2011 Air Quality Detailed Assessment of 1-hour Mean Air Quality Standard at Broomleys junction Coalville

for

North West Leicestershire District Council

In fulfilment of

Part IV of the Environment Act 1995

Local Air Quality Management

Date: November 2011

Local Authority Officer	Gareth Rees
Department	Environmental Health
Address	North West Leicestershire District Council, Council Offices, Whitwick Road, Coalville, Leicestershire, LE67 3FJ
Telephone	01530 454 615
e-mail	Gareth.rees@nwleicestershire.gov.uk

Report Reference number	NWLDC-Detailed assessment for of 1-hour Mean Air Quality Standard at Broomleys junction Coalville 2011
Date	November 2011

Executive Summary

This report has been undertaken to determine if the 1-hour mean air quality standard for Nitrogen Dioxide (NO_2) is being exceeded at the Broomleys Road, Stephenson Way crossroads within the Coalville AQMA declared for exceedances of the annual mean objective for NO_2

Monitoring has been under taken using an automatic monitor by chemiluminescence for the period 15/09/2010 to 13/10/2011.

The monitoring found that the 1-hour mean air quality standard was exceeded 29 times in the monitored period of 2010 and 20 times in the monitored period of 2011. This exceeds the allowed 18 exceedances of the standard

The local authority must therefore amend the air quality management order to include exceedances of the 1-hour mean air quality standard for Nitrogen dioxide.

Table of contents

List of Appendices

List of Tables

List of Figures

1 Introduction

1.1 Description of Local Authority Area

North West Leicestershire lies in the East Midlands Region and is both the name and geographical location. The district is situated in the heart of the National Forest and lies between Leicester, Burton-on-Trent, Derby and Nottingham, covering 105 square miles. The district is mostly rural with a large extent of industry historically from coal mining, but more recently with Nottingham East Midlands Airport and large quarries. The population of 88,800 live mainly in the principle towns of Coalville and Ashby-de-la-Zouch; and the large villages of Castle Donington, Kegworth and Ibstock. Three established main roads run through the district, the M42/A42 between Birmingham and Nottingham, the M1 and the A50/A511 from Leicester to Burton-on-Trent.

1.2 Purpose of Detailed Assessment Report

This report has been undertaken to determine if the 1 hour mean air quality standard for Nitrogen Dioxide (NO_2) is being exceeded at the Broomleys Road, Stephenson Way crossroads within the Coalville AQMA declared for exceedances of the annual mean objective for NO_2

1.3 Air Quality Objectives

The air quality objectives applicable to Local Air Quality Management (LAQM) in England are set out in the

- The Air Quality (England) Regulations 2000 (SI 2000/0928) [19]
- The Air Quality (England) (Amendment) Regulations 2002 (SI 2002/3043) [20]
- The Air Quality Standards Regulations 2007 (SI 2007/0717)[21]
- The Air Quality Standards Regulations 2010 (SI 2010/1001)[22]

They are shown in Table 1. Table 1 includes the number of permitted exceedances in any given year (where applicable)

Figure 1 Map of North West Leicestershire District

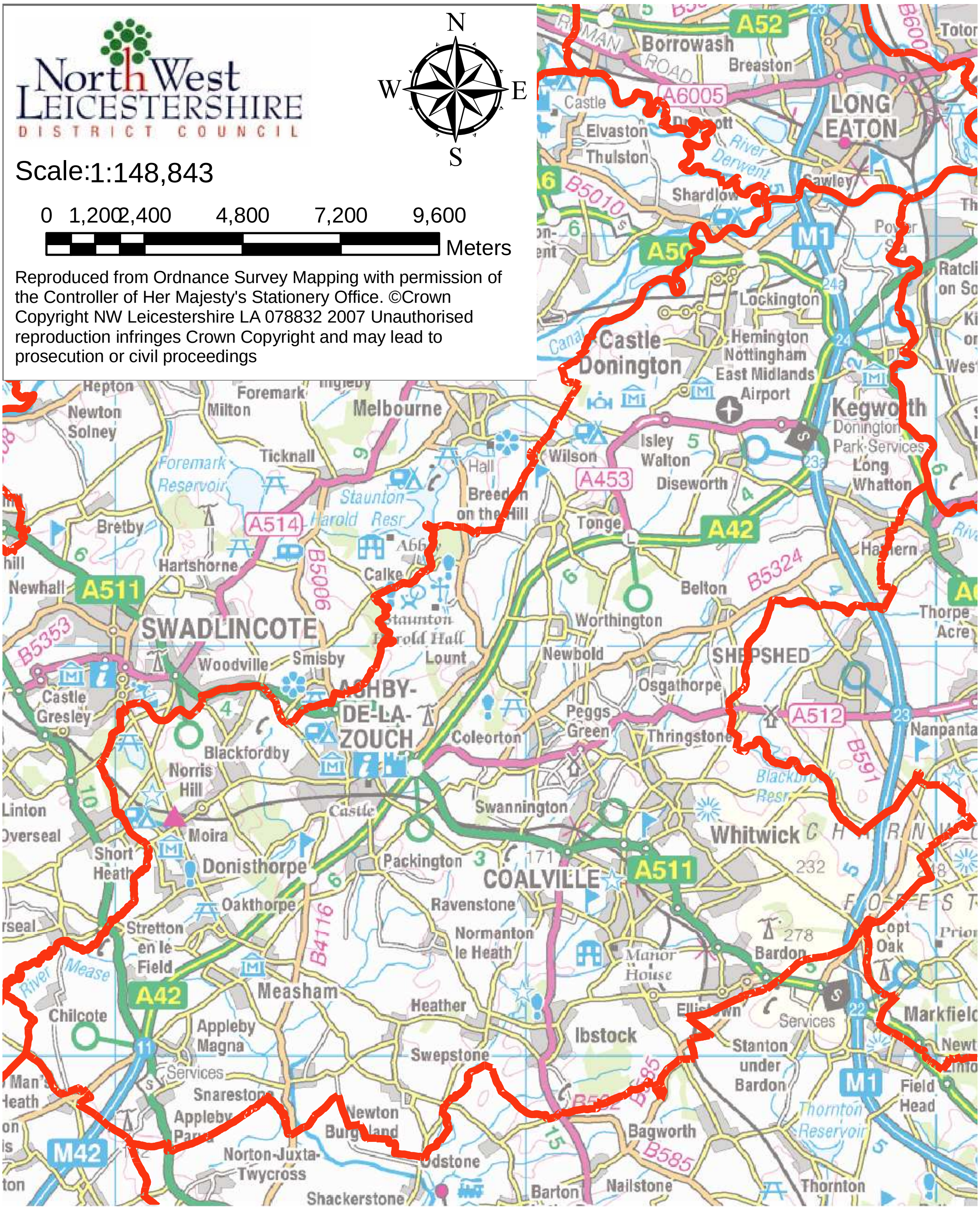


Table 1. Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England.

