2014 Further Assessment
Llandaff AQMA

In fulfillment of Section 84(2) of the Environment Act 1995
Local Air Quality Management

June 2014

Local Authority Officer	Rebecca Thomas

Department	Regulatory & Supporting Services
Address	City Hall, Cardiff, CF10 3ND
Telephone	(029) 2087 1828
e-mail	Rebecca.Thomas@cardiff.gov.uk

Report Reference number	LAQM.2014FA-Llandaff
Date	June 2014

Executive Summary

Following the declaration of the Llandaff Air Quality Management Area (AQMA) in April 2013, Cardiff Council is required by Section 84(2) of the Environment Act 1995 to carry out a “Further Assessment” of air quality within the AQMA.

This report focuses on Cardiff Road in Llandaff, which is one of the main arterial roads into Cardiff from the west of the City and beyond. It concludes that the declaration of the AQMA was justified at the time, and provides an assessment with regard to source apportionment for road traffic. The report also concludes that, whilst monitoring at relevant locations in the last three years has shown compliance with the annual mean nitrogen dioxide Objective, the degree of compliance is small and that the AQMA should remain in place.

It is essential that monitoring continues for the foreseeable future to inform future decisions.

Contents

1 Introduction

1.1 This report sets out the Further Assessment of air quality within the Llandaff Air Quality Management Area (AQMA). It forms part of the air quality Review and Assessment process prescribed by Defra and the Devolved Administrations (including the Welsh Assembly Government). The AQMA is shown in Figure 1 and was declared because of exceedences of the annual mean nitrogen dioxide Objective.

1.2 This Report focuses exclusively on the Llandaff AQMA.

Introduction to the Review and Assessment Process

1.3 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Defra and the DAs, 2007) 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 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. These locations must be designated as AQMAs and a subsequent Air Quality Action Plan developed in order to reduce pollutant emissions in pursuit of the Objectives.

1.4 Review and Assessment is a long-term, ongoing process, structured as a series of 'rounds'. Local Authorities in England, Scotland and Wales have now completed three rounds of Review and Assessment, with the fourth due to be completed this year.

1.5 Technical Guidance for Local Air Quality Management (LAQM.TG(09)) (Defra and the DAs, 2009) sets out a phased approach to the Review and Assessment process. This prescribes an initial Updating and Screening Assessment (USA), which all local authorities must undertake. It is based on a checklist to identify any matters that have changed since the previous round. If the USA 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 (DA).

1.6 The purpose of the DA is to determine whether there is an exceedence of an air quality Objective and the geographical extent of that exceedence. If the outcome of the DA is that one or more of the air quality Objectives are likely to be exceeded, then an Air Quality Management Area (AQMA) must be declared. Subsequent to the declaration of an AQMA, a Further Assessment must be carried out to confirm that the AQMA declaration is justified and that the appropriate geographical area has been included; 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 the Air Quality Action Plan (AQAP), which will identify measures to improve local air quality.

The Air Quality Objectives

1.7 The Government's Air Quality Strategy (Defra and the DAs, 2007) 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 (Wales) Regulations 2000 (Stationery Office, 2000) and The Air Quality (Wales)

(Amendment) Regulations 2002 (Stationery Office, 2002). Table 1 summarises the Objectives which are relevant to this report. Appendix 1 provides a brief summary of the health effects of nitrogen dioxide.

Table 1: Air Quality Objectives for Nitrogen Dioxide

Pollutant	Concentration	Measured as	Date to be achieved by
Nitrogen dioxide	200μg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40μg/m^3	Annual mean	31.12.2005

1.8 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 and also at any outdoor location where a member of the public might reasonably be expected to stay for 1 hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

1.9 Measurements across the UK have shown that the 1-hour nitrogen dioxide Objective is unlikely to be exceeded unless the annual mean nitrogen dioxide concentration is greater than 60µgm^{-3} (Laxen and Marner, 2003). Thus, potential exceedences of the 1-hour mean nitrogen dioxide Objective need only be considered where the annual mean is predicted to be above 60µgm^{-3}.

1.10 The European Union has also set limit values for nitrogen dioxide. Achievement of these values is a national obligation rather than a local one. The limit values for nitrogen dioxide are the same level as the UK Objectives and were to have been achieved by 2010.

