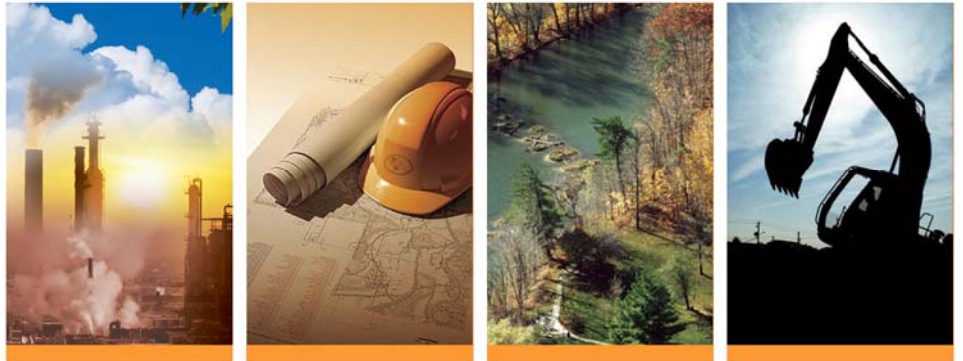


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# Air Quality Further Assessment of Castle Donington AQMA

North West Leicestershire District Council

Prepared for  
North West Leicestershire District Council

**April 2009**  
Ref. No. 933690(4)



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# **AIR QUALITY FURTHER ASSESSMENT OF CASTLE DONINGTON AQMA**

**NORTH WEST LEICESTERSHIRE DISTRICT COUNCIL  
COUNCIL OFFICES, COALVILLE**

**PREPARED FOR NORTH WEST LEICESTERSHIRE DISTRICT  
COUNCIL**

**APRIL 2009**

**REF. NO. 933690 (4)**

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## EXECUTIVE SUMMARY

Conestoga-Rovers & Associates (Europe) Ltd (CRA) were commissioned by North West Leicestershire District Council to conduct an Air Quality Further Assessment of the Castle Donington Air Quality Management Area (AQMA). This report represents the findings of the Further Assessment of the Castle Donington AQMA. The Further Assessment considers the original Detailed Assessment (NWLDC, 2007) and assesses additional monitoring data to determine whether amendments to the geographical extent of the AQMA are required. A preliminary source apportionment study has been conducted and the improvement in air quality required to meet the Air Quality Objective calculated.

North West Leicestershire District Council monitors nitrogen dioxide (NO<sub>2</sub>) concentrations at seven sites within the Castle Donington AQMA using passive diffusion tubes. The results of NO<sub>2</sub> diffusion tube monitoring conducted in 2008 have demonstrated exceedences of the annual mean 40µgm<sup>-3</sup> Air Quality Objective at two of the seven monitoring locations, CD High and 34 Bondgate; 40.23µgm<sup>-3</sup> and 52.92µgm<sup>-3</sup> respectively. The 2008 annual mean NO<sub>2</sub> concentrations at three of the remaining monitoring locations were within one standard deviation (4µgm<sup>-3</sup>) of the 40µgm<sup>-3</sup> annual mean Air Quality Objective. The monitored concentrations at the two remaining locations, High Street and 44 High Street were significantly below the objective level; 20.40µgm<sup>-3</sup> and 32.12µgm<sup>-3</sup> respectively.

Using year adjustment factors the annual mean NO<sub>2</sub> concentration is predicted to remain significantly above the 40µgm<sup>-3</sup> objective in 2010 at one monitoring location, 34 Bondgate; 49.11µgm<sup>-3</sup>. In 2010 it is estimated that the NO<sub>2</sub> concentrations at two other monitoring locations, CD High and 94 Bondgate will exceed 36µgm<sup>-3</sup>; the concentration at which AQMAs should be declared if the precautionary approach detailed within LAQM.TG(09) is followed.

The monitored and predicted annual mean concentrations in Castle Donington support the original AQMA declaration and demonstrate that no changes to the geographical extent of the AQMA are required.

An assessment of the improvement in NO<sub>2</sub> concentrations required within the Castle Donington AQMA, in order to achieve the 40µgm<sup>-3</sup> annual mean Air Quality Objective was conducted. An improvement of 0.23µgm<sup>-3</sup> is required at the CD High monitoring location, whilst at the 34 Bondgate monitoring location an improvement of 12.92µgm<sup>-3</sup> would be necessary in order to achieve the Air Quality Objective. In order to achieve these reductions the Local Authority will need to implement some far reaching air quality improvement measures.

A preliminary source apportionment assessment has been conducted for the Castle Donington AQMA to identify the predominant sources that contribute to air quality exceedences, with the aim of separating regional and local background air pollutant concentrations from local sources. The source apportionment assessment determined that 55% of the NO<sub>2</sub> concentrations monitored within the Castle Donington AQMA arose from road traffic emissions, 52.5% of the total emissions arose from cars and LDVs and 2.5% from buses and HGVs. The results of the source apportionment assessment indicate that air quality improvement measures should be targeted at road traffic sources.