Pollutant	Concentration	Measured as	Date to be achieved by
Benzene	16.25 µgm^{-3}	Running annual mean	31.12.2003
	5.00 µgm^{-3}	Running annual mean	31.12.2010
1,3-Butadiene	2.25 µgm^{-3}	Running annual mean	31.12.2003
Carbon monoxide	10.0 µgm^{-3}	Running 8-hour mean	31.12.2003
Lead	0.5 µgm^{-3}3	Annual mean	31.12.2004
	0.25 µgm^{-3}	Annual mean	31.12.2008
Nitrogen dioxide	200 µgm^{-3} not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µgm^{-3}	Annual mean	31.12.2005
Particles PM_{10} (gravimetric)	50 µgm^{-3}, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µgm^{-3}	Annual mean	31.12.2004
Particles $PM_{2.5}$ (gravimetric) (not currently included in regulations)	25 µgm^{-3} (target)	Annual mean	2020
Sulphur dioxide	350 µgm^{-3}, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µgm^{-3}, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µgm^{-3}, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

Six AQMA's were designated in North West Leicestershire during the first round of review and assessment for the level of nitrogen dioxide concentrations. After Further Assessments it was determined that only two of these locations required AQMA designations and the remaining four were revoked. The Update and Screening Assessment undertaken in 2006 [1] concluded that these two sites should remain AQMA's and identified three additional locations where Detailed Assessments should be undertaken to determine whether new AQMA's were required for nitrogen dioxide concentrations. The two AQMA's designated during the first round are presented in Figure 2 and Figure 3.

The Detailed Assessment [6] undertaken in September 2007 of the three locations identified as possible areas for AQMA's in the USA 2006 [1], the three locations were High Street/Bondgate in Castle Donington, Broom Leys Road, Coalville and Bardon Road, Coalville, found that exceedances of the nitrogen dioxide objective were occurring in Castle Donington at properties located next to the carriageway along High Street and Bondgate due to traffic emissions. Monitoring at both locations in Coalville identified nitrogen dioxide concentrations that exceeded the mean annual objective during 2005, 2006 and 2007. The Detailed Assessment concludes that AQMA's should be designated at all three locations. As a result of these reports, two additional AQMA's were designated; the first in Castle Donington, presented in Figure 4, and the second covering Broom Leys Road and Bardon Road in Coalville, presented in Figure 5.

The Air Quality Progress Report conducted in April 2008 [7] recommended that a detailed assessment of the village of Copt Oak and the area surrounding East midlands airport be undertaken to determine if AQMA's should be determined at these locations.

The Detailed Assessment of Copt Oak published in January 2009 [9] found that an AQMA should be declared and that the area should cross the district boundary to include an area within the borough of Hinckley and Bosworth as shown in Figure 6.

The Detailed assessment of East midlands airport published in March 2009 [8] concluded that the Air quality objective for NO_2 would not be exceeded within 1000m of the airport as a result of air traffic emissions.

The further assessment of Bardon Road, Coalville published in February 2009 [10] supported the original declaration of the AQMA comprising the four residential properties at Broom Leys Junction and the one hundred and seventy two residential properties on Bardon Road.

The further assessment of High street Castle Donington published in April 2009 [11] supported the original declaration of the AQMA comprising ninety one residential properties on High Street and Bondgate, Castle Donington.

The update and screening assessment published October 2009 [12] found that a detailed assessment for SO_2 was required in some areas of the district in relation to the burning of solid fuel, to which this report relates. The report also recommended that the M1 AQMA is expanded to include an exceedance of the 1-hour mean objective for NO_2 as the yearly mean has exceeded $60µgm^{-3}$.

The Progress Report published in April 2010 [13] found no significant change in the district.

A Detailed Assessment for SO_2 was conducted in 2010 [14]. This found that solid fuel usage within off-gas areas of the district was insufficient to warrant further investigation.

A Detailed assessment of the M1 AQMA conducted in 2011 [16] found that most of the declared area can be revoked as there is either no relevant receptor or the annual mean air quality standard for NO_2 is not being exceeded.

A Detailed Assessment of the Coalville AQMA conducted in 2011 [15] found that the declared area can be reduced to the declared area of Stephenson

Way as the annual mean air quality standard for NO_2 is not being exceeded along Bardon Road.

The 2011 progress report [17] found that Broomleys junction in the Coalville AQMA exceeded the 1-hour mean air quality standard for NO_2 and recommended that a detailed assessment be undertaken.

The progress report also found that the current air quality action plan is insufficient and needs to be updated.

A Further Assessment for the AQMA declared at Copt Oak is currently being undertaken.

Figure 2 Kegworth AQMA (Outlined in blue).

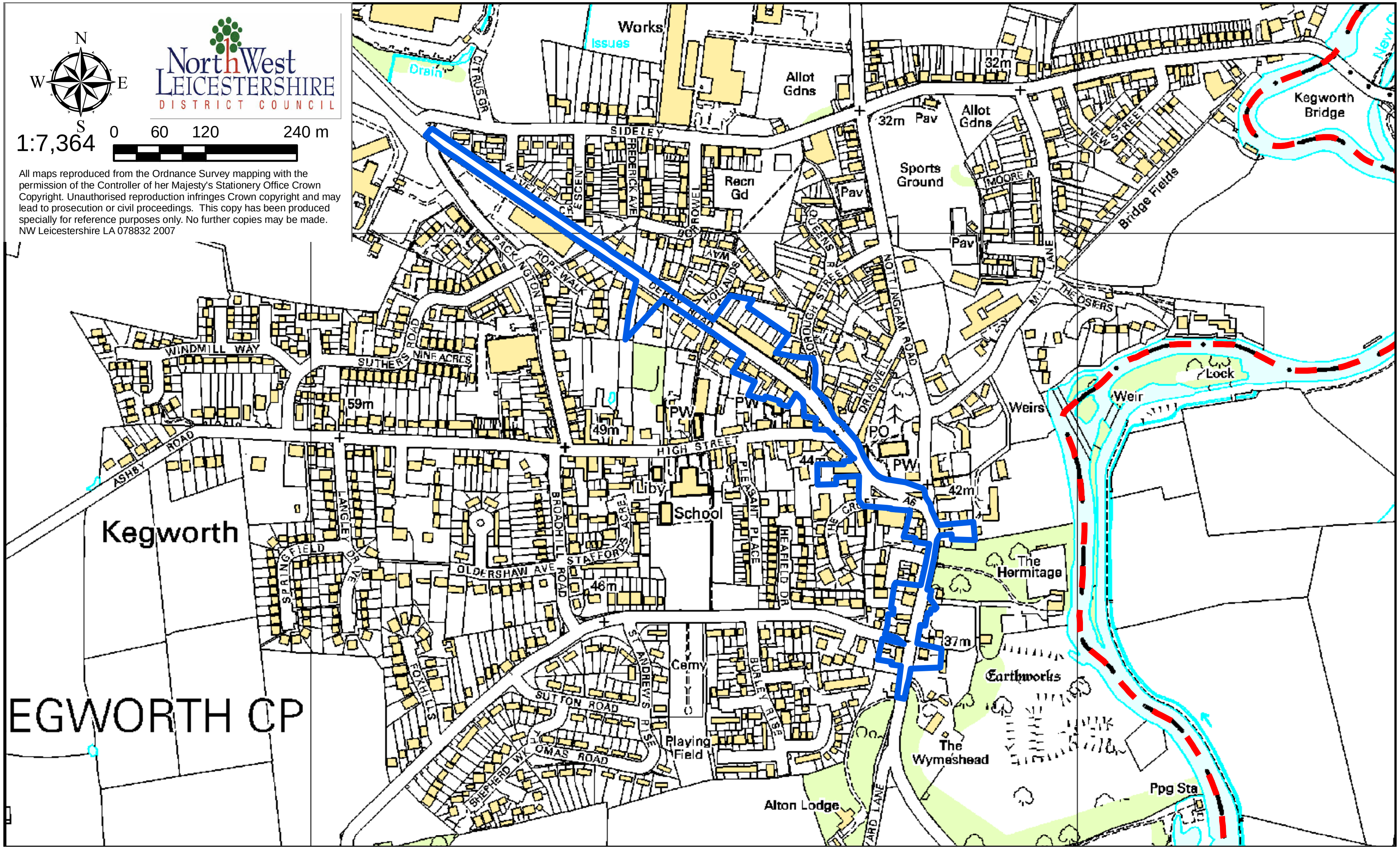


Figure 3   M1 AQMA (Outlined in Blue)

