2012 Air Quality Updating and Screening Assessment for Belfast City Council

In fulfillment of Environment (Northern Ireland) Order 2002 - Local Air Quality Management

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Executive Summary.

Belfast City Council has completed this 2012 Updating and Screening Assessment in accordance with the provisions of the Environment (Northern Ireland) Order 2002 and the Northern Ireland Local Air Quality Management Policy Guidance document LAQM.PGNI (09).

In completing this Updating and Screening Assessment, we have undertaken a review of potentially significant sources of air pollution across the city in order to identify new sources, sources with increased emissions and locations close to air pollution sources where public exposure did not previously exist.

In addition, we have completed a review of recent ambient air quality monitoring data across the city in order to identify locations where new or existing exceedences of Air Quality Strategy objectives and European Commission limit values are occurring.

We have already declared four air quality management areas across the city for exceedences of nitrogen dioxide and particulate matter short and longer-term air quality strategy objectives. A review of the monitoring data for these air quality management areas indicates that although there have been some recent improvements in nitrogen dioxide levels across the city, the air quality management areas will need to be maintained for the time being, particularly in the case of the M1 Motorway / A12 Westlink corridor. However, sustained improvements in particulate matter within the M1 Motorway / A12 Westlink air quality management area means that the council and its relevant authority partners will consider revocation for this pollutant during 2012. There have been no monitored exceedences any Air Quality Strategy objectives for any other ambient pollutant in recent years across the city. For

this reason, the number of ambient air quality monitoring sites in Belfast has been rationalised over recent years.

In terms of new sources of ambient air pollution, there have been few significant industrial developments across the city over recent years and the economic downturn has meant that the construction of domestic housing has declined also, thereby reducing the potential for introduction of new public exposure.

Accordingly, the council has not identified any new roads or road junctions that require a detailed assessment. In addition, it is the council's view that we do not need to proceed to a detailed assessment for any other transport modes including airports, bus stations, railways and ports. No new industrial processes have been established in the city and existing processes have not increased significantly their emissions. Furthermore, we have assessed the impact of the fuel storage depot at Airport Road West within the Port of Belfast previously, and of the recently opened petrol stations, none meets the requirements for a detailed assessment

Finally, the council is not aware of any new poultry farms, biomass combustion installations or fugitive sources of particulate material within city confines.

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1 Introduction.

1.1 Description of Local Authority Area.

Belfast is the capital of Northern Ireland and as such, the city, and its wider metropolitan area, is the largest settlement in the region and the second largest city on the island of Ireland with a population of around 270,000. The city lies at the head of Belfast Lough in the lower reaches of the Lagan Valley and is flanked by the Black Mountain to the west and Castlereagh Hills to the east. The Belfast City Council district area sits at the heart of the growing population of the wider Belfast Metropolitan Urban Area, which comprises also the surrounding district council areas of Castlereagh, Lisburn, North Down, Newtownabbey and Carrickfergus.

In terms of historical air quality issues, Belfast used to experience sustained elevated levels of sulphur dioxide (SO_2) and particulate matter (PM_{10}), associated principally with the widespread use of solid fuel for domestic heating. However, through the introduction of the council's smoke control programme in the late 1960s, the Clean Air (Northern Ireland) Order 1981 and the more recent availability of natural gas to domestic, commercial and industrial sectors, levels of particulate matter and sulphur dioxide have declined substantially over recent years to the extent that we do not experience exceedences of any of the air quality strategy objectives, or indeed European Commission limit values, for sulphur dioxide. Exceedences of the objectives for particulate matter have been restricted to a major arterial road transport route that traverses the city. Accordingly, the number of locations where we monitor these ambient pollutants has been reduced over recent years in accordance with the government's risk and exposure based approach to air quality management.

As levels of sulphur dioxide and particulate matter have declined across the city over recent years, so emissions of nitrogen dioxide, associated principally with road transport, have become more prominent. This is a similar situation to that experienced in many other major cities and conurbations across the United Kingdom. Accordingly, as a result of the first round of the review and assessment process, which was completed in 2004, Belfast City Council opted to declare four air quality management areas across the city for a combination of both modelled and monitored

exceedences of nitrogen dioxide and particulate matter short and longer-term objectives. We published our Air Quality Action Plan for the city in 2006 and it was completed substantially in 2010 with around 90% of planned actions delivered to schedule. Of the outstanding 10% of actions, it is considered that the majority of these would have had limited additional impact within our air quality management areas.

Although Belfast City Council is directed to comply with the provisions of the Air Quality Strategy for England, Scotland, Wales and Northern Ireland via Part III of the Environment (Northern Ireland) Order 2002, the council is aware also of the pressing need to achieve European Commission air quality limit values at national level in accordance with the schedules prescribed in Directive 2008/50/EC in respect of ambient air quality and cleaner air for Europe and the 4th Daughter Directive. It should be noted that the deadline for achieving limit values for nitrogen dioxide was 1 January 2010 but unfortunately this was not achieved at all locations across the city. For this reason, Defra and DoENI have recently submitted a joint application to the European Commission for a five-year derogation for achieving nitrogen dioxide limit values for the Belfast Metropolitan Urban Area and Northern Ireland as a whole. If this application is accepted by the Commission, we will be working to achieve limit values for nitrogen dioxide by 1 January 2015. As a consequence, and in order to address elevated levels of nitrogen dioxide, the council is consulting presently with other relevant authorities and the Department of Environment for Northern Ireland regarding development of a supplementary Air Quality Action Plan for the city.

1.2 Purpose of Report.

This report fulfils the requirements of the Local Air Quality Management process as established via the Environment (Northern Ireland) Order 2002, the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in review and assessment reports.

1.3 Air Quality Objectives.

The air quality objectives applicable to LAQM **in Northern Ireland** are set out in the Air Quality Regulations (Northern Ireland) 2003, Statutory Rules of Northern Ireland 2003, no. 342, and are shown in table 1.1. This table shows the objectives in units of micrograms per cubic metre μgm^{-3} (milligrammes per cubic metre, mgm^{-3} for carbon monoxide) with the number of exceedences in each year that are permitted.

Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in Northern Ireland.

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 μgm^{-3}	Running annual mean	31.12.2003
	3.25 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 mgm^{-3}	Running 8-hour mean	31.12.2003
Lead	0.5 μgm^{-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
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

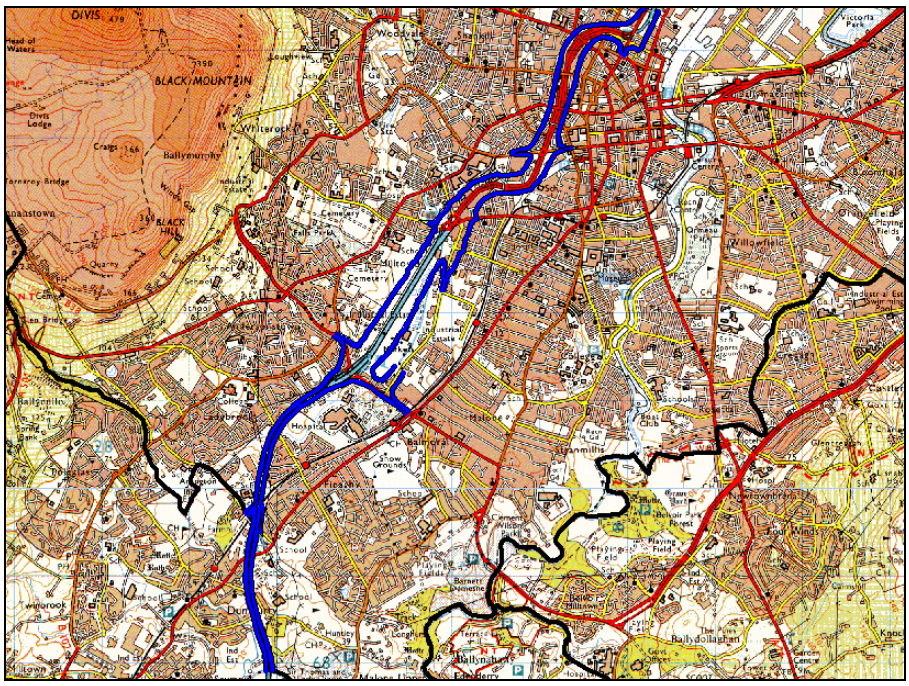
1.4 Summary of Previous Review and Assessments.