The findings of the Air Quality Further Assessment support the original declaration of the AQMA comprising ninety one residential properties on High Street and Bondgate, Castle Donington. Based on the findings of this Further Assessment the following recommendations are made to North West Leicestershire District Council:

- An Air Quality Action Plan be developed in partnership with Leicestershire County Council, detailing a range of options for reducing NO<sub>2</sub> concentrations within the Castle Donington AQMA with particular attention paid to options which would have a significant impact on road traffic emissions. North West Leicestershire District Council must submit the Castle Donington AQMA Air Quality Action Plan within twelve months following the submission of this Further Assessment to the Department for Food and Rural Affairs (DEFRA).
- The monitoring of NO<sub>2</sub> concentrations on the façade of residential properties on High Street and Bondgate, Castle Donington should continue to determine if any alterations in the geographical extent of the AQMA occurs in the future.

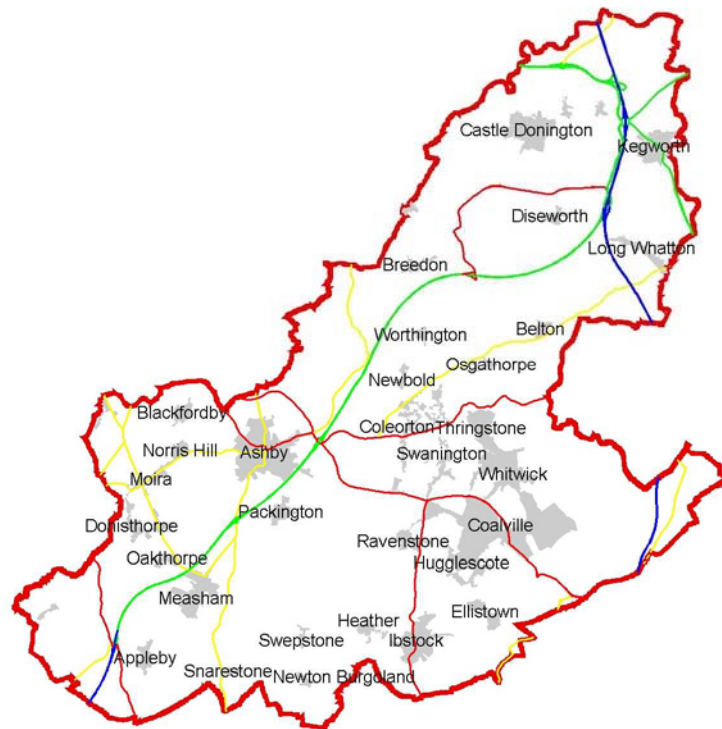
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## 1.0 INTRODUCTION

### 1.1 DESCRIPTION OF THE DISTRICT

North West Leicestershire lies within the East Midlands, between Leicester, Burton-on-Trent, Derby and Nottingham and encompasses 105 square miles. The major urban areas of the district are the towns of Coalville and Ashby-de-la-Zouch, and the large villages of Castle Donington, Kegworth and Ibstock. The M1, M42/A42 between Birmingham and Nottingham and the A50/A511 from Leicester to Burton-on-Trent all run through the district and East Midlands Airport is located north of Castle Donington.



**Figure 1 North West Leicestershire District Council Boundaries**

### 1.2 INTRODUCTION TO REVIEW AND ASSESSMENT

The UK Government's Air Quality Strategy for England, Scotland, Wales and Northern Ireland (DEFRA, 2007a) sets out a framework for air quality management, which includes a number of Air Quality Objectives. National and international

measures are expected to achieve these objectives in most locations, but where areas of poor air quality remain, air quality management at a local scale has a particularly important role to play. Part IV of the Environment Act 1995 requires local authorities to periodically review and assess the current, and likely future air quality in their areas. The role of this process is to identify areas where it is unlikely that the Air Quality Objectives will be achieved by the due date. These locations must be designated as Air Quality Management Areas (AQMAs) and a subsequent Action Plan developed in order to reduce pollutant emissions in pursuit of the objectives.

Review and Assessment is a long-term, ongoing process, structured as a series of 'rounds'. Local authorities in England, Scotland and Wales have now largely completed two rounds of Review and Assessment, with the third round underway.

Local Air Quality Management Technical Guidance (LAQM.TG(09)) (DEFRA, 2009) sets out a phased approach to the second and third rounds of Review and Assessment. This prescribes an initial Updating and Screening Assessment, which all authorities must undertake. It is based on a checklist to identify any matters that have changed since the first round. In subsequent years all Local Authorities must undertake a Progress Report. New monitoring data is presented within the Progress Report along with details of any significant changes within the Local Authority area which may have an impact on air quality. If either an Updating and Screening Assessment or Progress Report identifies any areas where there is a risk that the objectives may be exceeded, which were not identified in the previous round, then the Local Authority should progress to a Detailed Assessment.

