



CITY OF
WORCESTER

Local Air Quality Management

Air Quality Review and Assessment Progress Report 2005



Birdseye View of Worcester City Centre, 1998 (looking northwest)

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Executive Summary

The introduction of the Environment Act 1995 and subsequent National Air Quality Strategy instigated a framework of standards and objectives for the assessment of air pollution. The original strategy launched in 1997 was revised in January 2000 to reflect the requirement of the European Union Daughter Directive Limit Values. As part IV of the Environment Act 1995 requires the Local Authorities to periodically review the present air quality and the future air quality to assess whether the nationally prescribed objectives are likely to be achieved.

The Progress Report reviews the pollutants specified under LAQM with regard to guidance issued by Defra in 2003 and the objectives specified in the Air Quality (England) Regulations (2000), the 2002 (amended) objectives and EU Limit Values.

Progress Reports are required to be undertaken in the years when the authority is not carrying out Updating and Screening Assessments or a Detailed Assessment of air quality.

The First Stage of the Review and Assessment was completed in April 1999, which identified the requirement to proceed to a Stage 2 report for Nitrogen Dioxide (NO₂) and Particulate Matter (PM₁₀). Defra had also suggested in its critique of the Stage 1 that insufficient grounds had been given for the exclusion of other pollutants, such as Sulphur Dioxide (SO₂) and Benzene.

Stage 2 was completed in December 2000, this report demonstrated that there was no requirement to proceed to a Stage 3 Review and Assessment, as it was unlikely that any of the Air Quality Objectives would be exceeded.

The next process was the Updating and Screening Process which was completed in June 2003. And a further Review and Assessment Annual Report, which was completed in November 2004, both of these concluded that Worcester City Council was unlikely to exceed in any of the Air Quality Objectives. However it was noted that quality control needed to be improved to ensure that routine calibration, regular maintenance and data management are undertaken to improve the quality of the continuous monitoring data.

This report shows that there are some concerns with the Osiris Monitor at Bridge Street, this was due to road closures in the area causing traffic to take other routes than normal causing a build up of traffic. All of the other Air Quality Objectives are likely to be achieved.

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1. Introduction

The purpose of this report is to advise the residents in Worcester City of the recent air pollution data which gives an indication of the Air Quality across the City. The assessment forms part of the statutory duties surrounding the Local Air Quality Management (LAQM) under Part IV for the Environmental Act, 1995 and the requirement to meet the UK Air Quality Regulations.

This report presents an annual update of the conclusions of the Councils Air Quality Review and Assessment that was published in November 2004.

Progress reports have been introduced into the LAQM system following a detailed evaluation of the first round of the Local Authority review and assessment undertaken by Defra in 2002. They are required in the years that a detailed assessment is not taking place.

As detailed below in Table 1.

Date	Progress Report*	Updating Screening Assessment	Consult	Detailed Assessment	Consult	Declaration	Further Assessment	Consult	Action Plan
2003									
2004									
2005									
2006									
2007									
2008									
2009									

Table 1. Time table for Review and Assessment
Taken from Defra Technical Guidance LAQM. TG (03)

2. The Local Air Quality Management Framework

2.1 Legislative Background

Part IV of the Environment Act 1995 requires that the Local Authorities periodically review air quality within their areas. This process of the Local Air Quality Management (LAQM) is an integral part of delivering the Government's Air Quality Objectives (AQOs) first detailed in 1997 and updated in the Air Quality (England) Regulations 2000. New targets for benzene, carbon monoxide (CO) and particulate matter (PM₁₀) were published in 2002. The objectives for PM₁₀ and benzene supplement the Air Quality (England) Regulations 2000 whilst the objective for CO will replace the existing target.

The Air Quality (England) Regulations 2000 has therefore set standards and objectives for the seven pollutants that are associated with Local Air Quality. The objectives are aimed at reducing the health effects of the pollutants to negligible levels.

The standards are shown in Table 2 below.

Pollutant	Concentration	Measured As	Date to be achieved by
Benzene	16.25 µg/m ³	Running Annual Mean	31/12/2003
	5 µg/m ³	Annual Mean	31/12/2010
1,3-Butadiene	2.25 µg/m ³	Running Annual Mean	31/12/2003
Carbon Monoxide	10 mg/m ³	Running 8 Hour Mean	31/12/2003
Nitrogen Dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1 Hour Mean	31/12/2005
	40 µg/m ³	Annual Mean	31/12/2005
Particulate Matter (PM ₁₀)	50 µg/m ³ Max 35 exceedances	24 Hour Mean	31/12/2004
	40 µg/m ³	Annual Mean	31/12/2004
Lead	0.5 µg/m ³	Annual Mean	31/12/2004
	0.25 µg/m ³	Annual Mean	31/12/2008
Sulphur Dioxide (SO ₂)	266 µg/m ³ Max 35 exceedances	15 Minute Mean	31/12/2005
	350 µg/m ³ Max 24 exceedances	1 Hour Mean	31/12/2004
	125 µg/m ³ Max 3 exceedances	24 Hour Mean	31/12/2004

Table 2 - Air Quality Regulations (England) (Wales) 2000 and in Air Quality (England) (Wales) (Amendment) Regulations

µg/m³ - Micrograms per cubic meter

mg/m³ - Milligrams per cubic meter

The data is assessed in accordance with the air quality standards contained in the Air Quality (England) Regulations 2000, and the Worcester City Council Air Quality Strategy. The standards are expressed as objective levels to be achieved by the dates specified in the regulations.

In addition to the Air Quality (England) Regulations 2000 the EU set Limit Values for Nitrogen Dioxide (NO₂), Benzene and indicative values for Particulate Matter (PM₁₀), to be achieved by 1st January 2010. Although there is no statutory obligation for Worcester City Council to assess air quality against the EU Limit Values, an assessment against these criteria has been undertaken. This will assist with longer term planning and the assessment of development proposals in the area. This is particularly relevant considering the requirement for England to achieve tighter objective concentrations by 2010 in relation to benzene and PM₁₀.

