

WOLVERHAMPTON CITY COUNCIL

AIR QUALITY MANAGEMENT

ACTION PLAN

TECHNICAL REPORT TO DEPARTMENT FOR ENVIRONMENT FOOD AND RURAL AFFAIRS

Regeneration & Environment
Environmental Services Division
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Executive Summary

This Air Quality Action Plan sets out the work currently undertaken, and in progress, in order to discharge Wolverhampton City Council's obligations in respect of the Environment Act 1995 Part IV. This work has demonstrated that, whilst the quality of the air in Wolverhampton will comply with the objectives for the majority of pollutants for which objectives have been set in the Government's Air Quality Strategy (carbon monoxide, sulphur dioxide, lead, 1,3 butadiene, and benzene) there are parts of the City Centre and certain busy road junctions which are not likely to meet the objectives for certain pollutants (nitrogen dioxide and particles.)

Within the City of Wolverhampton, as with most urban environments (including much of the West Midlands conurbation,) the principal source of these air pollutants is transport. Whilst, in recent years, there has been increasing use of emissions control technology in vehicles (for example catalytic converters,) the number of vehicles on the roads is continually increasing. In short, technological improvements only partially mitigate the effects of increases in road traffic.

As a consequence of its work on air quality, Wolverhampton City Council has declared the whole of the City an Air Quality Management Area. This Action Plan, which is written as a result of this declaration, contains a total of twenty-three proposed actions, together with timescales, and the costs versus the benefits of each proposal.

Contents

<u>Chapter</u>		<u>Page</u>
1.	Introduction	4
2.	Wolverhampton in Context	5
3.	Review and Assessment Process	9
4.	Air Quality 'Hot-Spots' in Wolverhampton	13
5.	Development of an Air Quality Action Plan	17

Appendices

1.	Nitrogen Dioxide	22
2.	Particles	26
3.	National Air Quality Objectives	28
4.	Proposed Actions	29

Figures

1.	The City of Wolverhampton	5
2.	Location of Monitoring Sites	12
3.	Birmingham Rd/ Parkfield Rd Junction	13
4.	Willenhall Rd/ Neachells La Junction	14
5.	Lichfield St and Surrounding Area	15
6.	Nitrogen Oxides in Wolverhampton (2001)	23
7.	Nitrogen Oxides in Wolverhampton (2005)	23
8.	Nitrogen Oxides in Lichfield St (City Centre) Area (2001)	25
9.	Nitrogen Oxides in Lichfield St (City Centre) Area (2005)	25

Chapter 1

Introduction

The Environment Act 1995 (Part IV) established the current framework for the National Air Quality Strategy and placed statutory duties upon local authorities in respect of Local Air Quality Management (LAQM).

Regulations made under this Act have established a mechanism for LAQM, including the need to carry out the review and assessment of air quality on a rolling annual programme. The pollutants that must be considered in this review and assessment process are; carbon monoxide, sulphur dioxide, nitrogen dioxide, particles (PM₁₀), lead, 1,3 butadiene, and benzene.

Objectives have been set for each of these pollutants which specify numerical values and the dates by which these values should be achieved. These national air quality objectives for LAQM are shown in Appendix 3.

Wolverhampton City Council has worked in conjunction with the six other West Midlands unitary Councils on environmental issues for many years and continues to participate in the initiatives of the West Midlands (Chief Officer) Air Pollution Group. Given the history of cooperation and the transboundary nature of exposure to air pollution, the seven West Midlands Metropolitan Authorities continue to work together in discharging their LAQM duties and in particular maintain the resources of a sophisticated air quality model for their mutual benefit.

Since 1998, the City Council has completed periodic 'Review and Assessment' reports of the air quality in Wolverhampton, and this process (as detailed in Chapter 3,) has culminated in the decision of the Council to declare the whole City an Air Quality Management Area (AQMA.)

The decision making process, outlined above, utilised a corporate approach including transportation, planning, renewal and health practitioners who together formed the Cross Service Officer Group (described in Chapter 4.)

The Action Plan concludes with 23 proposed actions (Appendix 4) which aim to improve the air quality in Wolverhampton in order to approach the air quality objectives throughout the City; although it must be appreciated that this goal is extremely challenging and (given the urban character of the West Midlands conurbation) will be difficult to achieve.

Chapter 2

Wolverhampton in Context

The new City of Wolverhampton has over a thousand years of recorded history and boasts a vibrant mix of shopping, art, theatre, sport and nightlife. Wolverhampton has a cosmopolitan culture reflected in its restaurants, arts and university, the latter of which is undergoing continued expansion.



Figure 1: The City of Wolverhampton

Wolverhampton within the West Midlands Region

Wolverhampton is one of seven metropolitan local authorities, which form the West Midlands region, namely:

- Birmingham City Council
- Coventry City Council
- Dudley Metropolitan Borough Council
- Sandwell Metropolitan Borough Council
- Solihull Metropolitan Borough Council
- Walsall Metropolitan Borough Council
- Wolverhampton City Council

This region constitutes a predominantly urban area with no spacial separation between the built environments of these local authorities (apart from the rural area to the east of Solihull.) The region has approximately 2.5 million inhabitants occupying some 900km² on the western side of central England.

Wolverhampton is located in the north of the West Midlands conurbation, on the edge of the Black Country, some 15 miles from the regional centre of Birmingham. The City benefits from good communications links, with access to the national motorway network provided by the M6 to the east of the City and the M54 to the north. A major new motorway has recently been completed to the north of Wolverhampton; the M6 Toll runs around the northern and eastern edges of the West Midlands conurbation.

Wolverhampton functions as a major centre within the Black Country/northern part of the West Midlands conurbation. The City has park and ride facilities on three of the main arterial routes into the City and over 5000 parking spaces in the City centre. There are frequent services from the central bus station to all parts of the West Midlands and the Midland Metro (tram) runs through the Black Country to Birmingham.

Wolverhampton also has a mainline railway station, which provides frequent direct trains to London (journey time two hours) and a wide range of destinations, as well as frequent local services to Birmingham. Proposals are currently underway to introduce a number of improvements to the railway station and its environs through the City Interchange project

Wolverhampton within the Black Country

At a sub-regional level, Wolverhampton lies within the Black Country. Like the wider West Midlands region, the Black Country has experienced a decline in many of its traditional manufacturing industries reflecting, in part, structural changes within the UK economy as a whole. However, the region is now becoming a focus for a range of service-based employers, and also for more high-tech/high added value industries.

Wolverhampton has in recent years achieved considerable success with a number of development and regeneration projects. However, Wolverhampton (like other centres) is experiencing increasing competition from a range of destinations seeking to secure high quality development, and also a share of the finite financial 'pot' available for regeneration.

Wolverhampton's population at the beginning of the century (ONS 2001 Census) was approximately 237,000, with an estimated primary catchment population of 362,000. Unemployment at 5.9% (Wolverhampton City Council December 2003) is above the UK average. Over the next 20 years the population of the City is expected to decrease slightly and this trend will be accompanied by a gradual ageing of the population, with relatively more residents in the 50-plus age bracket.

Wolverhampton's 'star performing employers' include business and professional services, health/social services, education, and drinks and chemical sectors. Indeed, ONS statistics indicate that the strongest sectors within Wolverhampton are manufacturing and education, health and public administration. The transport and distribution sectors are also outperforming the UK average. Wolverhampton does, however, need to attract a greater share of high value added businesses, and to attract greater representation from businesses with strong prospects for output and employment growth.

Wolverhampton benefits from a strong geographical location, with 30 million people within a two-hour drive time. Factors such as land costs, rents, and labour costs are

relatively low (particularly given the City's central location). There is, however, scope to market these advantages to a greater extent to those companies to whom Wolverhampton is 'unfamiliar'. Wolverhampton also scores well on factors such as the availability of employment sites, proximity to markets, quality of labour, and transport infrastructure.

In recent years, Wolverhampton has experienced a number of significant development and regeneration projects which have had an important catalytic effect in improving perceptions of the City, improving the City's built environment, and in delivering new business, employment and residential opportunities. Examples of such projects include the following:

City Interchange: This will provide a major new transport Interchange to the east of the City Centre, based upon the existing railway station and bus station, with improved linkages to the road network, remodelling a number of elements of the existing railway station and its forecourt area, including enhancements to the existing car parking provision. This key project, which is detailed in the current Local Transport Plan (LTP) will better welcome visitors reaching the City by rail and by bus, and will improve linkages between the railway station and the City Centre.

