with an unusually high (greater than 25%) proportion of heavy duty vehicles.

These types of location were considered at the 2003 Review & Assessment, using local knowledge. The only road which was considered to fit the criteria, in principle, was Manchester Road (between Corporation Street junction and Wellington Street), which is a feeder road to the Swindon Bus Station. A DMRB assessment was conducted, despite the fact that only 10.25% of vehicles were categorised as HDV's, which predicted no exceedence of the objective standard. The circumstances are not considered to have changed significantly.

- g) New roads constructed or proposed since the previous round of R & A:

No new roads, of significance, have been constructed in the Swindon locality since the 2003 Review & Assessment.

- h) Roads with significantly changed traffic flows, or new relevant exposure:

Requirement: Identify any roads with more than 10,000 vehicles/day that have experienced 'large' (+25%) increases in traffic.

Local knowledge, and assessment of available traffic flow data, confirms that no roads within the Borough have experienced such 'large' traffic flow increases.

- i) Bus Stations:
Requirement: Collect information on the daily movements of buses at the bus station (for bus stations not assessed in previous rounds).

Air quality at Swindon Bus Station was assessed at the 2003 Review & Assessment. 'Relevant public exposure', relative to the objective standards for NO₂, is not considered to occur at the location.

j) New Industrial Sources:

There are no industrial sources of relevance for Nitrogen Dioxide in the authority, or any of the neighbouring authorities

k) Industrial sources with substantially increased emissions, or new relevant exposure:

An assessment of the relevant 'permitted processes' within the district has not revealed any substantially increased emissions. Neither has any new relevant exposure been identified.

l) Aircraft:

There are no airports, handling other than very light aircraft, within the Swindon Borough Council district.

9.3 Conclusion:

The updating & screening assessment for Nitrogen Dioxide indicates that no exceedences of the objective standards (previously specified), arising from either industrial or road traffic sources are predicted to occur within the Swindon Borough Council area.

No detailed assessment for this pollutant is therefore considered necessary at present.

10. Updating & Screening Assessment for Sulphur Dioxide.

Objective standards:

350 ug/m³ measured as a 1-hour mean not to be exceeded more than 24 times per year, to be achieved by the end of 2004

125 ug/m³ measured as a 24-hour mean not to be exceeded more than 3 times per year, to be achieved by end of 2004

266 ug/m³ measured as a 15-minute mean not to be exceeded more than 35 times per year, to be achieved by end of 2005

Sulphur Dioxide is a corrosive acidic gas which combines with water vapour in the atmosphere to produce acid rain. Acid rain has been implicated in the damage and destruction of vegetation and in the degradation of soils, building materials and water courses. SO₂ is also associated with asthma and chronic bronchitis.

The principle source of this gas is power stations burning fossil fuels which contain sulphur. Major SO₂ problems now only tend to occur in cities in which coal is still widely used for domestic heating, in industry and in power stations. As some power stations are now located away from urban areas, SO₂ emissions may effect air quality in both rural and urban areas.

Since the introduction of the Clean Air Acts in the 1950's & 1960's, UK-wide SO₂ emissions have diminished steadily and, in recognition of this fact, a decision was recently taken by DEFRA to substantially reduce the scope of the non-automatic Smoke & SO₂ monitoring network, to which Swindon Borough Council contributed until towards the end of 2004.

10.1 Information to collated for the R & A:

- a) Monitoring data outside an AQMA
- b) Monitoring data within an AQMA
- c) New industrial sources
- d) Industrial sources with substantially increased emissions, or new relevant exposure
- e) Areas of domestic coal burning
- f) Small boilers >5 MW (thermal)
- g) Shipping
- h) Railway Locomotives

10.2 Assessment:

- a) Monitoring data outside an AQMA:
Requirement: Collate all sulphur dioxide monitoring data, including data from 8-port bubbler samplers

As mentioned in the introductory narrative, evidence confirms that UK-wide SO₂ emissions have diminished steadily since the 1960's to the point that, in most UK cities, they are no longer considered to pose a threat to health. Accordingly DEFRA have determined that there is no longer a need to maintain the national network of Smoke & SO₂ samplers, one of which was located in Swindon. The Swindon unit was, therefore, formally de-commissioned. However, temporary operating problems had, in fact, resulted in a shut-down from the end of November 2004.

b) Monitoring within an AQMA:

No Air Quality Management Areas have been declared within the Swindon district

c) New industrial sources:

No new industrial sources of relevance for Sulphur Dioxide in the authority, or any of the neighbouring authorities, have been identified.

d) Industrial sources with substantially increased emissions, or new relevant exposure:

An assessment of the relevant 'permitted processes' within the district has not revealed any substantially increased emissions. Neither has any new relevant exposure been identified.

e) Areas of domestic coal burning:

This was examined in the 2003 USA. No areas of domestic coal burning were identified and there has been no change to this position.

f) Small boilers >5 MW:

This was examined in the 2003 USA. Local knowledge of the locality & significantly large buildings confirms that there are no boiler plants of such capacity burning coal or fuel oil.

g) Shipping:

Emissions from shipping are not relevant to the Swindon Borough district.

- h) Railway Locomotives:
Requirement: Identify locations where diesel or steam locomotives are regularly stationary for periods of 15 minutes or more.

This was examined in the 2003 USA. Despite the historic involvement of the Great Western Railway in the growth of Swindon through the nineteenth & twentieth centuries, there is no longer any noteworthy railway activity within the Borough which would give rise to exceedence of the 15 minute objective standard.

10.3 Conclusion:

The updating & screening assessment for Sulphur Dioxide indicates that no exceedences of the objective standards (previously specified), arising from either industrial or road traffic sources are predicted to occur within the Swindon Borough Council area.

No detailed assessment for this pollutant is therefore considered necessary at present.

11. Updating & screening assessment for Particulate Matter

Objective standards:

40 ug/m³ measured as an Annual mean, to be achieved by the end of 2004

50 ug/m³, measured as a 24-hour mean, not to be exceeded more than 35 times per year, to be achieved by the end of 2004

50 ug/m³ measured as a 24-hour mean not to be exceeded more than 7 times per year, to be achieved by the end of 2010 (not set in Regulation)

20 ug/m³ measured as an Annual mean, to be achieved by the end of 2010 (not set in Regulation)

Particles as PM₁₀ and PM_{2.5} are emitted by a wide variety of sources including road vehicles (from engine emissions, tyre and brake wear and re-suspended road dust), domestic heating (coal and wood fuels), quarrying, and other industrial sources. A large proportion of ambient Particulate Matter arises from atmospheric reactions between other pollutants, such as ammonia reacting with No_x or SO₂. Natural sources also contribute to ambient PM concentrations.