2.2 Phase 1 Review and Assessment

To carry out an Air Quality Review and Assessment the Government recommended a three stage approach. This phased review process used initial simple screening methods and progressed through to more detailed assessment methods of modelling and monitoring in areas identified to be at potential risk of exceeding the objectives. These included an appraisal of the emissions to air from industrial process that are controlled under Part 1 of the Environmental Protection Act 1990, through the Local Air Pollution Control (LAPC) regime. LAPC has now been replaced by:-

- Environment Agency Integrated Pollution Prevention and Control (IPPC) which covers A(1) Installations.
- Local Authority Integrated Pollution Prevention and Control (LA - IPPC) which covers A(2) Installations.
- Local Authority Pollution Prevention and Control (LAPPC) which covers Part B Installations.

The Stage 1 report identified a number of Part B authorised industrial processes in and around the City of Worcester, which required further assessment at Stage 2. Also some other potential sources of mobile emissions were identified from the A38, A4, A449 and B4205. From the findings of the Stage 2 assessment and consultation with Defra, further assessment at Stage 3 was not required hence an AQMA was not declared.

2.3 Phase 2 of Review and Assessment

A second phase of Review and Assessment is required under the 'on-going' Review and Assessment process, which is designed to build on the technical approach, developed for the first round assessments, and identifies the on-going needs or requirements for an AQMA designation. Whilst authorities must carry out what is termed the Updating and Screening Assessment (USA), it is not the intention that all will need to progress to a Detailed Assessment.

For those Local Authorities not progressing to a Detailed Assessment, a Progress Report was required for submission to Defra by the end of April 2004. Worcester City Council showed that it was unlikely that any of the Air Quality Objectives would be exceeded; therefore the next stage was to carry out an Updating and Screening Assessment (USA).

2.4 Updating and Screening Assessment (USA)

Since the publication of reports for the first round of Review and Assessment, there are potentially a number of issues that need to be addressed in terms of changes to the sources and emissions of pollutants that may affect ambient air quality in local authority areas. Furthermore, new policy developments and revisions to published guidance require consideration within the on-going assessment of air quality. The USA is based on a checklist whereby sources identified in the first round of Review and Assessment and any new or altered emission sources, area reviewed with regard to their current significance and any requirement for further assessment. For all emission sources, the 2003 USA concluded that no further assessment at that time was necessary, as the AQOs were not expected to be exceeded.

2.5 Detailed Assessment and Progress Report

Where the USA identifies a potential for the AQO's to be exceeded at location of relevant public exposure, the Local Authority will be required to undertake a Detailed Assessment. Using more sophisticated modelling and monitoring techniques the Detailed Assessment will conclude the need to declare or revise an AQMA if there is a likelihood of the AQO's to be exceeded.

Where it is concluded that a Detailed Assessment is not necessary, a Progress Report is required to be produced on an annual basis as detailed in Table 1 (page 4).

Worcester City Council are required to submit a Progress Report, as no likely exceedences of the AQO's were identified in the USA, and therefore a Detailed Assessment was not required.

In November 2004 the Progress Report was concluded it showed that there were no likely exceedences to AQO's, however it did highlight the need for quality control to ensure that routine calibration, regular maintenance and data management are undertaken to improve the quality of the continuous monitoring data. Therefore a Progress Report will be required for all the UK air quality strategy pollutants.

This Progress Report will cover an update of all the pollutants and where relevant recommendations have been made for emission sources and pollutants concentrations to be considered within the next round of annual reporting due for submission to Defra in April 2006.

3. Policy Developments

A review of the national policy developments has been undertaken. The air quality Progress Report for Worcester has examined the following sources, where relevant, and information as specified in the Government's LAQM technical guidance note published in 2003.

- Changes within local structure and transport plans;
- Additional UK and Local monitoring data;
- New planning developments and those under active consideration; and
- Impacts of Pollution Prevention and Control Regulations.

Since the last Progress Report there have been several planned developments converting office space into residential apartments bringing more people into the centre of the city; however this hasn't had an effect on the air quality at present.

There are two proposed developments which have been identified that may affect air quality in the Lowesmoor area of Worcester. An appropriate air quality impact assessment will be undertaken prior to the granting of planning consent. Given the current levels of pollution, unless actions are taken now to deal with the amount and flow of road traffic in that area there could be a possibility that the AQO's may be exceeded. We have moved the Continuous monitor to a location on this site to start monitoring real time data. (The report is included in Appendix 4.)

4. Air Quality Monitoring Results

4.1 Benzene

The Councils Stage 1 Review and Assessment did not identify any sources with potentially significant emissions of benzene. Further assessment and monitoring of benzene was carried out at Stage 2 to confirm the findings in Stage 1 report. The Stage 2 report concluded that the AQO's for 2003 was unlikely to be exceeded and further assessments were not required.

Diffusion tube monitoring of benzene was undertaken in 1999, but no local monitoring has been undertaken since this time.

There have been no proposed developments in the area that would emit significant amounts of benzene. Using the Defra guidance none of our Part A or Part B processes would give rise to emission that would result in the AQO being exceeded in 2010. Guidance also specifies that where Annual Average daily flow (AADT) flows are not expected to exceed 80,000 (single carriageway) or 140,000 (motorway) vehicles per day in 2010, annual mean concentrations are expected to be below $2\mu\text{g}/\text{m}^3$ and therefore further assessment will not be required at this stage.

The only processes likely to give rise to Benzene emissions within or near to the city boundary are service stations accepting the unloading of petroleum into storage. This is due to the displaced vapour from the storage tanks and, of course, from vehicle fuel tanks. Regulations issued under the Environmental Protection Act 1990 and 1995 amended the Part B process list to include Petrol Stations. As of January 1996 all new Petrol Stations were required to fit vapour recovery equipment to reduce evaporation of volatile organic compounds including Benzene, when the underground tanks are filled by road tankers. And all Existing Petrol Stations with a throughput of $>500\text{m}^3$ petrol will have vapour recovery installed by December 2004. All of our petrol stations have the vapour recovery equipment installed. The following table shows the traffic flow and petrol throughput of our petrol stations in Worcester.