Canalside Quarter: The City Council is working in partnership with Advantage West Midlands, British Waterways and others to secure regeneration of this former industrial area into a vibrant centre for City living. This project, in a gateway location, includes the conversion of a Grade II listed corn mill and the development of over 200 homes, which will act as a catalyst to further development within the Canalside Quarter. The canal is a linking theme running through the quarter's four 'character areas,' with differing relationships to its surroundings along its whole length. The future of this area is not seen solely in terms of how it is itself redeveloped, but more broadly in terms of how the Canalside Quarter relates to the City centre as a whole and the communities to the east of the City. To this end the project is set within a wider framework of policies for Wolverhampton. This wider framework includes the Local Transport Plan, which contains funded elements contributing to the redevelopment of this important area.

Learning Quarter: This includes a series of projects within the St John's Urban Village area, which relate to the provision of learning and training facilities, and associated uses including offices and a café. A landmark four storey further education building and the recently completed College Square (a pedestrianised area, founded in the LTP) provide the focus for this area, with future proposed development to extend the public library, creating a major resource and learning facility in conjunction with partner bodies including Wolverhampton University.

St. John's Urban Village: The Urban Village includes large areas of land in the southern sector of the City Centre, and a range of discrete projects including the recently completed Markets development (including a new town square – partly funded through the LTP- together with a landmark new residential building) and redevelopment of the southern gateway with a combination of high quality residential-led developments, some with ground floor retail units.

Retail Core Expansion: The City Council is currently progressing proposals for the redevelopment of land in the Bell Street, Cleveland Street, and Temple Street area, for a major expansion of the City's retail provision. It is anticipated that this development will

be primarily an open-street scheme, which is likely to include a major new department store. The retail core expansion is a hugely significant project for the City, and should lead to a step change in the range and quality of retailing provision within Wolverhampton. It is expected that development of the scheme will commence in 2006. This development will be augmented by the high quality mixed use development at Raglan Street, incorporating retail, housing and leisure uses, and also an enhanced crossing of the Ring Road. Implementation of the development is expected to start in the near future.

Chapter 3

Review and Assessment Process

The Environment Act 1995 provides local authorities (in Part IV) with duties in respect of local air quality management. District Councils are required to periodically review and assess local air quality against the standards specified in national objectives (detailed in Regulations; Appendix 3 refers) and where necessary to declare air quality management areas (AQMA.)

In 1998 Wolverhampton City Council started a review of air quality in conjunction with the six partner Authorities in the former West Midlands County Area. The purpose of the review was to determine if the air quality objectives set out in the Governments Air Quality Strategy were being met.

The First Review and Assessment

The first review and assessment followed a staged approach in order that the effort expended and the costs incurred were proportional to the risks of exposure.

- Stage 1** To identify the significant sources of air pollution both within and around the Wolverhampton City Council area: reviewing the levels of air pollutants for which air quality objectives have been set (including an estimate of future levels.)
- Stage 2** An assessment of pollutant levels in those areas where the highest concentrations of each pollutant are likely to occur to determine whether there is a significant risk of an air quality objective not being met on time.
- Stage 3** An accurate and detailed assessment of current and future air quality. The use of sophisticated modelling and measurement techniques to predict whether the air quality objectives would be achieved.

All authorities were required to undertake the first stage. Where areas of potentially high levels of pollutants were identified, then the second stage should be carried out. The guidance allowed an authority to go directly to the third stage if it considered air quality objectives may not be met.

The **first stage** review of significant sources of pollution within and near to the West Midlands conurbation was published in March 1999. This review considered all industrial and road sources in the conurbation and concluded that it was necessary to proceed directly to the 3 stage of the review and assessment process.

In order to complete the **third stage** of the review and assessment process the emissions from all sources identified in the Stage 1 report were assessed using a sophisticated air quality model. To do this an emissions data base (EDB) was compiled containing traffic flow data, emission factors for the various vehicle types and emissions data from all industrial processes prescribed for control under the Environmental Protection Act 1990. Meteorological data were also gathered and incorporated into the model. The model enabled pollutant concentrations to be predicted for Wolverhampton.

The third stage of the Review and Assessment (July 2001) concluded that ‘there were no significant sources of benzene, 1,3-butadiene, carbon monoxide, and lead in

Wolverhampton. Levels of these pollutants already meet the air quality objectives. The review, completing the First Review and Assessment, concluded that there were significant sources of nitrogen dioxide, particles and sulphur dioxide within Wolverhampton. However, current levels of particles and sulphur dioxide already meet their respective objectives and forecasts predict a continuing improvement through to 2005. Existing levels of nitrogen dioxide are close to and in some areas may be exceeding the objectives for this pollutant. As with particles and sulphur dioxide, forecasts predict that the objectives will be met by 2005.'

On completion of the First Review and Assessment Wolverhampton City Council concluded that there were no areas of the City likely to exceed the objectives, consequently no air quality management areas (AQMA) were declared. It was recognised that a further detailed assessment of nitrogen dioxide was necessary during the on-going process of review and assessment.

The Second Review and Assessment

The phased approach to the Review and Assessment process continued into the 'second round.' The intention being 'that local authorities should only undertake a level of assessment that is commensurate with the risk of an air quality objective being exceeded.' All authorities were required to undertake the first step (of two,) namely the **Updating and Screening Assessment (USA.)** The objective of the USA was to identify (using a 'checklist' approach) those matters that have changed since the 'first round,' which might lead to a risk of an air quality objective being exceeded.

Wolverhampton City Council completed the USA in May 2003. This included monitoring results from a number of new air quality monitoring sites established as a direct outcome of the First Review and Assessment. Figure 2 shows the current site locations. The USA concluded that 'the required standards for benzene, carbon monoxide, lead, sulphur dioxide, and 1, 3 butadiene are likely to be achieved by the required dates through the application of national measures. As a consequence no additional local measures are required for these pollutants.'

However, with regard to other pollutants the report states that 'concentrations of nitrogen dioxide in Lichfield Street, Wolverhampton are above the annual mean objective. It is therefore considered necessary to carry out a detailed assessment for nitrogen dioxide to determine if the objectives will be met by 2005.'

'The report has also highlighted the possible exceedence of the 2004 PM₁₀ objectives at two of the busiest junctions in the City. A detailed assessment will be carried out at both of these locations to determine if the objectives will be met.'

'Since the previous review and assessment provisional objectives have been proposed for fine particles (PM₁₀). The updating and screening assessment has indicated that these new objectives may not be met anywhere in the City. It is likely that a detailed assessment will need to be carried out for PM₁₀'s across the City should these objectives be incorporated into the Regulations.'

The objective of the **Detailed Assessment** of Air Quality (forming the final step of the 'second round,') is to 'provide an accurate assessment of the likelihood of an air quality objective being exceeded at locations with relevant exposure. This should be sufficiently

detailed to allow the designation, or amendment of any necessary Air Quality Management Areas (AQMAs.)'

Wolverhampton City Council completed the Detailed Assessment of Air Quality in May 2004. This report featured a comprehensive assessment of air quality, using a combination of real-time continuous analysers and sophisticated dispersion modelling techniques, at the locations identified in the USA. The report states 'The findings of the Detailed Assessment have confirmed that the objectives for PM₁₀ particles and nitrogen dioxide will not be met at Lichfield Street Wolverhampton and surrounding area. It will therefore be necessary to declare this part of the City Centre an Air Quality Management Area (AQMA.)'

'The Detailed Assessment has established that the PM₁₀ objectives are being met at the junctions of Birmingham Road/Parkfield Road and Willenhall Road/Neachells Lane. It will not be necessary to declare AQMA's at these locations at the present time.'

In order to declare the Air Quality Management Area (AQMA) Wolverhampton City Council set a timetable, culminating in the Report to Cabinet in December 2004. The Council also reconvened its Cross Service Officer Group, whose functions included the consideration of the geographical extent of the AQMA. The report to Cabinet made the recommendation, which was accepted, to declare the entire City an AQMA for both particles and nitrogen dioxide. This Cabinet decision resulted in the making of the "Wolverhampton Air Quality Management Area Order 2005" in March 2005.

The air quality review and assessment process is, however, an ongoing commitment, and the Council has most recently completed the Air Quality Progress Report 2005. A further assessment will be required prior to 1 April 2006.