The purpose of the Detailed Assessment is to determine whether an exceedence of an Air Quality Objective is likely and the geographical extent of that exceedence. If the outcome of the Detailed Assessment is that one or more of the Air Quality Objectives is being, or is likely to be exceeded, then an Air Quality Management Area (AQMA) must be declared. Subsequent to the declaration of an AQMA, a Further Assessment should be carried out to confirm that the AQMA declaration is justified and that the appropriate area has been declared; to ascertain the sources contributing to the exceedence; and to calculate the magnitude of reduction in emissions required to achieve the objective. This information can be used to inform an Air Quality Action Plan, which will identify measures to improve local air quality.

### 1.3 AIR QUALITY OBJECTIVES

The Government's Air Quality Strategy (DEFRA, 2007a) provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the Air Quality Objectives. The objectives are prescribed within The Air Quality (England) Regulations 2000 (HMSO, 2000) and The Air Quality (England) (Amendment) Regulations 2002 (HMSO, 2002). This latter publication sets more stringent objectives for benzene and carbon monoxide (CO). The 'standards' are set as concentrations below which health effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of a particular pollutant. The 'objectives' described in the Regulations set out the extent to which the Government expects the standards to be achieved by a certain date.

Table 1 summarises the objectives which are relevant to this report; those relating to nitrogen dioxide, (NO<sub>2</sub>). Short-term exposure to high concentrations of NO<sub>2</sub> may cause inflammation of respiratory airways. Long-term exposure may affect lung function and enhance responses to allergens in sensitised individuals. The young, old and asthmatics will be particularly at risk.

The Air Quality Objectives only apply where members of the public are likely to be regularly present for the averaging time of the objective (i.e. where people will be exposed to pollutants). For annual mean objectives, relevant exposure is limited to residential properties, schools and hospitals. The 1-hour objective applies at these locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for one hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

Measurements across the United Kingdom (UK) have shown that the 1-hour NO<sub>2</sub> Air Quality Objective is unlikely to be exceeded unless the annual mean NO<sub>2</sub> concentration is greater than 60µgm<sup>-3</sup> (Laxen and Marner, 2003). Thus, exceedences of 60µgm<sup>-3</sup>, as an annual mean NO<sub>2</sub> concentration, may be used as an indicator of potential exceedences of the 1-hour mean NO<sub>2</sub> objective.

The European Union (EU) has also set limit values for NO<sub>2</sub>. Achievement of these values is a national obligation rather than a local one. The limit values for NO<sub>2</sub> are the same levels as the UK objective, but are to be achieved by 2010.



**Table 1: Air Quality Objectives for Nitrogen Dioxide**

Status	Time Period	Objective / Value	To be Achieved by <sup>1</sup>
Statutory UK Objective	1-hour mean	200 µgm <sup>-3</sup> not to be exceeded more than 18 times a year	2005
	Annual mean	40 µgm <sup>-3</sup>	2005
EU Limit Value	1-hour mean	200 µgm <sup>-3</sup> not to be exceeded more than 18 times a year	2010
	Annual mean	40 µgm <sup>-3</sup>	2010

Note 1 The achievement dates for the UK objectives are the end of the specified year; achievement dates for the EU limit values are the start of the specified year.