Scope

1.11 Guidance explains that a Further Assessment report allows authorities:

- to confirm their original assessment of air quality against the prescribed Objectives, and thus ensure that they were right to designate the AQMA;
- to calculate more accurately how much of an improvement in air quality would be needed to deliver the air quality Objectives within the AQMA;
- to refine their knowledge of the sources of pollution so that air quality action plans can be properly targeted;
- to take account of national policy developments that may come to light after the AQMA declaration;
- to take account, as far as possible, of any local policy developments that are likely to affect air quality by the relevant date, and which were not fully factored into earlier calculations;
- to carry out real-time monitoring where this has not been done previously;
- to carry out further monitoring in problem areas to check earlier findings;

- to corroborate other assumptions on which the designation of the AQMA has been based, and to check that the original designation is still valid, and does not need amending in any way;
- to respond to any comments made by statutory consultees in respect of local authorities' previous reports, particularly where these have highlighted that insufficient attention has been paid to, for example, the validation of modelled data.

Report Structure and Issues Addressed

1.12 Section 2 of this report introduces the Llandaff AQMA, and hence defines the study area.
Section 3 describes new developments since the AQMA was declared in April 2013.
Section 4 comprises a review of new monitoring data.
Section 5 estimates the relative contribution of the most significant pollution sources to pollutant concentrations.
Sections 6 sets out the Air Quality Improvements required, if any, to meet the Objectives.
Section 7 presents the Summary and Conclusion of the report.

Key Findings of Previous Review and Assessment Reports

1.13 Version 2 of the Council's 2011 Progress Report was published in February 2012, the initial report having been submitted in June 2011.

This report concluded that a Detailed Assessment of nitrogen dioxide in the Llandaff area was necessary.

The Council's 2012 USA confirmed that a preparation of a Detailed Assessment was underway. The Detailed Assessment dated June 2012 was consulted upon during the autumn of 2012. The Llandaff AQMA came into force on 1st April 2013.

The AQMA declaration was made in April 2013 and is described in Section 2.

The Council's 2013 Progress Report was submitted in June 2013.

2 AQMA Location

2.1 The Llandaff AQMA is centred on Cardiff Road, Llandaff, and small sections of Llantrisant Road and Bridge Road. The eastern extreme of the AQMA is at the boundary of residential accommodation between Heol Fair and High Street.. The boundary of the AQMA is shown in Figure 1.

2.2 The air quality Objectives 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. In terms of relevant locations in Llandaff, Cardiff Road has residential accommodation on both sides, these being a mix of houses and blocks of flats.

2.3 The Detailed Assessment for Llandaff quoted a residential population of 338 from Electoral Roll records.

2.4 There are no major point sources of emissions within this AQMA nor any point sources significantly impacting upon it. The principal source of NOx emissions within the AQMA is road traffic.

Figure 1: Llandaff AQMA

3 Developments Since the Declaration of the AQMA

New/Proposed Local Developments

3.1 There have been no new road or housing developments within close proximity to the Llandaff AQMA since the AQMA was declared and none are currently proposed within the AQMA.

3.2 However, in the draft Local Development Plan, there are approximately 1500 houses proposed on land just north of Junction 33 of the M4. This proposed development means that the only route into Cardiff from that site is along Llantrisant Road and through Llandaff, effectively adding to the burden of traffic which already flows through the AQMA.

3.3 At the time of writing this report, there has been no documentation or appraisal provided to the authority to inform of the likely impacts that the increased traffic flow would have on the AQMA.

National Developments

3.2 The National Air Quality Strategy was last revised in July 2007, and this sets the statutory Objectives for nitrogen dioxide, against which local authorities have to carry out their Reviews and Assessments.