Although PM₁₀ emissions have continued to decline strongly from 1997 to 2003, this is not the case for urban PM₁₀ concentrations, and the declining trend has more recently given way to a flattening out or even a slight increase. It is unclear to what extent this change in behaviour arises from year-to-year weather variations.

Models are used to predict future concentrations of particulate matter, but the diverse sources of particulate matter make such predictions difficult. Local air quality management is able to identify local hotspots that are not necessarily identified through national studies.

Air Quality Management Areas (AQMA's) have been established by 63 local authorities where exceedences of the 2004 limit values for PM₁₀ are likely. The majority of these are for traffic sources, but there are also AQMA's for industrial, commercial and domestic sources of PM₁₀.

The Action Plans being developed will help to ensure that concentrations are driven down in these areas, but will probably make only a marginal contribution to the wider reduction in concentrations because of the substantial background contribution. The exception to this may be in London and other major conurbations where many local authorities are working together to develop larger scale plans, for example, the low emission zone initiative being developed in London.

11.1 Information to be collated for the R & A:

- a) Monitoring data outside an AQMA
- b) Monitoring data within an AQMA
- c) Road junctions
- d) Roads with high flow of buses and/or HGV's
- e) New roads constructed or proposed since last round of R & A
- f) Roads with significantly changed traffic flows, or new relevant exposure
- g) Roads close to the objective during the second round of R & A
- h) New industrial sources
- i) Industrial sources with substantially increased emissions, or new relevant exposure
- j) Areas of domestic solid fuel burning
- k) Quarries / landfill sites / opencast coal / handling of dusty cargoes at ports etc.
- l) Aircraft

11.2 Assessment:

- a) Monitoring data outside an AQMA
Requirement: Collate all PM₁₀ monitoring data

The authority is not currently monitoring Particulate Matter.

National maps indicate that the estimated annual mean background PM₁₀ values for the Swindon area are in the band 18 > 20 ug/m³ for 2004 and 15 > 18 ug/m³ for 2010

- b) Monitoring data within an AQMA

No Air Quality Management areas have been declared within the Swindon district.

- c) Road Junctions
Requirement: Identify 'busy' (10,000+ vehicles/day) junctions, where there is relevant exposure within 10 metres of the kerb

The Newport Street/Devizes Road/Croft Road junction, and the Westcott Place/Kingshill Road/Wootton Bassett Road junction were considered at the 2003 review & assessment stage. In accordance with the Technical Guidance, PM₁₀ values were predicted using the DMRB (Version 1.01). No Exceedences were predicted to occur at these locations. These junctions have now been re-processed using the DMRB (Version 1.02) as follows:

Newport Street/Devizes Road/Croft Road*Grid Ref: 415500 / 183500**Estimated 2005 background PM₁₀ value =**Distance from road centre to house façade = 5m**Projected AADT = 40907 vehicles/day (figure computed as per technical guidance - $22875 + 28082 + 16604 \times \frac{2}{3}$)**Annual average speed = 10 km/h**Vehicle mix: 94% LDV; 6% HDV****DMRB assessment: 30.7 ug/m³ Annual Mean + 30 days above 50 ug/m³ - No Exceedence*****Westcott Place/Kingshill Road/Wootton Bassett Road***Grid Ref: 414500 /184500**Estimated 2005 background PM₁₀ value = 21.8ug/m³**Distance from road centre to house façade = 5m**Projected AADT = 44267 vehicles/day (figure computed as per technical guidance - $16318 + 22485 + 27598 \times \frac{2}{3}$)**Annual average speed = 10 km/h**Vehicle mix: 94% LDV; 6% HDV****DMRB assessment: 31.1 ug/m³ Annual Mean + 32 days above 50 ug/m³ - No Exceedence***

- d) Roads with high flow of buses and/or HGV's
 Requirement: Identify all roads with an unusually (20%+ of AADT flow) high proportion of heavy duty vehicles
Only one such location, (Manchester Road, between Corporation Street and Wellington Street) exists within the Swindon district. A DMRB assessment carried out at the last round of R & A confirmed no exceedence of the Particulate Matter objective standard was occurring.
- e) New roads constructed or proposed since last round of R & A
 Requirement: Check whether an air quality assessment has already (i.e. for the planning process) been carried out for the new road / establish whether the traffic flow on the new road is/will be 10,000+ vehicles/day, or whether the new road has increased traffic flow on existing roads

No new roads have been constructed, during the past 3 years, within the Swindon district, which meet/are expected to meet the traffic flow criteria, or have impacted upon existing roads to a significant extent.

- f) Roads with significantly changed traffic flows, or new relevant exposure
 Requirement: Identify any roads with more than 10,000 vehicles/day (AADT) that have experienced 'large' (i.e. 25%+) increases in traffic

No roads within the Swindon district have been identified which have experienced such 'large' increases in traffic flow.

- g) Roads close to the objective during the second round of R & A
 Requirement: Identify any roads where between 25 and 35 days exceedences of the 24-hour objective were predicted at relevant locations.

NOTE: In the absence of readily obtainable, up-to-date traffic volume information, the Projected AADT flows which were used for the 2003 USA have been increased by 5% for all sites.

Swindon Road, Stratton:

Grid Ref: 417500 / 186500

Estimated 2004 background PM_{10} value = 23.2 $\mu\text{g}/\text{m}^3$

Distance from road centre to house façade = 5.9m

Projected AADT flow = 35537 vehicles/day

Annual average speed = 44.8 km/h

Vehicle mix: 90% LDV; 10% HDV

DMRB prediction: 30.0 $\mu\text{g}/\text{m}^3$ Annual Mean + 28 days above 50 $\mu\text{g}/\text{m}^3$ - No Exceedence

Kingshill Road, Swindon:

Grid Ref: 414500 / 183500

Estimated 2004 background PM_{10} value = 21.7 $\mu\text{g}/\text{m}^3$

Distance from road centre to house façade = 4.7m

Projected AADT flow = 23609 vehicles /day

Annual average speed = 44.8 km/h

Vehicle mix: 98% LDV; 2% HDV

DMRB prediction: 24.9 $\mu\text{g}/\text{m}^3$ Annual mean + 12 days above 50 $\mu\text{g}/\text{m}^3$ - No Exceedence

Cricklade Road, Swindon:

Grid Ref: 415500 / 187500

Estimated 2004 background PM_{10} value = 22.7 $\mu\text{g}/\text{m}^3$

Distance from road centre to house façade = 13.5m

Projected AADT flow = 25833 vehicles/day

Annual average speed = 36.8 km/h

Vehicle mix: 945 LDV; 6% HDV

DMRB prediction: 27 ug/m3 Annual mean + 18 days above 50 ug/m3 - No Exceedence

Wootton Bassett Road, Swindon

Grid Ref: 413500 / 184500

Estimated 2004 background PM₁₀ value = 21.1 ug/m³

Distance from road centre to house façade = 10.8m

Projected AADT flow = 29486 vehicles/day

Annual average speed = 44.8 km/h

Vehicle mix: 94% LDV; 6% HDV

DMRB prediction: 25.4 ug/m3 Annual mean + 13 days above 50 ug/m3 - No Exceedence

Bruce Street, Swindon:

Grid Ref: 413500 / 185500

Estimated 2004 background PM₁₀ value = 21.2 ug/m³

Distance from road centre to house façade = 22.3m

Projected AADT flow = 41680 vehicles/day

Annual average speed = 38.4 km/h

Vehicle mix: 95% LDV; 5% HDV

DMRB prediction: 24.9 ug/m3 Annual mean + 12 days above 50 ug/m3 - No Exceedence

Queens Drive (Drakes > Magic R'abouts), Swindon:

Grid Ref: 416500 / 184500

Estimated 2004 background PM₁₀ value = 22.2 ug/m³

Distance from road centre to house façade = 22m

Projected AADT flow = 56376 vehicles/day

Annual average speed = 48km/h

Vehicle mix: 94.4% LDV; 5.6% HDV

DMRB prediction: 26ug/m3 Annual mean + 15 days above 50 ug/m3- No Exceedence

Marlborough Road, Swindon:

Grid Ref: 416500 / 182500

Estimated 2004 background PM₁₀ value = 21.3 ug/m³

Distance from road centre to house façade = 16.5m

Projected AADT flow = 23652 vehicles/day

Annual average speed = 48 km/h

Vehicle mix: 98% LDV; 2% HDV

DMRB Prediction: 23.6 ug/m3 Annual mean + 9days above 50 ug/m3 - No Exceedence

h) New Industrial sources

No new Industrial processes of relevance for Particulate Matter in the authority, or neighbouring authorities, have been identified.

i) Industrial sources with substantially increased emissions, or new relevant exposure

Requirement: Determine whether any of the sources identified during previous rounds as potentially significant have 'substantially' (greater than 30% increase) increased emissions

At the 2003 round of R & A only one industrial process, Tyco Electronics Ltd. based at Dorcan Industrial Estate, was identified as a potential source of significant Particulate Matter emission. Current emissions data from the plant operators confirms that there has been no change in this position.

j) Areas of domestic solid fuel burning

Requirement: Identify areas where 'significant' (any area of about 500 sq.m. with more than 50 houses burning solid fuel as their primary source of heating) solid fuel burning still takes place

This was examined in the 2003 USA. No areas of domestic coal burning were identified and there has been no change to this position.

k) Quarries / landfill sites / opencast coal / handling of dusty cargoes at ports etc.

Requirement: Evaluate such fugitive dust sources if they were not assessed during previous rounds of R & A, or if there is new relevant exposure

This was examined at the 2003 USA. No such sources of Particulate Matter emission were determined and there has been no change to this position.

l) Aircraft

Requirement: Evaluate aircraft emissions at airports if they had not been considered during previous rounds of R & A, or if there is new relevant exposure

There are no airports, handling other than very light aircraft, within the Swindon Borough Council district.

11.3 Conclusion:

The updating & screening assessment for Particulate Matter indicates that no exceedences of the objective standards (previously specified), arising from either industrial or road traffic sources are predicted to occur within the Swindon Borough Council area.

No detailed assessment for this pollutant is therefore considered necessary at present.

Appendix 1

Nitrogen Dioxide Passive Diffusion Tube Monitoring

Monitoring of Nitrogen Dioxide levels, using passive diffusion tubes, is a widely used and recognised technique. Passive samples are easy to use, easy to site, and are relatively inexpensive, so they can be deployed in large numbers over a wide area, giving good spatial coverage.

However, diffusion tubes have two limitations, Firstly they are only an *indicative* monitoring technique, which, whilst ideal for screening surveys, or for identifying locations where NO₂ concentrations are highest, they do not provide the same level of accuracy as automatic monitoring techniques. Secondly, as the exposure period is typically several weeks, the results cannot be compared with air quality objective standards based on shorter averaging periods, such as hourly means.

Diffusion tube samplers operate on the principle of molecular diffusion, with molecules of a gas diffusing from a region of high concentration (i.e. the open end of the tube) to a region of low concentration (i.e. the closed, absorbent, end of the tube).

Their performance is affected by several mechanisms, which may cause them to exhibit positive bias (over-read), or negative bias (under-read) relative to the reference technique. It is therefore necessary to adjust the raw data by an appropriate factor which will have been derived by comparison of diffusion tube data with an automatic chemiluminescent analyser.

In view of the fact that Swindon B.C. does not operate a real-time chemiluminescent analyser, the appropriate bias correction (1.07 for the year 2005) has been taken from studies undertaken by Air Quality Consultants Ltd., on behalf of DEFRA.

Bristol City Council Scientific Services unit has been contracted by Swindon Borough Council, since the inception of the Nitrogen Dioxide monitoring programme, to supply and analyse the diffusion tubes. The laboratory does not hold accreditation for NO₂ tube analysis, but does participate in the Workplace Analysis Scheme for Proficiency (WASP) for NO₂ tubes. The laboratory also participates in a Quality Control programme managed by the National Environmental Technology Centre (NETCEN).

Nitrogen Dioxide diffusion tube results: 2000 onwards

All values expressed as micrograms/cubic metre - ug/m3

Objective Standard:

200 ug/m3 not to be exceeded more than 18 times per year, measured as a 24-hour mean to be achieved by the end of 2005

40 ug/m3 measured as an Annual Mean to be achieved by the end of 2005

(Note: DEFRA guidance advises that if the Annual Mean objectives are not exceeded, Authorities may confidently assume that the short-term (1-hour) objectives will also be met).