As part of the review and assessment process, Belfast City Council completed a 2nd and 3rd stage review and assessment of air quality throughout the city in early 2004. This assessment concluded that modelled and monitored exceedences of short and longer-term objectives for both nitrogen dioxide and particulate matter were occurring in the city and would be likely to continue to do so in some locations beyond 2010. Consequently, in August 2004 the council, in consultation with other relevant authorities, declared four Air Quality Management Areas (AQMA), comprising the M1 Motorway and Westlink corridor, Cromac Street to the junction of Short Strand, Woodstock Link and the Albertbridge Road, the Upper Newtownards Road and the Ormeau Road.

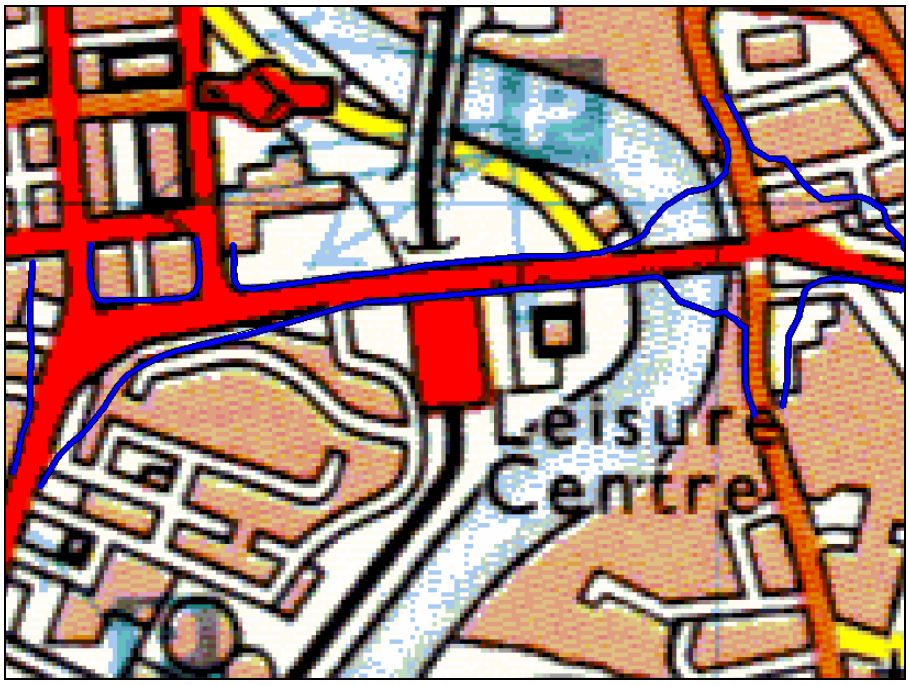
By way of amplification, the M1-Westlink AQMA was declared on the basis that annual and hourly-mean nitrogen dioxide concentrations would exceed the 2005 Air Quality Strategy objectives. In addition, particulate matter annual and 24-hour mean concentrations were predicted also to exceed relevant objectives in this location. The three other air quality management areas were declared on the grounds that the annual mean nitrogen dioxide objective would be exceeded in these locations during 2005 and beyond. A subsequent source apportionment study, completed for the air quality management areas, indicated that the principal cause of the exceedences was emissions emanating from road transportation.

Current air quality management areas are described and depicted in more detail as follows:

1. The M1 / Westlink corridor from the Belfast City boundary at Sir Thomas and Lady Dixon Park to the end of the Westlink at the junction with Great George's Street and York Street including Stockman's Lane and Kennedy Way. This area was declared for predicted exceedences of both the nitrogen dioxide and particulate material annual mean air quality strategy objectives as well as exceedences of the particulate matter 24-hour mean objective and the nitrogen dioxide 1-hour mean objective. The boundary of the air quality management area is denoted in blue and has been set to take account of dispersion modelling uncertainties. In addition, the solid black line denotes the Belfast City Council boundary with Lisburn City Council.

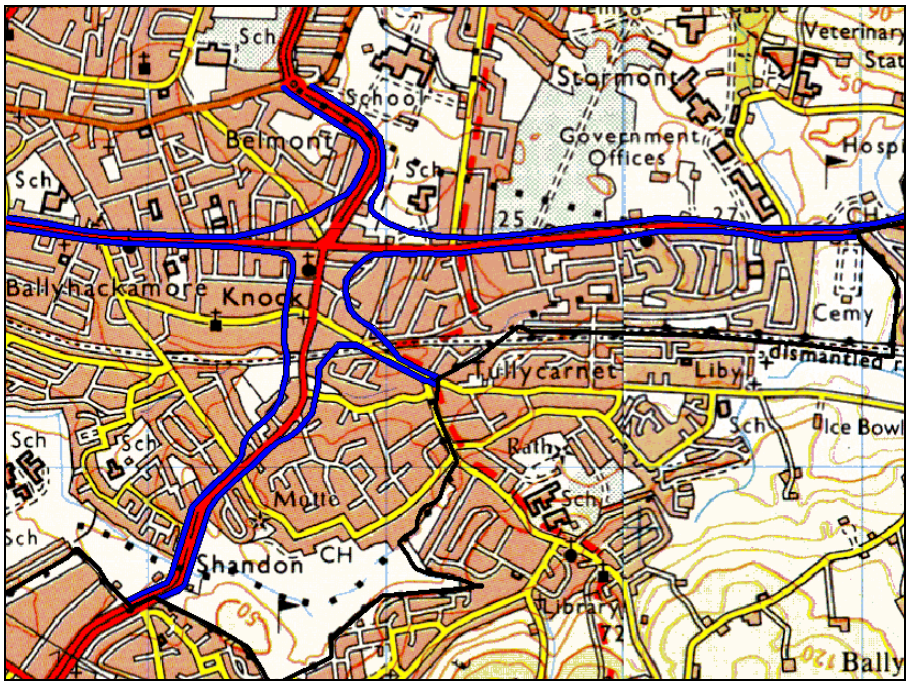


2. Cromac Street to the junction with East Bridge Street and then from East Bridge Street to the junction with the Ravenhill and Albertbridge Roads and Short Strand. This area was declared for predicted exceedences of the nitrogen dioxide annual mean air quality strategy objective.

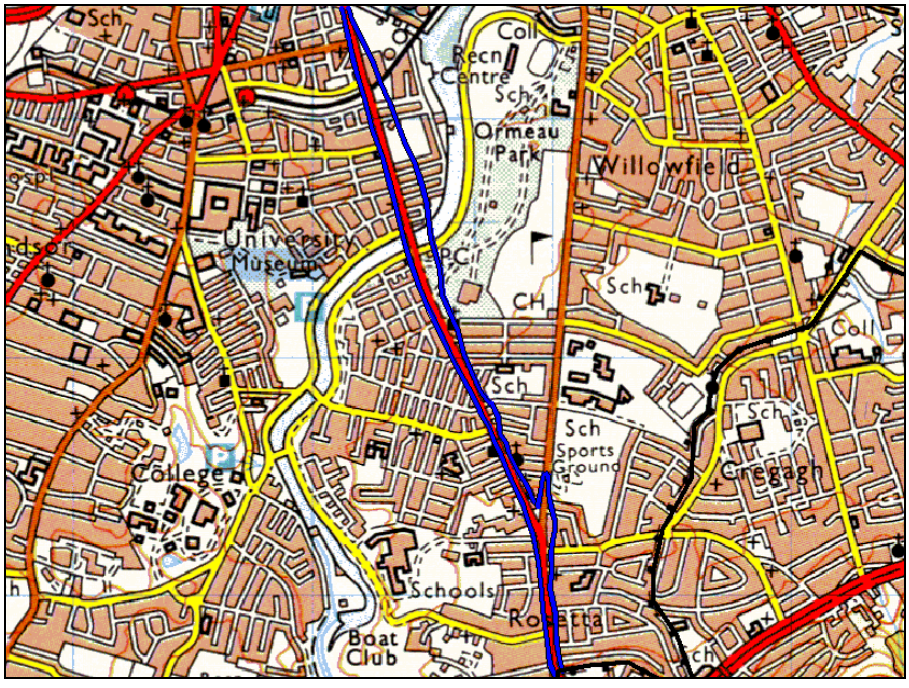


3. The Upper Newtownards Road from the North Road junction to the Belfast City boundary at the Ulster Hospital incorporating the Knock Road to the City boundary at Laburnum Playing Fields and Hawthornden Way. This area was

declared for predicted exceedences of the nitrogen dioxide annual mean air quality strategy objective. The Belfast City Council boundary with Castlereagh Borough council is denoted by the solid black line.