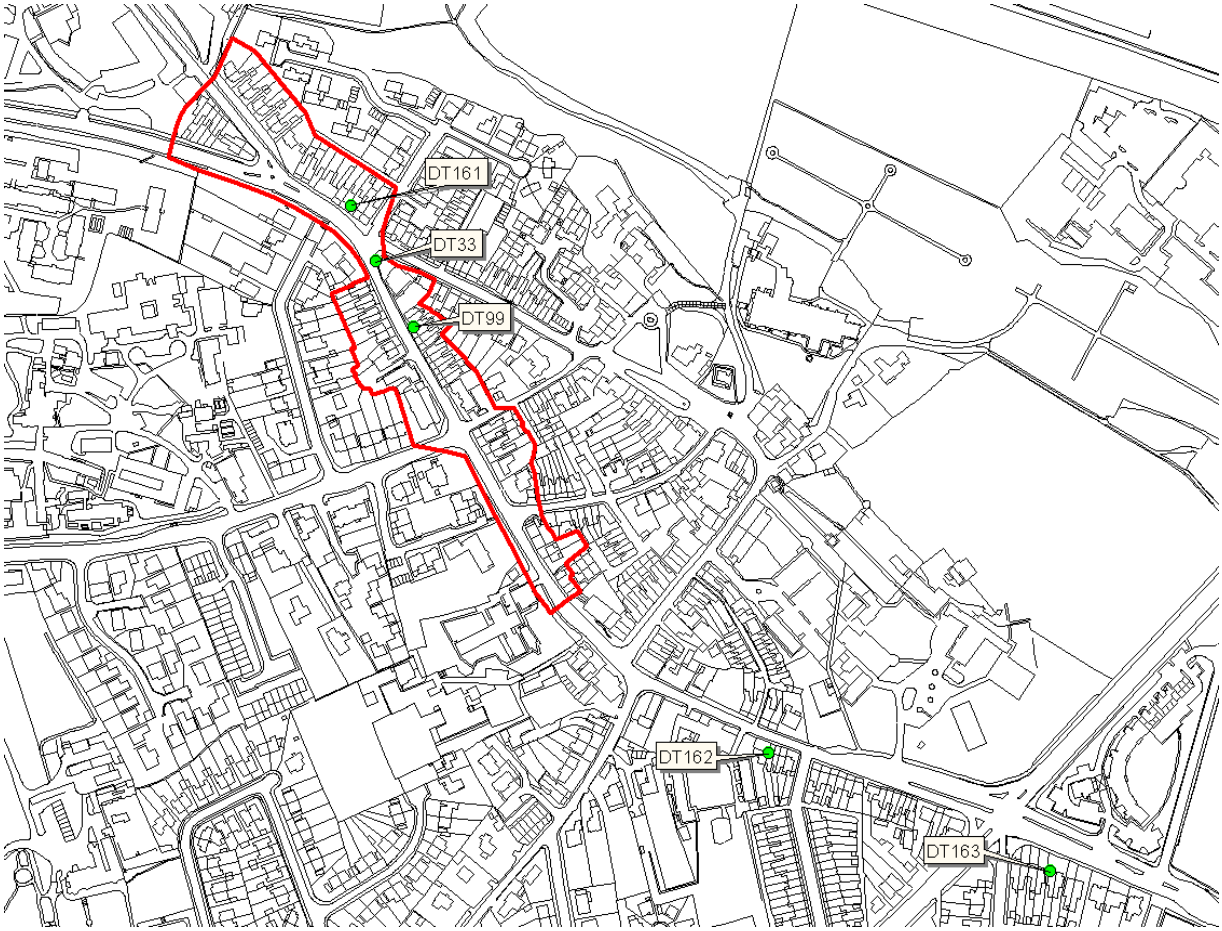
4 New Monitoring and Modelling Data

New Monitoring Data

4.1 Within the AQMA Cardiff Council measures monthly average nitrogen dioxide concentrations at three sites using diffusion tubes. Two of these (Sites 99 and 161) are on the façades of residential accommodation and therefore representative of relevant exposure. The third site (33) is a kerbside site located on street furniture.. Additionally, there are two diffusion tubes (Sites 162 and 163) on the façades of residential accommodation on Cardiff Road to the east of the AQMA.

4.2 Diffusion tubes are a type of passive sampler, which absorb the pollutant to be monitored directly from the surrounding air with no need for a power supply. Passive samplers are easy to use and relatively inexpensive. Cardiff Council uses diffusion tubes prepared and analysed by Cardiff Scientific Services (50% TEA in acetone).

Figure 2: Llandaff AQMA Diffusion tube locations



4.3 Triplicate diffusion tubes are collocated with the Cardiff Centre AURN monitoring site at Frederick Street to allow local bias adjustment factor to be determined annually, and also to allow an indication of the precision of the diffusion tubes to be calculated. Overall, the tubes were found to have good precision. Precision is an indication of reproducibility of results, and tubes are said to have good precision when the coefficient of variation between the triplicate tubes for eight or more months (during a twelve month period) is less than 20%, and the average coefficient of variation for all periods is less than 10%.

The average coefficient of variation during the 12 month monitoring period presented was 5%.