Table 3 Authorised Petrol Stations

Company	EPA Ref	Address	AADT (2005)	Petrol Throughput
Lower wick Station	24	Malvern Road	<30,000	5200m ³
Sainsburys Service Station	25	Windermere Drive	<30,000	7000m ³
Commandery Service Station	26	20 Bath Road	16,868	3200m ³
Tesco Service Station	27	Millwood Drive	<30,000	12900m ³
Tesco Service Station	28	St Peters Drive	<30,000	10900m ³
St Stephens Service Station	30	46/48 Droitwich Road	15,694	2300m ³
Barneshall Service Station	31	Bath Road	16,868	3000m ³
Whittington Road Service Station	32	Whittington Road	20,605	2000m ³
Tesco Service Station	33	London Road	20,605	5000m ³
Blackpole Road Service Station	34	Blackpole Road	16,761	5000m ³
Elbury Park Road	35	Tolladine Road	<30,000	3000m ³
Castle Street Service Station	36	Castle Street	23,481	3000m ³
Tolladine Service Station	40	Tolladine Road	<30,000	1500m ³
Northwick Service Station	42	Ombersley Road	12,598	2750m ³

Notes: AADT flow on minor roads where traffic data is not available have been assumed to be under 30,000 vehicles, based on measured flows for comparative roads.

The petrol stations detailed in Table 3 have an authorised petrol throughput of >1000m³. All of the petrol stations have fitted the vapour recovery equipment. From a review of their locations, none are sited on or near a road with existing or predicted AADT flows in excess of 30,000 vehicles and therefore, do not require further assessment.

Summary

A review of background monitoring data indicates that the running annual mean objective of 16.25 µg/m³ is currently achieved and that the annual mean objective of 5µg/m³ is likely to be achieved by 2010. After review with current Government guidance the Industrial sources and road transport information provided, are still considered unlikely to release significant quantities of benzene. A Update and Screening Assessment will be required for 2006.

4.2 1, 3-Butadiene

In the Councils Stage 1 Review and Assessment and subsequent reports no potentially significant sources of 1, 3-butadiene emissions were identified. Therefore it was concluded that concentrations of 1, 3-butadiene were below the objective and this was likely to be the case for Worcester. Further assessment was therefore not undertaken.

As in our previous assessments a review of the background data (compiled from the UK's National Atmospheric Emissions Inventory sponsored by DEFRA) indicated that the annual mean levels are significantly lower than the objectives. Industrial source information was reviewed in line with government guidance and these were considered unlikely to release significant emissions of 1, 3-butadiene, and there has not been any permitted or planned industrial sources within the Authority since compilation of the data during the first round of assessments.

Summary

A review of the background data indicated that the annual mean objective is already significantly lower than the AQO value and will still be achieved in 2010. A review of the Industrial source information, no Part A or B processes would give rise to significant emissions that would result in the AQO being exceeded in 2005 or 2010 for 1, 3-butadiene.

A Update and Screening Assessment will be required for 2006.

4.3 Carbon Monoxide (CO)

During the Councils Stage 1 Review and Assessment no roads were identified where current or projected flows would be likely to result in an exceedance of the AQO. Guidance specifies that where Annual Average Daily Flow (AADF) flows are not expected to exceed 80,000 (single carriageway) or 140,000 vehicles per day (motorway), the annual mean concentrations are expected to be below 10 mg/m³ in 2005.

No roads within the Worcester region have been identified with existing or predicted AADT flows exceeding 80,000 vehicles. Potential impacts from the M5, on the eastern boundary, are considered to be insignificant due to the effects of dispersion and the distance of relevant receptors. Because the main source of Carbon Monoxide in Worcester is road traffic, and traffic flows in the City do not reach the levels in these sites, no further investigation into this pollutant is deemed necessary.

Road Traffic data has been provided by Worcestershire County Council and is detailed in Table 4 below.

The Table 4 below shows Road Traffic Data supplied by Worcestershire County Council

Road	Location	2001	%HGV	2005	2010
A38	North of St. Martins Gate	16,600	6%	17,722	19,125
A38	South of St. Martins Gate	21,990	5%	23,477	25,334
A38	City Walls Road	23,000	6%	24,555	26,498
A38	Foregate Street	7,208	11%	7,695	8,304
A38	Bath Road	15,800	4%	16,868	18,203
A38	Droitwich Road	14,700	4%	15,694	16,936
A38	Barbourne Road	23,000	6%	24,555	26,498
A44	Bridge Street (one way)	22,000	5%	23,487	25,346
A44	Deansway	19,300	5%	20,605	22,235
A44	North Parade (one way)	21,994	4%	23,481	25,339
A44	Bull Ring	19,300	6%	20,605	22,235
A442	Hylton Road	14,430	3%	15,405	16,625
A4440	Temeside Way	31,200	7%	33,309	35,945
A4440	Broomhall Way	25,000	8%	26,690	28,802
A4440	Nunnery Way	20,700	3%	22,099	23,848
A449	Ombersley Road	11,800	6%	12,598	13,595
A449	Croft Road	22,700	5%	24,235	26,152
A449T	WNL East	19,500	12%	20,818	22,466
A449T	WNL West	19,000	13%	20,284	21,890
B4205	East of St. Martins Gate	20,330	5%	21,704	23,422
B4550	Astwood Road	15,700	2%	16,761	18,088
B4638	Woodgreen Drive	12,300	5%	13,131	14,171
M5	North of Junction 7	98,400	14%	105,052	113,365
M5	North of Junction 6	102,000	14%	108,895	117,513
Junctions					
A38	St. Martins Gate	38,590	11%	41,199	44,456
A44	Bridge St/North Parade	43,994	9%	46,968	50,685
A44/A38	North Parade/Foregate Street	29,202	15%	31,176	33,643
A38	City Walls/Foregate Street	30,208	17%	32,250	34,802

Summary

A review of the background monitoring data indicates that the maximum daily running 8-hour mean objective has been achieved in 2004. Industrial source and road transport information has been reviewed in line with the new Government guidance and these sources are considered unlikely to release significant emissions of Carbon Monoxide.