4. The Ormeau Road from the junction with Donegall Pass to the City boundary at Galwally. This area was declared for predicted exceedences of the nitrogen dioxide annual mean air quality strategy objective. Belfast City Council's boundary with Castlereagh Borough Council is denoted by the solid black line.



A further detailed air quality assessment was completed by Belfast City Council in 2010, informed by the outcome of the 2009 Updating and Screening Assessment. Accordingly, the 2010 detailed assessment considered the potential for exceedences of the nitrogen dioxide objectives at a number of further locations across the city including the junction of the Sydenham Bypass with the Lower Newtownards Road, Shaftesbury Square, Donegall Road and Albertbridge Road, and at locations throughout the city centre. Although atmospheric dispersion modelling studies, undertaken as part of the detailed review and assessment process, did suggest exceedences of the nitrogen dioxide annual mean objective at some the of above-mentioned locations, the review and assessment identified also that there was no relevant public exposure at these locations during 2010. As a result, the 2010 Detailed Air Quality Assessment for Belfast City Council concluded that there was no need to declare further air quality management areas or to expand or revoke the existing AQMAs. This view was accepted by government.

In order to provide further confirmation regarding the outcome of the modelling studies and the need, or otherwise, for the declaration of further air quality management areas in the city, Belfast City Council sited nitrogen dioxide diffusion tubes in a number of the above-mentioned locations. The monitoring data from these tubes will be discussed in subsequent sections of this 2012 Updating and Screening Assessment report.

For reference and additional background information, historical Belfast City Council air quality review and assessment reports are listed in the following table, together with relevant download links to the Department of Environment for Northern Ireland ‘Northern Ireland Air’ website.

Table 1.2 Historical Belfast City Council Air Quality Reports.

Title	Publication date	Weblink
2011 Progress Report	30 April 2011	Download report
2010 Detailed Assessment	30 September 2010	Download report
2010 Progress Report	30 April 2010	Download report
2009 Updating and screening assessment	30 April 2009	Download report
2008 Joint Air Quality Progress and Action Plan Progress Report	10 June 2006	Download report
2007 Detailed assessment	30 April 2007	Download report
2007 Joint Air Quality Progress and Action Plan Progress Report	30 April 2007	Download report

2 New Monitoring Data.

2.1 Summary of Monitoring Undertaken.

2.1.1 Automatic Monitoring Sites.

Belfast City Council operates a number of automatic monitoring stations across the city in order to inform its air quality management processes and to provide real time information to the public in relation to pollution levels within our air quality management areas.

Accordingly, to ensure that the data from our sites is both accurate and representative, the monitors at each site are calibrated on a four-weekly basis by the council's technical staff in accordance with the procedures detailed in the Defra Automatic Urban and Rural Network (AURN) local site operators' manual. In addition, data management is undertaken by Air Quality Data Management, quality assurance and quality control services are provided by AEA and service and maintenance support is provided by Enviro Technology Services. The data from our sites is made available to the Department of Environment for Northern Ireland and is reported on the 'Northern Ireland Air' website. For consistency, all automatic monitoring data reported in this Updating and Screening Assessment report has been obtained from the 'Northern Ireland Air' website. In addition, automatic data reported in this report relates to the calendar year (i.e. January – December) and for council operated sites, data capture levels exceed substantially the Department's 75% data capture threshold for the calculation of annual statistics. Further information regarding our QA/QC procedures and processess can be obtaiend in appendix A to this report.

In relation to data correction for our automatic data, this process is generally of principal concern with regard to the treatment of particulate matter monitoring data. It should be noted that both the Belfast Centre and Stockman's Lane sites utilise Filter Dynamics Measurement System (FDMS) equipped Tapered Element Oscillating Microbalances (TEOMs) for particulate matter (PM_{10}) monitoring. Government equivalence tests have determined that this equipment meets the equivalence criteria and on that basis, no correction factor needs to be applied to this monitoring data.

Since publication of the 2011 Air Quality Progress Report for Belfast City Council that considered 2010 monitoring data, the council has established a new automatic roadside monitoring site adjacent to the A12 Westlink at residential properties in Roden Street. The site is located within the M1 Motorway / A12 Westlink air quality management area and its location is shown on the following map of automatic monitoring sites. The site is equipped with a reference method chemiluminescent analyser for monitoring nitrogen dioxide levels, as well as a Met One Instruments Beta Attenuation Monitor (BAM) with unheated inlet for monitoring particulate matter. Government technical guidance highlights that a BAM, equipped with an unheated inlet, meets the equivalence criteria for PM_{10} monitoring, provided that the results are corrected for slope. This correction involves dividing measured concentrations by a factor of 1.21. It should be noted that the data presented on the Northern Ireland Air website and in this Updating and Screening Assessment report have already been corrected to the reference equivalent.

Figure 2.1 Map of Automatic Monitoring Sites.

Table 2.1 Details of Automatic Monitoring Sites.

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
Belfast Centre AURN site Lombard Street	Urban Centre	333898	374358	Nitrogen dioxide, sulphur dioxide, carbon monoxide, ozone and particulate matter (PM_{10} and $PM_{2.5}$)	N	Chemiluminescence, UV Fluorescence, IR Absorption, UV Absorption, TEOM (Tapered Element Oscillating Microbalance) with FDMS (Filter Dynamics Measurement System) Sharp Cut Cyclone for $PM_{2.5}$	Y (monitoring site is located in a city centre pedestrian precinct)	30 m	Y
Belfast Ormeau Road	Roadside	334272	373012	Nitrogen dioxide	Y	Chemiluminescence	Y (6 m)	3 m	Y
Belfast Ballyhackamore	Roadside	337911	373972	Nitrogen dioxide	Y	Chemiluminescence	Y (7 m)	1.5 m	Y
Belfast Stockman's Lane	Roadside	331010	371252	Nitrogen dioxide and Particulate matter (PM_{10})	Y	Chemiluminescence TEOM with FDMS	Y (6 m to façade of housing and 1m to gardens)	2 m	Y
Belfast Westlink Roden Street	Roadside	332617	373431	Nitrogen dioxide and Particulate matter (PM_{10})	Y	Chemiluminescence Beta Attenuation Monitor	Y (20 m)	5 m	Y

2.1.2 Non-Automatic Monitoring Sites

The government's risk and exposure-based approach to air quality management has meant that Belfast City Council's principal focus has been on addressing city-wide ambient nitrogen dioxide levels over recent years. Accordingly, in order to understand how nitrogen dioxide levels are varying across the city and in addition to our automatic analysers, the council operates a range of passive diffusion tubes for monitoring nitrogen dioxide at both background and roadside locations across the city. These locations are detailed in figure 2.2 and table 2.2.

Diffusion tubes are comprised of a small clear plastic tube containing a chemical reagent supported on stainless steel grids that absorbs the pollutant directly from the air. In this case, triethanolamine is used to monitor levels of ambient nitrogen dioxide. Belfast City Council's diffusion tubes are exposed for successive four-week periods generally in accordance with the dates recommended by Defra and, as a result, they provide a good general indication of average nitrogen dioxide concentrations, thereby allowing a comparison with the annual mean objective.