#### 1.4 KEY FINDINGS OF PREVIOUS REVIEW AND ASSESSMENT REPORTS

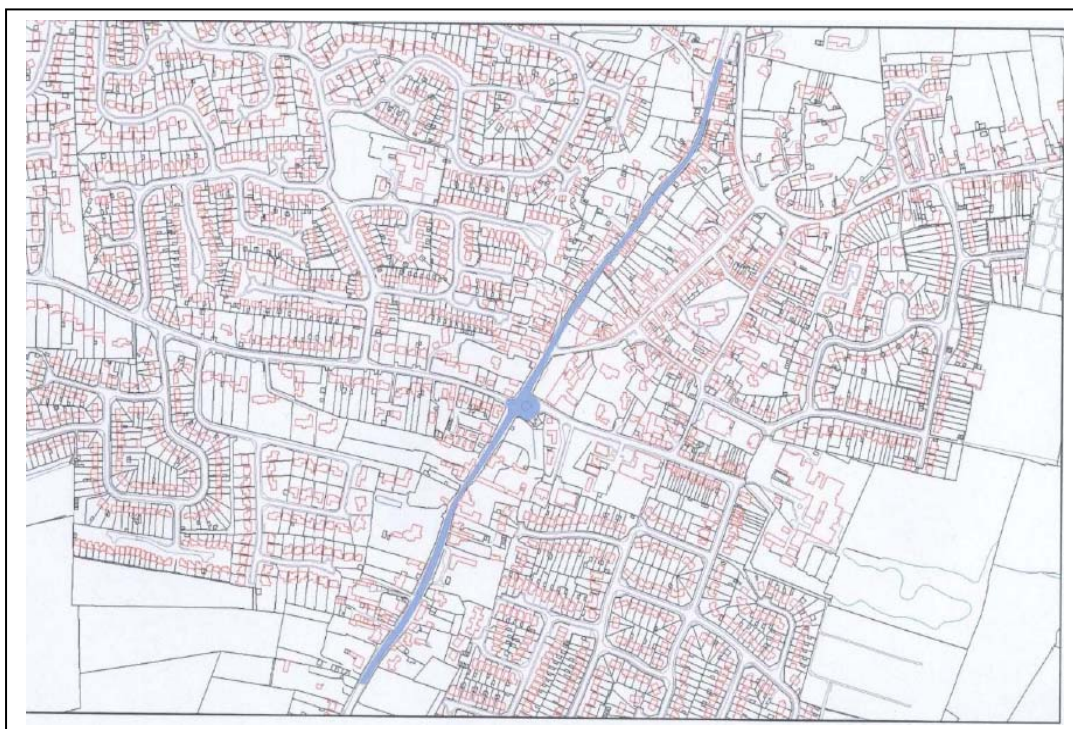
Two AQMAs were declared by North West Leicestershire District Council in 2003 due to exceedences of the annual mean NO<sub>2</sub> Air Quality Objective (40µgm<sup>-3</sup>) from road traffic emissions at residential properties within 10 metres of the A6 in Kegworth and Molehill House Farm, situated next to the M1 near Kegworth. The Updating and Screening Assessment conducted in 2006 (NWLDC, 2006) identified two areas within North West Leicestershire; High Street/Bondgate in Castle Donington and Bardon Road to Broom Leys Junction in Coalville as areas in which the NO<sub>2</sub> concentrations exceeded the annual mean Air Quality Objective due to traffic emissions.

The Detailed Assessment conducted for High Street/Bondgate, Castle Donington identified exceedences of the annual mean NO<sub>2</sub> Air Quality Objective between 2005 and 2007. Atmospheric dispersion modelling was conducted and the results identified that properties situated next to the carriageway along High Street and Bondgate, in particular at the junction with Delvin Lane, would exceed the NO<sub>2</sub> annual mean Air Quality Objective.

As a result of these findings it was recommended that an AQMA be declared covering the High Street and Bondgate area, from the junction of Bondgate and Spital to 56 High Street, encompassing properties immediately alongside the street and those in the vicinity of the Delvin Lane Junction (NWLDC, 2007).

The assessment noted that these recommendations were based on the  $36\mu\text{g}\text{m}^{-3}$  contour line which is in-line with the precautionary approach detailed within LAQM.TG(09), (DEFRA, 2009). In December 2007 North West Leicestershire District Council declared the Castle Donington AQMA encompassing ninety one residential properties along High Street and Bondgate. The boundaries of the Castle Donington AQMA are presented in Figure 2.

**Figure 2: Castle Donington Air Quality Management Area (High Street and Bondgate)**



Conestoga-Rovers & Associates (Europe) Ltd (CRA) were commissioned by North West Leicestershire District Council to conduct a Further Assessment of the Castle Donington AQMA. This report represents the findings of the Further Assessment conducted for the Castle Donington AQMA. It considers the original Detailed Assessment and assesses additional monitoring data to determine whether amendments to the geographical extent of the AQMA are required. A preliminary source apportionment study has been conducted and the improvement in air quality required to meet the Air Quality Objective calculated.

## 1.5 DEVELOPMENTS SINCE THE DECLARATION OF THE AQMA

### 1.5.1 LOCAL DEVELOPMENTS

Since the declaration of the Castle Donington AQMA in 2007 a planning application for 250 residential properties located on Park Lane, Castle Donington has been approved by North West Leicestershire District Council. All traffic movements to and from the development will be via the Park Lane/High Street Junction which is located within the AQMA. Atmospheric dispersion modelling, conducted as part of the planning application, concluded that the proposed development would have a marginally significant impact on air quality at one receptor location on Castle Donington High Street (Wardell-Armstrong, 2008). However, the NO<sub>2</sub> concentrations at this receptor location are predicted to remain below the 40µgm<sup>-3</sup> annual mean Air Quality Objective.

An assessment of the potential impact to local air quality associated with the proposed redevelopment of the Donington Park Race Circuit was conducted by URS Corporation Limited in September 2008 (URS, 2008). The race circuit is situated 1km to the north-east of the Castle Donington AQMA and is being redeveloped to enable the British Formula 1 Grand Prix to take place at the site in 2010. The results of the assessment indicated that construction and road traffic emissions arising from the development would have a negligible impact on air quality in the vicinity of the race circuit.