2000 Nitrogen Dioxide diffusion tube results - ug/m3

Site 1^:	GWR Museum , Faringdon Road, Swindon	(Roadside site) - 2.7m from Emlyn Square) Grid Ref: SU 146 847
Site 2^:	Pipers Way, Swindon	(Intermediate site) – 30m from Pipers roundabout) Grid Ref: SU 159 829
Site 3^:	Roussel Laboratory, Kingfisher Drive, Swindon	(Urban background site) – 123m from Dorcan Way) Grid Ref: Su 185 853
Site 4^:	Crowdys Hill School, Jefferies Avenue, Swindon	(Urban background site) – 170m from Cricklade Road) Grid Ref: SU 158 868
Site 5:	F/O 186 Kingshill Road, Swindon	(1m from Kingshill Road, at bottom of hill) Grid Ref: SU 142 839
Site 6	Chalet School, Queens Drive, Swindon	(14.3m from Queens Drive) Grid Ref: SU 160 849
Site 7:	Link Centre, Tewkesbury Way, Swindon	(60m from Tewksbury Way) Grid Ref: SU 117 844
Site 8:	Thornhill, South Marston	(on Thornhill roundabout Grid Ref: SU 189 871
Site 9:	Village Hall, South Marston	(10m from Old Vicarage Lane) Grid Ref: SU 193 879
Site 10:	Ermin Street, Blunsdon	(on dual-carriageway central reservation) Grid Ref: SU 147 899
Site 11:	South Street, Swindon	(Established Nov.1999) (1m from kerbside in South Street, adj. 25 Bow Court) Grid Ref: SU 152 839
Site 12:	Swindon Bus Station	(Established Nov.1999) (within Bus Station) Grid Ref: SU 153 840
Site 13:	Meadow Way, Badbury Wick	(Established Dec.1999) (70m from M4 Motorway kerbside) Grid Ref: SU 194 809
Site 14:	Kingshill Road/Clifton Street, Swindon	(Established Dec.1999) (1m from kerbside of Kingshill Road, towards top of hill) Grid Ref: SU 147 838
Site 15:	Westcott Place, Swindon	(Established Dec.1999) (1.4m from kerbside of Westcott Place) Grid Ref: SU 141 841
Site 16:	F/O 483 Cricklade Road, Swindon	(Established Dec.1999) (5.5m from kerbside of Cricklade Road) Grid Ref: SU 157 860
Site 17:	Bruce Street Bridges, Swindon	(Established Dec.1999) (5.5m from kerbside of Bruce Street roundabouts) Grid Ref: SU 138 855
Site 18:	Validation sample	(*located at site 5)

site no.	Jan.	Feb.	Mar.	Apr.	May	June.	July	Aug	Sept	Oct	Nov	Dec
1^	44.1	36.6	41.3	36.1	19.5	34.8	27.9	25.9	35	23.8	38.5	33.2
2^	29.5	24.9	22.6	23.1	22.8	20.2	12.4	20.3	19.9	20.5	22	25.6
3^	31.5	26.3	26.4	18.3	18.9	15.5	16.2	18.4	22.4	18.9	20.1	30
4^	34.2	n/r	22.9	19.7	15.6	18	10.4	21.6	20.4	38.9	31.9	26.5
5	54.7	39.6	43.3	43.5	43.8	43.7	31.7	42.1	40.2	31.9	40.5	49.8
6	49.7	46.8	43.2	30.5	32.6	33.4	24.2	34.3	32.7	26.4	49.8	39.4
7	34.6	29.9	32.9	23.9	n/r	18.9	16.3	18.6	17	20.8	24.9	25.9
8	44.2	41.7	29.1	30.3	19.8	29.1	14.6	26.2	36.2	35.4	49.8	36.7
9	36	27.7	23.4	14.5	13.1	15.3	8.9	15.3	15.7	19.1	26.6	27.3
10	42.3	29.8	41.1	37.4	28	35.4	29.7	32.5	28.6	30.8	30.9	36.4

11	39.6	32.7	33.9	27.6	22.1	16.6	15.2	20.1	24.1	25.2	30.5	34.7
12	43.6	45.9	49	41.9	37.5	50.4	35.2	35.8	36.4	44	58	47.7
13	46.5	42.6	43.2	25.1	27.4	34.6	21	31.1	26.5	30.5	39.5	42.7
14	49.9	59.1	55.1	42.7	51.4	63.1	38.5	54.1	39.8	39.9	49.6	41.5
15	47.8	46.7	53	53.6	48.8	33.7	30.8	37	44.8	n/r	n/r	48.3
16	51	44.9	48.9	35.1	38.8	33.7	29.2	39.6	34.8	40.8	42.6	37.1
17	42.7	28.9	39.7	42.3	50.1	29.9	22.5	33	27.8	20.3	31.5	42
18*	32.1	46.5								36.1	40.8	50.9

Sites marked ^ contribute to the National Survey and are classified accordingly.

2000 Annual Mean Values:

Site 1^:	(2.7m from kerbside at Emlyn Square)	33.1 (82.75%)	12 samples
Site 2^:	(30m from Pipers Roundabout)	22.0 (55.00%)	12 samples
Site 3^:	(123 m from Dorcan Way)	21.9 (54.75%)	12 samples
Site 4^:	(170m from Cricklade Road)	23.7 (59.25%)	11 samples
Site 5:	(1m from kerbside at bottom of Kingshill Road)	42.1 (105.25%)	12 samples
Site 6:	(14.3m from Queens Drive)	36.9 (92.25%)	12 samples
Site 7:	(60m from Tewksbury Way)	24.0 (60.00%)	11 samples
Site 8	(on Thornhill Roundabout)	32.8 (82.00%)	12 samples
Site 9:	(10 m from Old Vicarage Lane)	20.2 (50.50%)	12 samples
Site 10:	(on dual-carriageway central reservation)	33.6 (84.00%)	12 samples
Site 11	(1m from kerbside at South Street)	26.9 (67.25%)	12 samples
Site 12:	(within Bus Station)	43.8 (109.50%)	12 samples
Site 13:	(74m from M4 Motorway eastbound carriageway)	34.2 (85.50%)	12 samples
Site 14:	(1m from kerbside at top of Kingshill Road)	48.7 (121.75%)	12 samples
Site 15:	(1.4m from kerbside at Westcott Place)	44.5 (111.25%)	10 samples
Site 16:	(5.5 m from kerbside at Cricklade Road)	39.7 (99.25%)	12 samples
Site 17:	(5.5 m from Bruce Street Roundabout)	34.2 (85.50%)	12 samples
Site 18:	Validation sample for Site 5	41.3 (103.25%)	5 samples
	Average for sites 5 & 18 =	41.7 (104.25%)	

2001 Nitrogen Dioxide diffusion tube results - ug/m3

All site details as 2000 (except Site 2)

NOTE: Beginning January 2001, the classifications of sites contributing to the National survey were altered by NETCEN with the effect that Site Nos 1 & 16 are now 'Roadside' sites, (being sites 1 – 5 metres from a busy road, but may be up to 15metres) with sites 3 & 4 'Urban Background' sites, (being sites >50 metres from a busy road and typically in a residential area).

Site No. 2 now re-located at Leamington Grove, Swindon [Grid Ref: SU 166 827] from 01/01/01 and deleted from National Survey.