A Update and Screening Assessment will be required for 2006.

4.4 Lead

During the Councils Stage 1 Review and Assessment five processes were identified as potentially significant sources of lead. However it was concluded that the AQO for lead would not be exceeded as a result of the emissions from these sources due to the controls in place under the respective Part B authorisations.

Worcester City Council have not undertaken a programme of monitoring for lead, as it is anticipated that only locations in the vicinity of major industrial processes, which emit significant quantities of lead, will report concentrations above normal background levels. In our last Report it was considered unlikely that any of the industrial sources were to release significant emissions of lead to exceed the AQO and a Detailed Assessment of lead was not required.

Summary

Industrial source information has been reviewed in line with current Government guidance and is considered unlikely to release significant emissions of lead. In addition it is expected that existing national policies will deliver the air quality objectives for lead.

A Update and Screening Assessment will be required for 2006.

4.5 Nitrogen Dioxide (NO₂)

A number of industrial Part B processes and roads within the Worcester City Council area were identified as potential sources of NO_x emissions during the Councils Stage 1 Review and Assessment. Further investigation and assessment at Stage 2 concluded that industrial sources would not have a significant impact at locations of relevant exposure. A simple modelling assessment was undertaken at Stage 2 using the diffusion tubes and continuous monitor. This was undertaken on roads where diffusion tube monitoring had indicated a potential exceedance of the AQO. The assessment concluded that predicted concentrations in 2005 would not exceed the AQO's for NO₂ and therefore further assessment at Stage 3 was not required.

In the USA report the background data was reviewed and it indicated that the annual mean of 40 µg/m³ NO₂ objective was unlikely to be exceeded in 2005 at kerbside locations. The assessment of road transport emissions, utilising Defra screening tools and the Design of Manual Roads and Bridges (DMRB), identified that it was also unlikely that the annual mean AQO would be exceeded at locations of relevant exposure. A detailed assessment was therefore not needed at this stage.

At present there are no proposed developments to the road network within the Worcester City Councils district and no indication of any significant increase in road traffic levels. Therefore any increases in sources of NO₂ from road transport can be considered negligible and further assessment is therefore not required.

There are two proposed developments that have been identified that may affect nitrogen dioxide levels in the Lowesmoor area. It is anticipated that an appropriate air quality impact assessment will be undertaken prior to the granting of any planning consent. The continuous NO₂ monitor has been moved to a location in the area to start gaining background data.

From a review of the industrial sources in Worcester no Part A or Part B processes were identified as having potential to emit sources of NO₂ which would result in the AQO being exceeded, therefore no further assessment is required.

4.5.1 NO₂ Diffusion Tube Data

Worcester City Council currently undertake ambient monitoring of NO₂ using passive diffusion tubes supplied and analysed by Gradko International utilising a 20% triethanilamine (TEA) in water preparation method, these are located at 15 sites around Worcester. A continuous monitor is also used providing information on NO, NO₂, NO_x, SO₂ and PM₁₀.

At the location of the continuous monitor a co-location study is continuously undertaken whereby two diffusion tubes are mounted at the inlet to a continuous chemiluminescent NO₂ analyser. Essentially, an estimate of bias for the diffusion tube is determined on the basis of the difference between the NO₂ period averages given by the tubes and the continuous analyser. A correction factor can then be applied to the diffusion tube concentrations to account for this inherent bias.

Gradko participated in the UK NO₂ diffusion tube network laboratory inter-comparison scheme, run on an annual basis by NETCEN. Although this scheme does enable the performance of tubes from one laboratory to be compared against another, the data is only compiled on the basis of a one-month period of monitoring data. Longer-term co-location data is recommended for bias correction.

The site classification and location are given in Table 5 below, the annual mean concentrations monitored from 2003 and 2004 are also detailed in the table using the bias corrected data. (Full results of the data are provided in Appendix 2 and 3.)

Table 5. Location of Diffusion Tubes in Worcester City Council with Monitoring Data, NO₂ (µg/m³) (bias corrected)

Location	Grid Reference	Classification	Date Started	Monitoring Data 2003 Annual Mean	Monitoring Data 2004 Annual Mean
1 McIntrye Road	383454/254606	Urban Background	1997	20.20	17.29
2. King Charles Place	384016/254399	Kerbside	1997	35.65	38.64
3. Sidbury	385162/254441	Kerbside	1997	47.52	31.61
4. Astwood Road	386068/256535	Urban Background	1997	17.60	12.72
5. Windermere Drive	387229/256756	Kerbside	1997	28.06	21.24
6. Newtown Road	387801/254987	Kerbside	2003	31.54	22.45
7. Vicar Street	385764/255968	Kerbside	1997	39.58	32.69
8. Lowesmoor Crossing	385141/255414	Kerbside	1997	49.46	38.09
9 St Martins Gate	385246/254932	Kerbside	1997	39.97	26.18
10. Bridge Street	384666/254818	Kerbside	1997	38.81	27.23
11. Farrier Street	384783/255270	Urban Background	1997	19.61	12.04
12. Hospital 1*	382582/253893	Urban Background	2003	21.35	36.94**
13. Hospital 2*	382582/253893	Urban Background	2003	21.64	41.45**
12. Newland Crescent 1*	382582/253893	Urban Background	2004		10.05
13. Newland Crescent 2*	382582/253893	Urban Background	2004		10.12
14. Castle Street	384804/255426	Urban Background	2003	27.08	19.53
15. Fry Close	388089/254908	Urban Background	2003	24.97	18.08

* collocated with continuous monitoring unit

** Only two months data before monitoring unit relocated to new location.

Table 5. Shows the data of the diffusion tubes concentrations with a correction factor of 0.62, based on the co-location study.

