

**Third Round Updating and Screening
Assessment
for
Woking Borough Council**



University of London

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Acknowledgements

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Executive Summary

The role of the local authority review and assessment process is to identify the areas where it is considered that the government's air quality objectives will be exceeded. The Woking Borough Council has previously undertaken the earlier rounds of review and assessment (R&A) of local air quality management and not identified areas that these objectives might be exceeded and where there is relevant public exposure.

This report concerns the third round Updating and Screening Assessment. Local authorities are required to review and assess air quality against the objectives in the Air Quality Regulations 2000 and the amendment regulations as part of a rolling three-year cycle ending in 2010. The air quality objectives to be assessed are for the following seven pollutants: carbon monoxide, benzene, 1,3-butadiene, lead, nitrogen dioxide, sulphur dioxide and particles (PM₁₀). This report provides a new assessment to identify those matters that have changed since the last review and assessment, and which might lead to a risk of the objective being exceeded.

The report follows the prescribed guidance given in technical guidance LAQM. TG (03) and additional advice provided by DEFRA (as Frequently Asked Questions) for the purposes of this round of R&A. This includes guidance on the use of background pollutant concentrations, monitoring results, industrial sources, and road traffic. The guidance also requires both a phased approach and that local authorities only undertake a level of assessment that is commensurate with the risk of an air quality objective being exceeded.

The report identifies that:

For carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide and particles PM₁₀ (for 2004 only) there is not a significant risk of the objectives being exceeded in the Council's area.

For PM₁₀ (for 2010 only) there is a risk of the objectives being exceeded across parts of the Borough. The Council however is not required to undertake actions at this time in respect of this finding, other than to note it for longer term planning purposes.

For nitrogen dioxide the monitoring site results indicated that the annual mean objective was exceeded at Anchor Hill, Knaphill. The monitoring site is located where there is relevant exposure. As a consequence the Council is required to produce a Detailed Assessment based on these findings.

The Council is therefore recommended to undertake the following actions:

1. Undertake a Detailed Assessment of Anchor Hill, Knaphill to determine with reasonable certainty whether or not there is a likelihood of the objective not being achieved.
2. Undertake consultation on the findings arising from this report with the statutory and other consultees as required.
3. To maintain the diffusion monitoring survey of the area.

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1. Introduction

This report is the 2006 Updating and Screening Assessment of air quality for the Woking Borough Council. The purpose of the report is to fulfil the Council's initial obligation under the third round review and assessment of air quality. In so doing it will determine whether or not there is a risk that an air quality objective will be exceeded in the Borough and therefore whether or not the Council needs to undertake a Detailed Assessment of air quality

1.1 Background

Part IV of the Environment Act 1995 introduced new responsibilities to both national and local government throughout the UK.

These responsibilities include the requirement upon the national government and devolved administrations to develop an Air Quality Strategy (AQS) for England, Wales, Scotland and Northern Ireland (DEFRA, 2000). The overall purpose of the AQS is to seek improvements in air quality for the benefit of public health. The first AQS was produced in 1997; it was amended in 2000 and is currently undergoing a further revision. A consultation on the latest review has just been released.

Local air quality management (LAQM) was also introduced by the Environment Act 1995. It requires local authorities to periodically review and assess air quality across their areas. The AQS confirms that LAQM provides a major component of the government's plan for air quality improvement across the UK.

Air quality objectives have been set for those air pollutants deemed to be of most concern and relevance by the AQS. Seven of these pollutants are included under the LAQM regime and regulations for these were introduced. The air quality objectives for the relevant pollutants are given in Table 1. Additional objectives have been set for ozone and polycyclic aromatic hydrocarbons (PAHs), although these have been deemed the responsibility of national government and therefore not applicable to the LAQM process.

The objectives are all based on health-based standards using current scientific advice taking into account the likely cost and benefits, as well as feasibility and practicality in meeting the objectives. The objectives are mostly in line with limit values prescribed by EU Directive, although additional objectives (including bringing forward the date for compliance) have been included for some pollutants.

1.2 Third Round Review and Assessment

This report concerns the third round of LAQM review and assessment (R&A), which is part of a three yearly cycle for review and assessment ending in 2010. It follows the prescribed guidance given in Technical Guidance LAQM. TG (03) (DEFRA, 2003a) and specific amendments released by DEFRA as Frequently Asked Questions in January 2006, supported where necessary by new LAQM Tools. The guidance is designed to help local authorities undertake their duties under the Environment Act 1995 to review and assess air quality in their area from time to time.

It is recognised that whilst most of the original TG03 guidance is still relevant, some parts required revision to reflect the most up-to-date understanding, and to draw upon experience gained during the second round of Review and Assessment.

Updated guidance has been prepared to cover the following issues:

- Background pollution maps and future year calculation tools
- Emissions of sulphur dioxide from steam locomotives
- Emissions of sulphur dioxide from shipping
- Emissions of PM₁₀ from poultry farms

- Data ratification procedures
- NO_x:NO₂ relationships

In addition, the Updating and Screening Assessment (USA) checklists provided in TG03 have been revised and re-issued to take account of all necessary changes.

The guidance requires a phased approach, as with the previous guidance. This requires local authorities to undertake a level of assessment that is commensurate with the risk of an air quality objective being exceeded. It is considered that not every authority will need to proceed beyond the first step of the third round of review and assessment.

The findings from the USA determine the need for the Council to undertake the next step i.e. a Detailed Assessment and then potentially progressing to the declaration of an air quality management area (AQMA) with a need for an air quality action plan (AQAP).

1.3 Progress with Local Air Quality Management – Woking Borough Council

Woking is situated in the heart of Surrey, and is a modern town with excellent rail links to the South West and London Waterloo just 25 minutes away. 60% of the Borough's 6,359 hectares are Green Belt. The Borough has a population of approximately 90,000 in 2004.

The M25 runs through the Borough with the M3 and A3 in easy reach. The main sources of air pollutants are busy and congested roads. There are about 20 minor industrial processes that are regulated by the Council.

The Council undertook its First Round review and assessment of air quality during 1999 – 2000. The main issue with respect to local air quality was found to be road traffic emissions (NO₂ and PM₁₀) emanating from vehicles, but it was considered that the air quality objectives would be met and that it was not necessary to progress to the Stage 3 Review and Assessment.

The 2003 USA considered each pollutant and concluded that the Council needed to undertake a Detailed Assessment for nitrogen dioxide for parts of its area only; Parvis Road in West Byfleet and Maybury Road in Woking. The modelling predictions for the Parvis Road area of Woking indicated that annual mean NO₂ concentrations did not exceed the air quality objective where there is relevant exposure. The junction of Maybury Road and Monument Road were also re-assessed in the light of these findings and found not to exceed the annual mean objective. On the basis of these findings the Council was not required to declare an Air Quality Management Area (AQMA).

The 2005 Progress Report (Woking, 2005) based on up to monitoring showed that the Council is meeting the air quality objectives for NO₂ and benzene.

1.4 Updating Screening and Assessment – important considerations

As with the second round USA, relevant considerations and sources of data include the following:

Monitoring Data

The Council's monitoring of air quality in its area provides an important source of information for understanding air quality in its area. This benefit can be further enhanced if the monitoring is undertaken as part of a wider e.g. national or regional network. It is however important to ensure that there is confidence in the data being produced and used. Hence QA/QC issues need to have been considered and the data produced also need to be properly validated and preferably ratified.

Background Pollutant Concentrations

These are produced nationally for all local authorities in the UK and provide the estimated background annual mean air pollutant concentrations at a 1 km x 1 km grid resolution for 2004 for NO_x, NO₂, PM₁₀, PM₁₀ secondary concentrations, with projected concentrations also available for NO_x (2005,

2010), NO₂ (2005, 2010), PM₁₀ (2005, 2010). The data is available from <http://www.airquality.co.uk/archive/laqm/tools.php?tool=background04>.

The methods to estimate concentrations in other years use Year Adjustment Factors, which are designed to represent typical trends.

Industrial Sources

Both the Environment Agency and the Council regulate industrial sources under the Pollution Prevention and Control Act 1999 and Environmental Protection Act 1990. The Environment Agency is responsible for the largest industrial processes (IPPC/Part A processes), whilst the Council is mainly responsible for smaller Part B and A2 processes. Those small industrial processes that fall outside of Part B/A2 Process control can also be of interest to LAQM. Details of the processes and installations are available from the Council's Public Register (see tables in the Appendix). Since the previous USA, three new operations (printing, respraying of road vehicles and a small waste burner) have commenced. In addition, five processes have ceased to operate. None of these changes are considered to be important for the purposes of this USA.

Road Traffic

Updated details of road traffic movements across the Borough have been made available from the local highway authority, in this instance the Surrey County Council to check for significant changes from the previous USA.