Site No.16 classified as a 'Roadside' Site contributing to National Survey from 01/01/01 - Due to repeated loss of tubes, this site re-located to F/O 461 Cricklade Road with effect from 02/10/2001; due to further repeated loss of tubes, this site re-located again to opposite side of Cricklade Road, F/O No. 422 (lamp-post 124, 2.6m from kerbside) with effect from 04/03/2003.

site no.	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1^	n/r	42.3	28.5	33.9	34.7	25.2	23.9	23.2	29.3	30.8	35.5	n/r
2	35.5	31.7	30.6	20.2	15.6	8.8	9.7	13.5	17.7	14.5	30.3	21.5
3^	30.3	36.3	24.3	19.2	23.3	12.3	16.8	15.7	13.6	17.2	32.6	28.7
4^	n/r	29.4	26.2	20.7	19.5	10	14.1	16.9	15.6	24.6	34.4	26.5
5	25.9	50.4	37.3	35.6	18.9	28.9	n/r	33.6	29.9	39	56.6	35.9
6	39.1	47	31.9	41.1	28.8	24.5	27.8	29.8	21.4	21.4	45.5	28.9
7	28.3	36.3	26.3	18.6	23.1	12.7	n/r	17.8	n/r	23.4	34.6	26.3
8	36.8	33.9	32.9	21.9	20.5	16.2	25.4	15.2	21.4	27.7	47.6	25.8
9	21	26.7	22.4	18.5	14.3	11.8	14.6	12.5	18.3	15.5	34.4	25.5
10	28.2	42.8	33	28.6	44.7	20.3	26.4	24	32.8	28.8	41.1	38.8
11	44.9	n/r	33.3	26.3	25.7	11.3	15.3	17.7	19	25.2	35.4	19.2
12	50.5	56.3	52.2	57.9	50.3	23.6	35.5	35.5	33.7	37.1	57.7	n/r
13	38.5	46	39.7	36.1	25.4	14.7	22.6	21.6	13.8	31.3	52.8	n/r
14	44.9	61.65	55.7	43.6	49.1	28.3	40.6	37.9	29.1	37.4	44.8	46.9
15	n/r	52.6	n/r	39.2	28	23.4	n/r	32.8	37	42	n/r	n/r
16^	34	48.9	n/r	n/r	n/r	22.1	n/r	n/r	n/r	23.1	n/r	29.5
17	56.9	46.2	43.2	28.8	40.5	19.7	17.2	22.1	24.2	30.5	42.3	40.8
18*	37.3	49.9	47.2	32	31.4	15	n/r	33.5	35.2	36.8	34.7	29.8

2001 Annual Mean Values:

Site 1^: (2.7m from kerbside at Emlyn Square)	30.73	(76.83%)	10 samples
Site 2: (0.5m from kerbside at Leamington Grove)	20.80	(52.00%)	12 samples
Site 3^: (123m from Dorcan Way)	22.53	(56.33%)	12 samples
Site 4^: (173m from Cricklade Road)	21.63	(54.08%)	11 samples
Site 5: (1m from kerbside at bottom of Kingshill Road)	35.64	(89.10%)	11 samples
Site 6: (14.3m from Queens Drive)	32.27	(80.68%)	12 samples
Site 7: (60m from Tewksbury Way)	24.74	(61.85%)	10 samples
Site 8: (on Thornhill Roundabout)	27.19	(67.98%)	12 samples
Site 9: (10m from kerbside at Old Vicarage Lane, South Marston)	19.63	(49.08%)	12 samples
Site 10: (on dual carriageway central reservation, Blunsdon)	32.46	(81.15%)	12 samples
Site 11: (1m from kerbside at South Street)	24.85	(62.13%)	11 samples
Site 12: (within Bus Station)	44.57	(111.43%)	11 samples
Site 13: (74m from M4 Motorway eastbound carriageway)	31.14	(77.85%)	11 samples
Site 14: (1m from kerbside at top of Kingshill Road)	43.33	(108.33%)	12 samples
Site 15: (1.4m from kerbside at Westcott Place)	36.43	(91.08%)	7 samples
Site 16^ (5.5m from kerbside at Cricklade Road)	31.52	(78.80%)	5 samples
Site 17: (5.5m from Bruce Street Roundabout)	34.37	(85.93%)	12 samples
Site 18*: (Validation sample for site 5)	34.80	(87.00%)	11 samples
Average of Sites 5 & 18 = 35.22 (88.05%)			

2002 Nitrogen Dioxide diffusion tube results - ug/m3**All sites as 2001**

site no.	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1^	34.8	24.4	34.7	38.7	n/r	21.1	29.4	29	28.7	29.3	19.5	20.9
2	20.3	19.8	19.1	n/r	11.5	11.5	10.2	7.9	22.2	20.3	25	29.6
3^	26.9	n/r	n/r	16.4	19.5	7.9	18.2	16.9	20.7	24.8	25.9	39.7
4^	31	22.7	17.5	18.2	12.2	15.6	14.5	13.4	23.1	24.5	26.9	10.6
5	n/r	38.9	60.1	40.2	44.7	n/r	18.8	28.9	35	37.5	44	41.3
6	31.4	30.3	42.4	29.5	28.9	22.2	12.9	13.5	24	37.4	34.4	26.7
7	25.6	29.9	36.5	18.9	n/r	n/r	17.6	14.7	17.7	14.8	18.5	29.4
8	32.4	21.7	27.8	23.2	n/r	13.2	26.9	16	17.6	32.2	26.9	20.8
9	44.8	21.7	36.1	13.2	13.1	18.5	17.4	8.9	12.7	22.2	12.2	27.3
10	26.9	23.6	31.3	20.6	20.6	19.7	27.1	26.5	45.7	37.7	28.6	23.3
11	31.6	27.1	33.5	20.5	19	n/r	13.4	n/r	23.4	11.2	8.2	31.3
12	41.7	14.4	44.8	47.9	46	30.5	40.8	30.2	45.7	46.7	47.3	30.6
13	31.8	26.8	37.7	31.5	40.4	45.1	35.4	19	31.6	34.4	21.7	17.4
14	47.4	31	44.3	34.5	39.7	n/r	n/r	35.3	48.2	47.4	20.8	37.2
15	33.1	n/r	30.3	n/r	n/r	15.2	40.9	28.7	48	45.6	53.1	29.8
16^	44	18.7	36.2	23.8	22.5	15.9	n/r	22.7	n/r	n/r	n/r	n/r
17	28.5	21.2	33.1	30	28.5	15.5	22.2	17.8	43.6	38.1	37.8	42.0
18*	n/r	33.6	46.4	n/r	32.1	n/r	29.4	29.4	32	26.8	41.8	38.3