Co-location of duplicate tubes with a chemiluminescent analyser has been undertaken by Worcester City Council at two locations, the first location was at the new hospital at Newtown Road, outside the city centre. The data is only for two months before it was relocated to St Johns side of Worcester where the County Council are making decisions about putting in a New Park and Ride on Bransford Road, hence background NO₂ levels were required. The continuous monitor was located in Newland Crescent with duplicate tubes.

In Table 5 a bias adjustment factor has been calculated, in line with Defra guidance that has been based on duplicate diffusion tubes and chemiluminescent analyser concentrations monitored at the location of both sites, Newtown Road Hospital and Newland Crescent. The diffusion tube bias has been calculated on the basis of monthly monitoring data supplied by Worcester City Council for 2004.

The calculations are shown below,

Newtown Road Hospital and Newland Crescent

- (Dm) Diffusion Tube Mean = 27.73 (µg/m³)
- (Cm) Analyser Mean Jan-Dec = 17.18 (µg/m³)
- Cm/Dm = 17.18(µg/m³)/ 27.73(µg/m³) = 0.62

The bias corrected 2003 data demonstrates that there are likely exceedences of the AQO of 40µg/m³ at two locations, although these are at kerbside locations so the AQO's does not apply. It was discussed that the levels of nitrogen dioxide in 2003 were significantly higher than 2002 due to the unusually warm weather. This was a partial explanation for the higher levels monitored across Worcester City, it was also recognised by Defra that the increases seen across the UK were not outside the normal year on year variation seen in data over a long period.

The bias corrected 2004 data demonstrates that there are likely exceedences of the AQO of 40µg/m³ at one location; this was due to the diffusion tubes being at the site for two months before it was relocated to another site in Lowesmoor. As a result the data was not truly representative.

4.5.2 Continuous Monitoring Data

The continuous monitor was located at the New Hospital Site off Newtown Road in 2003 and was moved to a new location off Bransford Road as there have been talks about a new park and ride scheme for Worcester, and the County Council wanted air quality data to see if there would be any impact on the area if this was introduced. The information in Table 6 below gives the data collected from the Continuous NO₂ Monitor.

Table 6. Worcester City Council Continuous NO₂ Monitoring Data (µg/m³)

Monitoring Period	Maximum hourly mean	Annual Mean	99.8 th Percentile	Data Capture %
2003 Newtown Road	2886.84	21.50	1829.33	63%
Jan – Feb 2004 Newtown Road	68.55	10.16	41.30	99%
March – Dec 2004 Bransford Raod	78.00	9.14	44.29	99%

The data from the continuous monitor for 2003 shows that the annual mean of 40µg/m³ was not exceeded during that year. However, the maximum hourly mean and the 99.8th percentile, are significantly higher than would be expected compared to the other AURN sites in the area. It was believed that this anomaly was due to the malfunction of the continuous monitoring unit, hence only showing data capture of 63%. Taking this into account it can therefore be concluded, that the continuous monitoring data is not a true representation of the NO₂ concentrations at this location due to the low Data Capture.

Although basic ratification of the data set has been undertaken, it is considered that quality assurance and quality control measures still need to be revised in order to ensure good data capture and data validity is maintained in relation to ongoing monitoring. Because the continuous monitoring unit runs 24 hours a day and 365 days a year it is vital to ensure that monthly checks are maintained and a full service calibration is done by the engineers every 6 months.

In assessing the data for 2004 the continuous monitoring data indicates that the maximum hourly mean AQO of 200µg/m³ and the annual mean of 40µg/m³ were not exceeded. Using the

guidance the calculated prediction for the annual mean for 2005 will be 8.56µg/m³ and for 2010 it is predicted to be 7.05µg/m³, therefore it is unlikely that the AQO will be exceeded.

Summary

A review of the 2004 passive monitoring data indicates that the annual mean NO₂ objective is likely to be achieved in 2005. However we have some concerns with the data at the Lowesmoor Site and have moved the continuous monitor to collect real time data and put an extra diffusion tube at a background location to monitor the site.

A Update and Screening Assessment will be required for 2006.

4.6 Particulate Matter (PM₁₀)

The Councils Stage 1 Review and Assessment did not identify any sources with potentially significant emissions of PM₁₀. Further assessment at Stage 2 was recommended based on national exceedences of the AQO's reported by National monitoring Data. The Council undertook continuous monitoring of PM₁₀ and reviewed emissions from Part B processes as part of their Stage 2 assessment. The Stage 2 assessment concluded that the AQO's were unlikely to be exceeded. Further assessment of PM₁₀ emissions was therefore not required.

In the USA and the previous Progress Report it was concluded that data from the industrial emission information and traffic flows are unlikely to exceed the AQO's.

Worcester had undertaken continuous monitoring of PM₁₀ concentrations, using the Turnkey Osiris particulate monitor, at three locations in Worcester and a TEOM in the continuous monitoring unit. (Map of site locations in the Appendix 5) Defra has stated that optical measurement of particulates as made by Osiris, may only be used as part of a USA or Progress Report. However, the most recent data from the Turnkey Osiris monitoring method is presented in Table 7.

Table 7 Worcester City PM₁₀ Monitoring Data (µg/m³)

Location	Criteria	Data for 2003	Data for 2004
Osiris 1 St Johns	Max 24hr Mean	808	112.39
	90 th Percentile of 24hr Means	113.18	51.10
	Annual Mean	50.82	25.99
	Number of exceedences	99	33
	Data Capture	80%	79%
Osiris 2 Bridge Street	Max 24hr Mean	67.91	258.29
	90 th Percentile of 24hr Means	33.22	109.75
	Annual Mean	15.01	53.54
	Number of exceedences	3	126
	Data Capture	88%	88%
Osiris 3 Rainbow Hill	Max 24hr Mean	76.45	71.28
	90 th Percentile of 24hr Means	37.95	27.44
	Annual Mean	19.49	11.80
	Number of exceedences	8	2
	Data Capture	76%	89%
TEOM	Max 24hr Mean		35.95
	90 th Percentile of 24hr Means		20.48
	Annual Mean		-3.35
	Number of exceedences		0
	Data Capture		88%

As it can be seen from the above statistics, the concentrations monitored for the Osiris 1 have decreased since 2003. This indicates that the AQO's will be achieved at this location. Osiris 2 shows a significantly higher concentration than in 2003 this has been mainly due to road works diverting the traffic flow passed the monitoring site, therefore showing higher readings. Osiris 3 shows a steady decrease in the results, this suggests that the AQO's will be met at this location. The data from the TEOM unit in the continuous monitor shows that the AQO's are also likely to be met.