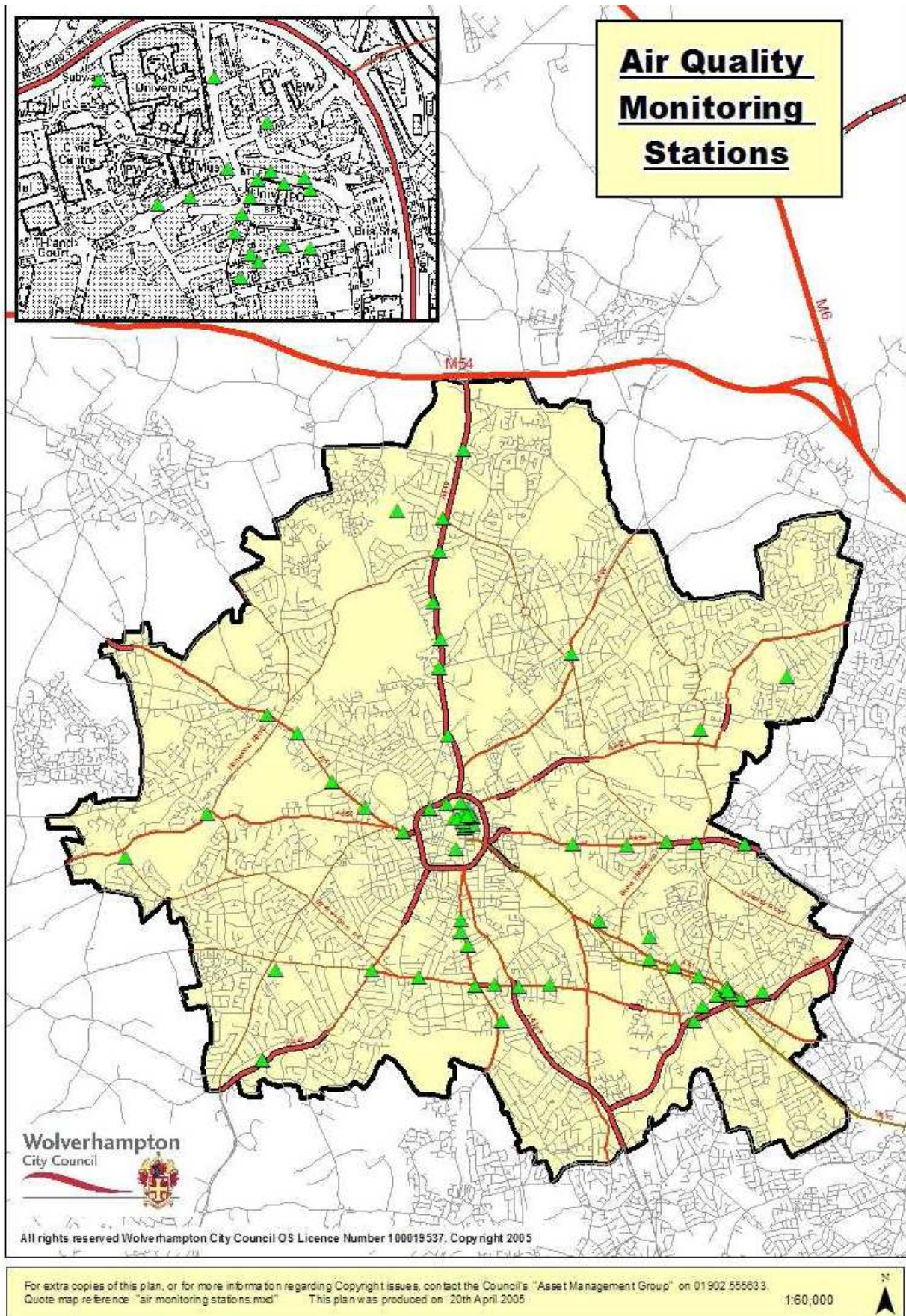


Figure 2: Location of monitoring sites (City Centre inset)

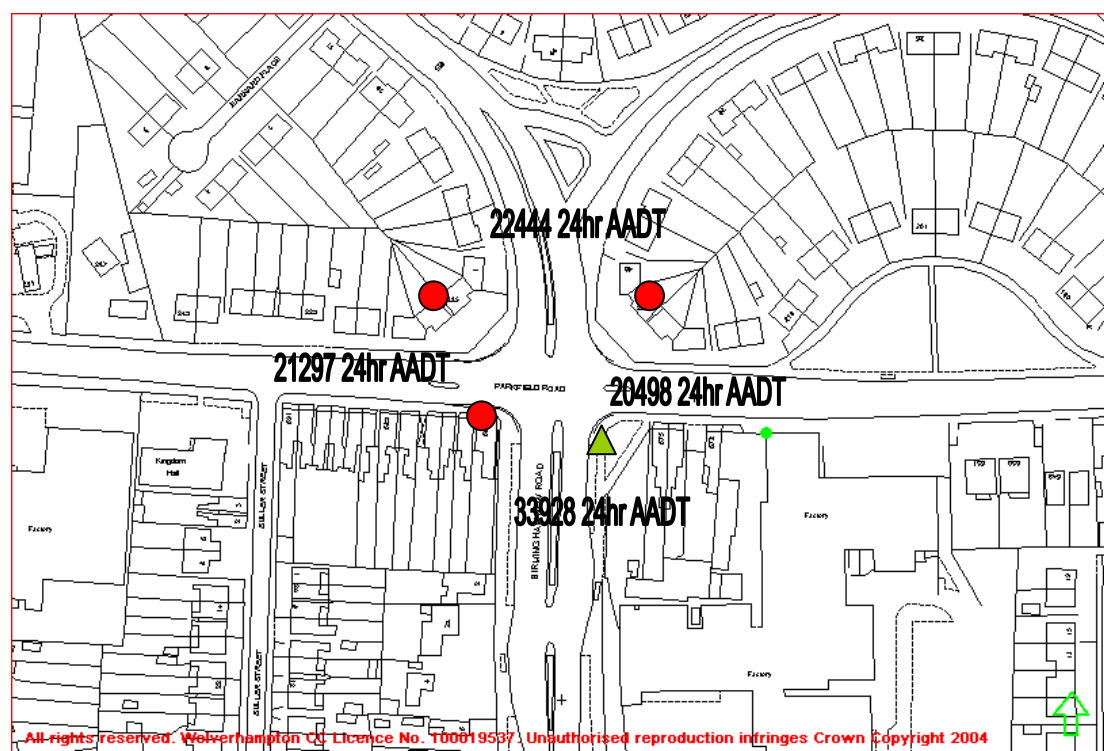
Chapter 4

Air Quality 'Hot-Spots' in Wolverhampton

The Environment Act 1995 requires district councils to declare, at least, those parts of their areas which are likely to fail to meet the Air Quality Objectives by the given dates. The air quality review process requires first, the identification of these air quality 'hot-spots' and then the assessment of these areas in order to determine the necessity for designation of air quality management areas. The areas of the City described in the following paragraphs have been profiled in this process:

- The junction of Birmingham Road and Parkfield Road in the Parkfields area of the City.
- The junction of Neachells Lane and Willenhall Road in the Portobello area of the City.
- Lichfield Street and surrounding areas of the City centre.