To ensure that experimental error is minimised in the preparation and analysis of its nitrogen dioxide diffusion tubes, Belfast City Council has appointed Gradko to supply, analyse and report data for its diffusion tubes. Gradko employs a 20% triethanolamine solution for monitoring ambient nitrogen dioxide and adheres to the requirements of the government's 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users' publication. Moreover, in the January – December 2011 Workplace Analysis Scheme for Proficiency (WASP) NO_2 diffusion tubes proficiency tests, Gradko Laboratory's analysis of nitrogen dioxide diffusion tubes was found to be 100% satisfactory for 3 out of 4 periods. In the October – December period of 2011, this score decreased to 37.5% for the eight test diffusion tubes under consideration.

To ensure further that its diffusion tube monitoring data is as accurate as possible, the council co-locates a number of diffusion tubes with a reference method compliant chemiluminescent nitrogen dioxide analyser at the Lombard Street, Newtownards Road and Stockman's Lane monitoring sites. This process allows a bias adjustment

factor (with a 95% confidence interval as an estimate of the uncertainty on the bias adjustment factor) to be calculated that can be used to *correct* the diffusion tube monitoring data. In the case of diffusion tube data presented in this report, the data has been corrected using a bias adjustment derived from the co-location study at the Belfast Centre Lombard Street AURN site. The bias calculation and data scaling was undertaken using Defra's 'Bias Adjustment Factor Calculation' spreadsheet. Outputs from the spreadsheet for treatment of Belfast City Council's 2011 data are included in appendix A to this report. The outputs show also monthly nitrogen dioxide monitoring data for each diffusion site for 2011 where available. It should be noted that at some monitor locations, diffusion tubes have been removed by members of the public during 2011. For this reason, we have had to annualise some of our diffusion tube monitoring data in accordance with government guidelines. Methodology for annualising data has been included in appendix A for those sites where data capture was less than 9 months during 2011.

Figure 2.2 Map of Non-Automatic Monitoring Sites.

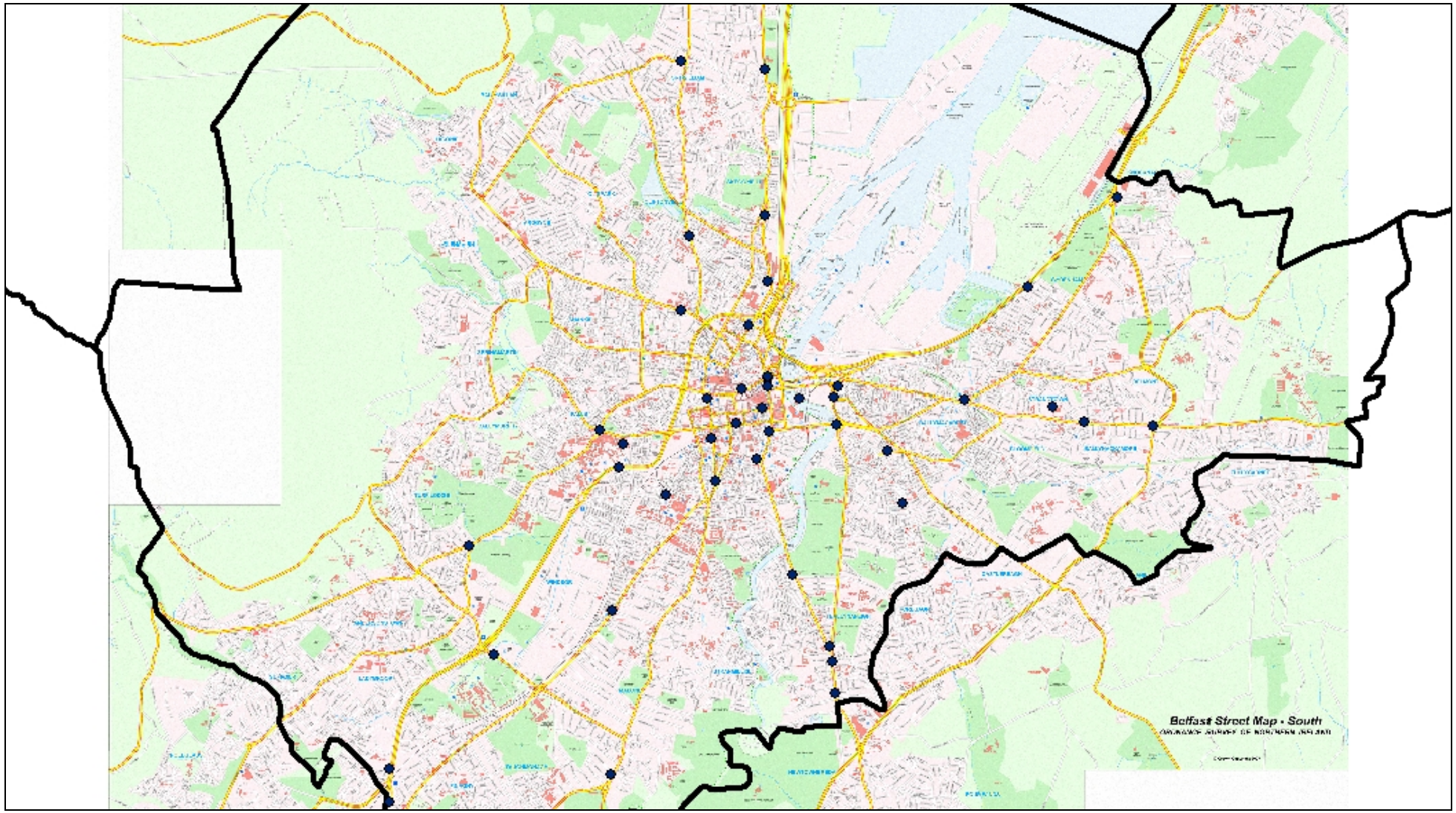


Table 2.2 Details of Non-Automatic Monitoring Sites.

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
Royal Victoria Hospital	Urban Background	332522	373708	NO_2	N	N	Y Hospital grounds	93 m	N
Black's Road	Roadside	329782	369522	NO_2	Y	N	Y 6 m	3 m	Y
61 Cromac Street	Roadside	334220	373853	NO_2	N	N	Y 13 m	3 m	Y
Ravenhill Road	Roadside	335014	373942	NO_2	N	N	Y 4 m	5 m	Y
Queen's Bridge	Urban Background	334581	374248	NO_2	N	N	Y 13 m	95 m	N
North Road	Urban Background	337551	374151	NO_2	N	N	Y School grounds	130 m	N
Donegall Square South	Roadside	333837	373950	NO_2	N	N	N	3 m	N
Milner Street	Roadside	332476	373434	NO_2	Y	N	Y 25 m	3 m	Y
Short Strand	Roadside	334980	374254	NO_2	N	N	Y 15 m	2 m	Y
301 Ormeau Road	Roadside	334503	372176	NO_2	Y	N	Y 1 m	2 m	Y
400 Ormeau Road	Roadside	335006	370796	NO_2	Y	N	Y 8 m	13 m	Y
Knock Road	Roadside	338718	373918	NO_2	Y	N	Y 7m	2 m	Y
Great George's Street	Kerbside	333981	375102	NO_2	Y	N	Y 25 m	1 m	Y

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
Lisburn Road	Roadside	332393	371766	NO_2	N	N	Y 5 m	1.5 m	Y
Shaftesbury Square	Kerbside	333594	373283	NO_2	N	N	Y 7 m	1 m	Y
Lombard Street	Urban Centre	333898	374358	NO_2	N	Y	Y Located in city centre pedestrian precinct	30 m	N
Albert Clock	Roadside	334212	374489	NO_2	N	N	Y 3.6 m	2.4 m	Y
Victoria Street	Roadside	334208	374386	NO_2	N	N	Y 2.5 m	3.8 m	Y
Stockman's Lane	Roadside	331007	371254	NO_2	Y	Y	Y 6 m to dwelling façade 1m to garden	2 m	Y
Ballyhackamore	Roadside	337911	373972	NO_2	Y	Y	Y 7 m	3 m	Y
Whitewell Road	Roadside	333563	380450	NO_2	N	N	Y 7 m to School grounds	12 m	N
Donegall Road	Roadside	333022	373122	NO_2	N	N	Y 2m	1.5 m	Y
Grosvenor Road and Falls Road	Roadside	332252	373878	NO_2	N	N	Y 4 m to public park and Hospital	3 m	Y