Since the declaration of the Castle Donington AQMA in 2007 there have been no substantial changes to the road layout on High Street or Bondgate which would have an impact on NO<sub>2</sub> concentrations. However North West Leicestershire District Council's Core Planning Strategy (NWLDC, 2009) which is currently being consulted upon, has identified an area of land to the east of Castle Donington for a relief road linking the B6540 to Trent Lane crossing Park lane. A scoping opinion has been received by the Local Authority Planning Department with a view to developing this area. The reduction of road traffic movements along High Street and Bondgate as a result of the relief road may lead to a reduction in associated air pollution levels with the AQMA.

### 1.5.2 NATIONAL DEVELOPMENTS

The Local Air Quality Management Technical Guidance, LAQM.TG has been revised by DEFRA, (DEFRA, 2009). New, year adjustment factors have been issued by DEFRA for predicting NO<sub>2</sub> concentrations in future years and are detailed within the Technical Guidance (DEFRA, 2009).



## 2.0 MONITORING

Nitrogen dioxide concentrations are monitored within North West Leicestershire using diffusion tubes. The monitoring locations within the Local Authority area are presented in Appendix A, Figure 3. Diffusion tubes are passive samplers which absorb the pollutant from the surrounding air without the need for a power supply. They consist of small plastic tubes with an open and a closed end. The closed end contains an absorbent for NO<sub>2</sub>, and after one month the tubes are closed and returned to a laboratory for analysis. North West Leicestershire District Council use Gradko laboratories for analysis of diffusion tubes using 50% TEA in acetone.

Diffusion tubes are inexpensive and are able to provide good spatial coverage, however they should ideally, be supported by more expensive automatic techniques, as laboratory analysis will introduce different levels of bias depending on the laboratory used. The Technical Guidance LAQM.TG(09) (DEFRA, 2009) therefore recommends that a 'bias adjustment factor' is used for diffusion tube measurements. This should be determined by undertaking a co-location study, with a diffusion tube and a real time (reference method) analyser monitoring at the same location. The factor difference can then be applied to all diffusion monitoring undertaken in the district.

North West Leicestershire District Council co-located two NO<sub>2</sub> diffusion tubes with a real-time NO<sub>2</sub> chemiluminescence analyser to determine a local bias adjustment factor. This local bias adjustment factor, calculated as 1.04, is applied to all NO<sub>2</sub> diffusion tube results reported by North West Leicestershire District Council. Default factors have been developed should this not be possible; however North West Leicestershire District Council used a real time monitor and a diffusion tube at their Council offices in Coalville for a year and calculated a ratification factor of 1.04. This has been applied to the monitoring data.

### 2.1 CURRENT MONITORING LOCATIONS

At the time of the Updating and Screening Assessment conducted in 2006, only one diffusion tube was located along the High Street in Castle Donington. Monitoring data from this tube is available from 1998. Prior to the Detailed Assessment in 2007, four additional tubes were located in this area, at Bondgate, 34 High Street, Park Road Opposite High Street and 56 High Street. These four diffusion tubes were relocated in 2007 prior to the declaration of the AQMA and two further tubes were added. Appendix A presents the positions of these tubes.

### 3.0 RESULTS

The results of the NO<sub>2</sub> diffusion tube monitoring conducted within the Castle Donington AQMA by North West Leicestershire District Council are presented in Table 2. The local bias adjustment factor of 1.04 has been applied to all NO<sub>2</sub> concentrations. Using the year adjustment factors detailed within the Technical Guidance (LAQM.TG(09)) (DEFRA, 2009) the annual mean results from each monitoring location have been projected forward for 2009 and 2010.

**Table 2: Nitrogen dioxide diffusion tube monitoring results**

Monitoring Location	Receptor Type	Annual Mean NO <sub>2</sub> Concentration (µgm <sup>-3</sup> )			
		2007	2008	2009	2010
CD High (Castle Donington High Street)	Residential Façade	40.20	40.23	38.82 <sup>1</sup>	37.33 <sup>2</sup>
High Street <sup>3</sup>	Roadside		29.04	28.02 <sup>1</sup>	26.95 <sup>2</sup>
44 High Street <sup>3</sup>	Residential Façade		32.12	30.99 <sup>1</sup>	29.81 <sup>2</sup>
Bondgate Crossroads <sup>3</sup>	Roadside		37.62	36.30 <sup>1</sup>	34.91 <sup>2</sup>
34 Bondgate <sup>3</sup>	Residential Façade		52.92	51.07 <sup>1</sup>	49.11 <sup>2</sup>
61-79 Bondgate <sup>3</sup>	Residential Façade		36.14	34.88 <sup>1</sup>	33.54 <sup>2</sup>
94 Bondgate <sup>3</sup>	Residential Façade		38.85	37.49 <sup>1</sup>	36.05 <sup>2</sup>