Birmingham Road/ Parkfield Road junction



▲ Location of continuous monitoring station

● Location of relevant receptors

Figure 3: Birmingham Road/Parkfield Road junction

Some 200 road links within the City were modelled (as part of the Updating and Screening Assessment of Air quality 2003) Following on from this a review of the continuous monitoring station provision (and location) and the establishment of the

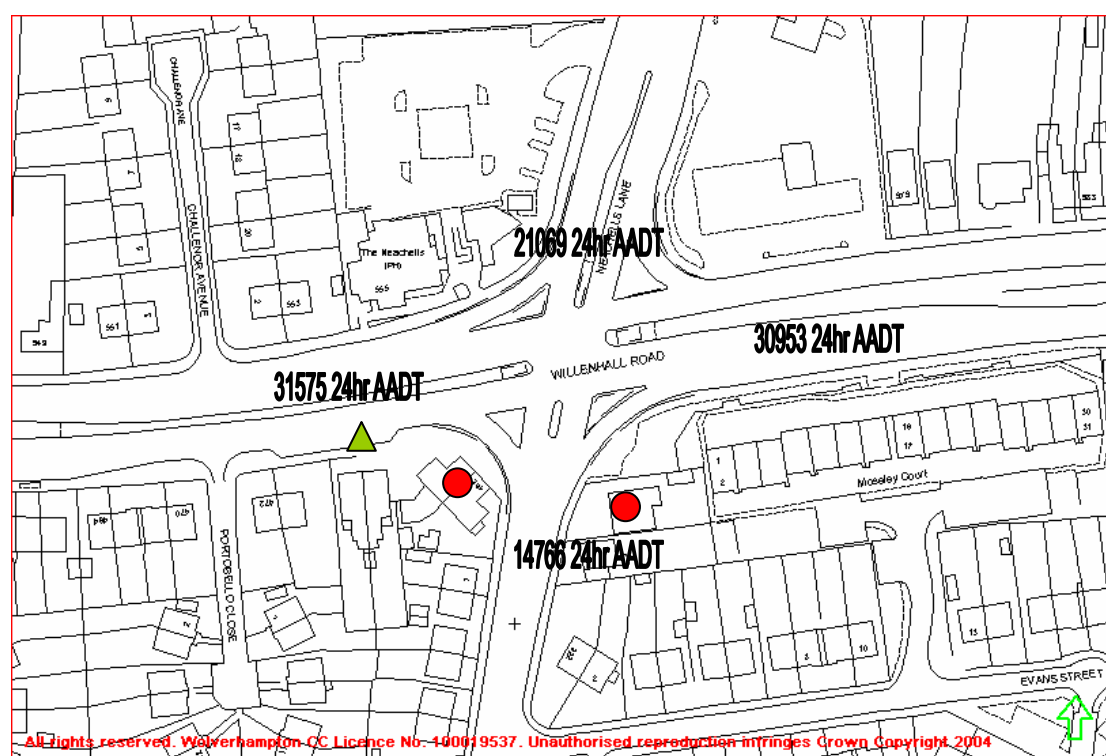
nitrogen dioxide intensive survey areas (ISA's) was undertaken to begin a rolling programme to monitor all major road links (highlighted as being a significant source of nitrogen dioxide in the first review and assessment.)

Included in these ISA's are the busiest junctions in the City including the Birmingham Road/ Parkfield Road junction, situated to the south of the ring road on a major arterial route (A 459) into the City.

On the basis of modelling information, it was decided to proceed to a detailed assessment of this location and a new continuous monitoring station was sited on the junction during 2003.

The Detailed Assessment (May 2004) concluded on the basis of the monitoring information then available, together with sophisticated computer modelling of the junction that it was not necessary to declare this junction alone as an air quality management area at that time, although monitoring at this location is continuing.

Neachells Lane/ Willenhall Road Junction



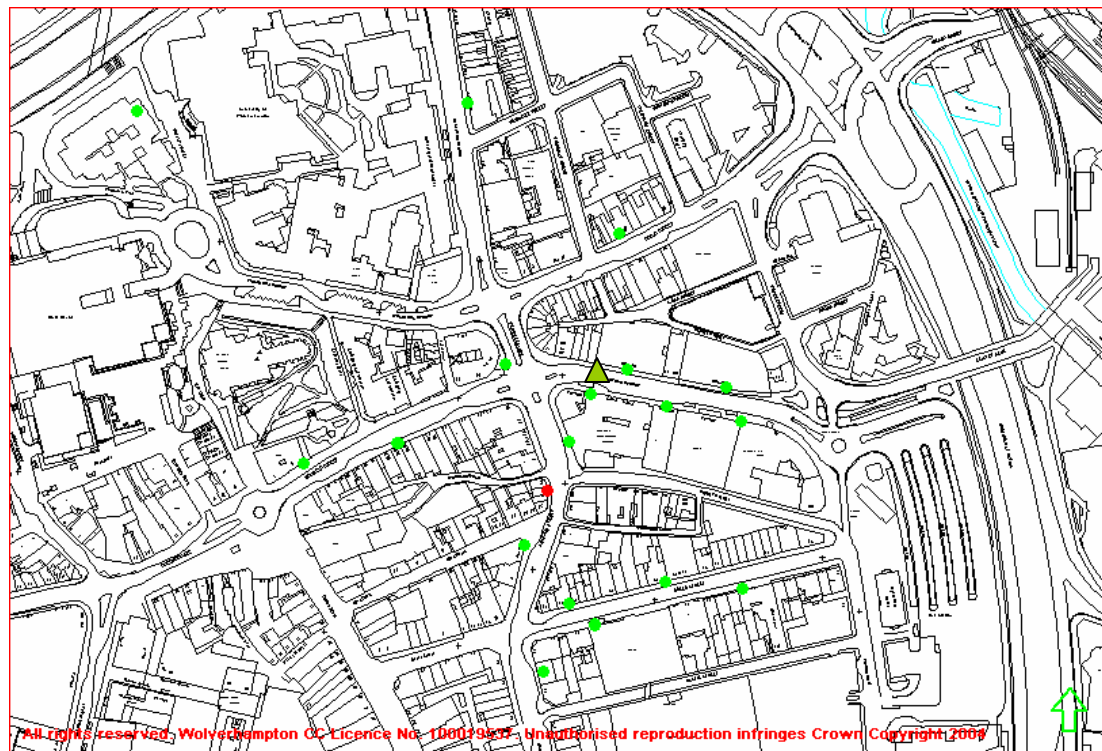
- ▲ Location of PM₁₀ monitor
- Location of relevant receptors

Figure 4: Willenhall Road/Neachells Lane junction

This junction, situated on another arterial route into the City centre (A454) is a similar junction to that at Birmingham Road/ Parkfield Road both in terms of traffic flow and the distance to the nearest receptors (approximately 5 metres.)

The Detailed Assessment of this junction (May 2004) showed good correlation between modelled and measured data, and results were comparable with those at the Birmingham Road/Parkfield Road junction. Both the modelled data and the estimated annual average from the data set available at the time concluded that the PM₁₀ objectives were being achieved at this junction. It was therefore not necessary for the Council to consider the declaration of an AQMA solely in respect of this junction. Further work at this location is also continuing.

Lichfield Street Wolverhampton



- ▲ Lichfield Street Continuous monitoring station
- ▲ St Peter's Square AURN station
- NO₂ Diffusion tube locations
- Site closed

Figure 5: Lichfield Street and surrounding area.

The area studied (in the Detailed Assessment of Air Quality 2004) includes Lichfield Street, Broad Street, Stafford Street, Princess Square, Princes Street and Queen Street within the City Centre. Lichfield Street is the City's main access route into the bus station with some 4000 bus movements per day and is included in the area to be affected by the **City Interchange project**. The surrounding roads are also subject to high numbers of bus movements as well as local shopping traffic using the many car parks located in this part of the City Centre. A comprehensive network of nitrogen dioxide diffusion tubes was established in this area for the first Review and Assessment. In addition, a further automatic monitoring station was located in Lichfield Street in order to undertake the Detailed Assessment of nitrogen dioxide (NO₂) and particles (PM₁₀).

The Detailed Assessment concluded that the annual NO₂ objective was exceeded at the diffusion tube intensive survey areas (ISA's) along Lichfield Street, Princess Street and Queen Street. The 24hr PM₁₀ objective was exceeded at the Lichfield Street automatic monitoring site. On the basis of this conclusion, an air quality management area, to comprise at least this area of the City, was required.

Other Monitoring Sites

Continuous Monitoring Sites: In addition to the above, the City Council also acts as a Local Site Operator for DEFRA in respect of the urban background site at St. Peter's Square, Wolverhampton (which contributes to the UK Automatic Urban and Rural Network,) and maintains further sites at the road junctions of Stafford Road (A449) and Church Road, Bushbury; and Penn Road (A4039) and Goldthorn Hill, Penn Fields. With the exception of 2003 (exceptionally adverse weather conditions being responsible for poor air quality) these sites have continually shown compliance with the air quality objectives.

Diffusion Tube Sites: The City Council maintains a network of over 60 sites at background and potential 'hot-spot' locations throughout the City. The 2005 Annual Progress Report (on air quality in Wolverhampton) confirmed potential exceedences of the annual nitrogen dioxide objective at the Grape Vine Island, Stafford Road, Bushbury and Lichfield Street, Bilston. These additional areas are incorporated into the declaration of the whole City as an AQMA.