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
Falls Road and Glenn Road	Roadside	330716	372519	NO_2	N	N	Y 15 m	2.8 m	
Knocknagoney Road (Sydenham Bypass)	Suburban	338299	376602	NO_2	N	N	Y 4 m	29 m	Y
Station Road	Roadside	337252	375555	NO_2	N	N	Y 2 m	12 m	Y
Upper Malone Road	Roadside	332373	369851	NO_2	N	N	Y 2 m	10 m	Y
Great Victoria Street	Kerbside	333548	373772	NO_2	N	N	Y 1m	1 m	Y
College Square East	Roadside	333498	374241	NO_2	N	N	Y 1.5m	2m	Y
Chichester Street	Roadside	334147	374123	NO_2	N	N	Y 1m	2m	Y
Cromac Street & Ormeau Avenue	Kerbside	334085	373542	NO_2	Y	N	Y 2.5m	0.8m	Y
Ormeau Road (junction with Ravenhill Road)	Roadside	334943	371342	NO_2	Y	N	Y 3m	2 m	Y
Upper Newtownards Road & Hollywood Road	Roadside	336519	374233	NO_2	N	N	Y 2m	3m	Y

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
Crumlin Road	Roadside	333195	375279	NO_2	N	N	Y 2m Hospital grounds	2m	Y
228 Antrim Road	Roadside	333288	376143	NO_2	N	N	Y 3m	2m	Y
Shore Road (M2 Junction 1)	Roadside	334180	378100	NO_2	N	N	Y 2m	3m	Y
Shore Road (Ivan Street)	Roadside	334174	376384	NO_2	N	N	Y 2m	4m	Y
North Circular Road	Roadside	333189	378195	NO_2	N	N	Y 12m	2 m	Y
Woodstock Road	Roadside	335783	373011	NO_2	N	N	Y 3 m	3 m	Y
Beersbridge Road	Roadside	335616	373624	NO_2	N	N	Y 8 m	2 m	Y
York Street	Roadside	334212	375614	NO_2	N	N	Y 5 m	2 m	Y
Rosetta Court	Roadside	334963	371167	NO_2	N	N	Y 8 m	8 m	Y
Strand Walk	Roadside	335038	374384	NO_2	N	N	Y 2 m	14 m	Y
St. Anne's Close	Roadside	329773	369915	NO_2	N	N	Y 1 m	10 m	Y
Custom House Square	Kerbside	334208	374507	NO_2	N	N	Y 2 m	0.5 m	Y

2.2 Comparison of Monitoring Results with AQ Objectives.

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

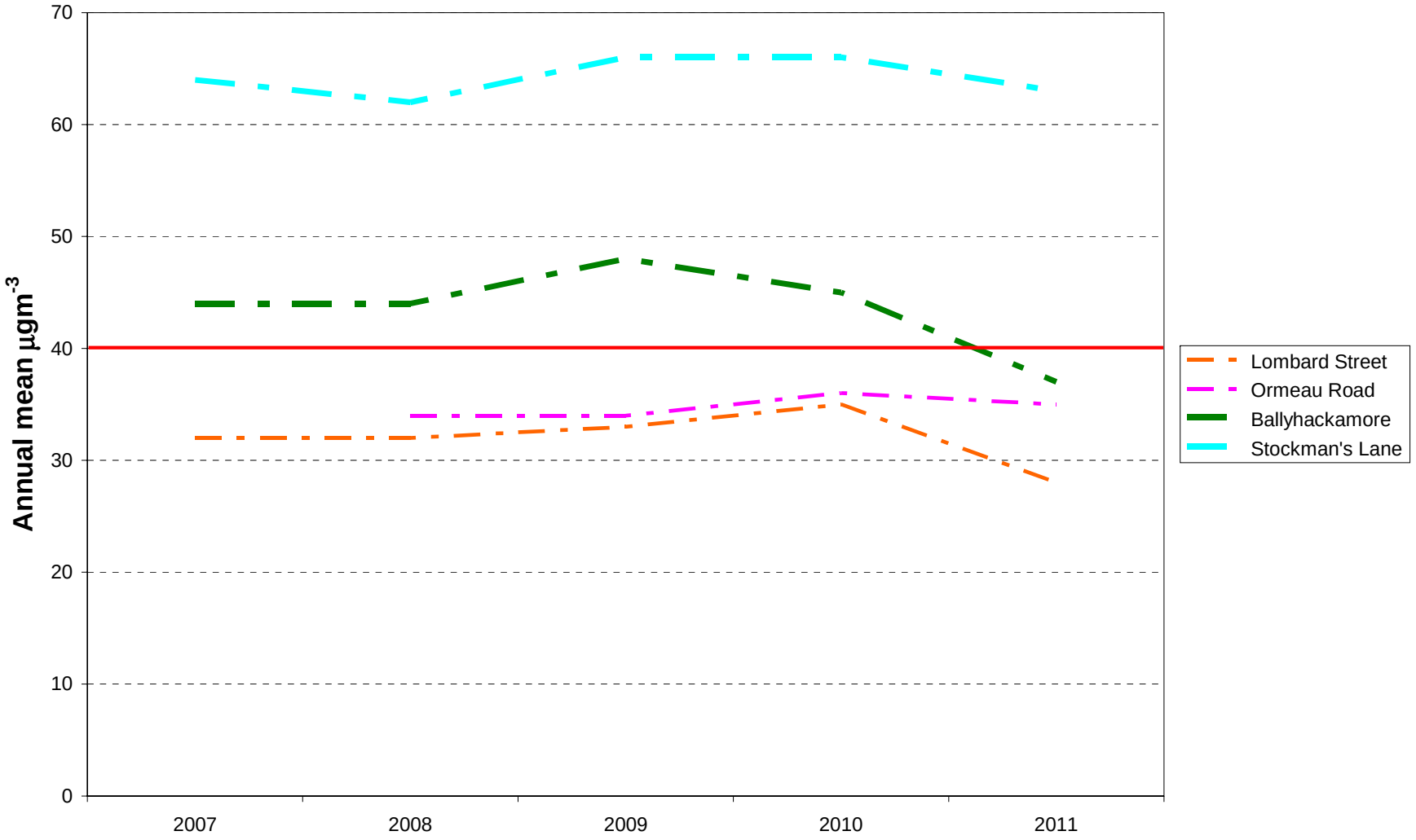
The following table summarises recent monitoring data from the council's nitrogen dioxide automatic analysers for 2011 and preceding years from 2007 where this data is available. In all cases, exceedences of the Air Quality Strategy objectives are highlighted in bolded 'red'.

Table 2.3 Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA ?	Valid Data Capture for period of monitoring %[a]	Valid Data Capture 2011 % [b]	Annual Mean Concentration µg/m^3				
					2007*[c]	2008* [c]	2009* [c]	2010* [c]	2011 [c]
Belfast Centre Lombard Street	Urban Centre	N	99%	99%	32	32	33	35	28
Belfast Ormeau Road	Roadside	Y	97%	97%	-	34	34	36	35
Belfast Ballyhackamore	Roadside	Y	96%	96%	**44**	**44**	**48**	**45**	37
Belfast Stockman's Lane	Roadside	Y	95%	95%	**64**	**62**	**66**	**66**	**63**
Belfast Westlink	Roadside	Y	96%	96%	-	-	-	-	33

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.
*Annual mean concentrations for previous years are optional.

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Automatic Monitoring Sites



Trends in annual mean monitoring data for nitrogen dioxide are summarised in the preceding graph – figure 2.3.

Annual mean concentrations at the Belfast Centre AURN and Ormeau Road sites continue to remain below the 40 μgm^{-3} annual mean objective for nitrogen dioxide as denoted by the solid red line on the graph. Based upon this data, the council has been considering the continuing need for the Ormeau Road air quality management area over recent years – Ormeau Road data denoted by the pink line on the graph..