1.5 Relevant exposure

The objectives relate to public exposure to the pollutants. More specifically any areas that may exceed the objectives should relate to "the quality of air at locations which are situated outside of buildings or other man made structures above or below ground, and where members of the public are regularly present" (from the Air Quality regulations). TG03 advises further that the assessment should focus on those locations where members of the public are likely to be regularly present and are likely to be exposed over the period of the objective.

Table 1 Air quality objectives (from Air Quality Regulations 2000 and Amendment Regulations 2002)

Pollutant	Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g m}^{-3}$	Running Annual Mean	31 Dec 2003
	5 $\mu\text{g m}^{-3}$	Annual Mean	31 Dec 2010
1, 3 Butadiene	2.25 $\mu\text{g m}^{-3}$	Running Annual Mean	31 Dec 2003
Carbon Monoxide	10 mg m^{-3}	Daily Maximum Running 8 hour mean	31 Dec 2003
Lead	0.5 $\mu\text{g m}^{-3}$	Annual Mean	31 Dec 2003
	0.25 $\mu\text{g m}^{-3}$	Annual Mean	31 Dec 2008
Nitrogen Dioxide (provisional)	200 $\mu\text{g m}^{-3}$ not to be exceeded more than 18 times a year	1 hour mean	31 Dec 2005
	40 $\mu\text{g m}^{-3}$	Annual Mean	31 Dec 2005
Particles (PM_{10})	50 $\mu\text{g m}^{-3}$ not to be exceeded more than 35 times a year	24 hour mean	31 Dec 2004
	40 $\mu\text{g m}^{-3}$	Annual Mean	31 Dec 2004
Sulphur Dioxide	350 $\mu\text{g m}^{-3}$ not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
	125 $\mu\text{g m}^{-3}$ not to be exceeded more than 3 times a year	24 hour mean	31 Dec 2004
	266 $\mu\text{g m}^{-3}$ not to be exceeded more than 35 times a year	15 minute mean	31 Dec 2005

Table 2 Proposed new particle objectives (from Air Quality Strategy Addendum (2003))

Pollutant	Objective		Date to be achieved by
	Concentration	Measured as	
Particles (PM_{10}) (NB the objective for <u>London is given in brackets</u>)	50 $\mu\text{g m}^{-3}$ not to be exceeded more than 7 (10) times a year	24 hour mean	31 Dec 2010
	20 (23) $\mu\text{g m}^{-3}$	Annual Mean	31 Dec 2010

2. Carbon Monoxide

2.1 Introduction

Carbon monoxide (CO) is a colourless and odourless gas produced by the burning of fuels. Exposure to CO leads to a decreased uptake of oxygen by the lungs and can lead to a range of symptoms as the concentration increases. Early symptoms of exposure include tiredness, drowsiness, headache, pains in the chest and sometimes stomach upsets. Some people, for example those with heart disease, are at an increased risk. Exposure to very high concentrations will lead to death. However such conditions, where there are very high concentrations, are most likely to arise in confined spaces, rather than outdoors where the public are exposed and the air quality strategy (AQS) applies.

The AQS objective for CO, based on advice from the Expert Panel of Air Quality Standards (EPAQS), is as follows:

Objective		Date to be achieved by
Concentration	Measured as	
10 mg m ⁻³	Daily Maximum Running 8 hour mean	31 Dec 2003

2.2 National Perspective

The dominant source of CO in the UK remains road transport (49% of UK emissions in 2003) (DEFRA, 2005), although annual emissions are declining mainly as a result of uptake of abatement technologies (catalytic converters) following the introduction of the Euro standards for road vehicles (since 1993). Significant emissions reductions have occurred over the last decade from Euro standards, with reductions of 42% for CO relative to the no abatement scenario (DEFRA, 2004).

Monitoring results from the UK national network sites confirm that no site exceeded the objective during the period between 2001 and 2005.

Current projections are that emissions will reduce by 78% between 2000 and 2010. National modelling has further indicated that at the end of 2003, major roads will not exceed the objective.

No AQMA were declared in the first and second rounds of R & A (although the first round was based on the previous objective of 11.6mg m⁻³).

Based on TG03 guidance, it is considered highly unlikely that any authority will be required to proceed beyond the updating and screening assessment.

2.3 Third round assessment of CO

A checklist approach is used, based on 1) monitoring data and 2) data relating to very busy roads.

1. For this pollutant, ratified monitoring data are required at locations where there is a potential for public exposure. If the data indicate that the maximum daily running 8-hour concentration exceeds the objective then the Council will be required to proceed to the Detailed Assessment stage.
2. This relates to roads not previously considered and to annual average daily traffic flows exceeding stated flows (which are dependent on the type of road) for areas where the annual mean background is expected to be greater than 1mg m⁻³. If there is relevant exposure within 10m of the kerb then it will be necessary to obtain additional traffic information relating to average speeds and the HGV/LGV split. The DMRB screening model can be used to predict concentrations. (Note if junctions occur along any of the roads then the flows from the roads should be added together.) If the predicted annual mean concentration is greater than 2mg m⁻³ then it is necessary to proceed to the Detailed Assessment stage.

2.4 Monitoring

The Council does not undertake CO continuous monitoring in its area, however monitoring is undertaken in other nearby local authorities, these include the government's AURN site on the A3 near Hook in Kingston (roadside site) and a London Air Quality Network (LAQN) site Sutton 1 (roadside site) in Sutton town centre. The Sutton 1 site closed in 2002. Details of the monitoring and data capture are given in Table 3 based on scaled and ratified data.

There were no periods exceeding the CO objective at these sites over the period 2000 to 2005.

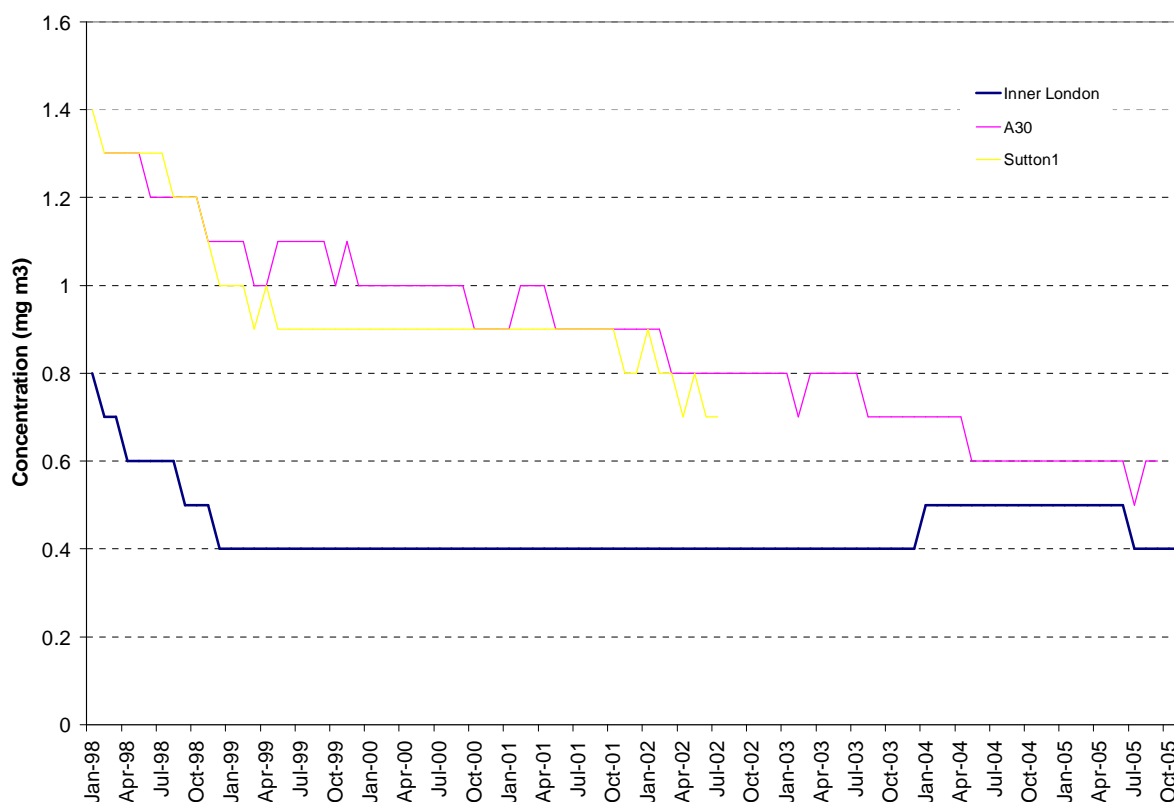
Table 3 CO statistics from nearby LAQN/ AURN sites (mg m^{-3})

A30	2000	2001	2002	2003	2004	2005
Max 8 Hour	5.4	6.5	2.8	3.1	3.1	4.1
Data capture %	97	98	97	97	96	95
Sutton 1	2000	2001	2002	2003	2004	2005
Max 8 Hour	4	7.5	2.2	<i>Closed</i>	<i>Closed</i>	<i>Closed</i>
Data capture %	89	98	32			

(Note – NO indicates not in operation; *italics* indicates < 90% data capture)

An analysis of rolling annual mean concentrations is provided for these sites (plus a background site in inner London for comparison purposes). The analysis is for the period from 1998. Figure 1 illustrates changing concentrations over time, based on changing annual averaged hourly mean concentrations. The use of rolling annual concentrations in this way largely removes seasonal influences and provides a guide to changing trends over time.