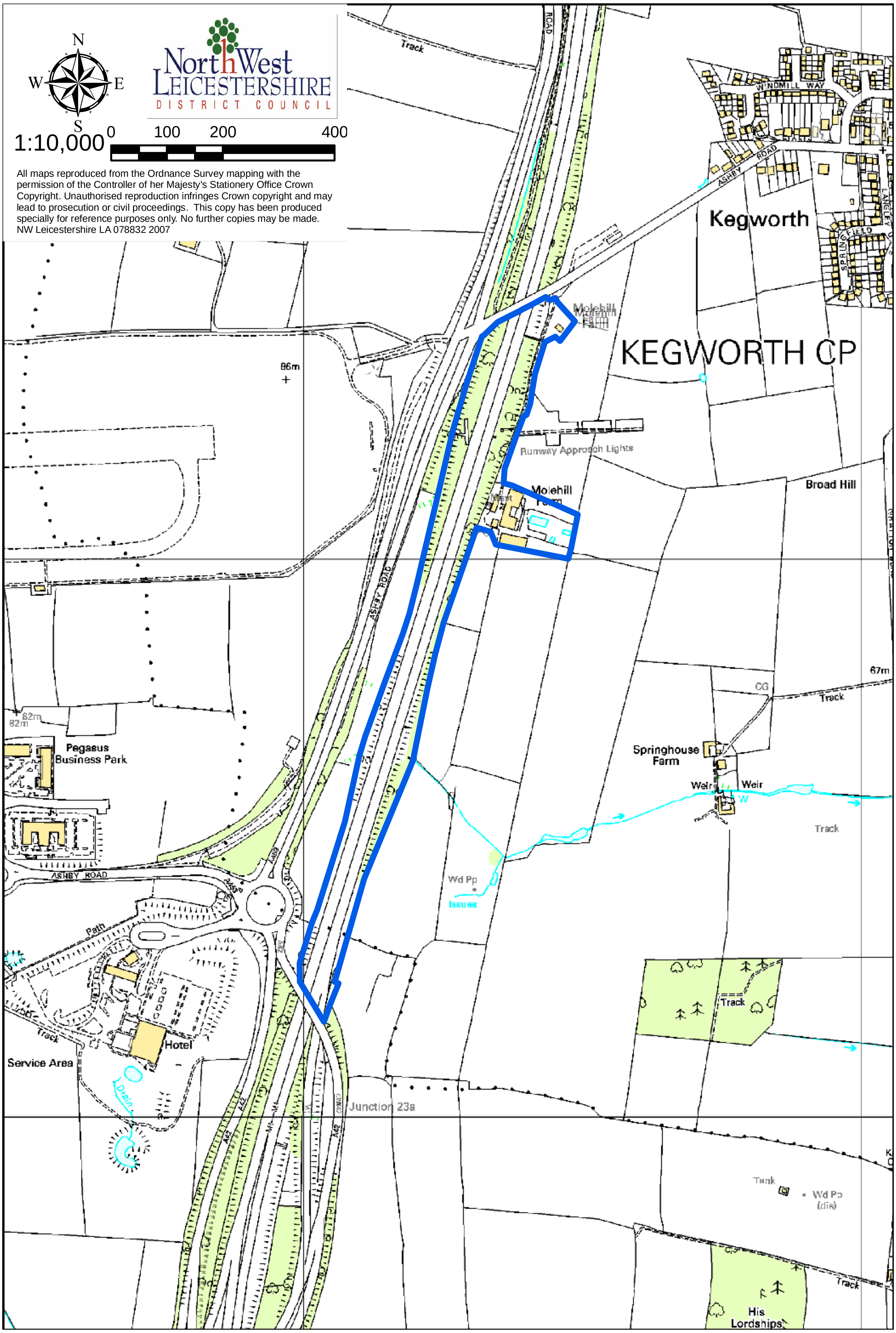


Figure 4   Castle Donington Air Quality Management Area (Outlined in Blue)