4.4 Data from 2008 – 2012 presented in this report have been adjusted to account for diffusion tube bias using the annual factors reported in the 2013 Progress Report. The Bias Adjustment Factor for 2013 has not been previously reported.

4.5 Table 2 provides details of the five current diffusion tube monitoring sites in the area and monitoring data for 2008 - 2013 are presented in Tables 3 and 4.

4.6 The results indicate that the annual mean nitrogen dioxide Objective is being consistently exceeded at the kerbside Site 33. This is not the case in respect of the three façade-based monitoring locations during the last three years (2011 -2013) where there has been just one exceedence.

4.7 The single exceedence of the annual mean Objective at a façade-based monitoring location occurred in 2012 at Site 161 (52 Bridge Street). The site was commissioned in February 2012 and the measured concentrations in that and the following month were elevated to an unexpected extent. Subsequent investigation revealed that the diffusion tube had been located above a low-height heating flue (the appliance is in the basement of the house. The monitoring site was relocated a short distance (<2m) at the beginning of April 2012 and this appears to have resolved the issue. Excluding the data for February and March 2012 gives a bias adjusted concentration of 36.2µgm^{-3}, which is in compliance with the Objective.

4.8 Table 4 includes historic data from Site 109, highlighted in green, which was a façade-based monitoring site formerly located at 66 Cardiff Road, i.e. between the current Sites 162 and 163. The data from 2008 and 2009 provide further evidence that nitrogen dioxide concentrations along Cardiff Road east of the AQMA are not a cause for concern.

Table 2 Details of Nitrogen Dioxide Diffusion Tube Monitoring Sites in the Llandaff area

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
33	Mitre Place	Kerbside	315248	178165	3.0	NO_2	Y	N	N (20m)	1m	Y
99	Cardiff Road Llandaff	Façade	315275	178117	1.5	NO_2	Y	N	Y (0.05m)	3m	Y
161	52 Bridge Road	Façade	315230	178205	1.5	NO_2	Y	N	Y (0.05m)	7.9m	Y
162	58 Cardiff Road	Façade	315533	177809	1.5	NO_2	N	N	Y (0.05m)	8.8m	Y
163	118 Cardiff Road	Façade	315738	177723	1.5	NO_2	N	N	Y (0.05m)	14.8m	Y

Table 3 Results From Nitrogen Dioxide Diffusion Tube Monitoring Sites in the Llandaff area in 2013

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2012 (Number of Months or %) [a]	2013 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.85
33	Mitre Place	Kerbside	Y	N	12	**49.6**
99	Cardiff Road Llandaff	Façade	Y	N	12	38.9
161	52 Bridge Road	Façade	Y	Y	12	39.1
162	58 Cardiff Road	Façade	N	N	12	27.6
163	118 Cardiff Road	Façade	N	N	12	25.4

NOTES: Data in bold denote exceedences of the air quality Objectives.

Table 4 Results From Nitrogen Dioxide Diffusion Tube Monitoring Sites in the Llandaff area,2008 to 2013

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]					
			2008 (Bias Adjustment Factor = 0.84)	2009 (Bias Adjustment Factor = 0.89)	2010 (Bias Adjustment Factor = 0.92)	2011 (Bias Adjustment Factor = 0.88)	2012 (Bias Adjustment Factor = 0.86)	2013 (Bias Adjustment Factor = 0.85)
33	Kerbside	Y	**49.0**	**52.3**	**53.5**	**55.0**	**49.8**	**49.6**
99	Façade	Y	38.6	**41.7**	**48.6**	39.8	34.5	38.9
109	Façade	N	29.3	34.4	-	-	-	-
161	Façade	Y	-	-	-	-	**43.0**	39.1
162	Façade	N	-	-	-	-	28.5	27.6
163	Façade	N	-	-	-	-	27.5	25.4

5 Source Apportionment

5.1 In order to develop an appropriate action plan it is necessary to identify the sources contributing to the Objective exceedences at locations within the AQMAs. The data presented here could be used to inform any future traffic management decisions.

5.2 Following declaration of the AQMA on 1st April 2013, the Council made classified traffic counts to inform this Assessment. There are five secondary and one primary school in the area and traffic flows, particularly at peak times, are thought to be influenced by this. Therefore two sets of classified counts were made, one in term-time (on 18/04/2013) and one out-of-term-time (03/04/2013). The counts were made at a location between Fairwater Road and Heol Fair.