However, referring to the local air quality management technical guidance LAQM.TG(09), government has indicated that the decision to revoke an air quality management area should recognise that pollutant concentrations can vary significantly from one year to the next, due to the influence of meteorological conditions. Accordingly, government has stated that it is important that authorities should avoid cycling between declaring, revoking and declaring again, due simply to these variations. In attempting to reach a decision regarding the potential for revocation along the Ormeau Road, Belfast City Council has considered monitoring data for the first 3 months of 2012 and has noted that nitrogen dioxide concentrations at the Ormeau Road site have increased significantly when compared to equivalent 2011 months. Although the 2012 data is provisional at this time and reprepsents a small portion of the overall 2012 sampling year, monthly mean nitrogen dioxide levels for January, February and March 2012 are 42, 50 and 49 μgm^{-3} respectively, as compared to 43, 36 and 38 μgm^{-3} for January, February and March 2011. If this increase in ambient nitrogen dioxide levels is sustained throughout 2012, then the air quality management area will need to be maintained and additional mitigation measures applied. Accordingly, the council will continue to review nitrogen dioxide monitoring data for the Ormeau Road site during 2012 and liaise with the Department of Environment for Northern Ireland and Department for Regional Development Roads Service before coming to a conclusion regarding the potential for revocation.

From the data in table 2.3, it can be seen that until 2011, year on year annual mean nitrogen dioxide concentrations along the Upper Newtownards Road remained reasonably static with little evidence of a downward trend. Certainly, data from this site did not appear to adhere to the government's reduction projections for year on

year measured annual mean roadside nitrogen dioxide concentrations. However, monitoring data for 2011 has demonstrated a sharp decrease in the annual mean nitrogen dioxide concentration at this site to the extent that during 2011, the nitrogen dioxide annual mean objective was achieved along the Upper Newtownards Road. The reason for this decrease is unclear since the Belfast City Air Quality Action Plan was substantially completed during 2010 and, in its latter stages, action plan mitigation measures did not focus particularly upon the Upper Newtownards Road area. Nonetheless, the council will continue to monitor nitrogen dioxide concentrations along the Upper Newtownards Road in order to determine whether this improvement in ambient conditions is sustained.

Unfortunately, despite the recent completion of significant structural improvements to the M1 Motorway and A12 Westlink corridor, nitrogen dioxide concentrations along Stockman's Lane continue to exceed significantly the 40 μgm^{-3} annual mean objective for nitrogen dioxide with levels typically around 63 μgm^{-3}. There are a number of residential premises directly adjacent to the carriageway at Stockman's Lane necessitating continuation of the air quality management area for this location. In addition, exceedences of the 1-hour mean objective for nitrogen dioxide are also common at this location and will be addressed in a subsequent section of this report.

Through its previous review and assessment reports, Belfast City Council has highlighted sustained elevated nitrogen dioxide levels in the vicinity of the M1 Motorway / Westlink corridor to government since this data is important in determining whether Belfast and Northern Ireland, as a whole, is able to achieve EC limit values for nitrogen dioxide. Unfortunately, annual mean and hourly mean nitrogen dioxide monitoring data from the Stockman's Lane site has confirmed that the city and Northern Ireland did not achieve the EC limit values for nitrogen dioxide by the compliance date of 1 January 2010. As a result, Defra and DoENI have jointly submitted an application to the European Commission for a 5-year derogation to the compliance date for achieving limit values for nitrogen dioxide in the Belfast Metropolitan Urban Area and Northern Ireland. If this application is accepted, the revised deadline for achieving the limit values for nitrogen dioxide in Northern Ireland will be 1 January 2015.

Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean objective.

Site ID	Site Type	Within AQMA ?	Valid Data Capture for period Of monitoring %[a]	Valid Data Capture 2011 % [b]	Number of Exceedences of Hourly Mean (200 µg/m^3)				
					2007*[c]	2008* [c]	2009* [c]	2010* [c]	2011 [c]
Belfast Centre Lombard Street	Urban Centre	N	99%	99%	0	3	0	0	0
Belfast Ormeau Road	Roadside	Y	97%	97%	0	0	0	0	0
Belfast Ballyhackamore	Roadside	Y	96%	96%	0	0	0	1	0
Belfast Stockman's Lane	Roadside	Y	95%	95%	18	**21**	**27**	**56**	**40**
Belfast Westlink	Roadside	Y	96%	96%	-	-	-	1	3

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] If the period of valid data is less than 90%, include the 99.8th percentile of hourly means in brackets
*Number of exceedences for previous years are optional.

Historically, modelled and monitored exceedences of the 1-hour mean objective for nitrogen dioxide were encountered only in the vicinity of the M1 Motorway / A12 Westlink corridor. As a result, this is the only air quality management area within Belfast that has been declared on the basis of exceedences of the 1-hour objective. From ambient monitoring data for Stockman's Lane, as summarised in table 2.4, it can be seen that the number of exceedences of the hourly objective has broadly increased over recent years with 56 exceedences recorded during 2010 and 40 during 2011, with the objective providing for a maximum of 18 per annum. As highlighted previously, there are residential properties located directly adjacent to the carriageway in Stockman's Lane and most of these properties have gardens facing onto the roadway thereby providing for short-term relevant public exposure.

Diffusion Tube Monitoring Data.

In order to obtain a better understanding of how levels of nitrogen dioxide are varying across the city over time and to investigate those locations where previous rounds of the review and assessment process have highlighted areas of concern, Belfast City council has placed around 50 diffusion tubes at relevant locations across the city. Data from these tubes for 2011 has been summarised in table 2.5 alongside historical data where it is available – table 2.6.

In terms of the outcome of the 2011 nitrogen dioxide diffusion tube monitoring, it is noted that there has been a significant decrease in the number of locations across the city where ambient levels of nitrogen dioxide exceeded the annual mean objective. Indeed, there have been significant improvements over the 2010 monitoring data to the extent that the only monitored annual mean exceedences during 2011 occurred at Great George's Street and Stockman's Lane, both of which are located within the existing M1 Motorway / A12 Westlink air quality management area and have been the subject of mitigation measures for some time. Both these locations have sustained exceedences of the nitrogen dioxide annual mean objective and are expected to continue to do so in future years.

Although this apparent improvement in ambient conditions in 2011 is to be welcomed, and taking into account that 2010 may come to be regarded as a high pollution year as a result of severe climatic conditions, the reductions in ambient annual mean nitrogen dioxide levels during 2011 are not fully explained by the completion of local air quality action planning measures.

Furthermore, and as highlighted previously during our discussion of the nitrogen dioxide automatic monitoring data, some of the recent year-on-year improvements in ambient nitrogen dioxide levels do not readily conform to the Defra factors for projecting measured annual mean roadside nitrogen dioxide concentrations to future years. For example, referring to the annual trends data for the period 2007-2011 as detailed in the table 2.6, we can see that at Cromac Street in the city centre, nitrogen dioxide levels have been comfortably above the 40 μgm^{-3} objective since 2007 but in 2011, there was an unexpected decline to 36 μgm^{-3}. A similar situation occurred at

our Donegal Square South, Short Strand, Knock Road, Victoria Street, Ballyhackamore and Great Victoria Street monitoring sites

Accordingly, the council intends to maintain its diffusion tubes monitoring at the majority of these locations during 2012 in order to determine whether ambient nitrogen dioxide concentrations continue to remain below the annual mean objective for nitrogen dioxide particularly where levels are close to, or at the objective.

With regard to addressing exceedence issues in the vicinity of Stockman's Lane and Great George's Street, we have already highlighted these problematic locations to the Department for Regional Development Roads Service which has responsibility for transport planning within Northern Ireland. In addition, we have commenced the development of a supplementary air quality action plan for the city which will specifically address these locations and will adopt a precautionary approach to other locations with sustained historical exceedences.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2011.