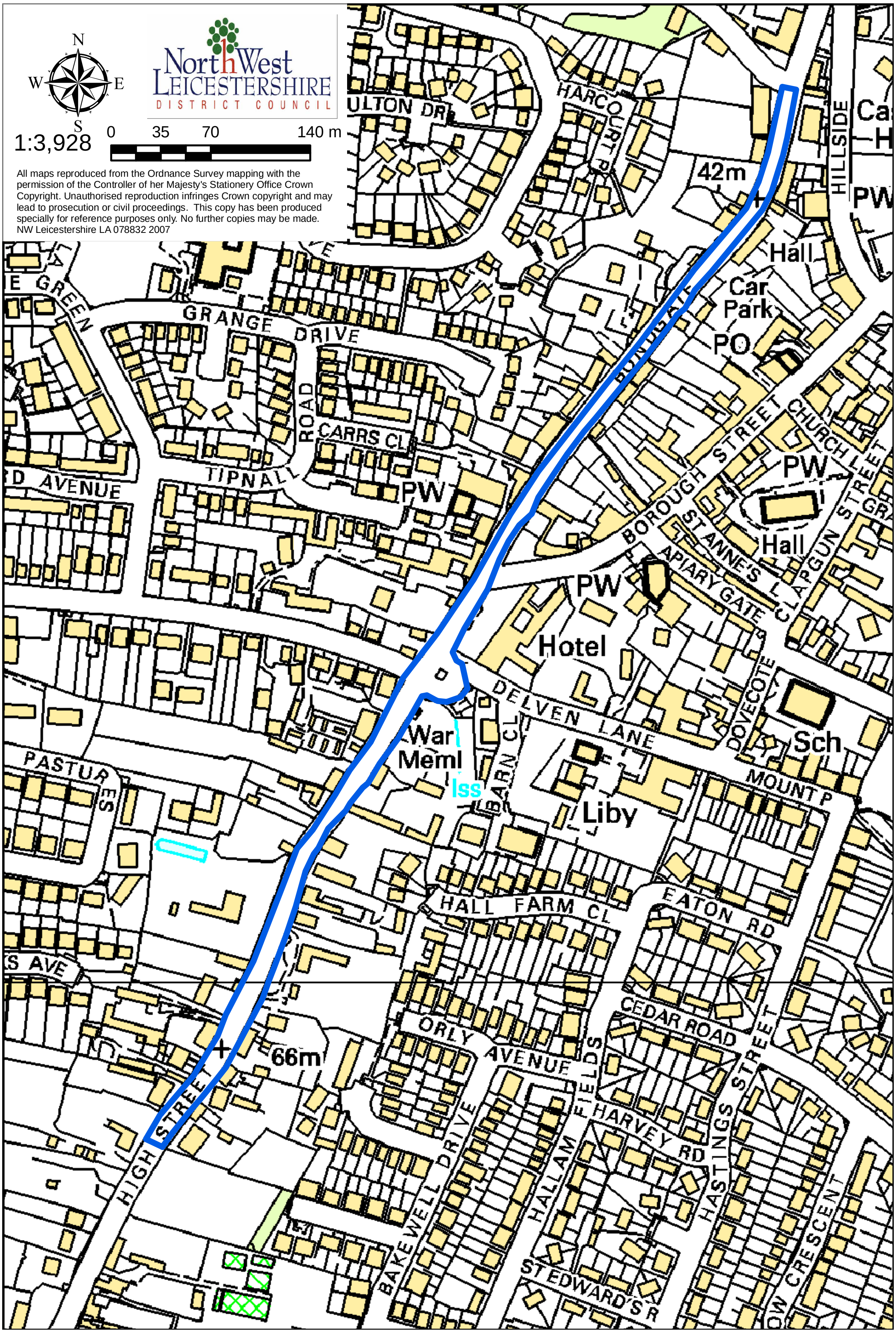


Figure 5   Coalville Air Quality Management Area (Broomleys Junction) (Outlined in Blue)

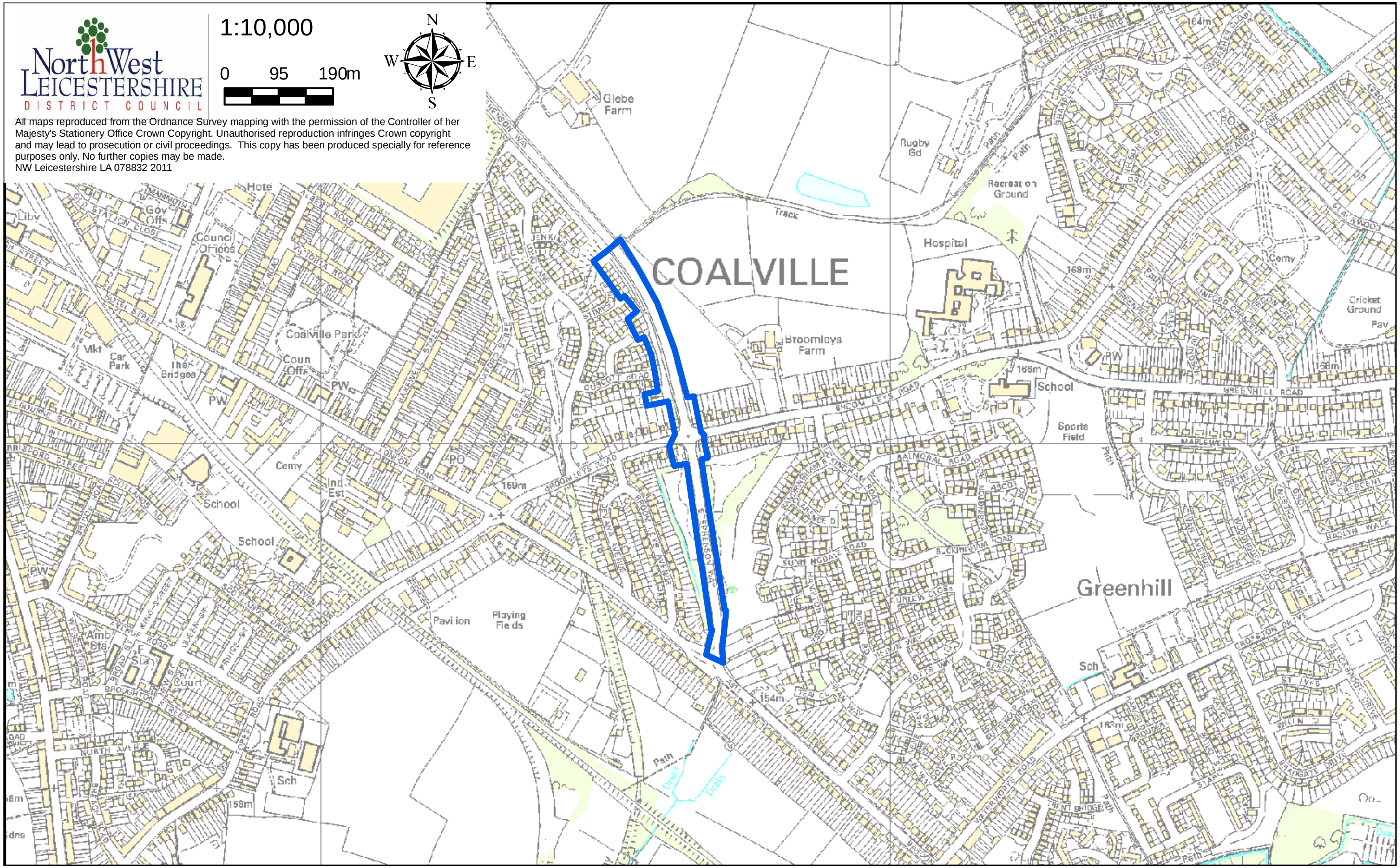
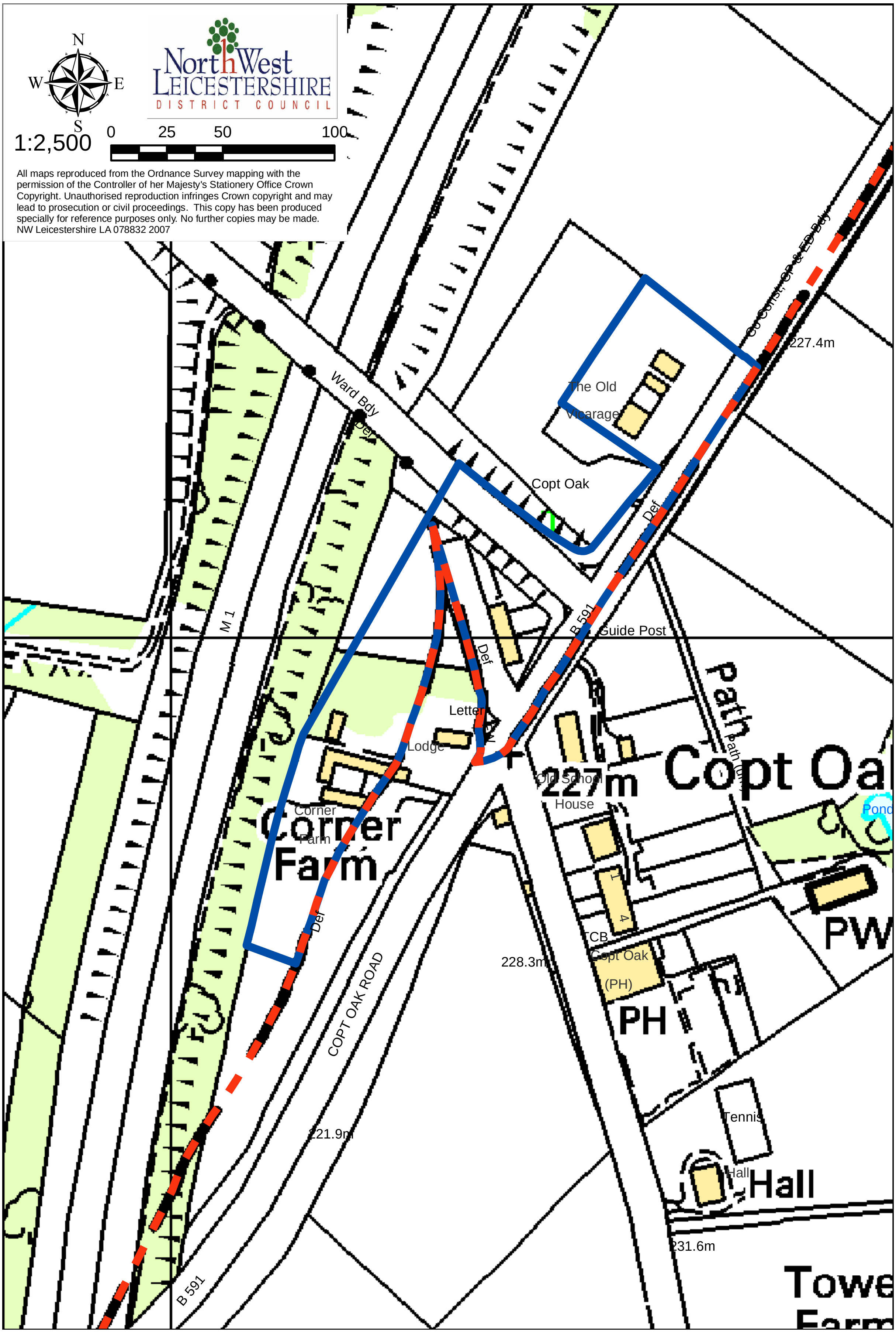