Figure 1 Rolling annual mean trends for nearby sites and an inner London site (1998 to 2005)



The rolling annual mean CO concentrations for all sites indicate a downward trend over time in line with reductions in emissions over time. This is as would be expected with older more polluting vehicles being replaced by Euro vehicles incorporating catalytic converters. The reduction in concentration for an average of sites in the London Air Quality Network was 56% (based over the period from 1996 to 2004).

The results of the monitoring in these other authorities are considered representative of the Council's area. These indicate that the objective is being met and therefore a Detailed Assessment of CO based on monitoring is not required.

2.5 Very busy roads or junctions in built up areas

All roads and junctions were considered in the previous USA (including the M25) and none were found to need a Detailed Assessment. This assessment indicated that no road and junction had flows >80,000 vehicles per day for single carriageways, >120,000 vehicles per day for dual carriageways and >140,000 vehicles per day for motorways, apart from the M25. Estimated background concentrations were also below the annual mean threshold of 1mg m^{-3} for CO. For the M25 there was no relevant exposure within 10m of the kerb. Based on these findings it is considered that the objective is very unlikely to be exceeded in the Borough as a result of road traffic emissions.

2.6 Conclusion of third round assessment of CO

There have been no significant changes to CO concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for CO will not be required.

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3. Benzene

3.1 Introduction

Benzene at normal ambient temperatures occurs as a liquid, but it readily evaporates and small amounts are detectable in the air. It is known from workplace studies that benzene is potentially carcinogenic, that is, exposure to it may lead to the development of cancer.

EPAQS (1994) considered that the risks associated with the levels found in the air in the UK to be small and not be measurable with any accuracy. Nevertheless, it considered that efforts continue to be made to reduce the levels even further as a precautionary measure.

The AQS objectives for benzene, based on advice from EPAQS, are as follows:

Objective		Date to be achieved by
Concentration	Measured as	
16.25 $\mu\text{g m}^{-3}$	Running Annual Mean	31 Dec 2003
5 $\mu\text{g m}^{-3}$	Annual Mean	31 Dec 2010

3.2 National Perspective

Benzene emissions arise from the evaporation and combustion of petroleum products, as benzene is a constituent of petrol. It is estimated that 11% of the total emissions from 2003 arose from fuel combustion. Benzene is also exhausted in stack emissions and as fugitive emissions from its manufacture and use in the chemical industry.

In total benzene emissions are estimated to have decreased by 71% between 1990 and 2003, to 18.3 kt in 2003 (DEFRA, 2005).

Monitoring results from national sites using pumped tubes indicated that the stricter 2010 objective was not exceeded. This network started in 2002 and the results include the period from 2002 to 2005.

Emissions from vehicles are predicted to reduce by over 90% from 1990 levels by 2010 (DEFRA, 2004).

One AQMA was declared for benzene during the second round of R & A. This was at a school, which is sited close to a busy petrol station. It was based on the 2010 objective. No AQMAs were declared during the first round.

3.3 Third round assessment of Benzene

A checklist approach is used, based on 1) monitoring data 2) data relating to very busy roads 3) industrial sources/ petrol stations/ major fuel storage depots.

- For monitoring the data should be prioritised, based on locations near busy roads the results at building facades. Where monitoring relating to industrial and other sources is undertaken then monitoring down wind from the site is recommended. If monitoring is undertaken by diffusion tube, suitable QA/QC procedures should be used and the tubes validated and bias corrected. The results will need to be corrected to 2010. If the data indicates that the objective is exceeded then the Council will be required to proceed to the Detailed Assessment stage.
- This relates to roads not previously considered and to 2010 only, where the 2010 annual mean background exceeds $2\mu\text{g m}^{-3}$ and the annual average daily traffic flows exceed the

stated flows (which are dependent on the type of road). If there is relevant exposure within 10m of the kerb then it will be necessary to obtain additional traffic information relating to average speeds and the HGV/LGV split. The DMRB screening model can be used to predict 2010 concentrations. (Note if junctions occur along any of the roads then the flows from the roads should be added together.) If the predicted concentration is greater than $5\mu\text{g m}^{-3}$ then it is necessary to proceed to the Detailed Assessment stage.

- For new industrial and other sources listed in TG03 it is likely that an air quality assessment will have been undertaken as part of planning or authorisation/permit process. The results from this should be cited. Authorities are also asked to check information from previous rounds of R&A and if there are substantially increased emissions (>30% per annum). Where it is necessary to check industrial sources then the annual emission of benzene is needed along with the height of discharge to calculate whether the relevant threshold in the guidance has been exceeded.

For petrol stations it is necessary to identify those stations not covered by previous reports and with a throughput of more than 2000m³, and with nearby roads with more than 30,000 vehicles per day. If there is relevant exposure within 10m of the pumps it is necessary to proceed to a Detailed Assessment.

For major petrol storage depots not covered by previous reports it is necessary to identify relevant exposure and annual emissions to calculate whether the relevant threshold in the guidance has been exceeded.

3.4 Monitoring

The Council undertakes benzene monitoring by diffusion tube at a representative location in its area. The results are shown in Table 4 below. This monitoring indicates that annual mean levels are well below the 2003 objective. Concentrations have varied in recent years but remain less than $3\mu\text{g m}^{-3}$ at the site. Continuous monitoring of benzene is not undertaken nearby; hence it has not been possible to undertake a co-location study to derive a bias correction factor.

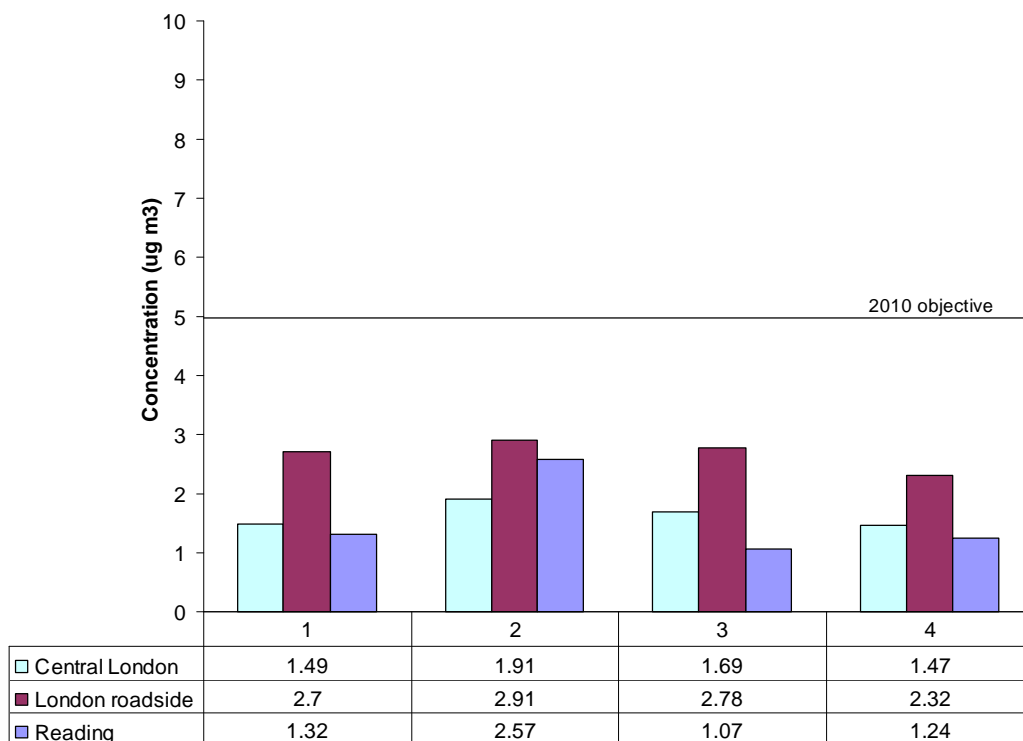
Table 4 Results of benzene monitoring ($\mu\text{g m}^{-3}$) in Woking (2000-2005)

Location	2000	2001	2002	2003	2004	2005
Sandy Lane	1.6	2.3	1.3	2.0	1.3	1.2

Monitoring of benzene is also undertaken at the urban background site in nearby Reading as part of the government's non-automated hydrocarbon network. This network uses pumped tubes that are replaced fortnightly. This site along with other measurements from central London and a London roadside are presented in Figure 2.