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y / N)	Confirm if data has been distance corrected (Y / N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2011 (μg/m^3)
Royal Victoria Hospital	On façade of building within hospital grounds	Urban Background	N	-	12 months	N/A	N	21
Black's Road	On lamppost adjacent to residential property	Roadside	Y	-	12 months	N/A	N	40
61 Cromac Street	On lamppost at residential properties	Roadside	Y	-	12 months	N/A	N	36
Ravenhill Road	On façade of building at junction with East Bridge Street	Roadside	Y	-	12 months	N/A	N	25
Queen's Bridge	On lamppost adjacent to Laganview Court	Urban Background	N	-	7 months	Y	N	21
North Road	On a building façade at a primary school	Urban Background	N	-	11 months	N/A	N	19
Donegall Square South	Located on façade at rear of City Hall	Roadside	N	-	12 months	N/A	N	36

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y / N)	Confirm if data has been distance corrected (Y / N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2011 (µg/m^3)
Milner Street	Located on lamppost adjacent to residential properties	Roadside	Y	-	10 months	N/A	N	27
Short Strand	On lamppost adjacent to residential premises at Mountpottinger Road	Roadside	N	-	9 months	N/A	N	40
301 Ormeau Road	On façade of building on Ormeau Road	Roadside	Y	-	12 months	N/A	N	31
400 Ormeau Road	On façade of building at junction of Ormeau Road and Knockbreda Park	Roadside	Y	-	11 months	N/A	N	24
Knock Road	At junction of Upper Newtownards Road and Knock Road	Roadside	Y	-	12 months	N/A	N	38
Great George's Street	At junction of Great George's Street and York Street	Kerbside	Y	-	12 months	N/A	N	**45**

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y / N)	Confirm if data has been distance corrected (Y / N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2011 (µg/m^3)
Lisburn Road	Junction of Lisburn Road and Cadogan Park	Kerbside	N	-	9 months	N/A	N	27
Shaftesbury Square	Junction of Donegal Road, Dublin Road ands Great Victoria Street	Roadside	N	-	8 months	Y	N	36
Lombard Street	Collocated at Belfast Centre AURN site	Urban Centre	N	Triplicate and Co-located	12 months	N/A	N	29
Albert Clock	On façade of flats at Customhouse Square	Roadside	N	-	12 months	N/A	N	40
Victoria Street	On façade of flats at Victoria Street	Roadside	N	-	11 months	N/A	N	36
Stockman's Lane	Collocated with automatic monitoring site	Roadside	Y	Triplicate and Co-located	12 months	N/A	N	**64**
Ballyhackamore	Collocated with automatic monitoring site	Roadside	Y	Triplicate and Co-located	12 months	N/A	N	39
Whitewell Road	Adjacent to primary school grounds	Roadside	N	-	8 months	Y	N	15

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y / N)	Confirm if data has been distance corrected (Y / N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2011 (µg/m^3)
Donegall Road	On Donegall Road at entrance to City Hospital	Kerbside	N	-	12 months	N/A	N	28
Grosvenor Road and Falls Road	Junction of Grosvenor Road and Falls Road adjacent to Royal Victoria Hospital	Roadside	N	-	10 months	N/A	N	34
Falls Road and Glen Road	Junction of Falls Road and Glen Road	Roadside	N	-	8 months	Y	N	27
Knocknagoney Road (Sydenham Bypass)	At residential properties at Knocknagoney Dale	Suburban	N	-	7 months	Y	N	21
Station Road	Junction of Station Road and Inverary Drive	Roadside	N	-	10 months	N/A	N	22
Upper Malone Road	Junction of Rosemary Park and Upper Malone Road	Roadside	N	-	12 months	N/A	N	21
Great Victoria Street	Junction of Great Victoria Street and Glengall Street	Roadside	N	-	11 months	N/A	N	37

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y / N)	Confirm if data has been distance corrected (Y / N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2011 (µg/m^3)
College Square East	On façade of residential premises at College Avenue	Roadside	N	-	10 months	N/A	N	32
Chichester Street	Junction of Seymour Street and Chichester Street	Roadside	N	-	12 months	N/A	N	39
Cromac Street and Ormeau Avenue	Junction of Joy Street and Ormeau Avenue	Kerbside	N	-	12 months	N/A	N	33
Ormeau Road (junction with Ravenhill Road)	At residential premises at the junction of the Ormeau and Ravenhill Roads	Roadside	Y	-	11 months	N/A	N	25
Upper Newtownards Road & Hollywood Road	At library at the junction of Upper Newtownards Road & Hollywood Road	Roadside	Y	-	11 months	N/A	N	26
Crumlin Road	At Mater Infirmorum Hospital	Roadside	N	-	12 months	N/A	N	31
228 Antrim Road	On Antrim Road at junction with Atlantic Avenue	Roadside	N	-	11 months	N/A	N	37

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y / N)	Confirm if data has been distance corrected (Y / N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2011 (µg/m^3)
Shore Road (M2 Junction 1 end)	At residential premises at Midland Terrace	Kerbside	N	-	11 months	N/A	N	29
Shore Road (Ivan Street end)	At residential premises at Ivan Street	Roadside	N	-	11 months	N/A	N	30
North Circular Road	At residential premises at the junction with Coolmoyne Park	Kerbside	N	-	6 months	Y	N	23
Woodstock Road	398 Woodstock Road	Kerbside	N	-	11 months	N/A	N	26
Beersbridge Road	61 Beersbridge Road	Kerbside	N	-	12 months	N/A	N	28
York Street	59 York Street	Kerbside	N	-	8 months	Y	N	35
Rosetta Court	On façade of residential premises facing Ormeau Road	Roadside	Y	-	12 months	N/A	N	28
Strand Walk	In front of residential premises adjacent to Bridge End	Roadside	N	-	10 months	N/A	N	30

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y / N)	Confirm if data has been distance corrected (Y / N)	Annual mean concentration (Bias Adjustment factor = 0.81)
								2011 (μg/m^3)
St. Anne's Square	On façade of residential premises adjacent to Blacks Road and M1 Motorway	Roadside	N	-	11 months	N/A	N	26
Custom House Square	On façade of flats at Custom House Square	Roadside	N	-	11 months	N/A	N	33

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.
*Annual mean concentrations for previous years are optional.

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011).

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m^3				
			2007* (Bias Adjustment Factor = 0.79)	2008* (Bias Adjustment Factor = 0.80)	2009* (Bias Adjustment Factor = 0.87)	2010* (Bias Adjustment Factor = 0.92)	2011 (Bias Adjustment Factor = 0.81)
Royal Victoria Hospital	Urban Background	N	21	21	23	25	21
Black's Road	Roadside	Y	40	36	**44**	**46**	40
61 Cromac Street	Roadside	Y	**42**	**45**	**42**	**48**	36
Ravenhill Road	Roadside	Y	31	33	31	36	25
Queen's Bridge	Urban Background	N	-	31	27	29	21
North Road	Urban Background	N	15	18	15	21	19
Donegall Square South	Roadside	N	**42**	**42**	**43**	**48**	36
Milner Street	Roadside	Y	39	35	31	38	27
Short Strand	Roadside	N	22	**42**	**48**	**50**	40
301 Ormeau Road	Roadside	Y	33	35	33	35	31
400 Ormeau Road	Roadside	Y	25	27	29	30	24
Knock Road	Roadside	Y	-	**47**	**44**	**48**	38
Great George's Street	Kerbside	Y	40	**51**	**48**	**55**	**45**
Lisburn Road	Kerbside	N	33	34	31	38	27
Shaftesbury Square	Roadside	N	38	38	36	**43**	36