Figure 6 Copt Oak AQMA



2 Methodology

2.1 Automatic Monitoring

An automatic monitor leased from TRL ltd was installed at the Stephenson Way / Broomleys Road junction on the 15th September 2010. The automatic monitor takes an air sample every 5 minutes and analyses it using chemiluminesence.

Chemiluminescence literally means a chemical reaction that produces light. When an NO (nitrogen oxide) molecule reacts with ozone, it is oxidized to NO_2 (nitrogen dioxide), in an excited state. A small fraction of the molecules in this excited state decay by emitting a photon (i.e. giving off light) in the near infrared portion of the spectrum. Thus, if one mixes a gas sample with ozone and measures the amount of light emitted, the concentration of NO_x in the sample may be determined. This technique provides an extraordinarily sensitive, selective, and linear measurement of NO_x, precisely why chemiluminescence has become the standard high-performance NO_x measurement technology. Any NO_2 (nitrogen dioxide, the other component of NO_x) in the sample may be converted to NO for measurement purposes, as discussed below.

NO is the thermodynamically favoured species at high temperatures, which is why it is the dominant species of NO_x in combustion exhausts. NO_2 is the thermodynamically favoured species at low temperatures, making it the dominant species in ambient air. But, the conversion between the species happens extremely slowly at room temperature. While most chemical reactions occur in a small fraction of a second, this conversion takes up to a day under normal atmospheric conditions.

Conversion of NO_2 to NO, is necessary to get an accurate reading of total NOx since only NO can be detected, At elevated temperatures, the reaction between NO and NO_2 occurs very quickly, and if the temperature is high enough essentially all NO2 in a sample can be converted to NO. As the sample cools, the NOx is temporarily "frozen" as NO since the timescale for conversion back to NO_2 is so long.

2.2 Non-Automatic Monitoring

Though non automatic monitoring has been undertaken alongside the automatic monitoring it cannot be used to compare air quality with the 1-hour mean air quality standard for NO_2

3 Results

Table 2. Overview of hourly monitoring results for NO_2

	2010 **µgm^{-3}**	**2011** **µgm^{-3}**
Minimum	1.0	0.5
Mean	67.1	36.6
Standard Deviation	41.9	32.0
Median	61.4	27.4
Maximum	297.8	316.2
monitoring period	15/09/2010 - 31/12/2010	01/01/2011 - 13/10/2011
No. of days in monitoring period	109	287
Count (No. of data points in monitoring periods)	2533	6623
Data Capture (%) for monitoring period	96.83%	96.63%
No. Exceedances of the NO_2 1-hour mean objective (200µgm^{-3})	29	20
percentage annual data coverage	28.92%	75.61%
99.8th percentile	270.44	243.89
annualised mean	54.63	