Although basic ratification of the data set has been undertaken, it is considered that quality assurance and quality control measures still need to be revised in order to ensure good data capture and data validity is maintained in relation to ongoing monitoring. Because the Osiris runs 24 hours a day and 365 days a year it is vital to ensure that they are sent back for a full service and calibration every 6 months.

There have been no additional industrial sources since the last Progress Report that are considered likely to emit significant emissions therefore there is no need to undertake a detailed assessment of PM₁₀.

In relation to the proposed development in the Lowesmoor area, it has been requested that an appropriate air quality assessment be undertaken prior to the granting of planning permission.

Worcester City operates a smoke control area, which through restriction of the use of solid fuel, removes the potential for problems caused by domestic PM₁₀. Monitoring data within Worcester and from background data from Defra indicates that these provisions combine to make it highly unlikely that the domestic PM₁₀ levels will exceed the AQO.

SUMMARY

A review of the monitoring data, road traffic and industrial emission information indicates that the objectives for PM₁₀ are unlikely to be exceeded.

A Update and Screening Assessment will be required for 2006.

4.7 Sulphur Dioxide (SO₂)

The Councils Stage 1 Review and Assessment did not identify any sources with potentially significant emissions of SO₂. Further assessment and monitoring of SO₂ concentrations was undertaken at Stage 2 to confirm the findings in Stage 1 Report. The Stage 2 Report concluded that based on the monitoring data the AQO were unlikely to be exceeded. Further assessment of SO₂ was therefore not required.

In the USA and the previous Progress Report in 2004 the background data and industrial source information was reviewed in line with Government guidance. The screening assessment initially indicated that the 15-minute mean of SO₂ may be exceeded in 2005, due to domestic fuel emissions. The fact that Worcester City had declared a Smoke Control Area since 1st April 1982, this should not be a significant factor to contribute to the emissions. Monitoring data within Worcester indicated that SO₂ would be unlikely to exceed the AQO and a detailed assessment was not required.

The continuous monitoring unit has been located at a background site off the Bransford Road in Worcester since March 2004 and records real-time concentrations of SO₂. Previously the unit was located at the Newtown Hospital Car Park. Whilst the figures for this location would tend to indicate high levels of SO₂, insufficient data capture of 63% is believed to be the cause for this and therefore the data provided is unable to show reliable comparisons with the AQO's.

The continuous monitor has provided data for SO₂ during 2004, this is recorded in Table 8.

Table 8. Worcester City Council Continuous SO₂ Monitoring Data in 2004 (µg/m³)

Criteria	AQO	Data for 2003	Data for 2004
Maximum 15 min Mean	266	342.34	1.87
Maximum Hourly Mean	350	98.29	1.87
Maximum 24 Hour Mean	125	16.33	1.86
Annual Mean	-	2.36	1.86
Data Capture	-	63%	99%

The data from the continuous monitor shows that the objective for the 15 minute mean, hourly mean and the 24-hour mean for SO₂ during 2004 were not exceeded.

Basic ratification of the continuous monitoring data has been undertaken, and the quality assurance and quality measures were revised. This ensured as far as possible that data validity and acceptable data capture was maintained in relation to ongoing monitoring.

Defra guidance lists the significance of industrial sources by process type as a percentage of the total Part A emissions in 2000 and Part B process types that are considered likely to produce emissions.

There have been no new processes or proposed development within Worcester since the last Progress Report that would result in a change in the emissions, therefore no further investigation is required.

Worcester operates a Smoke Control Area, which restricts the usage of solid fuels and hence removes a large proportion of domestic SO₂. Using the background data and the monitoring data within Worcester this indicates that it is unlikely that the domestic use of solid fuel would result in the AQO's being exceeded.

Summary

A review of the industrial information and the data from the continuous monitor indicates that the objectives for SO₂ will not be exceeded during 2005.

A Update and Screening Assessment will be required for 2006.

5 Summary and Conclusions

The assessment had been produced in line with the technical guidance developed on behalf of Defra for the LAQM Review and Assessment process. (Including LAQM.TG (03)).

So in summary the data provided has concluded the following:

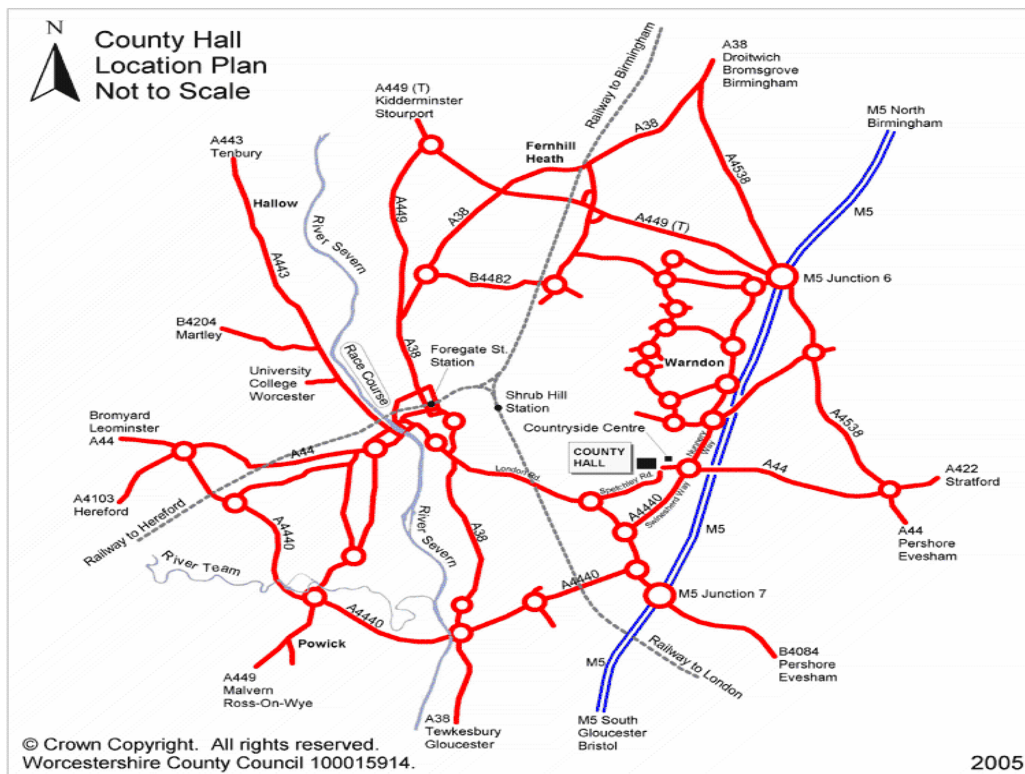
- No exceedances were recorded for Nitrogen Dioxide at any of the locations; however we have now relocated the continuous monitor has been relocated to capture some real time data in the Lowesmoor area. The Lowesmoor report is in Appendix 4.
- There were some 126 exceedances from the monitoring of PM₁₀ at the Osiris Unit on Bridge Street. This was mainly due to road works in the area and a break down of the unit. Therefore reviewed quality assurance and quality control measures still need to be revised in order to ensure good data capture and data validity is maintained in relation to ongoing monitoring. It is considered unlikely that the PM₁₀ will exceed the AQO in 2010.
- All other pollutants included in the Air Quality Strategy are meeting their respective compliance date. This situation is unlikely to change.

Although basic ratification of the continuous monitoring data provided has been undertaken, it is considered that quality assurance and quality measures across the range of monitoring procedures utilised may need to be revised. This should ensure as far as possible that data validity and acceptable data capture are maintained in relation to ongoing monitoring.

6 Appendices

Appendix 1

The information provided in the map below show the main routes in and out of Worcester City.



Appendix 2

NOx Data for 2003

NOx 2003 μgm^3	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Average	correlated
McIntyre Road	89	20	37	30	30	13.27	13.25	13.25	16.13	24.19	28.57	31.68	28.86	20.20
King Charles Place	50	40	50	61	61	38.39	48.39	44.09	53.76	58.18	56.22	50.11	50.93	35.65
Sidbury	67	91	66	74	74	48.82	70.85	63.98	60.12	69.12	66.36	63.36	67.88	47.52
Astwood Road	34	16	32	33	33	16.12	16.12	16.13	20.04	28.8	22.58	33.99	25.15	17.60
Windermere Drive	49	32	38	48	48	33.25	33.41	29.03	36.66	46.08	41.47	46.08	40.08	28.06
Newtown Road	54	40	40	47	47	32.23	39.17	39.25	44.48	54.15	54.38	48.96	45.05	31.54
Vicar Street	66	47	56	77	77	44.56	44.56	17.2	66.47	54.72	61.75	66.24	56.54	39.58
Lowesmoor	75	50	63	94	94	54.98	71.43	59.68	75.27	68.55	74.65	67.4	70.66	49.46
St Martins Gate	67	96	50	62	62	45.5	42.63	39.78	43.99	63.36	50.69	62.21	57.10	39.97
Bridge Street	62	50	43	67	67	37.92	52.42	44.62	60.12	62.79	60.83	57.6	55.44	38.81
Farrier Street	39	20	35	34	34	16.12	17.28	16.67	20.04	32.83	30.41	40.9	28.02	19.61
Hospital 1	35	17	42	40	40	17.06	21.89	18.28	24.44	31.68	31.34	47.23	30.49	21.35
Hospital 2	41	26	36	32	32	17.54	25.35	20.97	25.42	31.68	36.41	46.66	30.92	21.64
Castle Street	34	32	48	46	46	27.49	28.8	27.42	28.84	51.84	39.17	54.72	38.69	27.08
Fy Close	42	30	42	44	44	22.28	30.53	25.27	24.44	40.32	37.79	45.51	35.68	24.97
Total Average	23.53	29.18	26.91	17.85	13.63	14.24	12.54	19.02	27.65	18.87	22.5	32.03	44.10	30.87
Ambirak total No2													21.50	

Appendix 3

NOx Data for 2004

Nox 2004 μgm^3	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Average	correlated figure	Total
Total hours out	672	768	840	696	696	672	840	672	672	744	768	840			8040
Days	28	32	35	29	29	28	35	28	28	31	32	35			335
Bridge Street	61.09	40.96	44.25	60.39	51.49	0	48.39	39.23	41.47	43.18	52.05	44.45	43.91		27.23
King Charles Place	53.24	42.51	38.47	20.73	44.05	27.65	43.61	34.19	34.19	38.93	47.02	39.03	38.64		23.95
McIntyre Road	28.02	19.70	22.15	0.70	17.16	7.78	13.75	12.33	11.77	20.81	25.51	27.81	17.29		10.72
Sidbury	53.24	45.10	48.78	71.27	66.36	0	54.13	50.44	49.88	52.24	69.52	50.86	50.99		31.61
St Martins Gate	58.29	50.29	41.79	52.92	43.48	31.68	45.03	0	40.91	42.37	56.51	43.45	42.23		26.18
Lovesmoor	71.18	49.25	64.21	73.27	64.07	39.75	65.74	64.29	65.41	39.13	76.93	63.93	61.43		38.09
Vicar Street	60.53	47.18	56.76	61.91	58.92	42.63	55.98	50.44	44.28	46.37	59.88	47.87	52.73		32.69
Astwood Road	29.14	25.40	21.16	21.65	20.02	10.66	16.59	17.37	15.69	17.36	23.85	27.24	20.51		12.72
Windermere Drive	42.60	32.14	35.56	37.77	33.75	23.62	30.34	31.95	24.66	35.18	42.93	40.69	34.27		21.24
Fry Close	41.47	32.14	30.71	31.44	30.40	14.40	24.65	25.22	21.86	28.25	35.36	34.08	29.17		18.08
Hospital 1	44.84	29.03											36.94		22.90
Hospital 2	47.64	35.25											41.45		25.70
Ambirack 1			21.84	20.89	16.59	8.64	13.27	12.33	12.89	14.93	21.46	19.25	16.21		10.05
Ambirack 2			21.66	20.89	16.02	8.06	13.27	12.89	10.65	17.21	20.43	22.20	16.33		10.12
Newtown Road	50.44	43.03	38.65	37.55	41.76	28.80	36.02	0	36.99	31.79	49.98	39.60	36.22		22.45
Castle Street	45.96	43.03	24.93	33.44	29.75	16.70	26.07	28.02	25.22	27.94	35.3	41.55	31.49		19.53
Farrier Street	36.43	31.11	21.16	0.97	18.31	12.67	0	17.93	15.69	17.06	32.04	29.61	19.42		12.04
Ambirak	7.78	17.68	22.8	21.62	14.42	7.66	9	10	8.64	17.33	30.95	38.22	17.18		21.49