Note 1 2009 concentrations predicted from 2008 concentrations using year adjustment factor of 0.965 (LAQM.TG(09)) (DEFRA, 2009)

Note 2 2010 concentration predicted from 2008 concentrations using year adjustment factor of 0.928 (LAQM.TG(09)) (DEFRA, 2009)

Note 3 Monitoring location commissioned in December 2007

The results of the 2008 annual mean concentrations recorded at the seven diffusion tube monitoring locations in Castle Donington indicate that the NO<sub>2</sub> annual mean Air Quality Objective was exceeded at two locations, CD High (High Street) and 34 Bondgate. Both diffusion tubes are located on residential facades and therefore represent sites of relevant exposure (DEFRA, 2009).

The results from the five other monitoring locations indicate that the NO<sub>2</sub> annual mean concentration in 2008 was within one standard deviation (4µgm<sup>-3</sup>) of the 40µgm<sup>-3</sup> Air Quality Objective at three monitoring locations; Bondgate Crossroads, 61-79 Bondgate and 94 Bondgate; 37.62µgm<sup>-3</sup>, 36.14µgm<sup>-3</sup> and 38.85µgm<sup>-3</sup> respectively. The annual mean NO<sub>2</sub> concentrations at the two remaining monitoring locations, High Street and 34 High Street were significantly below the Air Quality Objective; 29.04µgm<sup>-3</sup> and 32.12µgm<sup>-3</sup> respectively. Overall the 2008 monitored

results demonstrate that the declaration of the AQMA in 2007 was justified and that no alterations to the boundaries of the AQMA are required.

The 2009 and 2010 annual mean NO<sub>2</sub> concentrations have been predicted for the Castle Donington monitoring locations, using the 2008 monitored results and year adjustment factors detailed within the technical guidance, LAQM.TG(09), (DEFRA, 2009). The predicted concentrations, presented in Table 2, are expected to decrease from the 2008 concentrations in 2009 and again in 2010. The results indicate that the 40µgm<sup>-3</sup> annual mean Air Quality Objective will be exceeded at only one monitoring location, 34 Bondgate in 2010. As monitoring at this location is undertaken at the façade of the residential property it is considered to represent a site of relevant exposure. The predicted exceedence of the annual mean Air Quality Objective for NO<sub>2</sub> in 2010 demonstrates that the AQMA should remain and that no alterations in the boundaries of the AQMA are required.

#### 4.0 AIR QUALITY IMPROVEMENTS

The degree of improvement required in order for the annual mean NO<sub>2</sub> Air Quality Objective to be achieved can be defined as the difference between the monitored annual mean concentrations and the objective level of 40µgm<sup>-3</sup>. The reduction in NO<sub>2</sub> concentrations required at each monitoring location in order to achieve the annual mean Air Quality Objective within the Castle Donington AQMA is presented in Table 3.

**Table 3: Reduction in Annual Mean NO<sub>2</sub> Concentrations required to Achieve Air Quality Objective at Monitoring Locations within the Castle Donington AQMA**

<b>Monitoring Location</b>	<b>2008 Annual Mean NO<sub>2</sub> Concentration (µgm<sup>-3</sup>)</b>	<b>Required Reduction in NO<sub>2</sub> Concentration (µgm<sup>-3</sup>) to Achieve 40µgm<sup>-3</sup> Annual Mean Air Quality Objective</b>
CD High	40.23	0.23
High Street	29.04	-
44 High Street	32.12	-
Bondgate Crossroads	37.62	-
34 Bondgate	52.92	12.92
61-79 Bondgate	36.14	-
94 Bondgate	38.85	-

Only two monitoring locations within the Castle Donington AQMA recorded exceedences of the 40µgm<sup>-3</sup> annual mean Air Quality Objective in 2008; CD High and 34 Bondgate. The improvement in NO<sub>2</sub> concentrations required in order to achieve the annual mean Air Quality Objective is 0.23µgm<sup>-3</sup> at CD High and 12.92µgm<sup>-3</sup> at 34 Bondgate.



## 5.0 SOURCE APPORTIONMENT

A source apportionment assessment is used to identify the predominant sources that contribute to air quality exceedences. The aim is to separate regional and local background air quality from local sources. This information can then be used to target the action plan to the principle sources.

Source apportionment requires the use of regional and local background data along with annual mean NO<sub>2</sub> concentrations recorded at relevant receptors. In this source apportionment assessment 2007 data has been utilised, as more recent 2008 data was unavailable.