All the results are below the 2003 and 2010 objectives, with the concentrations measured at roadside higher than those measured at background. Nevertheless even at busy roadsides in London the 2010 objective is not exceeded. The results also indicate only very slight changes over the limited period of monitoring. Due to the measurement uncertainty and inter annual variability it is not possible to confirm that concentrations are decreasing, although as outlined above further emission reductions are expected.

These monitoring results are considered representative of the Council's area. They indicate that the concentrations will not exceed the benzene objectives for 2003 and 2010 and therefore a Detailed Assessment based on monitoring is not required.

Figure 2 Annual mean concentrations of benzene at representative sites ($\mu\text{g m}^{-3}$)

3.5 Very busy roads or junctions in built up areas

All roads and junctions were considered in the previous USA and none were found to exceed the criteria for the benzene objective. This assessment indicated that no road and junction had flows >80,000 vehicles per day for single carriageways, >120,000 vehicles per day for dual carriageways and >140,000 vehicles per day for motorways, apart from the M25 (where there was no relevant exposure). Estimated 2010 background concentrations were also below the annual mean threshold of $2\mu\text{g m}^{-3}$ for benzene. Based on these findings it is considered that the objective is very unlikely to be exceeded in the Borough as a result of road traffic emissions.

3.6 Industrial sources

There are no new industrial processes or significant increased emissions of benzene from existing industrial processes of relevance in the Borough, or neighbouring areas.

3.7 Petrol stations

The previous USA did not identify any petrol stations where the TG03 criteria applied in the Borough and there has been no change to this position. Two petrol stations have closed since the previous USA. (See Appendix for list of permitted petrol stations in the Borough.)

3.8 Conclusion of third round assessment of benzene

There have been no significant changes to benzene concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for benzene will not be required.

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4. 1,3 Butadiene

4.1 Introduction

1,3 Butadiene arises from the combustion of petroleum products and its manufacture and use in the chemical industry. It is not present in petrol but is formed as a by-product of combustion.

The AQS objective for 1,3 butadiene, based on advice from EPAQS, is as follows:

Objective		Date to be achieved by
Concentration	Measured as	
2.25 $\mu\text{g m}^{-3}$	Running Annual Mean	31 Dec 2003

4.2 National Perspective

Road transport and other machinery are the dominant sources of UK emissions (83% of the total in 2003) (DEFRA, 2005). As with other predominantly vehicle related pollutants, annual emissions are declining mainly as a result of uptake of abatement technologies (i.e. catalytic converters) following the introduction of the Euro standards for road vehicles (since 1993). This has led to a reduction in emissions of 55% relative to a "no abatement" scenario (DEFRA, 2004). Current projections are that emissions will continue to reduce by 81% in 2010.

Current monitoring indicates that all of the UK national network sites were significantly below the 2003 objective during the period between 1999 and 2004 (from TG03) apart from the Marylebone Road site in London in 1999. This site is a very busy kerbside site and concentrations at this site have greatly reduced since. Reductions in emissions from road vehicles are continuing and hence only locations close to industrial sites were expected to proceed beyond the second round updating and screening assessment for this objective.

National mapping also indicated that for all areas the 2003 objective would not be exceeded. No AQMAs were declared in the first round of R&A.

4.3 Third round assessment of 1,3 butadiene

A checklist approach is used, based on 1) monitoring data 2) new industrial sources and existing industrial sources with significantly increased emissions.

1. For monitoring the data should be prioritised and for locations near industrial sites monitoring down wind from the site is recommended. If the data indicates that the objective is exceeded then the Council will be required to proceed to the Detailed Assessment stage.
2. For new industrial processes listed in the guidance it is likely that an air quality assessment will have been undertaken as part of planning or authorisation/permit process. The results from this should be cited. Authorities are also asked to check information from previous rounds of R&A and if there substantial increases in emissions (>30% per annum). Where it is necessary to check an industrial sources then the annual emission of 1,3 butadiene is needed, along with the height of discharge, to calculate whether the relevant threshold emissions rate in the guidance has been exceeded.

4.4 Monitoring

The Council does not undertake monitoring of 1,3-butadiene.

Continuous monitoring however is undertaken at the busy central roadside London site at Marylebone Road, which is part of the government's automated network.

The maximum running annual mean results at this site for the period 2002 to 2005 are approximately $1.14 \mu\text{g m}^{-3}$ (in 2002) and $0.57 \mu\text{g m}^{-3}$ (in 2005). These results indicate that concentrations are dropping over time. The results are also less than the 2003 objective and can be considered representative of the likely maximum in the Council's area, hence they indicate that the concentrations will not exceed the 1,3-butadiene objective. In view of this a Detailed Assessment is not required.

4.5 Industrial sources

There are no new industrial processes or changes relating to existing industrial processes of relevance for 1,3-butadiene in the Borough, or neighbouring areas.

4.6 Conclusion of third round assessment of 1,3-butadiene

There have been no significant changes to 1,3-butadiene concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for 1,3-butadiene will not be required.

5. Lead

5.1 Introduction

Lead in particulate form in air can be inhaled directly by people, and ingested indirectly following its deposition on soil and crops. Exposure to lead has been known to be harmful to people for many years, with severe adverse effects on the blood, the nervous system and the kidneys (although these effects only occur with high exposures). More subtle effects caused by lower exposure to lead can also arise, such as may occur from the presence of lead in drinking water, paint and dust, and in the ambient air. These effects include the impaired intellectual development of children. EPAQS concluded that the available evidence suggests that the risks associated with the levels found in the air in the UK are very small and cannot be measured with any accuracy (EPAQS, 1998). However, efforts should continue to reduce the levels even further as a precautionary measure.

The AQS objective for lead, based on advice from EPAQS, is as follows:

Objective		Date to be achieved by
Concentration	Measured as	
0.5 $\mu\text{g m}^{-3}$	Annual Mean	31 Dec 2003
0.25 $\mu\text{g m}^{-3}$	Annual Mean	31 Dec 2008

5.2 National Perspective

Lead emissions have declined greatly in recent decades, principally as a result of the lead content in fuel (where it was used as an anti-knock additive) being reduced and subsequently phased out at the end of 1999.

Other sources include industrial processes, such as iron and steel production and waste incineration. Emissions from these sources have also decreased as a result of improved abatement measures.

Emissions in 2003 are estimated to be 0.13 kt, a decrease of 95% on the 1990 estimates, with road transport contributing only 1% to UK emissions total (DEFRA, 2005).

Current monitoring indicates that none of the UK national network sites exceeded the 2004 objective during the period between 2000 and 2004, with industrial sites having higher concentrations than urban background sites. Similarly no network sites exceeded the stricter 2008 objective during the period since 2002 (one industrial site in the Midlands exceeded this objective in 2001).

No AQMAs were declared in the first and second rounds of R&A.

Based on TG03, it is considered that only relevant locations in the vicinity of major industrial processes emitting lead will be required to proceed beyond to a Detailed Assessment.

5.3 Third round assessment of lead

A checklist approach is used, based on 1) monitoring data 2) new industrial sources and existing industrial sources with significantly increased emissions.

1. For monitoring the data should be prioritised and for locations near industrial sites monitoring down wind from the site at the nearest residential property is recommended. If the data indicates that the objective is exceeded then the Council will be required to proceed to the Detailed Assessment stage.
2. For new industrial processes listed in the guidance it is likely that an air quality assessment will have been undertaken as part of planning or authorisation/permit process. The results from this should be cited. Authorities are also asked to check information from previous rounds of R&A if there are substantial increases in emissions (>30% per annum). Where it is necessary to check industrial sources then the annual emission of lead is needed along with

the height of discharge to calculate whether the relevant threshold in the guidance has been exceeded.

5.4 Monitoring

The Council does not monitor lead in its area.

Monitoring however is undertaken at a number of sites in London as part of the government's national network. The results from these sites (between 1999 and 2005) show that concentrations do not exceed the objectives for 2003 and 2008. The highest annual mean concentration was $0.038 \mu\text{g m}^{-3}$ at the kerbside site at Marylebone Road site in central London in 2000, although concentrations at the London sites have since reduced. The results are all less than the 2008 objective.

Table 5 Lead monitoring results from London ($\mu\text{g m}^{-3}$)

	2000	2001	2002	2003	2004
Cromwell Rd London	0.032	0.031	0.027	0.022	0.017
Central London			0.022*	0.021	0.015
London Brent	0.024	0.030	0.022	0.025	0.020
London Marylebone Road	0.038	0.036	0.028	0.028	0.0183

These monitoring results are considered representative of the likely highest concentrations in the Council's area. The results indicate that the concentrations will not exceed the 2004 and 2008 lead objectives and therefore a Detailed Assessment is not required.