Chapter 5

Development of an Air Quality Action Plan

Wolverhampton City Council is required, after its AQMA declaration to submit to DEFRA, within a period of twelve to eighteen months of making this declaration (i.e. prior to 30 September 2006,) an Action Plan in the pursuit of the achievement of the air quality standards and objectives.

In addition to the Action Plan, there is a separate requirement to produce, prior to 31 March 2006, a Further Assessment of Air Quality. The Further Assessment is intended to 'supplement such information as the Council already has in relation to the designated AQMA.' The Further Assessment is a public document and has to be subject to a consultation process. In practice the Further Assessment and the Updating and Screening Assessment (USA) 2006 is likely to be incorporated into a single report.

In order for the Action Plan to be effective it must attempt to balance the overall effects of actions with the potential air quality benefits. For this reason it was considered essential to establish a Cross Service Officer Group with wide representation from a broad range of relevant disciplines.

Cross Service Officer Group

The Council set up a Cross Service Officer Group to oversee the preparation of the Air Quality Action Plan. This group comprises representatives from Transportation Network Management, Transportation Development, Development Control, Regeneration, Strategic Planning, Neighbourhood Renewal and Public Protection.

The Group began by sharing an understanding of the legislative framework and the current status of air quality in the City. This included a review of the limit values for each pollutant and the medical background to these limits. Forecasts of future air quality were then considered against the required limit values. There followed the process of identifying actions proposed under existing policies that were likely to result in an improvement in air quality.

As part of its forecasting work, the Group considered the extent of the area(s) that were required to be declared as Air Quality Management Areas. All the air quality 'hot-spots' (including the areas currently complying but close to the objectives) were identified, together with the methods involved in dealing with the uncertainties incorporated in the scientific projection of air quality values. Several options were considered from declaring smaller areas around the areas of exceedance to the declaration of the whole of the City. Whilst opinion in the Group was originally split, it was decided that the benefits of declaring the whole City as a single AQMA was preferable for the following reasons:

- A single declaration covers the whole City. Declaring the whole City avoids the necessity to make further declarations should further exceedances be found in other areas of the City.
- The declaration embraces the provisional air quality objectives. New objectives have been proposed for fine particles to be met by 2010. These objectives may not be met anywhere in the City. If incorporated into Regulations then the likely consequence is that the whole City will need to be declared an AQMA.

- Better links with other corporate strategies and plans. The Action Plan will be easier to link to strategies and plans that affect the whole City, such as the Local Transport Plan and the Strategic Transport Plan.
- A single Action Plan incorporating all Council Wards. Individual areas would require individual Action Plans. The range of actions is likely to be similar for all areas and therefore the plans would be duplicitous. Specific action within one area is likely to have effect on adjoining areas of the City and therefore effects need to be considered collectively. Wherever the boundaries are drawn, the Action Plan is likely to need to cover a wider area than just the locations where there are exceedences.

The broad basis of the group enabled this process to proceed very swiftly and significant amounts of existing actions were identified. In particular the Local Transport Plan (LTP) for the West Midlands was identified as containing both the broad vision and a multitude of specific initiatives aimed at improving the transport mechanisms of the entire City. Those measures aimed at reducing road congestion are often beneficial to the improvement of air quality. In addition, the emerging LTP contains an improved evaluation of the air quality implications of its proposals.

Existing Transportation Initiatives in Wolverhampton

The actions proposed within this Action Plan are listed in Appendix 4. These actions are principally additional to those existing transport initiatives (some of which are supported by the existing LTP) which the Cross Service Officer Group identified as beneficially contributing to the air quality of the City. These initiatives are listed below:

Lichfield Street Wolverhampton

Initiatives aimed at reducing the bus flows in this City Centre thoroughfare have already been implemented. Phase 1 of the Bus Access Study was successful in removing some of the outbound traffic from the bus station. Measures implemented included the establishment of one-way bus only gates into adjacent roads.

Bus Access Study

Further potentially workable proposals are contained in Phase 2 of this study. Further work is currently underway on the fine details and approval of Members of the Council has to be sought, prior to launching the required consultation period.

The principal proposal, for which finance may be secured within the current financial year, is to remove buses from Market Street (north of Tower Street) and Princess Street, Wolverhampton. This would result in alterations to the flow of buses both into and out from the bus station. As a consequence of these proposed changes an approximate total of 60 buses in the peak hour (pm) would be removed from Lichfield Street.

City Interchange

The Wolverhampton City Interchange is one of the major initiatives identified within the current West Midlands Local Transport Plan. The project has progressed to the point where works are expected to commence shortly.

The Interchange Project will have a beneficial effect on bus traffic in Lichfield Street Wolverhampton. It will create a new access to the Bus Station at its north-eastern most point, from Horseley Fields and the new railway station approach road, incorporating Corn Hill. Buses approaching from the East will benefit from reduced journey times and the ability to drop-off and pick-up passengers at the Wolverhampton railway station.

Prior to the implementation of these proposals, it is difficult to quantify the volume of bus movements that will be diverted, as the precise intentions of the bus operators have yet to be determined. The project does, however, contain many incentives for operators' routes to the north and east of the City Centre.

The Proposed Actions

Action planning is an essential part of the local air quality management process, providing a practical opportunity for improving air quality in areas where review and assessment has shown that national measures will be insufficient to meet one or more of the air quality objectives. An air quality action plan should include the following:

- quantification of the source contributions to the predicted exceedences of the limit values. This allows the action plan measures to be effectively targeted.
- evidence that all available options have been considered on the grounds of cost and feasibility.
- how the Council will use its powers and also work together with others in pursuit of the relevant air quality objectives.
- clear timescales within which the authority and other organisations propose to implement the measures contained in the plan.
- quantification of the expected impacts of the proposed measures and, where possible, an indication as to whether these will be sufficient to ensure compliance with the objectives.
- how the Local Authority intends to monitor and evaluate the effectiveness of the plan.

These principles were followed in the development of this Air Quality Action Plan for Wolverhampton. Proposed Actions are detailed in Appendix 4 of this report.

Public Consultation

The process of public consultation is critical to the success of any Air Quality Action Plan. A range of consultation strategies were considered including the use of focus groups set up specifically for this purpose, and utilising existing consultation mechanisms such as the Council's 'Peoples Panel.' However, these types of consultation mechanism are most appropriate for situations where a range of significantly different courses of action are proposed, and a consensus of opinion is required to inform this choice. In the case of this Air Quality Action Plan little flexibility exists in terms of significantly different courses of action. This is because the most significant source of air pollutants in Wolverhampton is from transportation sources, and the LTP published in 2003 has already set out the comprehensive strategy for transportation policy across the West Midlands region.

As a consequence the consultation strategy likely to be adopted will be aimed at groups of people at a local level where the specific detail of the broad policies could still be applied in different ways. For this reason the consultation strategy includes discussing the Action Plan at all relevant Council meetings, as well as making the report available on the Council website and at the Wolverhampton Central Library. In addition a range of additional stakeholders will be identified for future consultation.

Proposed Actions for Wolverhampton

The 23 proposed actions contained in Appendix 4 of this Action Plan are grouped under the following headings:

- Reducing vehicle emissions
- Improving public transport
- Road network improvements
- Measures to reduce traffic volumes
- Reducing air pollution from industry, commerce and residential areas
- Changing levels of travel demand / promotion of alternative modes of transport.

Implementation of the Action Plan

It is essential that the implementation of the Action Plan is closely monitored alongside the anticipated improvement in air quality. Wolverhampton City Council will take the lead role in monitoring the implementation of the Action Plan and will report annually to DEFRA.

Since road traffic is the most significant source of air pollutants in Wolverhampton it is especially important to ensure that the Air Quality Action Planning process is harmonised with the process of Local Transport Planning. For this reason work is now well advanced to embed the Air Quality Action Planning process firmly into the development of the emerging Local Transport Plan for the West Midlands in order to ensure the maximum possible gains for the City of Wolverhampton in terms of air quality.

Achieving the air quality objectives throughout the City of Wolverhampton, given the urban character of the West Midlands conurbation (of which Wolverhampton forms part) is an extremely challenging goal which, in practice, will be difficult to achieve.

Appendices

1. Nitrogen Dioxide
2. Particles
3. National Air Quality Objectives
4. Proposed Actions

Nitrogen Dioxide

Nitrogen dioxide is an oxidizing irritant that can cause damage to the lung tissue as a result of this (oxidizing) property. At very high concentrations it is thought to cause inflammation of the airways. At lower concentrations, it is believed to exacerbate respiratory problems.