5.3 The 12-hour two-way classified vehicle counts are given in Table 5 below. In order to reflect an annual mean flow reflecting the school year, the counts have been calculated as 39/52 of term-time counts plus 13/52 out-of-term-time.

Table 5 Classified traffic counts on roads in the vicinity of the Llandaff AQMA.

Cars (%)	LGV (%)	HGV (%)	Bus/Coach (%)	Motorcycles (%)	Total (%)
16409 (88.3)	1672 (9)	152 (0.82)	281 (1.51)	69 (0.37)	18583 (100)

5.4 NOx emissions were calculated from the classified traffic count data in Table 5 using version 5.2c of the Emissions Factor Toolkit (EFT) made available by DEFRA and the Devolved Administrations here:

http://laqm.defra.gov.uk/documents/EFT2013_v5.2c.xls.zip

The EFT was run with inputs based on "Detailed Option 1" for Wales in 2013 using the total vehicle flow and % of each vehicle type given in Table 5.

5.5 The EFT was run with vehicle speeds of 50, 40, 30, 20 and 10kph to assess the effect on both total and proportionate emissions at lower vehicle speeds.

5.6 Based upon these inputs, the EFT was used to estimate:

- Light Duty Vehicles which consist of:
  - Petrol Cars
  - Diesel Cars
  - Petrol LGV
  - Diesel LGV
  - Motorcycles
- Heavy Duty Vehicles which consist of;
  - Rigid HGV
  - Arctic HGV
  - Buses & Coaches

5.7 The data output which is given in Tables 6 and 7 over leaf show that:

- total NOx emissions (g/km) increase with decreasing speed
- HDVs (HGVs and buses/coaches) become more significant with decreasing speed
- Light Duty Vehicles are the largest single source of emissions at all speeds.

5.8 The data in Tables 6 and 7 are for vehicles travelling at constant speed, which is an unrealistic real-world scenario. There is vehicle queuing within the AQMA at the roundabout at the junction of Llantrisant Road, Bridge Road and Cardiff Road and at the light-controlled junction of Cardiff Road and Fairwater Road. Additional queuing is caused at the bus stop on Cardiff Road on the east-bound carriageway just west of High Street.

5.9 In the vicinity of the bus stop there is a pedestrian light-controlled on-demand crossing which caused further perturbation of traffic flows, particularly when children/parents are crossing Cardiff Road to enter and leave Llandaff city Church in Wales Primary School.

5.10 Whilst the above hindrances to the free flow of vehicles will no doubt cause increases in emissions over and above that which would occur were there to be constant speed, free flow, it is unlikely that the proportion of emissions attributed to vehicle types (see Table 7) would alter greatly. The target of remedial measures in respect of emissions would not change.

5.11 Diesel powered vehicles (both LDV and HDV) account for the vast majority of emissions of nitrogen oxides. Petrol-powered cars account for no more than 13% of emissions.

Table 6 Emission Factor Toolkit output, NOx by vehicle type at constant speed (g/km)

				Light Duty Vehicles				Heavy Duty Vehicles			LDV
Vehicle Speed	All Vehicles	All LDV	All HDV	Petrol Cars	Diesel Cars	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses/Coaches	Motorcycles
50	7543.756	5758.409	1785.348	946.747	3730.837	24.811	1046.949	425.073	95.617	1264.658	9.064
40	8477.249	6353.860	2123.388	1008.872	4161.921	24.146	1150.875	499.822	119.624	1503.942	8.045
30	9925.269	7246.813	2678.456	1102.557	4808.565	23.744	1304.241	619.335	158.317	1900.804	7.705
20	12178.095	8493.080	3685.015	1225.332	5728.310	23.630	1507.566	830.159	226.625	2628.231	8.242
10	15817.425	10263.566	5553.858	1335.883	7131.560	23.452	1762.718	1166.072	334.708	4053.078	9.954

Table 7: Emission Factor Toolkit output, NOx by vehicle type at constant speed (%)

			Light Duty Vehicles				Heavy Duty Vehicles			LDV
Vehicle Speed	All LDV	All HDV	Petrol Cars	Diesel Cars	Petrol LGV	Diesel LGV	Rigid HGV	Artic HGV	Buses/Coaches	Motorcycles
50	76%	24%	13%	49%	0%	14%	6%	1%	17%	0%
40	75%	25%	12%	49%	0%	14%	6%	1%	18%	0%
30	73%	27%	11%	48%	0%	13%	6%	2%	19%	0%
20	70%	30%	10%	47%	0%	12%	7%	2%	22%	0%
10	65%	35%	8%	45%	0%	11%	7%	2%	26%	0%

6 Air Quality Improvements Required

6.1 The following section is included for the sake of completeness as recent monitoring data for nitrogen dioxide at relevant locations within the Llandaff AQMA indicate compliance with the Objectives. It can be considered to be showing the degree of compliance.