5.5 Industrial sources

There are no new industrial processes or changes relating to existing industrial processes of relevance for lead in the Borough, or neighbouring areas.

5.6 Conclusion of third round assessment of lead

There have been no significant changes to lead concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for lead will not be required.

6. Nitrogen Dioxide

6.1 Introduction

Nitrogen dioxide (NO₂) and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as nitrogen oxides (NO_x). All combustion processes produce NO_x emissions, largely in the form of nitric oxide, which is then converted to nitrogen dioxide, mainly as a result of reaction with ozone in the atmosphere. It is nitrogen dioxide that is associated with adverse effects upon human health. At high concentrations NO₂ causes inflammation of the lung. Long-term exposure is also considered to affect lung function and exposure to NO₂ is particularly important for people with asthma and related diseases. NO_x is also important in the formation of ozone and secondary particle formation.

The AQS objectives for NO₂ are as follows:

Objective		Date to be achieved by
Concentration	Measured as	
200 µg m ⁻³ not to be exceeded more than 18 times a year	1 hour mean	31 Dec 2005
40 µg m ⁻³	Annual Mean	31 Dec 2005

6.2 National Perspective

The dominant source of NO_x in the UK remains road transport (around 40% of UK emissions in 2003) (DEFRA, 2005). Although in urban areas this proportion is higher, up to 70%. Combustion sources also emit significant amounts of NO_x, however such sources only make a small contribution to NO₂ levels. Significant emissions reductions have occurred over time primarily as a consequence of: abatement measures in road transport and power stations and the increased use of other fuels for power generation. Since 1989, total NO_x emissions are estimated to have declined by 45%.

Despite the above reductions, monitoring results from across the UK continue to indicate that sites, particularly at roadside, exceed the annual mean objective. Although it is only the busiest urban roadside sites that have recorded periods where the hourly standard has been exceeded.

Further improvements are projected to 2010 (with emissions reductions of 69% for NO_x, relative to the no abatement scenario). These reductions arise as tougher Euro standards enter into force for new vehicles, and as the older vehicle fleet is retired. Further emissions reductions are also projected to occur post 2010.

As a result of high concentrations arising post 2005 more than 150 AQMAs were declared across the UK during the first and second rounds of R & A for the annual mean objective.

6.3 Third round assessment of NO₂

A checklist approach is used for the updating and screening assessment, based on 1) monitoring data 2) roads including narrow congested streets and junctions 3) bus stations 4) new industrial sources and existing ones with significantly increased emissions 5) aircraft.

1. Ratified monitoring data should be considered and if the data indicate that the concentration exceeds either objective then the Council will be required to proceed to the Detailed Assessment stage.
2. This section focuses on specific road traffic locations, not fully considered during previous rounds of R&A. For these situations, annual average daily traffic flows exceeding stated flows (which are dependent on the type of road) for different locations are required. If the indications arising from these assessments are greater than 40 µg m⁻³ then a Detailed Assessment is necessary. For any new roads a specific assessment is required based on the

DMRB screening model. Similarly roads close to the objective at the last R&A or roads with significantly changed flows (> 25% increase) should be re-assessed.

3. Bus stations not previously considered should be assessed, based on the numbers of bus movements and the proximity of relevant exposure (in this instance it should be judged against the 1 hour criteria). If the bus station meets these requirements then DMRB is to be used to obtain a predicted annual mean. If the predicted concentration is greater than $40 \mu\text{g m}^{-3}$ then it is necessary to proceed to the Detailed Assessment stage.
4. For new industrial sources (as listed in TG03) it is likely that an air quality assessment will have been undertaken as part of planning or authorisation/permit process. The results from this should be cited. If no assessment were undertaken then TG03 provides nomograms for an assessment. The same approach is required where there has been a substantial increase in emissions (i.e. one greater than 30%).
5. Aircraft emissions not previously considered are important if there is relevant exposure within 1000m of the airport boundary and the equivalent passenger numbers is predicted to exceed 5 million passengers per annum.

6.4 Monitoring

The Council uses diffusion tubes to measure NO_2 in its area. The diffusion tubes used are supplied and analysed by Lambeth Scientific Services using a preparation method of 50% TEA in acetone. The monitoring sites are located mostly at kerbsides and roadsides in the Borough, including one site on a bridge over the M25 motorway. Many of the sites have been monitored since 1996.

Locally derived correction factors are not available, instead default factors obtained from DEFRA helpdesks have been used. The correction factors used (from revised factors dated 31 March 2006) are as follows and the results presented in Table 6 are the bias adjusted results for 2000 to 2005:

Year	Bias adjustment factor
2000	0.97
2001	1.09
2002	1.15
2003	1.05
2004	1.21
2005	1.13

Table 6 NO_2 bias adjusted results in Woking (2000 – 2005) ($\mu\text{g m}^{-3}$)

Location	Type	2000	2001	2002	2003	2004	2005
Cotteridge 1, Constitution Hill, Woking	k	27.8	39.6	52.2	39.9	39.2	32.2
Cotteridge 2, Guildford Rd, Woking	k	40.8	35.4	32.8	25.7	35.4	NA
Parvis Rd, bridge over M25	Other	46.3	41.6	63.3	48.0	59.7	47.5
Church Rd, Byfleet	b	29.6	27.1	32.9	28.1	28.3	23.2
Roseberry Crescent, Old Woking	k	20.4	22.9	22.3	21.1	19.8	18.2
Anchor Hill, Knaphill	k	33.3	43.7	41.0	39.4	43.5	41.6
Lincoln Drive, Pyrford	k	25.9	22.9	24.5	24.6	31.9	21.7
Victoria Way, Woking	k	37.1	47.9	47.0	42.6	34.6	38.2
Bittern Drive, Goldsworth Park	b	20.4	25.0	20.5	18.2	22.9	19.8
Bagshot Rd, Brookwood	k	33.3	31.2	31.7	32.6	28.7	30.4
Parvis Rd, Byfleet	r	50.0	58.3	59.7	47.5	54.3	43.4
Woodham Lane, Woking	k	33.3	39.6	36.6	31.4	42.2	29.5
Goldsworth Rd, Woking	k	29.6	33.3	40.6	35.9	34.0	31.9
Monument Rd, Old Woking	k	35.2	43.7	40.6	35.8	36.7	29.4

It should be noted that the results presented above reflect up to date bias adjustment factors for not only the most recent year (i.e. 2005) but also for earlier years. As a result the bias adjusted results are in some instances different from those reported in the Council's Progress report for 2005.

The results (also shown in Figure 3) indicate that the annual mean objective was not exceeded at any of the background sites (Church Rd, Byfleet and Bittern Drive, Goldsworth Park) over this period. The results for the kerbside sites at Goldsworth Road, Woking; Roseberry Crescent, Old Woking; Lincoln Drive, Pyrford; Woodham Lane, Woking and Bagshot Road, Brookwood have also been consistently below the annual mean objective for the years 2000 to 2005 (apart from 2002 in Goldsworth Road and 2004 in Woodham Lane).