Sources of Nitrogen Dioxide

The primary sources of oxides of nitrogen are the transport sector and combustion processes. Almost all combustion processes emit nitrogen oxides in one form or another. In heating boilers and internal combustion engines, the primary pollutant is nitric oxide, which is then further oxidized in the atmosphere to nitrogen dioxide. In more open highly oxygenated combustion, such as in some furnaces and open gas burners, a higher proportion of the nitrogen oxides are emitted as nitrogen dioxide directly.

The London Research Centre (now incorporated into The Greater London Authority) on behalf of the then Department of Environment, compiled an inventory of the sources of nitrogen oxides in the West Midlands in the early 1990s. This inventory recorded the details of the amounts of pollutant emitted by, industrial processes, commercial and domestic premises, road, rail and air traffic, and miscellaneous sources such as agriculture. The inventory is regularly updated by Birmingham City Council to ensure that the information remains relevant for partner Local Authorities within the West Midlands Region.

The transportation sector is the major contributor to the emissions of nitrogen oxides across Wolverhampton. However, it is noteworthy that there is a slight decrease from a traffic contribution of 74% in 2001 to 69% in 2005. It is anticipated that with the improved technology in vehicles being manufactured, this downward trend will continue to 2010.

Although this describes the relative emissions for Wolverhampton as a whole, the relative amounts of pollution vary across the City. Thus, in an industrial area, the percentage of pollution from industry may be higher than the City average, whilst that from road traffic may be less significant. Conversely, in areas close to major roads, pollution from road traffic may dominate the emissions.

Nitrogen Dioxide Source Apportionment

Figures 5 & 6 show the nitrogen dioxide source apportionment for the City of Wolverhampton for the base year (2001) and for the objective year (2005.)

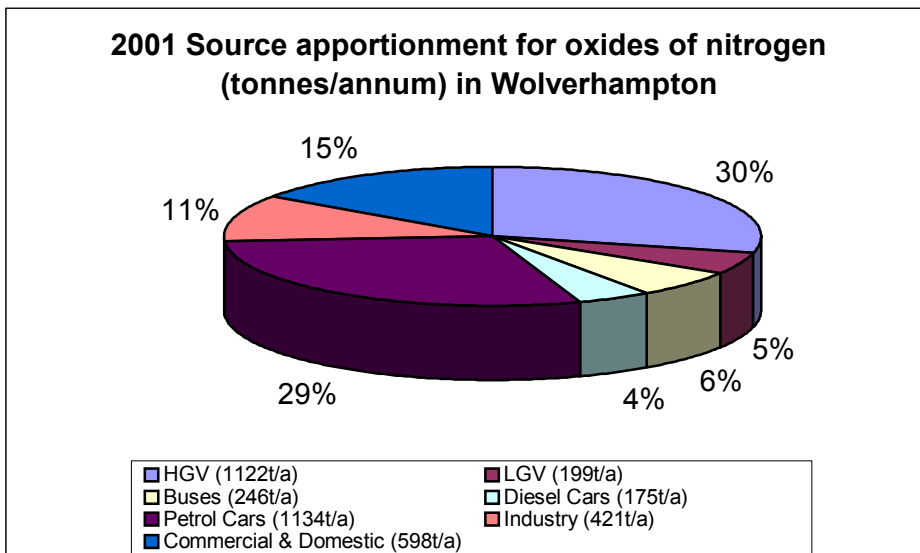


Figure 6: Nitrogen oxides in Wolverhampton (2001)

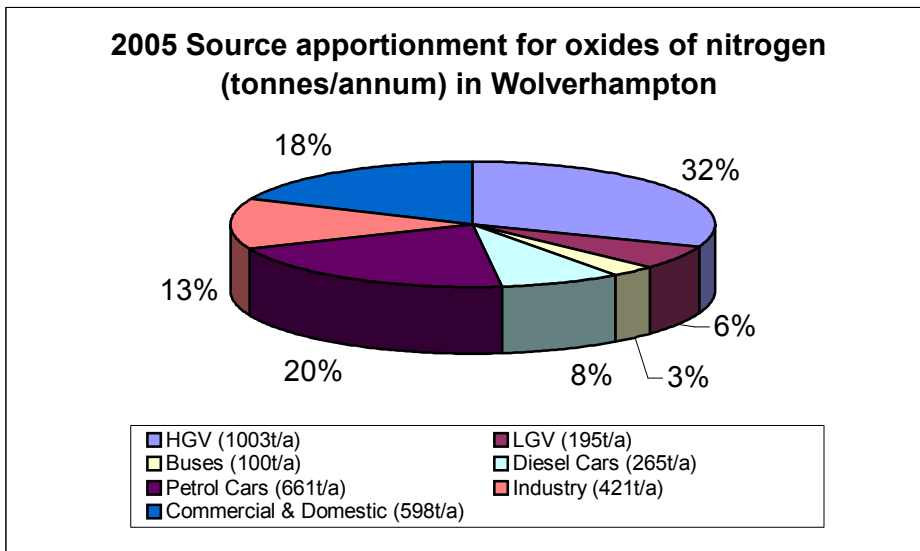


Figure 7: Nitrogen oxides in Wolverhampton (2005)

The emissions inventory is compiled such that investigations of three types of petrol cars, namely Pre-Euro, Euro 1 and a composite of Euro 2, 3 and 4 can be carried out. These types refer to the gradually improving emission standards applied to new cars sold within the EU. For 2001, the Pre-Euro cars made up 23% of the total vehicle fleet composition (31% of the petrol car fleet) but contributed approximately 80% of the total emissions from petrol cars. Then, as predicted to occur in 2005, the Pre-Euro cars are forecast to make up 11% of the total vehicle fleet composition (15% of the petrol car fleet) but to contribute approximately 67% of the total emissions from petrol cars. This suggests that it may be necessary to target this particular type of petrol car in a bid to reduce the emissions of nitrogen oxide throughout Wolverhampton.

The Level of Reduction in Nitrogen Dioxide Needed

Nitrogen dioxide can arise from the direct emission of nitrogen dioxide (NO₂) and from the emission of nitric oxide (NO) reacting to produce NO₂; collectively known as total oxides of nitrogen (NO_x). Emissions of oxides of nitrogen from motor vehicles consist, predominantly, of nitric oxide, which is then converted, in the atmosphere, to nitrogen dioxide. The rate at which nitrogen dioxide is formed from nitric oxide is proportional to the ambient temperature and the availability of other reactants, including ozone and hydrocarbons. Whenever high levels of total oxides of nitrogen are present, the conversion of nitric oxide to nitrogen dioxide is rate limited if the other chemicals are not present.

In the summer, the chemical reactions are faster so that, at low pollution concentrations, more than 80% of the total oxides of nitrogen might consist of nitrogen dioxide. In the winter, the chemical reactions are much slower so that, at high pollution concentrations in particular, perhaps only 20% of the total oxides of nitrogen consist of nitrogen dioxide. The overall effect of the atmospheric chemistry is to have a reserve of nitric oxide in the atmosphere, so that a reduction in the levels of total oxides of nitrogen does not produce a proportionate reduction in the levels of nitrogen dioxide.

This effect can be demonstrated by the pollution levels, observed over the past decade. In the early 1990s, maximum hourly concentrations of 1500µg/m³ of total oxides of nitrogen were associated with around 200µg/m³ of nitrogen dioxide. Now, although the maximum concentrations of total oxides of nitrogen have fallen to around 800µg/m³, these are still associated with maximum hourly nitrogen dioxide levels of around 150µg/m³. The corresponding average levels of total oxides of nitrogen, in the 1990s, of around 180µg/m³, were associated with around 50µg/m³ of nitrogen dioxide. But, although average levels of total oxides of nitrogen concentrations have fallen to around 130µg/m³, these are still associated with levels of nitrogen dioxide of around 45 to 50µg/m³. Historical information indicates that the concentrations of total oxides of nitrogen might have to be reduced to between 50 to 60µg/m³ to achieve concentrations of nitrogen dioxide, which are consistently below 40µg/m³.

This drastic level of reduction may be all the more necessary, if the British climate becomes warmer and more unsettled, causing the rates of conversion of nitric oxide to nitrogen dioxide to increase. If this were to occur, then the levels of levels of nitrogen dioxide, near busy roads, might increase even as the total concentrations of oxides of nitrogen continued to fall. Furthermore, there is evidence that background concentrations of ground-level ozone are increasing. If 'all other things are equal' this could result in future increases in nitrogen dioxide concentrations.