6.2 The degree of improvement needed in order for the annual mean Objective for nitrogen dioxide to be achieved can be considered as the difference between the highest monitored concentration and the Objective level (40µg/m-3). The highest monitored concentrations year-on-year within the Llandaff AQMA are at Site 99 .with the highest bias-adjusted annual mean concentration at this site was 48.6µgm^{-3} in 2010. The measurements in 2010 across local and regional networks demonstrated unusually elevated concentration levels and, whilst not wholly disregarding this result, the highest bias-adjusted annual mean in the past three years was at 39.8 µg/m-3.

6.3 For road-traffic sources, nitrogen dioxide is very much a secondary pollutant. Concentrations will be dependent not only on local and regional emissions but also on prevailing weather conditions and the availability of atmospheric oxidants. The relationship between emissions of nitrogen oxides (NOx) and concentrations of nitrogen dioxide is not linear. In terms of describing the improvement that is required it is more useful to consider emissions of NOx rather than concentrations nitrogen dioxide. DEFRA and the Devolved Administrations have made available a tool for estimating NOx concentrations from NO_2 measurements here:

http://laqm.defra.gov.uk/documents/NOx-NO2-Calculator-v3.2.xls

6.4 The tool allows the calculation of NOx concentrations from NO_2 concentrations. It has been used to calculate the road traffic contribution to total NOx (total minus background) and the reduction in NOx concentration needed for the NO_2 Objective to be achieved. The background used is the annual mean NO_2 concentration as measured Green Street, Site 73, which is located in a quiet, lightly-trafficked side-road just outside the City Centre.

Table 7: Road traffic contributions to NOx concentrations

Year	Site	Diffusion tube NO_2 µgm^{-3}	Background NO_2 µgm^{-3}	Traffic NO_x, µgm^{-3}	Required reduction %
2013	Site 99	38.9	24.9	31.94	-8.7
	Objective	40.0	24.9	34.74	
2012	Site 99	34.5	25.6	19.67	-68.3
	Objective	40.0	25.6	33.11	
2011	Site 99	39.8	28.0	27.07	-1.8
	Objective	40.0	28.0	27.56	

6.4 The negative value in the “Required reduction %” column in Table 7 above results from each of the measured concentrations at Site 99 being below the Objective in each year.

6.5 Consequently, this means that no improvements to emissions within the AQMA are necessary at the present time.

7 Summary and Conclusion

7.1 Nitrogen dioxide concentrations within and around the Llandaff AQMA have been assessed using monitoring data. The results indicate that the annual mean nitrogen dioxide concentrations measured at the sites vary from year to year; this will be due to variations in prevailing atmospheric conditions. In earlier years the measured concentrations varied at levels around the Objective whereas in latter years variation has tended to be at levels below the Objective.

7.2 The monitoring data indicates that concentrations of nitrogen dioxide at relevant locations (with one exception at one site in 2012 discussed in paragraph 4.7) are now consistently below the Objective.

7.3 Annual mean concentrations of nitrogen dioxide measured at relevant locations within the AQMA (Sites 99 and 161) are not sufficiently below the Objective for the risk of an exceedence in future years to be discounted, particularly in light of potential developments at sites adjacent to Llantrisant Road.

7.4 A simple source apportionment exercise with regard to local traffic emissions in Llandaff has been undertaken. This shows that emissions from cars are the dominant source of road traffic emissions of NOx gases and that these are, in turn, dominated by emissions from diesel-powered vehicles.