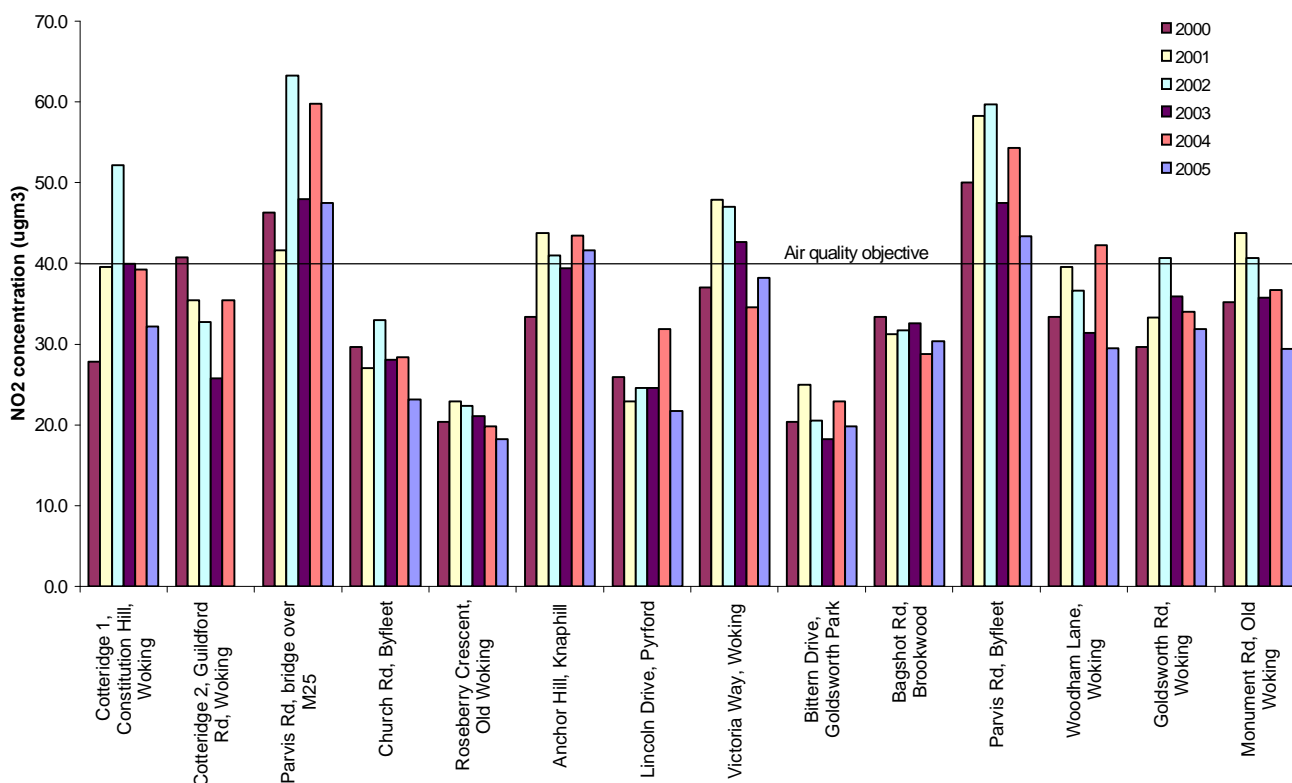
The only sites exceeding the objective in 2005 were the Parvis Road (Byfleet and M25) and Anchor Hill sites. The annual mean results at these sites have been consistently greater than the $40 \mu\text{g m}^{-3}$ standard for the years 2000 to 2005. Both Parvis Road sites have previously been discussed in the both Council's Updating and Screening Assessment in 2003 and Detailed Assessment in 2004. As mentioned above the M25 site does not represent a location relevant for public exposure.

The Parvis Road (Byfleet) site was however investigated more fully in the Council's Detailed Assessment and based on the in depth modelling carried out found not to exceed the air quality objective. As a result of this finding the following comment was made (see Detailed Assessment for Woking BC 2004):

"The measured concentrations also indicated that the site is heavily polluted, indeed more so than other far more heavily trafficked sites e.g. the A3 (greater than 100,000 vehicles per day). This is despite the site having only a moderate traffic flow (22,000) as outlined in Appendix D with low numbers of HGVs. The road is also open to one side and therefore cannot be considered a street canyon. A possible reason for the high concentrations measured is that the diffusion tube is sited very close to the kerb (as a result this means that it does not represent exposure at the façade)."

In conclusion it was confirmed that there was no relevant exposure at this monitoring site and hence there was no need for the Council to designate an AQMA. This report was accepted by DEFRA in its consultation response to the Council.

Figure 3 NO₂ bias adjusted results in Woking (2000 – 2005) ($\mu\text{g m}^{-3}$)



The only other site where the objective has been exceeded in 2005 is Anchor Hill in Knaphill on the outskirts of Woking. Previously the site has not exceeded the annual mean objective, however revised bias adjustment results now indicate that it has exceeded the objective in recent years. The façades of the adjacent houses site are located close to the monitoring site and as such the site represents relevant exposure.

A number of other sites exceeded the $40 \mu\text{g m}^{-3}$ standard prior to 2005, including Victoria Way, Constitution Hill, Woodham Lane, Goldsworth Road and Monument Road. The monitoring results at these sites have since dropped to below the objective in 2005. This suggests either polluting emissions have decreased, in line with national expectations or that another factor e.g. reduced traffic activity or meteorological influence has led to this reduction. The Council will maintain its monitoring at these sites to confirm that this remains the case.

Although continuous monitoring is not undertaken in the Borough, it is undertaken elsewhere in nearby areas. The results for these sites are presented below. The sites include sites that belong to the government's network (AURN) and the London Air Quality Network (LAQN).

The results indicate that the annual mean objective was not exceeded at the background sites for the years monitored, similarly the hourly standard of $200 \mu\text{g m}^{-3}$ was not approached at either site during this time. The A3 roadside site however easily exceeded the annual mean objective for all years monitored. The stricter hourly objective was also exceeded at site in 2005. Recent research (Carslaw D.C and Beevers, S. D, 2005) indicates that direct NO_2 emissions may be increasing and this may be a reason for the hourly objective being exceeded in 2005.

Table 7 Continuous NO_2 monitoring results from nearby sites (2000 to 2005)

		2000	2001	2002	2003	2004	2005
A3 (AURN Roadside)	Annual mean	55	53	58	73	66	61
	Data capture %	97	97	88	80	96	96
	Maximum 1hour	140.2	172.8	368.6	495.8	437.8	563
	Periods exceeding	0	0	6	16	8	21
Mole Valley 2 (LAQN Suburban)	Annual mean	27	28	25	27	26	26
	Data capture %	98	98	99	97	98	99
	Maximum 1hour	107.5	104	97.7	113.5	102.2	108.1
	Periods exceeding	0	0	0	0	0	0
Teddington (AURN Urban background)	Annual mean	29	29	25	28	25	25
	Data capture %	99	94	98	96	94	94
	Maximum 1hour	136.5	143	99.8	131.5	113.1	126.1
	Periods exceeding	0	0	0	0	0	0

The above results from these sites suggest that annual mean objective in Woking may be exceeded at the busiest roadsides in the Borough (based on the busy A3 dual carriageway), but are not likely to exceed the objective at background locations.

6.5 Roads

The second round USA did not identify any narrow congested streets or busy streets where people may spend an hour or more close to traffic. In addition no roads were identified as having less than 20000vpd and a proportion of greater than 25% HGVs. There has been no change to these findings since then and no new roads have been constructed or proposed since the last review.

The busy roads and junctions identified previously have been re-checked as to the need for further action. Those roads that were screened and estimated to have concentrations in excess of the annual mean NO_2 objective were found not to relevant exposure. There has been no subsequent change to this position.

6.6 Bus stations

No potentially significant bus stations were identified in the previous assessment and there has been no change to this position.

6.7 Industrial sources

There are no new industrial processes or changes relating to existing industrial processes of relevance for NO₂ in the Borough, or neighbouring areas.

6.8 Aircraft

The nearest airport to Woking is Fairoaks in neighbouring Surrey Heath Borough Council's area. Although it is within 1km from the Borough's boundary it is a small airport below the passenger throughput of 5 million passengers per annum (as outlined in the TG03 guidance). As such further investigation is not required.

6.9 Conclusion of third round assessment of NO₂

Additional monitoring within the Borough has confirmed that the annual mean objective is exceeded at Anchor Hill, Knaphill. This site has relevant exposure nearby. Based on these findings the Council should now undertake a Detailed Assessment to quantify the extent of the area exceeding the objective near this location.

There have been no other significant changes to NO₂ concentrations or emissions in the Borough since the second round USA.

It is also recommended that the diffusion tubes located on Parvis Road, Byfleet be relocated to a site representing relevant exposure to confirm that the annual mean objective is not exceeded. The Council will also maintain its diffusion tube monitoring at all sites that have previously exceeded an annual mean of 40 µg m⁻³ to check that the objective is not exceeded in the future.

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7. Sulphur Dioxide

7.1 Introduction

Sulphur dioxide (SO₂) is a colourless gas, produced from burning fossil fuels like coal and oil. Power stations and oil refineries are the main sources in the UK, with small releases from other industries. SO₂ is also found naturally in the air at low concentrations from natural releases such as volcanoes and forest fires. SO₂ also has role in the formation of secondary particles.

SO₂ can cause breathing difficulties at high concentrations over short periods of time, particularly to those with asthma and chronic lung disease. As a result the AQS objectives are all incident based as follows:

Objective		Date to be achieved by
Concentration	Measured as	
350 µg m ⁻³ not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
125 µg m ⁻³ not to be exceeded more than 3 times a year	24 hour mean	31 Dec 2004
266 µg m ⁻³ not to be exceeded more than 35 times a year	15 minute mean	31 Dec 2005

7.2 National Perspective

UK emissions have decreased to approximately 1Mt in 2003, representing a decrease of 74% from 1990 (DEFRA, 2005). This is mostly as a result of reduced emissions from the industrial, particularly the electricity supply sector, arising from the decreasing use of coal and increasing use of abatement equipment. However, coal combustion still accounts for 76% of the 2003 UK SO₂ emissions.

Emissions from petroleum use also have reduced due to a decline in fuel oil use and the reduction in the sulphur content in the fuel. These have led (by 2001) to a 96% reduction in SO₂ from the transport sector.

Monitoring results from sites across most of the UK indicate that the AQS objectives are met and that concentrations have reduced in over time. Unlike other LAQM pollutants further large reductions in emissions are not expected in the coming years.