'Hot-Spot' Source Apportionment

Figures 7 & 8 show the nitrogen dioxide source apportionment for the Lichfield Street area of the City Centre (a central 'hot-spot' of the City.) Figure 7 shows the base year (2001) and figure 8 the objective year (2005.)

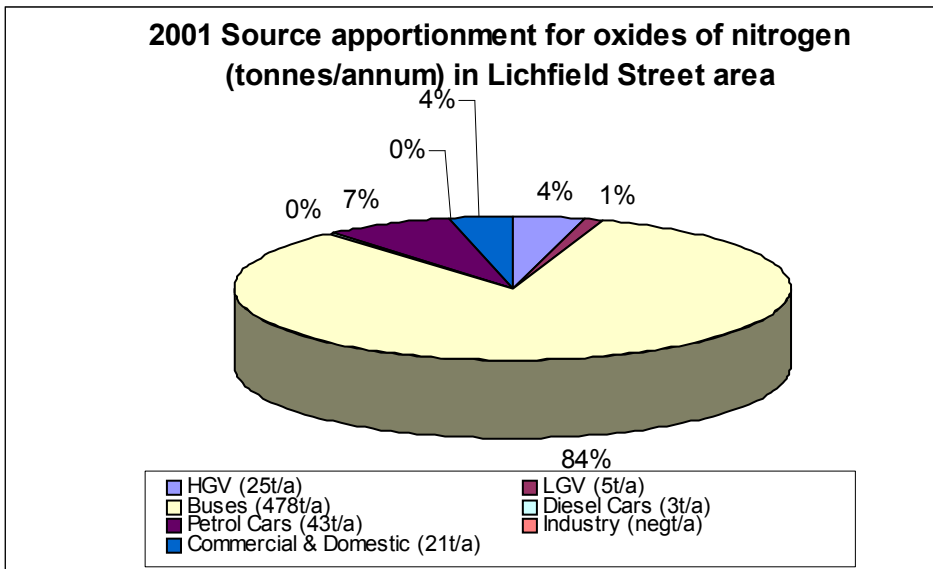


Figure 8: Nitrogen Oxides in Lichfield St (City Centre) Area (2001.)

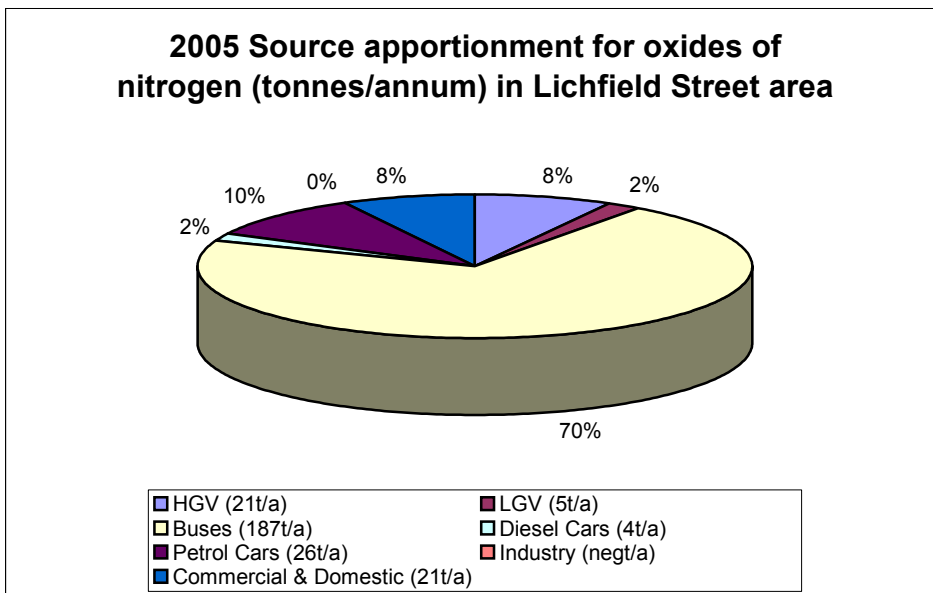


Figure 9: Nitrogen Oxides in Lichfield St (City Centre) Area (2005.)

The source apportionment work shows a marked difference in sources for the hot-spot area when compared to the City as a whole. This difference, based on traffic information for these two separate data areas, indicates the predominance of heavy duty diesel engines in this ‘hot-spot.’ It is of note that these engines have been described as making a major contribution to nitrogen oxide emissions, and of primary nitrogen dioxide, from UK Transport (AQEG ‘Nitrogen Dioxide in the UK’ 2004.)

Particles

Particles can cause irritation to the eyes, nose and throat. Larger particles reaching the nose or throat will be filtered out by the body's natural defence system. However, the very tiny particles that reach deep into the lung may be absorbed into the blood stream or cause lung problems. Those between 4µm and 10µm diameter are trapped by mucus in the airways, and those less than 4µm can reach deep into the air sacs in the lungs. Particle pollution <2.5µm diameter comes mainly from vehicles, and is responsible for elevated levels during pollution episodes, and is therefore associated with health effects. Studies in America have found that death rates from respiratory and cardiovascular diseases increase with increased concentrations of PM₁₀ contributing to 60000 deaths in 1996.

Both the size and composition of the particles determine any potential health effect. In old winter smogs it was soot and SO₂ that were identified as a health hazard, responsible for bronchitis and emphysema. These acidic particles can cause lung inflammation and changes in blood clotting. No direct link has been proved between particle pollution and asthma. Today with the decline of coal burning, diesel vehicles are the main source of urban particles. Some hydrocarbons are linked to cancer, and metal particles, (for example, lead) can cause poisoning. The Expert Panel on Air Quality Standards (EPAQs) recommended a standard of 50µgm³ as a 24 hour running average. The Committee on the Medical Effects of Air Pollution (COMEAP) estimated that respiratory disorders associated with PM₁₀ episodes are responsible for 8100 additional deaths and 10500 additional hospital admissions in the UK per year.

Sources of Particles

There are natural sources of particles as well as those emitted from human activities. The natural sources include windblown dust, soil, sand, sea salt, pollen and ash (from volcanoes and forest fires.) Most of this natural dust in the air is inert - it may be a nuisance, but does not have a serious impact on health. The particles that are emitted from human activities (characterised below as primary and secondary) are smaller and more reactive, and therefore more likely to cause health problems.

Primary sources

These are particles that are emitted or blown directly into the air - there are many sources including chimney stacks, dust from storage areas, spoil heaps, emissions from buildings (ventilation), emissions from road surfaces, vehicles, materials handling, construction sites, wind dust and sea spray.

Secondary sources

Particles may form when substances in vapour form react in the atmosphere. These are often from the oxidation of sulphur and nitrogen oxides, which form nitrates and ammonium salts. These are usually less than 10 µm diameter (PM₁₀.) and originate from combustion and natural sources.

The behaviour of an atmospheric particle is determined by size. Larger particles will not stay in the air for very long and will be deposited close to their source. Smaller particles

can be carried long distances. PM₁₀ particles can further be subdivided into the coarse and fine fractions.

The fine fraction includes those formed by both nucleation (< 0.2µm diameter - particles recently emitted from a process or freshly formed within the atmosphere, present in large numbers in urban air) and accumulation (> 0.2µm diameter - 2µm diameter - particles which have grown from nucleation mode by coagulation or condensation of vapours. Particles formed by the accumulation mode are stable in the air with a lifetime of 7-30 days.) The coarse fraction (> 2µm diameter) are particles mainly formed by weathering processes, such as includes soil dust, sea spray and industrial dusts. The larger size means that their atmospheric lifetime is short.

In urban air, particles come from many sources. Along with size, the composition of particles in air will determine any health effects they have. Assessing the exact makeup of particles in air is complex, however, as they are monitored either by size or composition.

The London Research Centre (now incorporated into The Greater London Authority) on behalf of the then Department of Environment, compiled an inventory of the sources of particles in the West Midlands in the early 1990s. This inventory recorded the details of the amounts of pollutant emitted by, industrial processes, commercial and domestic premises, road, rail and air traffic, and miscellaneous sources as detailed above. The inventory is regularly updated by Birmingham City Council to ensure that the information remains relevant for partner Local Authorities within the West Midlands Region.