Figure 7   Automatic Monitoring Data 2010

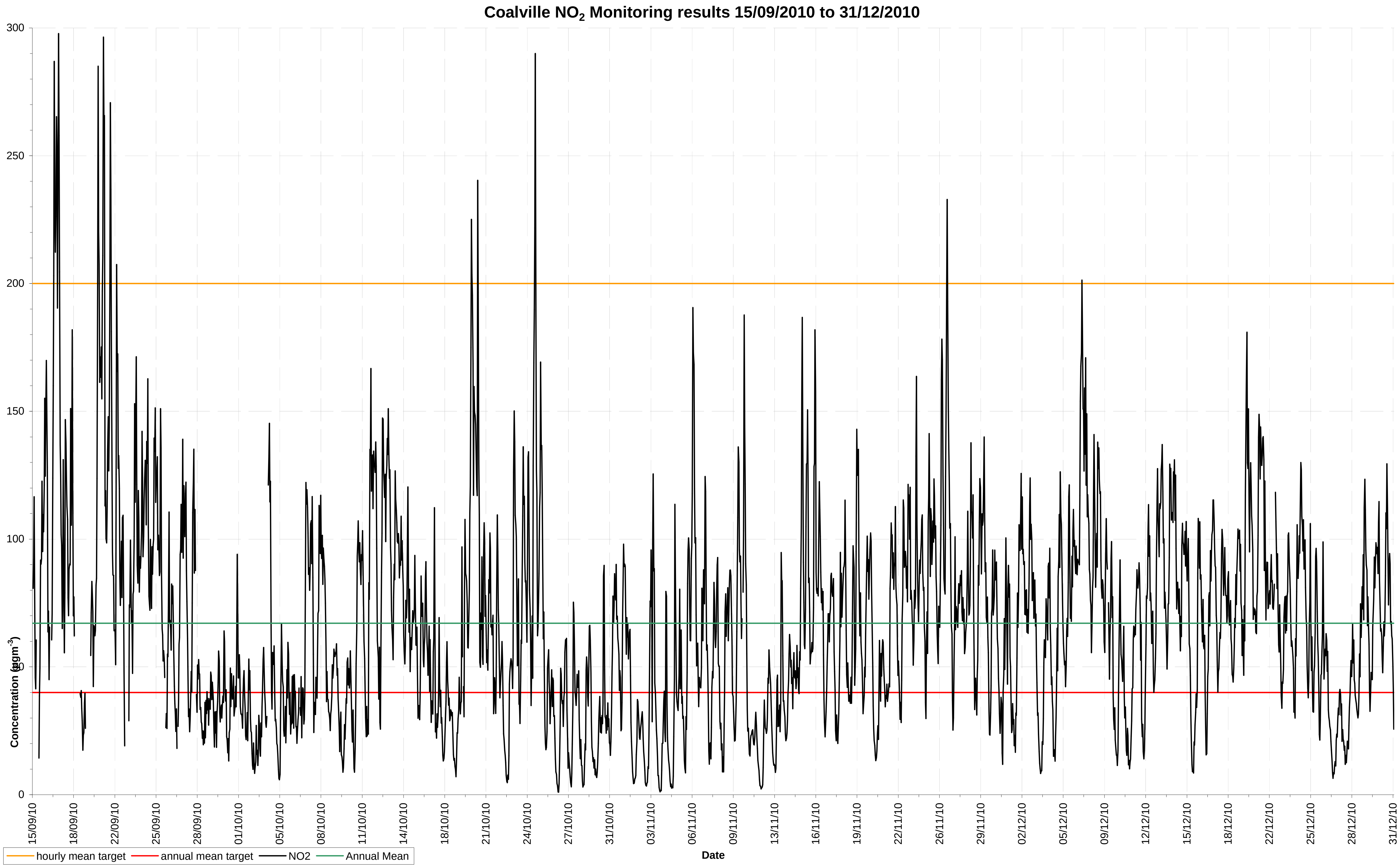
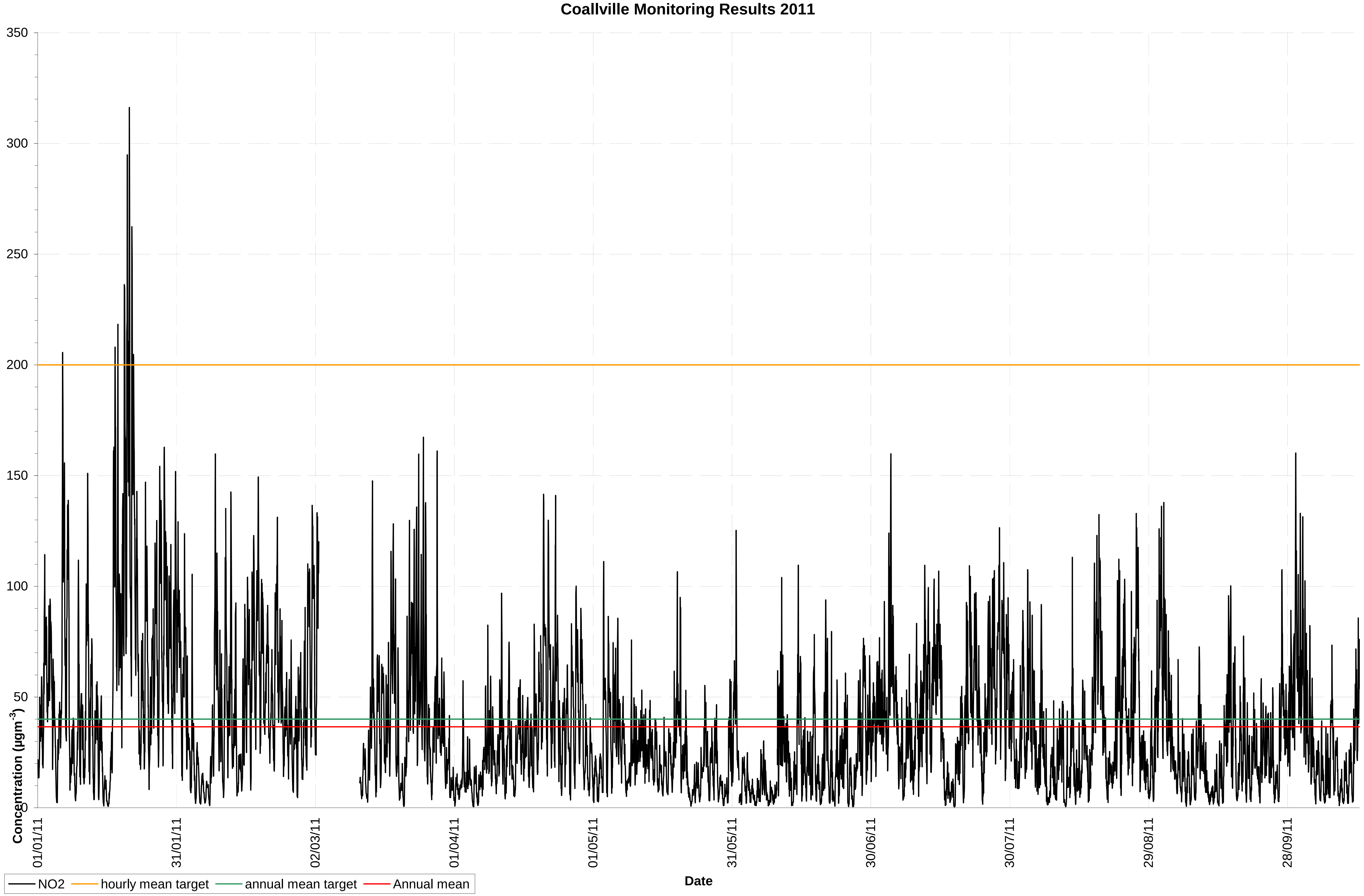


Figure 8 Automatic Monitoring Data 2011



4 Analysis of Results

During the period 15/09/2010 to 31/12/2010 the 1-hour mean air quality standard for NO_2 was exceeded 29 times which exceeds the allowed 18 exceedances

During the Period 01/01/2011 to 13/10/2011 1-hour mean air quality standard for NO_2 was exceeded 20 times which exceeds the allowed 18 exceedances.

Therefore the 1-hour mean air quality standard has been exceeded in excess of the allowed number of exceedances in 2 consecutive years.

Table 3. table of the 49 recorded exceedances of the 1-hour mean air quality standard for NO_2 during the period 15/09/2010 – 13/10/2011

Date	Time	NO_2	Period
	Hour beg.	μgm^{-3}	
17/09/2010	08:00	203.04	Morning Peak Hour
17/09/2010	09:00	286.90	Morning Peak Hour
17/09/2010	10:00	228.02	
17/09/2010	11:00	212.30	
17/09/2010	12:00	226.31	
17/09/2010	13:00	265.29	
17/09/2010	14:00	251.70	
17/09/2010	16:00	233.43	Evening Peak Hour
17/09/2010	17:00	297.79	Evening Peak Hour
17/09/2010	18:00	257.86	Evening Peak Hour
17/09/2010	19:00	204.55	
20/09/2010	19:00	201.03	
20/09/2010	20:00	285.01	
20/09/2010	21:00	220.27	
20/09/2010	22:00	207.51	
21/09/2010	05:00	210.96	
21/09/2010	06:00	296.41	
21/09/2010	07:00	261.54	Morning Peak Hour
21/09/2010	08:00	265.73	Morning Peak Hour
21/09/2010	19:00	270.76	
21/09/2010	20:00	236.89	
22/09/2010	07:00	207.41	Morning Peak Hour
20/10/2010	06:00	225.09	
20/10/2010	07:00	203.44	Morning Peak Hour
20/10/2010	18:00	240.38	Evening Peak Hour
25/10/2010	06:00	221.76	
25/10/2010	07:00	289.99	Morning Peak Hour
26/11/2010	18:00	232.90	Evening Peak Hour
07/12/2010	09:00	201.37	Morning Peak Hour
06/01/2011	09:00	205.56	Morning Peak Hour