Despite most locations meeting the objectives, there are some areas and locations where high concentrations do arise from specific local sources. As a result 11 local authorities across the UK declared AQMAs during the previous rounds of R & A.

7.3 Third round assessment of SO₂

A checklist approach is used, based on 1) monitoring data 2) new industrial sources and existing ones with significantly increased emissions 3) areas of domestic coal burning 4) boilers burning coal or oil 5) shipping and 6) railway locomotives.

1. Ratified monitoring data are to be considered and if the data indicate that the concentration exceeds any of the objectives then the Council will be required to proceed to the Detailed Assessment stage.
2. For new industrial sources listed in TG03 it is likely that an air quality assessment will have been undertaken as part of planning or authorisation/permit process. The results from this should be cited. If no assessment were undertaken then TG03 provides nomograms for an

assessment. The same approach is required where there has been a substantial increase in emissions (i.e. one greater than 30%).

3. For domestic sources not previously considered there is the need to identify small areas (500 x 500m) where significant coal burning still takes place. If the density of coal burning premises exceeds 100 per 500 x 500m then a Detailed Assessment is required.
4. For boiler plant it is necessary to identify all plant >5MW(thermal) that burns coal or fuel oil and establish whether there is relevant exposure within 500m. If such boilers are found then TG03 provides nomograms for an assessment to be made.
5. For shipping not previously considered or where there is new relevant exposure, it is necessary to identify whether there is relevant exposure close to the berths and main area of manoeuvring. If this is established then the number of ship movements (relating to large ships only) should be collated and if the number exceeds more than 5000 movements per year then a Detailed Assessment is required.
6. Both diesel and coal fired locomotives emit sulphur dioxide and this is most relevant where the locomotives are stationary for periods of 15 minutes or more. It is also necessary to establish whether or not there is relevant exposure within 15m of the source. If there are more than 2 occasions when locomotives are stationary with engines running then it is necessary to go to a Detailed Assessment.

7.4 Monitoring

The Council does not monitor SO₂ in its area.

Monitoring is however undertaken in the neighbouring local authorities of Richmond upon Thames (an urban background AURN site in Teddington) and Sutton 1 (a roadside LAQN in Sutton town centre, which closed in 2002).

The monitoring results indicating the number of periods exceeding the objective standards since 2000 are given in Table 8, along with details of data capture. In all cases the data are fully ratified, apart from the 2005, which are still provisional.

Table 8 SO₂ monitoring in neighbouring local authorities (2000 to 2005)

Site	Data reported	2000	2001	2002	2003	2004	2005
Teddington (AURN)	15 minutes > 266 µg m ⁻³	0	0	0	0	0	0
	1 hour > 350 µg m ⁻³	0	0	0	0	0	0
	24 hour > 125 µg m ⁻³	0	0	0	0	0	0
	Data capture %	97	98	98	98	95	97
	Maximum 15 minute	134.3	139.9	80.1	179.2	169.5	83.3
Sutton 1 (LAQN)	15 minutes > 266 µg m ⁻³	0	0	0			
	1 hour > 350 µg m ⁻³	0	0	0			
	24 hour > 125 µg m ⁻³	0	0	0			
	Data capture %	87	97	31	Closed	Closed	Closed
	Maximum 15 minute	152.8	124.3	85.4			

These results indicate that the standards and hence the objectives have not been exceeded at the monitoring sites during any year. These results are considered representative of the Woking Borough.

7.5 Industrial sources

Part B sources in the Borough and Part A and B sources close to the borders were assessed previously and found not to be relevant. This position has not changed.

7.6 Domestic sources

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

7.7 Boilers

There have been no new small boilers installed within the Borough since the last USA.

7.8 Shipping

There are no local sources of shipping emissions.

7.9 Railway locomotives

Diesel trains were considered in the previous USA and found not to idle at locations close to relevant receptors. This position has not changed.

7.10 Conclusion of third round assessment of SO₂

There have been no significant changes to SO₂ concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for SO₂ will not be required.

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8. Particles (PM₁₀)

8.1 Introduction

The PM₁₀ (particles measuring 10µm or less aerodynamic diameter) standard was agreed to represent those particles likely to be inhaled by humans, accepting that the chemical and physical composition varies widely. In view of this there is a wide range of emission sources that contribute to PM₁₀ concentrations in the UK. Research studies have confirmed that these sources can be divided into 3 main categories (APEG): (i) Primary particle emissions derived directly from combustion sources, including road traffic, power generation, industrial processes etc. (ii) Secondary particles formed by chemical reactions in the atmosphere, comprising principally of sulphates and nitrates. (iii) Coarse particles comprising emissions from a wide range of sources, including re-suspended dusts from road traffic, construction works, mineral extraction processes, wind-blown dusts and soils, sea salt and biological particles.

Particles are associated with a range of health effects, including effects on respiratory and cardiovascular systems, asthma and mortality. As a result, EPAQS recommended a daily standard based on the evidence reviewed with an annual mean standard to assist with policy formation.

A subgroup of the Committee on the Medical Effects of Air Pollutants (COMEAP) is currently preparing a report which will, as far as possible, quantify the benefits to health of reducing air pollution in the UK. This group have previously advised that there is strengthening evidence base that links long-term exposure to particles and mortality and are of the view that the associations reported are likely to represent causal relationships with air pollution. They are also investigating the effects on morbidity and aim to publish a detailed report later in 2006.

The AQS objectives for PM₁₀ are as follows:

Objective		Date to be achieved by
Concentration	Measured as	
50 µg m ⁻³ not to be exceeded more than 35 times a year	24 hour mean	31 Dec 2004
40 µg m ⁻³	Annual Mean	31 Dec 2004

Proposed new particle objectives were introduced by the 2003 Air Quality Strategy Addendum (DEFRA, 2003b) based on the Stage 2 limit values set in the first EU Air Quality Daughter Directive. These objectives were included as provisional pending further EU reviews. TG03 guidance confirmed that local authorities are not statutorily required to assess air quality against these, but advised that they may find it helpful to do so, to assist with longer term development planning.

Objective		Date to be achieved by
Concentration	Measured as	
50 µg m ⁻³ not to be exceeded more than 7 (10) times a year	24 hour mean	31 Dec 2010
20 (23) µg m ⁻³	Annual Mean	31 Dec 2010

(NB the objective for London is given in brackets)

8.2 National Perspective

The main sources of primary PM₁₀ are road transport (with diesel vehicles emitting a greater mass per vehicle kilometre driven than other vehicles), stationary combustion (with domestic coal combustion traditionally being a major source of emissions) and industrial processes (including bulk handling, construction, mining and quarrying).

Current UK emissions are estimated to be 0.14 Mt in 2003 (DEFRA, 2005) and emissions have declined by 51% between 1990 and 2003, partly reflecting a trend away from coal use particularly by domestic users. PM₁₀ emissions from road transport have also shown a steady decline across recent years. Coal combustion and road transport together contributed 57% of UK emissions of PM₁₀ in 2003.

Monitoring results from across the UK continue to indicate that sites, including busy roadside sites, exceed the current 2004 daily mean objective during some years. Concentrations of annual mean PM₁₀ are generally well below the 2004 objective.

Further emissions reductions of 69% for PM₁₀ improvements are projected over the period to 2010, arising as tougher Euro standards enter into force for new vehicles, and as the older vehicle fleet is replaced. Additional post 2010 emissions reductions are also projected to occur (DEFRA, 2004).

As a result of high concentrations arising post 2004 more than 50 AQMAs were declared across the UK during the first and second rounds of R & A for the daily mean objective.

8.3 Third round assessment of PM₁₀

A checklist approach is used, based on 1) monitoring data 2) roads including junctions and new roads 3) new industrial sources and existing ones with significantly increased emissions 4) areas of domestic coal burning 5) quarries, landfill sites, opencast coal, handling of dusty cargoes at ports, etc and 6) aircraft.