2002 Annual Mean Values:**Bias correction factor = 1.09: values indicated in [] brackets**

Site 1^: (2.7 m from kerbside at Emlyn Square)	28.23 (70.58%)	[30.77]	[76.93%]	11 samples
Site 2: (0.5m from kerbside at Leamington Grove)	17.95 (44.88%)	[19.57]	[48.93%]	11 samples
Site 3^: (123m from Dorcan Way)	21.69 (54.23%)	[23.64]	[59.10%]	10 samples
Site 4^: (173m from Cricklade Road)	19.18 (47.95%)	[20.91]	[52.73%]	12 samples
Site 5: (1m from kerbside at bottom of Kingshill Road)	38.94 (97.35%)	[42.44]	[106.10%]	10 samples
Site 6: (14.3m from Queens Drive)	27.80 (69.50%)	[30.30]	[75.75%]	12 samples
Site 7: (60m from Tewkesbury Way)	22.36 (55.90%)	[24.37]	[60.93%]	10 samples
Site 8: (on Thornhill Roundabout)	23.52 (58.80%)	[25.64]	[64.10%]	11 samples
Site 9: (10m from kerbside at Old Vicarage Lane, South Marston)	20.68 (51.70%)	[22.54]	[56.35%]	12 samples
Site 10: (on dual-carriageway central reservation, Blunsdon)	27.63 (69.08%)	[30.12]	[75.30%]	12 samples
Site 11: (1m from kerbside at South Street)	21.92 (54.80%)	[23.89]	[59.73%]	10 samples
Site 12: (within Bus Station)	38.88 (97.20%)	[42.38]	[105.95%]	12 samples
Site 13: (74m from M4 Motorway eastbound carriageway)	31.07 (77.68%)	[33.87]	[84.68%]	12 samples
Site 14: (1m from kerbside at top of Kingshill Road)	38.58 (96.45%)	[42.05]	[105.03%]	10 samples
Site 15: (1.4m from kerbside at Westcott Place)	36.07 (90.18%)	[39.32]	[98.30%]	9 samples
Site 16^ (5.5m from kerbside at Cricklade Road)	26.43 (66.08%)	[28.80]	[72.03%]	7 samples
Site 17: (5.5m from Bruce Street Roundabout)	29.86 (74.65%)	[32.55]	[81.38%]	12 samples
Site 18*: (Validation sample for Site 5)	34.42 (86.05%)	[37.52]	[93.80%]	9 samples
Average of Sites 5 & 18 = 36.68 (91.70%) [39.98] [99.95%]				

2003 Nitrogen Dioxide diffusion tube results – ug/m3

All sites as 2002 excepting Site 16, which was re-located, due to repeated tube loss, to opposite side of road, F/O 422 Cricklade Road with effect from 04/03/0

Site No.	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1^	37.0	44.7	35.3	32.9	26.4	38.8	24.9	30.3	32.5	41.0	40.0	40.8
2	27.7	29.4	25.3	20.5	10.5	13.9	11.6	18.7	17.6	26.3	25.9	31.6
3^	30.9	34.8	30.5	25.2	5.8	18.0	13.9	22.1	25.1	30.5	36.4	33.2
4^	26.5	24.7	28.8	22.7	14.4	18.3	11.9	16.1	24.5	25.0	N/r	27.8
5	45.6	34.9	44.8	40.6	21.0	39.8	33.0	33.0	46.8	34.9	39.6	44.5
6	41.7	42.4	31.3	34.6	25.9	41.2	30.6	29.6	35.4	38.8	38.0	37.3
7	30.5	33.0	32.2	26.1	16.1	16.8	17.5	23.6	23.3	25.4	31.1	32.2
8	36.6	44.2	16.4	31.8	21.5	18.0	27.2	N/r	N/r	34.5	50.4	44.9
9	27.5	34.3	23.6	18.4	9.9	16.1	12.9	15.6	19.8	23.6	29.5	30.5
10	38.7	47.7	33.0	44.0	30.7	25.4	25.6	49.6	42.5	36.2	36.1	46.4
11	31.8	39.9	34.0	28.0	15.0	15.7	17.6	17.4	21.6	32.5	41.3	40.3
12	52.5	50.4	61.6	45.9	49.8	52.9	43.1	45.9	53.7	51.4	61.5	58.3
13	42.0	48.0	42.8	39.2	24.9	36.9	36.3	33.2	45.7	31.8	42.5	39.7
14	53.4	63.9	50.6	48.9	35.7	57.1	51.1	50.8	59.1	44.2	52.9	52.2
15	47.3	N/r	N/r	39.0	29.9	31.1	27.1	33.2	36.3	42.9	42.1	51.9
16^	N/r	N/r	42.8	40.2	23.8	30.7	27.8	38.6	45.2	37.2	41.5	49.3
17	35.5	56.8	60.8	48.1	19.9	27.8	21.7	38.2	30.6	43.8	38.6	46.0
18*	45.5	50.8	58.6	36.5	28.5	37.5	34.0	40.8	38.9	35.5	43.5	48.4

2003 Annual Mean Values:**Bias correction factor = 0.92; Values indicated in [] brackets**

Site 1^: (2.7m from kerbside at Emlyn Square)	35.38 (88.45%)	[32.55] [81.38%]	12 samples
Site 2: (0.5m from kerbside at Leamington Grove)	21.58 (53.95%)	[19.85] [49.63%]	12 samples
Site 3^: (123m from Dorcan Way)	25.53 (63.83%)	[23.49] [58.73%]	12 samples
Site 4^: (170m from Cricklade Road)	21.88 (54.70%)	[20.13] [50.33%]	11 samples
Site 5: (1m from kerbside at bottom of Kingshill Road)	38.21 (95.53%)	[35.15] [87.88%]	12 samples
Site 6: (14.3m from Queens Drive)	35.57 (88.93%)	[32.72] [81.80%]	12 samples
Site 7: (60m from Tewksbury Way)	25.65 (64.13%)	[23.60] [59.00%]	12 samples
Site 8: (on Thornhill Roundabout)	32.55 (81.38%)	[29.95] [74.88%]	10 samples
Site 9: (10m from kerbside at Old Vicarage Lane, South Marston)	21.80 (54.50%)	[20.06] [50.15%]	12 samples
Site 10: (on dual-carriageway central reservation at Blunsdon)	37.99 (94.98%)	[34.95] [87.38%]	12 samples
Site 11: (1m from kerbside at South Street)	27.93 (69.83%)	[25.70] [64.25%]	12 samples
Site 12: (within Bus Station)	52.25 (130.63%)	[48.07] [120.18%]	12 samples
Site 13: (74m from M4 Motorway eastbound carriageway)	38.58 (96.45%)	[35.49] [88.73%]	12 samples
Site 14: (1m from kerbside at top of Kingshill Road)	51.66 (129.15%)	[47.53] [118.83%]	12 samples
Site 15: (1.4m from kerbside at Westcott Place)	38.08 (95.20%)	[35.03] [87.58%]	10 samples
Site 16^: (2.6m from kerbside at Cricklade Road - from 04.03.03)	37.71 (94.28%)	[34.69] [86.73%]	10 samples
Site 17: (5.5m from Bruce Street Roundabout)	38.98 (97.45%)	[35.86] [89.65%]	12 samples
Site 18*: (Validation sample for site 5)	41.54 (103.85%)	[38.22] [95.55%]	12 samples

Average of sites 5 & 18 = 39.88 (99.70%) [36.69] [91.73%]