Regional background concentrations are monitored by the Automatic Urban and Rural Network (AURN), operated by Bureau Veritas. The Lady Bower monitoring station is located in the High Peak, Peak District, approximately 60km North North-West of Castle Donington; concentrations monitored by this station have been used as the regional background concentrations. The mean annual NO<sub>2</sub> concentration for 2007 was 8.40µgm<sup>-3</sup> and the mean annual Nitrogen Oxides (NO<sub>x</sub>) concentration for the same year was 11.65µgm<sup>-3</sup>.

The local background NO<sub>2</sub> concentrations for Castle Donington were estimated using background air pollution maps at 1km x 1km grid resolution published on the UK National Air Quality Archive website ([www.airquality.co.uk/archive/laqm/tools.php?tools=background](http://www.airquality.co.uk/archive/laqm/tools.php?tools=background)). The estimated background annual mean concentration for grid references 444500:326500 and 4445500:327500 were determined from the published 2005 map. The year adjustment factors provided in LAQM.TG(03) (DEFRA, 2003) were utilised to project this concentration forward to 2007, giving a concentration of 18.1µgm<sup>-3</sup>.

The highest monitored 2007 annual mean NO<sub>2</sub> concentration at a relevant receptor has been taken from the diffusion tube monitoring data within the AQMA. In 2007 NO<sub>2</sub> monitoring was only conducted at one location, CD High. The 2007 annual mean NO<sub>2</sub> monitored concentration from this location, 40.20µgm<sup>-3</sup>, has therefore been utilised for this source apportionment assessment.

It is considered that the major source of NO<sub>2</sub> at this location is traffic. Traffic monitoring data supplied by North West Leicestershire District Council has been used to determine the proportion of cars, Light Diesel Vehicles (LDVs), Heavy Goods Vehicles (HGVs) and buses using Castle Donington High Street/Bondgate. This data was collected between 2002 and 2005 at four locations; Hill Top/Ashby Road,

Bondgate, Station Road and Station Road/Trent Lane. The traffic monitoring data demonstrates that 95.5% of traffic using High Street / Bondgate were cars and LDVs and the remaining 4.5% were HGVs and buses. These values are comparable with the modelled proportions used in the Detailed Assessment conducted in 2007 (NWLDC, 2007).

Preliminary source apportionment has been conducted using the methodology described within the Technical Guidance, LAQM.TG(09). The results of the source apportionment assessment are presented in Table 4.

**Table 4: Results of Preliminary Source Apportionment Assessment**

Source	NO <sub>2</sub> Concentration (µgm <sup>-3</sup> )	Contribution to NO <sub>2</sub> Concentrations in AQMA (%)
Regional Background	8.09	20.1
Local Background	10.01	24.9
Cars and LDVs	21.11	52.5
HGVs and Buses	0.99	2.5
<b>Total</b>	<b>40.20</b>	<b>100</b>

The preliminary source apportionment assessment demonstrates that the significant proportion (55%) of NO<sub>2</sub> concentrations within the Castle Donington AQMA arise from road traffic emissions. Emissions from cars and LDVs accounted for 52.5% of the total NO<sub>2</sub> concentrations monitored in Castle Donington; whilst HGVs and buses accounted for just 2.5%.

## 6.0 DISCUSSION AND RECOMMENDATIONS

This report represents the findings of the Air Quality Further Assessment which has been conducted following the declaration of the Castle Donington AQMA by North West Leicestershire District Council in December 2007. The AQMA was declared by the Local Authority as a result of monitored and predicted exceedences of the  $40\mu\text{gm}^{-3}$  annual mean Air Quality Objective due to road traffic emissions.

The results of  $\text{NO}_2$  diffusion tube monitoring conducted in 2008 have demonstrated exceedences of the annual mean  $40\mu\text{gm}^{-3}$  Air Quality Objective at two of the seven monitoring locations, CD High and 34 Bondgate;  $40.23\mu\text{gm}^{-3}$  and  $52.92\mu\text{gm}^{-3}$  respectively. The 2008 annual mean  $\text{NO}_2$  concentrations at three of the remaining monitoring locations were within one standard deviation ( $4\mu\text{gm}^{-3}$ ) of the  $40\mu\text{gm}^{-3}$  annual mean Air Quality Objective. Whilst the monitored concentrations at the two remaining locations, High Street and 44 High Street were significantly below the objective level.

Using year adjustment factors the annual mean  $\text{NO}_2$  concentration is predicted to remain significantly above the  $40\mu\text{gm}^{-3}$  objective in 2010 at one monitoring location, 34 Bondgate;  $49.11\mu\text{gm}^{-3}$ . In 2010 it is estimated that the  $\text{NO}_2$  concentrations at two other monitoring locations, CD High and 94 Bondgate will exceed  $36\mu\text{gm}^{-3}$ ; the concentration at which AQMA's should be declared if the precautionary approach detailed within LAQM.TG(09) is followed.

The monitored and predicted annual mean concentrations in Castle Donington support the original AQMA declaration and demonstrate that no changes to the geographical extent of the AQMA are required.