1. Ratified monitoring data are to be considered and if the data indicates that the concentration exceeds the 2004 objectives then the Council will be required to proceed to the Detailed Assessment stage.
2. These sections focus on specific road traffic examples not considered in the previous rounds of R&A. For busy roads with annual average daily traffic flows exceeding 10,000vpd any relevant exposure within 10m of the kerb needs to be determined. Then using DMRB screening model to predict the number of 24-hour periods exceeding 50 µg m⁻³. If the number is greater than 35 then a Detailed Assessment is necessary. Similar assessments are required for roads with high numbers of HGVs and/or buses, i.e. where the proportion of this type of vehicle exceeds 20% and the HGV/ bus flow exceeds 2000vpd. For any new roads a specific assessment is required based on the DMRB screening model. Similarly roads close to the objective at the last review and assessment or roads with significantly changed flows (>25% increase) should be re-assessed.
3. For new industrial sources listed in the guidance it is likely that an air quality assessment will have been undertaken as part of planning or authorisation/permit process. The results from this should be cited. If no assessment were undertaken then TG03 provides nomograms for an assessment. The same approach is required where there has been a substantial increase in emissions (i.e. one greater than 30%).
4. For domestic sources, not previously considered, there is the need to identify small areas (500m x 500m) where significant solid fuel burning still takes place. If the density of such premises exceeds 50 houses then the nomogram in TG03 is used to determine whether or not a Detailed Assessment is required.
5. For quarries, landfill and other waste sites, and ports where dusty cargoes are handled not previously considered then it is necessary to identify whether there is relevant exposure near to any unpaved haul road, processing plant and materials handling facility. Poultry farms with known dust problems are also introduced by the new DEFRA advice. The proximity to each relates to distance, which is dependant on the annual mean background. For sites identified there is a need to use professional judgement based on complaints received and concerns with the facility.
6. Aircraft emissions are important if there is relevant exposure within 500m of the airport boundary. If the source has not been previously considered and the equivalent passenger

numbers is predicted to exceed 10 million passengers per annum (mppa) then a Detailed Assessment is required.

8.4 Monitoring

The Council does not monitor PM₁₀ in the Borough.

The following table however provides results from AURN and LAQN monitoring sites in nearby areas within Surrey and outer London. The A3 near Hook in Kingston (AURN) and Sutton 1 (LAQN) sites are roadside and the Mole Valley 2 and Heathrow (both LAQN) sites are located at background sites. The monitoring at these sites is undertaken using TEOM instruments and therefore the results were multiplied by 1.3 to obtain a gravimetric equivalent (in line with TG03 guidance). Monitoring at Sutton 1 closed in 2002 and, apart from that year for this site, 90% data capture was either approached or exceeded for all other sites and years.

Table 9 PM₁₀ monitoring in neighbouring local authorities (2000 to 2005)

		2000	2001	2002	2003	2004	2005
A3 (AURN)	Annual mean	26	27	24	33	27	31
	Days > 50 µg m ⁻³	16	15	3	43	18	20
	Data capture %	98	98	96	96	98	98
Mole Valley 2 (LAQN)	Annual mean	21	22	22	24	20	20
	Days > 50 µg m ⁻³	3	5	4	15	1	1
	Data capture %	90	99	96	99	99	99
Heathrow (LAQN)	Annual mean	28	29	28	31	26	30
	Days > 50 µg m ⁻³	14	21	15	39	13	19
	Data capture %	97	93	97	96	99	89
Sutton 1 (LAQN)	Annual mean	25	26	26			
	Days > 50 µg m ⁻³	10	12	4			
	Data capture %	92	86	33	Closed	Closed	Closed

(Note – bold indicates objective exceeded; italics < 90% data capture)

The results for the sites indicate that the 2004 annual mean objective was not exceeded during any of the years reported. The 24-hour standard however was exceeded for most years at all sites, with the 2004 daily mean objective being exceeded during 2003 at the A3 and Heathrow sites.

It should be noted that 2003 was a year with high pollutant concentrations in many areas of the UK, due to the long periods of high pressure that arose during the hot summer months. Such periods are conducive to secondary particle formation over wide areas.

The monitoring at these sites is considered representative of background and roadside locations in the Woking area.

Based on the above results, an estimate of 2010 concentrations and number of days greater than 50 µg m⁻³ can be made using the TG03 updated guidance. These estimates are given in Table 10.

Table 10 Estimated PM₁₀ results at nearby sites for 2010 (using updated TG03 guidance)

	Annual mean (µg m ⁻³)	No. of days > 50 µg m ⁻³
Mole Valley 2	18.1	1.5
A3	24.5	11.3

Despite the predicted reduction, resulting from future emission changes, the estimates for the A3 roadside site indicate that the provisional 2010 objectives may be exceeded. This suggests that busy roadside sites within Woking may also exceed these provisional future objectives.

8.5 Roads

The second round USA considered major roads in the area and concluded that the 2004 PM₁₀ objectives are unlikely to be exceeded within the Woking Borough as a result of road traffic emissions from busy roads and junctions. As a result a Detailed Assessment was not required.

Additionally no roads with unusually high proportions of heavy goods vehicles (>25%) were identified during the previous USA and there have been no significant increases in traffic flows. There is no change in this position since then and no new roads have been constructed or proposed since the last review.

8.6 Industrial sources

There are no new industrial processes or changes relating to existing industrial processes of relevance for PM₁₀ in the Borough, or neighbouring areas.

8.7 Solid fuel burning

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

8.8 Quarries, landfill sites, etc

There are no quarries or waste transfer sites within the Woking Borough.

The revisions to the TG03 guidance include a reference to potential problems from poultry farms. There is however no poultry farm within the Borough.

8.9 Aircraft

As described in the nitrogen dioxide chapter, there is not an airport in the Borough and therefore further investigation is not needed based on TG03 guidance.

8.10 Conclusion

There have been no significant changes to PM₁₀ concentrations or emissions in the Borough since the second round USA and as a result a Detailed Assessment for PM₁₀ will not be required.

However in line with previous government guidance and for the purposes of future planning the Council will note that the close to localised sources such as busy roads and junctions, the 2010 annual mean objective is likely to be exceeded in 2010.

9. Conclusion / Recommendations

This report follows the technical guidance (TG03 and Frequently Asked Questions) produced for this part of the third round of review and assessment. It therefore fulfils this part of the continuing LAQM process.

The results, from following this methodology, are that the Council has not identified an additional risk of the air quality objectives for the LAQM pollutants: carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide and particles (for 2004 only), being exceeded by the relevant years anywhere in the Council's area. Thus the Council need not proceed beyond the updating and screening assessment for these pollutants.

For nitrogen dioxide the monitoring site results have confirmed that the annual mean objective was exceeded at Anchor Hill, Knaphill. The monitoring site is located where there is relevant exposure. As a consequence the Council is required to produce a Detailed Assessment based on these findings.

The Council has also identified a risk that the air quality objectives for PM₁₀ (for 2010 only) may be exceeded at locations with relevant public exposure. However the Council are not required to undertake a Detailed Assessment for PM₁₀ at this stage and the findings for PM₁₀ will be noted for longer term planning.

The Council is therefore recommended to undertake the following actions:

4. Undertake a Detailed Assessment of Anchor Hill, Knaphill to determine with reasonable certainty whether or not there is a likelihood of the objective not being achieved.
5. Undertake consultation on the findings arising from this report with the statutory and other consultees as required.
6. To maintain the diffusion monitoring survey of the area.

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Appendix

Table 11 List of permitted petrol stations in the Council's area

Installation Address	Ref.
Jet Conaco Ltd., Oyster Lane S Stn., Oyster Lane Woking	EPA/19JL/1/V1
Tesco Esso Express, 77 Old Woking Road, West Byfleet	EPA/12/JL/1/V2
BP Express Ltd., Goldsworth Park Service Ctr., Denton Way	EPA/16/JL/1/V1
Sainsburys, Redding Way, Knaphill, Woking	EPA/11/JL/1/V1
Total, 23 High Street, Knaphill, Woking	EPA/13/JL/1/V1
Safeway Petrol Station, 82 Goldsworth Road, Woking	LC/VR/215
College Service Station, College Road, Maybury Hill, Woking	EPA/18/JL/1/V1
Maybury Hill Service Station, Maybury Hill, Woking	EPA/17/JL/1/V1
Total, 65 High Street, Old Woking	EPA/14/JL/1/V1
Connaught Service Station, Bagshot Road, Brookwood, Woking	FNA/EPA21/1A/V1

Table 12 Part B processes in the Council's area

Process Name	Installation Address
Respraying of Road Vehicles	P & T Repairs, Connaught Road, Brookwood, Woking, Surrey
Manufacture of Timber and Wood-Based Products	Jewson Timber and Building Supplies Limited, Horsell Moor, Horsell, Woking, Surrey
Respraying of Road Vehicles	VGL Accident Repair Centre Limited, Goldsworth Park, Woking, Surrey
Respraying of Road Vehicles	S T J Motors, Sheerwater, Woking, Surrey.
Respraying of Road Vehicles	TAG McLaren Holdings Limited, Units 7 & 8 Woking Business Park, Sheerwater, Woking, Surrey.
Respraying of Road Vehicles	TAG McLaren Holdings Limited, Paragon Centre, Chertsey Road, Horsell, Woking, Surrey.
Crematoria	Woking Crematorium, Hermitage Road, Woking, Surrey.
Waste Oil Burner (Under 0.4 Mw)	SPJ Autos Limited, Unit 6 Forsyth Road, Woking, Surrey
Printing	Unwin Brother Limited, The Gresham Press, Old Woking, Surrey