2004 Nitrogen Dioxide diffusion tube results – ug/m3**Sites 19, 20 & 21 established from August 2004****Sites 18* & 19* validating Site 14 from August 2004** (Validation of site 5 ceased therefrom)**Site 20** – Side of 130 Kingshill Road (7.0 m from kerbside) [Grid Ref: SU 146 838]**Site 21** – Front of 63 Kingshill Road (1.3 m from kerbside) [Grid Ref: SU 145 839]

Site No.	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1^	26.3	37.7	28.8	33.0	30.1	26.2	29.7	29.3	23.0	34.1	40.3	34.9
2	21.4	25.6	19.7	15.9	16.4	10.1	12.6	13.7	16.1	20.7	26.9	23.2
3^	27.3	28.2	21.2	25.5	19.9	13.9	17.9	20.1	19.6	26.1	36.8	23.6
4^	28.0	28.9	23.4	19.6	14.1	14.2	15.7	18.9	20.2	N/r	31.1	32.8
5	40.3	39.1	N/r	38.6	29.6	26.6	36.5	38.6	35.3	38.1	41.4	39.7
6	41.3	36.7	28.2	28.7	29.1	32.0	30.2	37.2	37.2	34.5	41.5	30.9
7	18.1	32.2	19.3	20.0	18.2	15.5	20.5	19.8	28.3	22.6	29.5	31.6
8	38.4	39.1	29.9	32.3	N/r	21.0	N/r	34.3	25.2	36.7	41.6	44.8
9	23.6	23.3	18.3	16.4	15.4	15.0	14.9	18.0	16.9	18.4	28.7	23.1
10	33.6	41.4	29.3	32.7	40.4	20.8	33.6	38.1	39.2	37.6	42.1	34.8
11	25.2	31.1	23.9	23.4	21.9	12.0	16.6	20.2	20.9	27.7	34.9	29.4
12	49.1	58.4	43.3	42.1	44.9	47.9	47.1	48.2	48.5	44.3	41.1	54.2
13	36.8	37.4	32.5	35.5	27.4	29.8	33.3	45.3	36.9	35.9	37.8	43.7
14	46.0	53.7	33.0	46.2	32.8	30.4	43.6	39.9	33.8	30.3	34.2	38.8

15	30.5	42.3	28.4	26.7	38.1	28.4	25.9	31.2	27.9	34.3	41.2	33.8
16^	30.0	44.9	32.4	34.5	35.4	21.1	24.8	30.7	29.0	N/r	35.7	37.9
17	27.3	39.1	29.1	31.6	33.5	18.2	22.2	23.1	30.5	29.8	29.0	35.0
18*	40.4	40.6	N/r	30.7	32.2	31.2	35.8	35.5	33.2	29.2	35.0	35.0
19*								36.6	33.6	28.5	35.1	45.5
20								18.4	20.5	35.4	27.0	26.0
21								27.7	28.8	21.8	37.0	36.4

2004 Annual Mean Values:

Bias correction factor = 0.97; Values indicated in [] brackets

Site 1^: (2.7m from kerbside at Emlyn Square)	31.12 (77.80%)	[30.19] [75.48%]	12 samples
Site 2: (0.5m from kerbside at Leamington Grove)	18.53 (46.33%)	[17.97] [44.93%]	12 samples
Site 3^: (123m from Dorcan Way)	23.34 (58.35%)	[22.64] [56.60%]	12 samples
Site 4^: (170m from Cricklade Road)	22.45 (56.13%)	[21.78] [54.45%]	12 samples
Site 5: (1m from kerbside at bottom of Kingshill Road)	36.71 (91.78%)	[35.61] [89.03%]	11 samples
Site 6: (14.3m from Queens Drive)	33.96 (84.90%)	[32.94] [82.35%]	12 samples
Site 7: (61m from Tewkesbury Way)	22.97 (57.43%)	[22.28] [55.70%]	12 samples
Site 8: (on Thornhill Roundabout)	34.33 (85.83%)	[33.30] [83.25%]	10 samples
Site 9: (10m from kerbside at Old Vicarage Lane, South Marston)	19.33 (48.33%)	[18.75] [46.88%]	12 samples
Site 10: (on dual-carriageway central reservation at Blunston)	35.30 (88.25%)	[34.24] [85.60%]	12 samples
Site 11: (1m from kerbside at South Street)	23.93 (59.83%)	[23.21] [58.03%]	12 samples
Site 12: (within Bus Station)	47.43 (119.33%)	[46.01] [115.03%]	12 samples
Site 13: (74m from M4 Motorway eastbound carriageway)	36.03 (90.08%)	[34.95] [87.38%]	12 samples
Site 14: (1m from kerbside at top of Kingshill Road)	38.56 (96.40%)	[37.40] [93.50%]	12 samples
Site 15: (1.4m from kerbside at Westcott Place)	32.39 (80.98%)	[31.42] [78.55%]	12 samples
Site 16^: (2.6m from kerbside at Cricklade Road)	32.40 (81.00%)	[31.43] [78.58%]	11 samples
Site 17: (5.5m from Bruce Street Roundabout)	29.03 (72.58%)	[28.16] [70.40%]	12 samples
Site 18*:a (Validation sample for Site 5)	35.15 (87.88%)	[34.10] [85.25%]	6 samples
b (Validation sample for Site 14)	33.58 (83.95%)	[32.57] [81.43%]	5 samples
Site 19*: (Validation sample for Site 14)	35.86 (89.65%)	[34.78] [86.95%]	5 samples
Site 20: (7m from kerbside at side of 130 Kingshill Road)	25.46 (63.65%)	[24.70] [61.75%]	5 samples
Site 21: (1.3m from kerbside front of 63 Kingshill Road)	30.34 (75.85%)	[29.43] [73.58%]	5 samples

7 month average of sites 5 & 18a = 35.13 (87.85%) [34.09] [85.23%]

5 month (2004) average of sites 14, 18b & 19 = 34.95 (87.38%) [33.90] [84.75%]

2005 Nitrogen Dioxide diffusion tube results – ug/m³

Site 22, F/O of 59 Edale Moor, Liden (Grid Ref: SU 193 830) est. March 2005

Site No.	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
1^	33.5	32.6	31.9	23.8	24.1	20.8	21.9	23.2	29.6	32.7	37.2	37.6
2	24.7	18.8	23.5	12.3	8.3	10.5	12.1	10.1	17.1	13.8	26.5	20.9
3^	25.0	22.5	28.7	17.1	9.0	14.7	14.3	17.2	20.8	21.6	33.9	26.5
4^	N/r	23.0	22.9	17.4	10.6	15.1	11.8	15.2	15.8	26.1	30.1	34.8