An assessment of the improvement in  $\text{NO}_2$  concentrations required within the Castle Donington AQMA, in order to achieve the  $40\mu\text{gm}^{-3}$  annual mean Air Quality Objective was conducted. An improvement of  $0.23\mu\text{gm}^{-3}$  is required at the CD High monitoring location, whilst the 34 Bondgate monitoring location an improvement of  $12.92\mu\text{gm}^{-3}$  would be necessary in order to achieve the Air Quality Objective. In order to achieve these reductions the Local Authority will need to implement some far reaching air quality improvement measures.

A preliminary source apportionment assessment has been conducted for the Castle Donington AQMA to identify the predominant sources that contribute to air quality exceedences, with the aim of separating regional and local background air pollutant concentrations from local sources. The source apportionment assessment

determined that over 55% of the NO<sub>2</sub> concentrations monitored within the Castle Donington AQMA arose from road traffic emissions; 52.5% from cars and LDVs and 2.5% from buses and HGVs. The results of the source apportionment assessment indicate that air quality improvement measures should be targeted at road traffic sources.

The findings of the Air Quality Further Assessment support the original declaration of the AQMA comprising ninety one residential properties on High Street and Bondgate, Castle Donington. Based on the findings of this Further Assessment the following recommendations are made to North West Leicestershire District Council:

- An Air Quality Action Plan be developed in partnership with Leicestershire County Council, detailing a range of options for reducing NO<sub>2</sub> concentrations within the Castle Donington AQMA with particular attention paid to options which would have a significant impact on road traffic emissions. North West Leicestershire District Council must submit the Castle Donington AQMA Air Quality Action Plan within twelve months following the submission of this Further Assessment to the Department of Food and Rural Affairs (DEFRA).
- The monitoring of NO<sub>2</sub> concentrations on the façade of residential properties on High Street and Bondgate, Castle Donington should continue to determine if any alterations in the geographical extent of the AQMA occurs in the future.

## 7.0 REFERENCES

**CRA (2008)** *Air Quality Progress Report 933628*. Conestoga-Rovers & Associates (Europe) Ltd prepared on behalf of North West Leicestershire District Council, April 2006.

**DEFRA (2003)** *Local Air Quality Management Technical Guidance (LAQM.TG(03))*. Department for Food and Rural Affairs

**DEFRA (2007a)** *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*. Department for Food and Rural Affairs July 2007. Cmd Paper No. 7169.

**DEFRA (2007b)** *National Atmospheric Emissions Inventory*. [www.naei.org.uk](http://www.naei.org.uk)  
Department for Food and Rural Affairs

**DEFRA (2007c)** *Air Quality Archive* via the internet [www.airquality.co.uk](http://www.airquality.co.uk)  
Department for Food and Rural Affairs

**DEFRA (2009)** *Local Air Quality Management Technical Guidance (LAQM.TG(09))*. Department for Food and Rural Affairs

**DfT (2008)** *Annual Average Daily Traffic Flows*. Department for Transport  
[www.dft.gov.uk/matrix](http://www.dft.gov.uk/matrix)

**Highways Agency (2007)** *Environmental Assessment Techniques - Design Manual for Roads and Bridges*. Highways Agency. Volume 11, Section 3.

**HMSO (2000)** *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*. CM 4548, Her Majesty's Stationary Office Publication

**HMSO (2002)** *The Air Quality (England) (Amendment) Regulations 2002* Statutory Instrument 3043. ISBN 0 11044220 2, Her Majesty's Stationary Office Publication

**Laxen & Marner (2003)** *Analysis of the Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites*. Available from DEFRA, 2007b.

**NWLDC (2006)** *Air Quality Updating and Screening Assessment*. North West Leicestershire District Council, April 2006.

**NWLDC (2007)** *Air Quality Detailed Assessment for Coalville and Castle Donnington*. North West Leicestershire District Council, April 2007.

**NWLDC (2009)** *Core Planning Strategy – Consultation Document*. North West Leicestershire District Council. Available at [www.nwleics.gov.uk/development\\_planning/documents/Appendix\\_7.pdf](http://www.nwleics.gov.uk/development_planning/documents/Appendix_7.pdf)

**UK National Air Quality Archive (2008)** *Background Air Quality Pollutant Maps*. [www.airquality.co.uk/archive/laqm/tools.php?tools=background](http://www.airquality.co.uk/archive/laqm/tools.php?tools=background)

**URS (2008)** *Development at Donington Park Race Circuit Air Quality Assessment*. URS Corporation Ltd. September 2008.

**Wardell-Armstrong (2008)** *Air Quality Assessment Addendum Report – Park Lane, Castle Donington*. Wardell-Armstrong LPP. October 2008.

## APPENDICES

APPENDIX A  
DIFFUSION TUBE MONITORING LOCATIONS