7.5 It is concluded that:

- The monitoring data from sites at relevant locations in 2013, when viewed in conjunction with that from earlier years, might suggest that the AQMA is not required. However, 2013 data was not available at the time of declaration and the Council took a precautionary approach to it, which was correct at that time.
- Whilst measured annual mean concentrations of nitrogen dioxide at relevant locations within the AQMA have been below the Objective in recent years they are not sufficiently below the Object for it to be concluded that the AQMA can be revoked at present. There remains a risk of exceedence in future years unless and until concentrations fall further.
- That cars account for approximately 98% of total vehicle emissions in Llandaff.
- There is no requirement to reduce emissions of nitrogen oxides within the AQMA at the present time and therefore need for the production of an Air Quality Action Plan. However, the Council must be mindful of developments which could increase traffic/emissions within the AQMA.
- No new sources of nitrogen oxides have come to light since the AQMA was declared.
- There is no new national policy or guidance published since the AQMA was declared.
- There was only one response to the proposal to declare the AQMA; this was from a local resident seeking clarification and explanation with regard to the Detailed Assessment.

7.6 It is recommended that:

- The Llandaff AQMA should remain in its present form and that monitoring of nitrogen dioxide within and around the AQMA should continue.
- The Council continues to review and assess concentrations of nitrogen dioxide in and around the AQMA on an annual basis.
- Should nitrogen dioxide concentrations increase to a point where they are consistently above the Objective at relevant locations then an Air Quality Action Plan focused on vehicle emissions derived from cars and diesel vehicles be developed.
- The Council ensure that developments with the potential to adversely impact nitrogen dioxide concentrations within the AQMA be effectively controlled or mitigated during the planning process.

8 Uncertainties

8.1 All values presented in this report are the best possible estimates, but uncertainties in the results might cause over-or under-predictions. All of the measured concentrations presented have an intrinsic margin of error. Defra and the DAs (2008e) suggest that this is of the order of plus or minus 20% for diffusion tube data and plus or minus 10% for automatic measurements.

8.2 It has been assumed that the vehicle fleet within the study area will conform to the national (UK) average composition; it has been assumed the emissions per vehicle conform to the factors included in the EFT.

8.3 No vehicle speed data is available for travel through the AQMA. Vehicle speeds used to calculate NOx emissions (Section 5, Tables 6 and 7) are simple estimates of moving speed based on experience of travelling through the AQMA. These are estimates based on travelling through the AQMA during the normal working day. They may not be representative of average speeds over a 24-hour period.

8.4 It has been assumed that calculations made using the NO2-to-NOx Converter are valid at the monitoring locations within the AQMA.

8.5 The UK Government's Air Quality Expert Group (AQEG) has published a report on trends in primary nitrogen dioxide in the UK (AQEG, 2007). This examines evidence that shows that while NOx emissions have fallen in line with predictions made a decade previously, the composition of NOx has, in some urban environments, changed. This may have caused nitrogen dioxide levels at some locations to fall less rapidly than was expected. The latest guidance from Defra and the DAs (2008b) has been followed regarding NOx to NO2 relationships.

8.6 The limitations to the assessment should be borne in mind when considering the results set out in preceding sections.

9 References

Air Quality Expert Group, 2007. Trends in Primary Nitrogen Dioxide in the UK. December 2007.

Review & Assessment: Technical Guidance LAQM.TG(09). Defra and the DAs, 2009.

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. July 2007.

Laxen and Marner, 2003. Analysis of the Relationship Between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites.

Stationery Office, 2000. Air Quality (Wales) Regulations, 2000. Statutory Instrument 1940.

Stationery Office, 2002. The Air Quality (Wales) (Amendment) Regulations 2002. Statutory Instrument 3182.

10 Glossary

Standards:
A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal.

Objectives:
A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date, taking into account costs, benefits, feasibility and practicality. There are also vegetation-based Objectives for sulphur dioxide and nitrogen oxides.

Exceedence:
A period of time where the concentration of a pollutant is greater than the appropriate air quality Objective.

Relevant Exposure:
Members of the public who are likely to be regularly present and exposed over the averaging period of the Objective.

AQMA:
Air Quality Management Area

PM10:
Small airborne particles, more specifically particulate matter less than 10 micrometers in aerodynamic diameter.

NOx:
Nitrogen oxides

NO2:
Nitrogen dioxide.

mg/m-3:
Microgrammes per cubic metre of air.

Urban Background:
An urban location distanced from sources and therefore broadly representative of city-wide background conditions (Defra and the DAs, 2003).

Roadside:
A site sampling between 1m of the kerbside of a busy road and the back of the pavement. Typically this will be within 5m of the road, but could be up to 15m.

HGV:
Heavy Goods Vehicle

LGV:
Light Goods Vehicle

LDV:
Light Duty Vehicles (taken as all vehicles excluding HDVs)

HDV:
Heavy Duty Vehicle (HGVs + Buses)