In its review and assessment work Wolverhampton City Council utilised a sophisticated computer model of the former west midlands county area to assess emissions from road traffic. The west midlands road network was split into approximately 3,000 road links. Information relating to the link length, traffic flows, vehicle type and traffic speed were fed into the model. It was determined that roads with more than 15,000 vehicles per day were significant sources of nitrogen dioxide and particles.

Pollutant	Air Quality Objective		Date to be Achieved by
	Concentration	Measured as	
Benzene	16.25µg/m ³ 5µg/m ³	running mean annual mean	31.12.03 31.12.10
1,3-butadiene	2.25µg/m ³	running annual mean	31.12.03
Carbon monoxide	10µg/m ³	maximum daily running 8-hour mean	31.12.03
Lead	0.5µg/m ³ 0.25µg/m ³	annual mean annual mean	31.12.04 31.12.08
Nitrogen dioxide	200µg/m ³ - not to be exceeded more than 18 times a year 40µg/m ³	1-hour mean annual mean	31.12.05 31.12.05
Particles (PM ₁₀) (gravimetric)	50µg/m ³ - not to be exceeded more than 35 times a year 40µg/m ³	24-hour mean annual mean	31.12.04 31.12.04
Sulphur dioxide	350µg/m ³ - not to be exceeded more than 24 times a year 125µg/m ³ - not to be exceeded more than 3 times a year 266µg/m ³ - not to be exceeded more than 35 times a year	1-hour mean 24-hour mean 15-minute mean	31.12.04 31.12.04 31.12.05

Table: National Air Quality Objectives

Appendix 4 Proposed Actions

	ACTION	DETAILS	STAKEHOLDER	COMPLETION	COST/BENEFIT
	REDUCING VEHICLE EMISSIONS				
1	Conduct a feasibility study of roadside emission testing	The City Council (WCC) will evaluate the viability of the testing of vehicle emissions at the roadside. If testing proves to be viable, drivers whose vehicles fail the test could be issued with a fixed penalty notice	WCC Regeneration & Environment CENTRO	Mid 2008	Med/Low
2	Improve the WCC Fleet	The City Council will continue to favour low emission vehicles in its own fleet	WCC Resources & Support	Ongoing	Med/Low
3	Discourage drivers from allowing their engines to idle unnecessarily when parked	WCC to undertake a driver awareness campaign	Wolverhampton Council	Mid 2008	Med/Low
	IMPROVING PUBLIC TRANSPORT				
	Buses				
4	Showcase route extension and improvements	The Council will implement a programme of enhanced bus routes featuring real time information at bus stops, improved bus shelters and lighting at stops and bus priority at junctions	WCC Regeneration & Environment CENTRO	Ongoing	High/Med
5	Increased bus lane enforcement	Increase the numbers of forward facing cameras installed in buses and fixed external cameras outside buses for bus lane enforcement	Travel West Midlands	Ongoing	High/Med

	ACTION	DETAILS	STAKEHOLDER	COMPLETION	COST/BENEFIT
	Light Rail				
6	Extension of Metro	WCC will continue to support and facilitate the extension of the Midland Metro system linking the City Centre to New Cross Hospital, Wednesfield, Willenhall, Walsall and Wednesbury. Proposals also include a new single track loop around Wolverhampton City Centre	WCC Regeneration & Environment CENTRO	Mid 2011	High/High
	Heavy Rail				
7	Increase in passenger capacity of rail network	Works will shortly begin on the City Interchange Project. This major new transport interchange, based upon the existing rail station and bus station will provide new linkages and encourage modal shift, enhancing and improving City Centre access	WCC Regeneration & Environment CENTRO (LTP Commitment)	Ongoing	High/Med
8	Improving rail freight capabilities	As part of freight strategy for the West Midlands a number of schemes are being evaluated to both enhance rail freight movements and reduce the conflict between freight traffic and the congested passenger services around Birmingham New Street. The City Council will continue to actively support such schemes	WCC Regeneration & Environment / Strategic Rail Authority / CENTRO (LTP Commitment)	Ongoing	High/Med

	ACTION	DETAILS	STAKEHOLDER	COMPLETION	COST/BENEFIT
	ROAD NETWORK IMPROVEMENTS				
9	The introduction of 'Red Routes' to ease congestion	WCC is undertaking a demonstration red route scheme on the A449 Stafford Road	WCC Regeneration & Environment (LTP Commitment)	Ongoing	High/Med
10	Improvement of Urban Traffic Control Systems designed to reduce congestion	WCC will participate in development of Urban Traffic Control arrangements for the West Midlands. This has identified the best enhancement linkages between the existing centres and between the urban systems and the Highways Agency systems	WCC Regeneration & Environment (LTP Commitment)	Ongoing	Med/Med
	MEASURES TO REDUCE TRAFFIC				
11	Management of the number of available City Centre parking spaces	WCC will seek to maintain the number of short stay parking places in the City Centre at a level of adequate supply	WCC Regeneration & Environment (LTP Commitment)	Ongoing	Low/Med
12	Encouragement of City Centre living	The City Council will continue its strategy to encourage City Centre living	WCC Regeneration & Environment	Ongoing	Med/Med
13	Presumption in favour of mixed use development	WCC will continue to maintain its policy of encouraging mixed use developments that assist in reducing the need to travel	WCC Regeneration & Environment	Ongoing	Med/Med

	ACTION	DETAILS	STAKEHOLDER	COMPLETION	COST/BENEFIT
14	Consideration of air quality in respect of Planning Applications	When assessing Planning Applications the implications of new development for air quality will be taken into consideration	WCC Regeneration & Environment	Ongoing (Emerging UDP Commitment)	Low/Med
	INDUSTRY/ COMMERCE				
15	Control of Industrial Emissions	WCC will continue to regulate approximately 150 industrial processes under Pollution Prevention & Control Act 1999	WCC Regeneration & Environment	Ongoing	Low/Low
16	Emissions from chimneys	The Council will continue to enforce the provisions of the Clean Air Act 1993 with respect to emissions of smoke from chimneys across the City	WCC Regeneration & Environment	Ongoing	Low/Low
17	Boiler plant and chimney heights	The Council will enforce the provisions of the Clean Air Act 1993 in respect of chimney heights for new plant and smoke control	WCC Regeneration & Environment	Ongoing	Low/Low
18	Energy Efficiency	WCC will encourage Wolverhampton Homes (ALMO) to continue its energy efficiency strategy for residential properties	Wolverhampton Homes	Ongoing	Med/Med

	ACTION	DETAILS	STAKEHOLDER	COMPLETION	COST/BENEFIT
19	Control of bonfires	WCC will enforce the provisions of the Clean Air Act 1993 and of the 1990 Environmental Protection Act. The City Council will continue to provide a bulk collection service to residents in order to reduce the need for bonfires. The City Council will continue to develop its programme of inspections of commercial premises to verify that waste is being disposed of in compliance with the duty of care provisions of the Environmental Protection Act 1990	Wolverhampton Council	Ongoing	Low/Low
	MODE OF TRANSPORT				
20	Additional park and ride	Wolverhampton City Council will investigate the development of the bus based park and ride concept where suitable opportunities exist	WCC Regeneration & Environment	Ongoing	Low/Low

	ACTION	DETAILS	STAKEHOLDER	COMPLETION	COST/BENEFIT
21	Promotion of walking	The City Council has adopted a Walking Strategy as a requirement of Government and the LTP. The Strategy promotes facilities to encourage people to walk for more journeys. It covers all aspects from the provision of pedestrian friendly facilities in new developments, education and promotion of walking as a mode of transport, as well as the maintenance of existing facilities	WCC Regeneration & Environment (LTP Commitment)	Ongoing	Med/Low
22	Promotion of cycling	WCC has adopted a Cycle Strategy and has an annual rolling programme for cycle facilities. These provide a framework for the City Council to promote and provide additional safe cycle routes, secure cycle parking and training initiatives. The Council will also continue to ensure that new residential and commercial developments provide secure cycle storage facilities and contribute to the cycle network	WCC Regeneration & Environment (LTP Commitment)	Ongoing	High/Low

	ACTION	DETAILS	STAKEHOLDER	COMPLETION	COST/BENEFIT
23	Use planning conditions to promote Travelwise	WCC will continue where appropriate to attach planning conditions relating to Travelwise to planning consents	WCC Regeneration & Environment	Ongoing	Low/Med