5	32.6	26.7	44.4	31.1	24.5	20.5	30.7	27.2	31.1	37.8	N/r	39.8
6	34.9	27.3	29.2	24.5	21.7	23.9	20.0	23.2	27.2	33.4	42.8	31.4
7	25.3	23.0	23.5	14.6	11.0	11.2	17.1	16.6	20.5	22.9	31.1	26.4
8	38.7	30.1	31.0	23.6	20.1	N/r	22.1	18.3	25.5	34.8	43.8	40.5
9	18.7	16.1	20.8	17.2	9.2	7.4	10.7	11.2	17.0	19.3	26.9	23.8
10	35.7	39.6	46.3	32.9	28.5	28.7	31.9	30.9	28.1	41.7	47.9	43.9
11	34.8	25.0	32.7	N/r	12.5	15.2	N/r	14.3	16.6	26.2	32.5	31.3
12	45.4	40.8	49.5	37.2	37.0	46.2	31.6	32.7	47.2	49.8	54.1	54.3
13	35.0	37.3	38.3	38.6	22.7	22.7	24.7	24.9	39.5	39.9	52.1	34.0
14	38.3	37.8	49.8	25.5	35.6	31.9	38.5	36.8	32.7	44.1	41.9	35.3
15	32.3	N/r	34.9	24.5	18.6	24.5	19.9	26.6	29.9	34.1	40.8	41.9
16^	59.2	36.7	37.9	25.7	21.3	21.9	22.9	27.7	30.5	34.8	49.0	40.2
17	32.3	28.9	34.7	24.4	15.9	20.1	20.8	23.4	24.0	30.7	38.1	31.8
18*	30.0	36.7	53.1	26.6	35.3	32.9	35.1	35.2	42.3	45.1	41.1	24.5
19*	36.8	42.7	40.7	28.1	34.2	31.4	37.6	39.4	41.8	44.5	32.0	32.4
20	28.3	27.7	28.1	23.3	12.4	14.9	17.8	17.2	20.4	25.5	33.9	29.9
21	35.4	44.2	51.1	26.8	24.9	22.9	25.6	29.8	27.5	30.7	48.2	44.1
22			23.2	19.1	14.9	26.8	18.1	15.2	19.0	31.6	27.0	25.5

2005 Annual Mean Values:

Bias correction factor = 1.07; Values indicated in [] brackets.

Site 1^ (2.7m from kerbside at Emlyn Square)	29.1 (72.75%)	[31.1]	[77.75%]	12 samples
Site 2 (0.5m from kerbside at Leamington Grove)	16.6 (41.50%)	[17.8]	[44.50%]	12 samples
Site 3^ (123m from Dorcan Way)	21.0 (52.50%)	[22.5]	[56.25%]	12 samples
Site 4^ (170m from Cricklade Road)	20.3 (50.75%)	[21.7]	[54.25%]	11 samples
Site 5 (1m from kerbside at bottom of Kingshill Road)	31.5 (78.75%)	[33.7]	[84.25%]	11 samples
Site 6 (14.3m from Queens Drive)	28.3 (70.75%)	[30.3]	[75.75%]	12 samples
Site 7 (60m from Tewkesbury Way)	20.3 (50.75%)	[21.7]	[54.25%]	12 samples
Site 8 (on Thornhill Roundabout)	29.9 (74.75%)	[32.0]	[80.00%]	11 samples
Site 9 (10m from kerbside at Old Vicarage Lane, South Marston)	16.5 (41.25%)	[17.7]	[44.25%]	12 samples
Site 10 (on dual-carriageway central reservation)	36.3 (90.75%)	[38.8]	[97.00%]	12 samples
Site 11 (1m from kerbside at South Street)	24.1 (60.25%)	[25.8]	[64.50%]	10 samples
Site 12 (within Bus Station)	43.8 (109.5%)	[46.9]	[117.3%]	12 samples
Site 13 (74m from M4 Motorway eastbound carriageway)	34.1 (85.25%)	[36.5]	[91.25%]	12 samples
Site 14 (1m from kerbside at top of Kingshill Road)	37.4 (93.50%)	[40.0]	[100.0%]	12 samples
Site 15 (1.4m from kerbside at Westcott Place)	29.8 (74.50%)	[31.9]	[79.75%]	11 samples
Site 16^ (5.5m from Cricklade Road)	34.0 (85.00%)	[36.4]	[91.00%]	12 samples
Site 17 (5.5m from Bruce Street Roundabout)	27.1 (67.75%)	[29.0]	[72.50%]	12 samples
Site 18* (Validation sample for Site 14)	36.5 (91.25%)	[39.1]	[97.75%]	12 samples
Site 19* (Validation sample for Site 14)	36.8 (92.00%)	[39.4]	[98.50%]	12 samples
Site 20 (7m from kerbside at side of 130 Kingshill Road)	23.3 (58.25%)	[25.0]	[62.50%]	12 samples
Site 21 (1.3m from kerbside at front of 63 Kingshill Road)	34.3 (85.75%)	[36.7]	[91.75%]	12 samples
Site 22 (40m from A419 northbound carriageway)	22.0 (55.00%)	[23.5]	[58.75%]	10 samples
Average for sites 14, 18 & 19 =	36.9 (92.25%)	[39.5]	[98.75%]	

2006 Nitrogen Dioxide diffusion tube results - ug/m3

Site No.	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1^	33.4	38.2	35.0	37.1								
2	24.7	17.2	19.1	16.1								
3^	27.8	31.4	24.1	22.0								
4^	21.5	25.3	21.4	19.0								
5	32.5	38.4	39.8	35.6								
6	30.2	31.2	32.1	33.8								
7	25.2	24.7	26.6	24.0								
8	31.6	37.6	35.8	33.4								
9	22.3	22.1	19.6	16.7								
10	30.9	30.5	33.7	33.2								
11	27.9	25.9	24.7	21.6								
12	46.7	47.0	57.9	55.6								
13	32.4	35.1	30.3	38.0								
14	29.3	50.9	50.2	39.9								
15	34.1	35.1	35.4	33.6								
16^	33.6	33.3	33.2	39.8								
17	40.3	33.1	33.5	26.0								
18*	27.6	35.6	49.5	41.9								
19*	27.9	43.7	45.9	39.6								
20	27.7	28.0	24.8	22.3								
21	43.3	31.7	38.3	39.0								
22	23.2	21.5	23.8	21.0								

Appendix 2

Glossary of Terms:

CO	Carbon Monoxide
SO ₂	Sulphur Dioxide
NO ₂	Nitrogen Dioxide
No _x	Collective term to describe Nitric Oxide & Nitrogen Dioxide
PM ₁₀	Particulate Matter less than 10 microns in diameter
ug/m ³	Micrograms / cubic metre (i.e. one millionth of a gram of pollution per cubic metre)
DEFRA	Department of Environment, Food & Rural Affairs
DMRB	Design Manual for Roads & Bridges
AADT	Annual average daily traffic flow (vehicles / day)
AQMA	Air Quality Management Area
NETCEN	National Environmental Technology Centre