Date	Time	NO_2	Period
	Hour beg.	μgm^{-3}	
17/01/2011	17:00	208.02	Evening Peak Hour
18/01/2011	07:00	218.35	Morning Peak Hour
19/01/2011	17:00	236.19	Evening Peak Hour
19/01/2011	18:00	234.71	Evening Peak Hour
19/01/2011	19:00	211.62	
20/01/2011	06:00	214.37	
20/01/2011	07:00	220.22	Morning Peak Hour
20/01/2011	08:00	294.84	Morning Peak Hour
20/01/2011	09:00	222.34	Morning Peak Hour
20/01/2011	15:00	210.61	
20/01/2011	17:00	223.16	Evening Peak Hour
20/01/2011	18:00	242.58	Evening Peak Hour
20/01/2011	19:00	316.19	
20/01/2011	20:00	259.94	
21/01/2011	08:00	262.40	Morning Peak Hour
21/01/2011	09:00	247.23	Morning Peak Hour
21/01/2011	10:00	203.05	
21/01/2011	16:00	204.75	Evening Peak Hour
21/01/2011	17:00	203.23	Evening Peak Hour

Though traffic flow peak-hour does not have a definition defined in legislation, for the purposes of this report peak-hours have been defined as 07:00 – 10:00 and 16:00 – 19:00, these are often used time periods as quoted in section 2.5.3 of DMRB 12.2.1[41]

15 of the recorded exceedances occurred during the commonly used morning peak-hour time

12 of the recorded exceedances occurred during the commonly used evening peak-hour time

12 of the recorded exceedance occurred in the hours immediately before/after after commonly used peak-hour times

39 of the recorded exceedances have occurred in or around peak-hour times

5 Conclusions and Proposed Actions

The 1-hour mean air quality standard for Nitrogen Dioxide (NO_2) has been exceeded in excess of the allowed number of exceedances. As the local authority has shown that the air quality standard is being exceeded it must extended the scope of the declaration of the current AQMA to included a declaration for exceeding the 1-hour mean air quality standard for NO_2

5.1 Proposed Actions

To amend the North West Leicestershire District Council Air Quality Management Order 2008 (No. 2), 2008 to include exceedances of the 1-hour mean air quality standard for NO_2

To undertake a further assessment to better understand the causes of the exceedance of the 1-hour mean air quality standard for NO_2

To amend the air quality action plan to include measures to combat exceedances of the 1-hour mean air quality standard for NO_2

6 References

6.1 Previous Review and Assessment Reports

[1] North West Leicestershire District Council , 2003a, *Air Quality Stage 4 Review and Assessment*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[2] North West Leicestershire District Council , 2003b, *Air Quality Updating and Screening Assessment 2003*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[3] North West Leicestershire District Council , 2005a, *Air Quality Detailed Assessment*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[4] North West Leicestershire District Council , 2005b, *Air Quality Progress Report 2005*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[5] North West Leicestershire District Council , 2006, *Air Quality Updating and Screening Assessment 2006*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[6] North West Leicestershire District Council, 2007, *Air Quality Detailed Assessment for Coalville and Castle Donington*. Coalville: North West Leicestershire District Council. Available at:

https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[7] Conestoga-Rovers & Associates (Europe) Ltd, 2008, *Air Quality Progress Report 2008 Report No. 933628*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[8] Conestoga-Rovers & Associates (Europe) Ltd, 2009a, *Air Quality Detailed Assessment For East Midlands Airport Report No.933690-1*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[9] Conestoga-Rovers & Associates (Europe) Ltd, 2009b, *Air Quality Detailed Assessment For Copt Oak Report No. 933690-2-RPT2*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[10] Conestoga-Rovers & Associates (Europe) Ltd, 2009c, *Air Quality Further Assessment Of Bardon Road AQMA, Coalville Report No. 933690-2-RPT3*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[11] *Conestoga-Rovers & Associates (Europe) Ltd, 2009d, Air Quality Further Assessment of Castle Donington AQMA Report No.933690-4*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[12] North West Leicestershire District Council, 2009e, *Air Quality Update and Screening Assessment 2009*. Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[13] North West Leicestershire District Council, 2010a, *Air Quality Progress Report 2010*, Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[14] North West Leicestershire District Council, 2010b, *Air Quality Detailed Assessment for SO_2*, Coalville: North West Leicestershire District Council Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/05/2011]

[15] North West Leicestershire District Council, 2011a, *Air Quality Detailed Assessment of Coalville AQMA*, Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[16] North West Leicestershire District Council, 2011b, *Air Quality Detailed Assessment of M1 AQMA*, Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

[17] North West Leicestershire District Council, 2011c, *Air Quality Progress Report 2011*, Coalville: North West Leicestershire District Council. Available at: https://www.nwleics.gov.uk/pages/local_air_quality_review_and_assessment [Accessed 21/09/2011]

6.2 Acts, Statutory Instruments and orders

[18] Environment Act 1996 (c. 25), London: Her Majesty's Stationary Office Available at: http://www.legislation.gov.uk/ukpga/1995/25/contents [Accessed 21/09/2011]

[19] *Air Quality (England) Regulations 2000* SI 2000/0928, London: HMSO Available at: http://www.legislation.gov.uk/uksi/2000/928/contents/made [Accessed 21/09/2011]]

[20] *Air Quality (England) (Amendment) Regulations 2002* SI 2002/3043, London: HMSO. Available at: http://www.legislation.gov.uk/uksi/2002/3043/contents/made [Accessed 21/09/2011]

[21] *The Air Quality Standards Regulations 2007* SI 2007/0717, London: HMSO Available at http://www.legislation.gov.uk/uksi/2007/64/contents/made [Accessed 21/09/2011]

[22] The Air Quality Standards Regulations 2010 SI 2010/1001, London: HMSO. Available at http://www.legislation.gov.uk/uksi/2010/1001/contents/made [Accessed 21/09/2011]

[23] *North West Leicestershire District Council Air Quality Management Order 2009 (No. 1),* 2009 Coalville: North West Leicestershire District Council. Available at http://www.nwleics.gov.uk/pages/air_quality_managment_area_copt_oak [Accessed 21/09/2011]

[24] *North West Leicestershire District Council Air Quality Management Order 2008 (No. 1)*, 2008, Coalville: North West Leicestershire District Council. Available at http://www.nwleics.gov.uk/pages/air_quality_managment_area_castle_donington [Accessed 21/09/2011]

[25] *North West Leicestershire District Council Air Quality Management Order 2008 (No. 2),* 2008, Coalville: North West Leicestershire District Council. Available at http://www.nwleics.gov.uk/pages/air_quality_managment_area_coalville [Accessed 21/09/2011]