Appendix 4

Air Quality in Lowesmoor
Prepared by Fiona Bull & Terry Ford
4th March 2005

History

Part IV of the Environment Act 1995, Worcester City Council along with all other local authorities were required to undertake Review and Assessments of air quality within their boundaries. This was to contribute to the UK National Air Quality Strategy born out of various international treaties which sought to reduce airborne pollutants, and establish a management system for air quality within their area.

Local authorities are not legally obliged to achieve the national air quality objectives. They are, however, required to work towards the objectives by drawing up action plans setting out the measures they intend to take in pursuit of them, and logically, putting them into action.

Pollutants

Although many pollutants are present in the atmosphere, national government decreed that priority should be given to the following, most of which are contributed by motor transport and which are potentially harmful to humans as well as the environment.

- Nitrogen dioxide
- Nitrous oxide
- Sulphur dioxide
- PM 10 (dust with a diameter of 10 microns or less)

Methodology

After due investigation and consultation, three methods of measuring air pollution were purchased and established.

1. **NO_x TUBES** These are small plastic tubes, open at one end, and contain a chemically coated piece of gauze that reacts with nitrogen gasses. They are mounted, usually on lamp posts, at 15 locations throughout the city. The tubes are exposed to the atmosphere for a month before being returned to a laboratory for analysis as to the amount of nitrogen gasses absorbed.

2. **DUST MONITORS** These are electronic devices that draw air into analysing chamber by means of a pump. The chamber is scanned by a laser beam, and the amount of dust present in the sample is calculated. They are calibrated to calculate small dust particles sized 10 microns or smaller as dust of this size on entering human lungs is not easily dislodged by coughing, and aggravates conditions such as asthma and bronchitis. We have three of these units, located at Bridge Street, St Johns and Rainbow Hill.

3. **AMBIRACK UNIT** This is a far more sophisticated unit than the above, although not in practical terms more accurate. The equipment, which is mounted in a medium sized, enclosed trailer, measures both the above plus sulphur dioxide, a bi-product of diesel engines. This unit is mobile, and is presently located near to a proposed park-and-ride site on Bransford Road.

INDICATIONS

National Government set targets that should not be exceeded for the pollutants mentioned. At present that limit for nitrogen dioxide is set at 40 micrograms per cubic metre of air when calculated as an annual average. This allows for weather conditions, seasonal traffic flows, roadworks etc. which may elevate the figures over short period of time.

Figures available already show the likelihood of further monitoring being required at several locations, where the annual average for nitrogen dioxide has been approached or exceeded. (See results and graphs attached)

The results of the comparative exercise showed that air quality, a significant factor in the life of those living and working in the City, particularly due to road congestion, was poor and likely to exceed the statutory limits set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2000), and associated Regulations. (see table below)

From the evidence presently collected, it is the view of the Pollution Team that there could be a requirement to designate an Air Quality Management Area (A.Q.M.A.) at Lowesmoor in Worcester, given the current levels of pollution, unless actions are taken now to deal with the amount and flow of road traffic in that area. This is particularly urgent as two new developments are being considered in the area, which can only add to the current problems.

CONCLUSIONS

It must be stressed that officers in the Pollution Team have no formal qualifications in the traffic management area, but from a purely laymen's observation of the current position, we have arrived at the current position in Lowesmoor due to:

- At present, the delivery lorries often block the highway causing traffic jams in Lowesmoor. Internal combustion engines produce far more pollutants at idling than under normal movement.
- Traffic light phases at the eastern end of Lowesmoor add to standing traffic
- The traffic movement restrictions in Lowesmoor are supposed to be restricted between 15.30 – 18.30 to buses and cyclists. However, this is not enforced and has fallen into disrespect. It is difficult to envisage how, without an enforcement officer being stationed on a permanent basis at some point in Lowesmoor how this system will ever work.

SUGGESTIONS

Possible improvements to traffic flow that would improve the air quality in Lowesmoor should be considered:-

1. banning traffic completely except for access
2. getting the police to enforce the restrictions at present
3. stopping deliveries at peak times,
4. changing the traffic light priorities to allow a better traffic flow out of Lowesmoor at its eastern end,
5. Making Lowesmoor into a one way system eastbound, with access to Lowesmoor Wharf at the east end.

To summarise the above, it can be seen that further monitoring and analysis of concentrations of NO₂, SO₂ and PM₁₀ will be required in order to assess the likelihood of exceedances of the 2005 air quality objectives. We are proposing to relocate the Ambirack Unit at Lowesmoor Wharf, near the traffic lights, in order to obtain real time data of all pollutants in the area. This is being done with the kind co-operation of Ms Nicky Harrison.

Appendix 5