[26] *The North West Leicestershire District Council (Kegworth Air Quality Management Area) Order 2001*, 2001, Coalville: North West

Leicestershire District Council Available at http://www.nwleics.gov.uk/pages/air_quality_managment_area_high_street_kegworth [Accessed 21/09/2011]

[27] *North West Leicestershire District Council (M1 Air Quality Management Area) Order 2001*, 2001, Coalville: North West Leicestershire District Council Available at http://www.nwleics.gov.uk/pages/m1_mole_hill_farm_kegworth [Accessed 21/09/2011]

[28] *Air Quality Management Area (Nitrogen Dioxide) Amendment Order 2011 (No.1).* 2011, Coalville: North West Leicestershire District Council Available at http://www.nwleics.gov.uk/pages/m1_mole_hill_farm_kegworth [Accessed 21/09/2011]

[29] *Air Quality Management Area (Nitrogen Dioxide) Amendment Order 2011 (No.1).* 2011, Coalville: North West Leicestershire District Council Available at https://www.nwleics.gov.uk/pages/air_quality_managment_area_coalville [Accessed 29/09/2011]

6.3 British Standards

[30] British Standards Institution, 2007. *BS EN 15259:2007 Air quality. Measurement of stationary source emissions. Requirements for Progress Report 32 measurement sections and sites and for the measurement objective, plan and report*. Milton Keynes: BSI

[31] British Standards Institution 2007. *BS ISO 4226:2007 - Air quality. General aspects. Units of measurement*. Milton Keynes: BSI

6.4 Technical guidance

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

[33] Department for Food and Rural Affairs, 2009. *Local Air Quality Management Policy Guidance LAQM.PG(09).* London: Department for Food and Rural Affairs

[34] Department for Food and Rural Affairs, 2003. *Local Air Quality Management Technical Guidance LAQM.TG(03)*. London: Department for Food and Rural Affairs

6.5 Other Documents

[35] AEA, 2007a, National Atmospheric Emissions Inventory. www.naei.org.uk Department for Food and Rural Affairs

[36] AEA, 2010, Quality assurance/quality control (QA/QC) framework. [Online] London: Department for Environment, Food and Rural Affairs. Available at: http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html [Accessed 21/09/2011]

[37] Bureau Veritas, 2011, *National Diffusion Tube Bias Adjustment Factor Spreadsheet version 06/11*. [online] London: Department for Environment Food and Rural Affairs. Available at: http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html [Accessed 21/09/2011]

[38] Department for Food and Rural Affairs, 2007, *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. CM 7169 NIA 61/06-07*, London: Her Majesty's Stationary Office.

[39] Department for Transport, 2008. *Annual Average Daily Traffic Flows.* London: Department for Transport http://www.dft.gov.uk/matrix

[40] Highways Agency, 1992 (updated June 2010). *Design Manual for Roads and Bridges Volume 11, Section 3 Environmental Assessment Progress Report 34 Techniques*. Birmingham: Highways Agency. Available at: http://www.standardsforhighways.co.uk/dmrb/index.htm [accessed 08/11/2011].

[41] Highways Agency, 1992 (updated June 2010). *Design Manual for Roads and Bridges Volume 12, Section 2 Part 1 Traffic Appraisal in Urban Areas* Birmingham: Highways Agency. Available at:

http://www.standardsforhighways.co.uk/dmrb/index.htm [accessed 08/11/2011].

[42] Laxen & Marner. 2003. A*nalysis of the Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites.* Available from DEFRA,.

[43] Office for National Statistics, updated 04 November 2010, *Resident Population Estimates, All Persons, Mid 2009*. [online] Available at: http://neighbourhood.statistics.gov.uk/dissemination/LeadTrendView.do?a=3&b=277034&c=north+west+leicestershire&d=13&e=13&f=26982&g=466548&i=1001x1003x1004x1005&l=1818&o=322&m=0&r=1&s=1297168244107&enc=1&adminCompId=26982&variableFamilyIds=6766&xW=779

7 Appendices

Appendix A QA:QC Data

QA/QC of automatic monitoring

The analyser at Coalville is an API 200 chemiluminescence analyser,

Routine instrument calibrations are conducted once per month, which involve zero and span checks, a written record of the gas analyser diagnostics and a general visual inspection of all equipment is undertaken.

Data retrieval and daily data checking

Data from the monitoring station is retrieved and processed on a data logger as 15-minute mean data. The logger is interrogated via a Siemens TC35i GSM modem at 8-hourly intervals by the ENVIEW 2000 software hosted at TRL. This is used to retrieve, check and archive data.

TRLs internal QA/QC procedures require all data to be backed up on a secure server and all documentation associated with each site to be uniquely identified and securely stored to provide an audit trail.

Daily data inspections are undertaken during office hours using the facilities of the Data Management System. Initial observations of the Management System indicate whether the site has been contacted during its nominated ‘poll time’ overnight. If this has not been successful a manual poll of the site may be required. If this is not successful further investigation of the communications integrity will be required to establish contact with the site modem and data logger.

Three day plots of recorded data are viewed for the requested site, and these are inspected and assessed for continuity, validity, minimum and maximum values, date and time, power failures and general integrity. All anomalies are recorded on the Daily Check sheet, as required. Any anomalies or queries arising from daily inspection of data, or system operation, are brought to the attention of the Project Manager who will evaluate the situation, and initialise any necessary action. In the event that the PM is not available, contact will be made with the next available senior person within the monitoring team. Any issues identified with equipment operation will be referred to the client for attention within 24 hours (excluding weekends).

On a weekly basis, data are examined using summary statistics and outlier analysis to establish data validity. In the event that unusual data episodes are recorded, these would be routinely examined over longer data periods to establish their impact on trends, but would also be cross referenced with data peaks and troughs recorded at other national monitoring stations. In addition, integrity and validity of data logger clock times are checked, and any significant errors recorded in the Data Management System logbook.

All site data recorded through the Data Management System is archived on TRLs Network. The data is backed up daily, and the TRL IT Department maintains these data within their long-term and secure archives. This secures all data in the event of any system failure.

Data calibration and ratification

Data is ratified as per AURN recommended procedures. The calibration and ratification process for automatic gas analysers corrects the raw dataset for any drift in the zero baseline and the upper range of the instrument. This is done using a Microsoft Excel-based calibration and ratification file which incorporates the zero and span check information from the calibration visits. The zero reading recorded during the calibration visits is used to adjust any offset of the baseline of the data. The difference between the span value obtained between one calibration visit and the next visit is used to calculate a factor. This change is assumed to occur at the same rate over the period between calibrations and as such the factor is used as a linear data scaler. This effectively results in the start of the period having no factor applied and the end of the period being scaled with the full factor with a sliding scale of the factor in-between. After applying the calibration factors, it is essential to screen the data, by visual examination, to see if they contain any unusual measurements or outliers. Errors in the data may occur as a result of equipment failure, human error, power failures, interference or other disturbances. Data validation and ratification is an important step in the monitoring process. Ratification involves considerable knowledge of pollutant behaviour and dispersion, instrumentation characteristics, field experience and judgement.

On completion of this data correction procedure, these data were converted to hourly means and a summary of these data were provided to North West Leicestershire District Council.