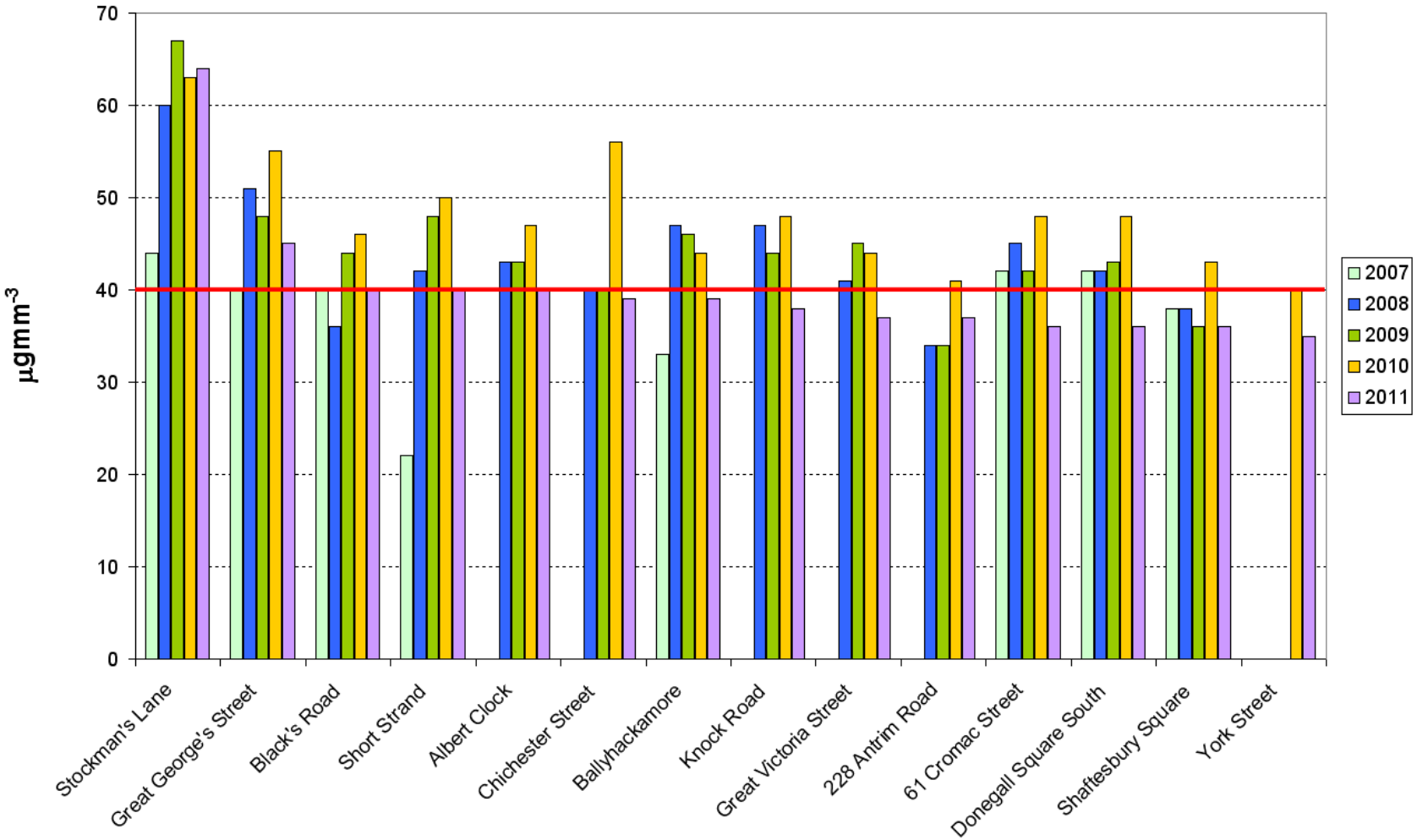
Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m^3				
			2007* (Bias Adjustment Factor = 0.79)	2008* (Bias Adjustment Factor = 0.80)	2009* (Bias Adjustment Factor = 0.87)	2010* (Bias Adjustment Factor = 0.92)	2011 (Bias Adjustment Factor = 0.81)
Lombard Street	Urban Centre	N	33	**41**	34	35	29
Albert Clock	Roadside	N	-	**43**	**43**	**47**	40
Victoria Street	Roadside	N	38	**42**	39	**48**	36
Stockman's Lane	Roadside	Y	**44**	**60**	**67**	**63**	**64**
Ballyhackamore	Roadside	Y	33	**47**	**46**	**44**	39
Whitewell Road	Roadside	N	23	21	21	25	15
Donegall Road	Kerbside	N	31	34	30	34	28
Grosvenor Road and Falls Road	Roadside	N	29	36	39	40	34
Falls Road and Glen Road	Roadside	N	29	30	31	33	27
Knocknagoney Road (Sydenham Bypass)	Suburban	N	29	29	29	31	21
Station Road	Roadside	N	23	24	24	25	22
Upper Malone Road	Roadside	N	27	21	23	28	21
Great Victoria Street	Roadside	N	-	**41**	**45**	**44**	37
College Square East	Roadside	N	-	37	37	**44**	32

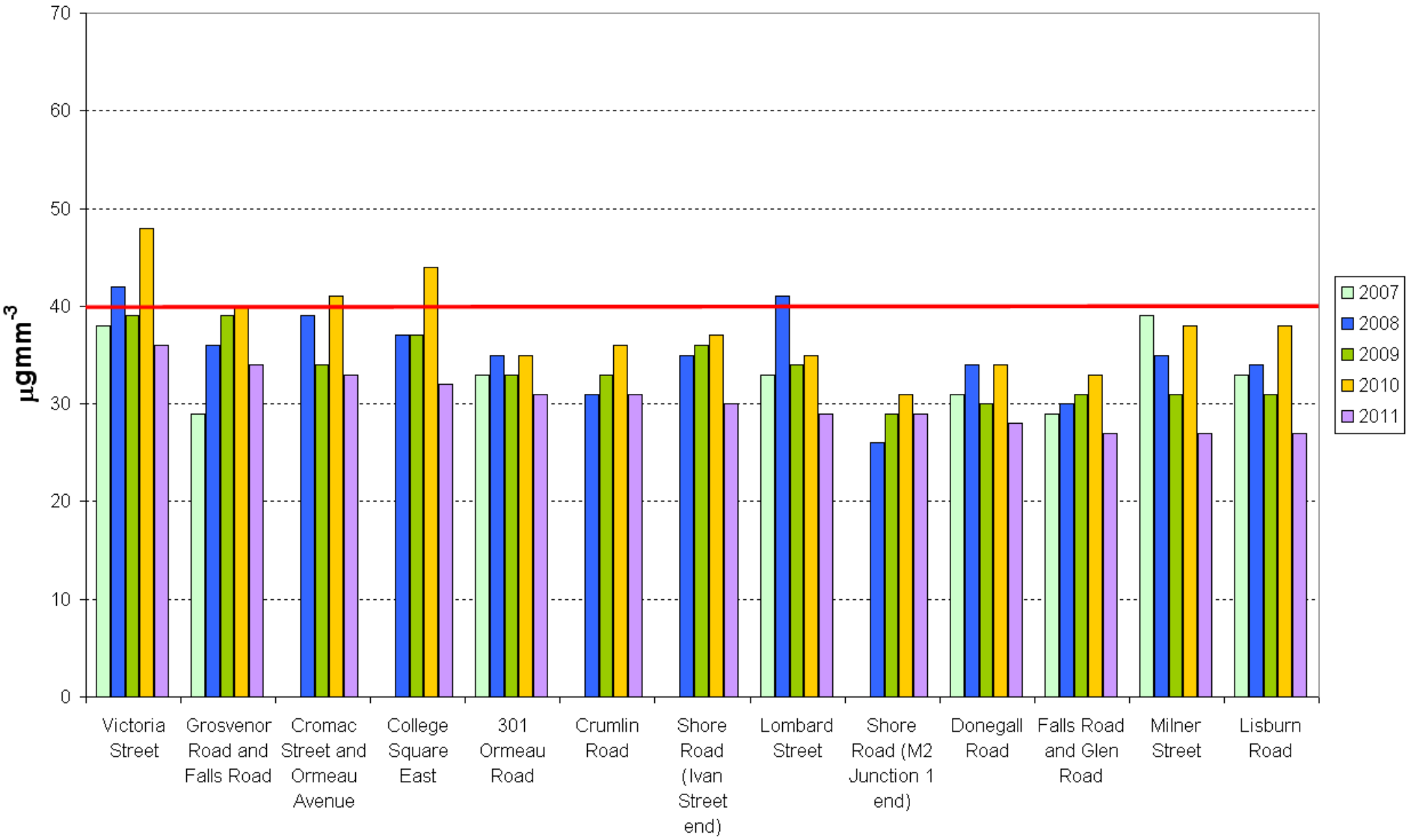
Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m^3				
			2007* (Bias Adjustment Factor = 0.79)	2008* (Bias Adjustment Factor = 0.80)	2009* (Bias Adjustment Factor = 0.87)	2010* (Bias Adjustment Factor = 0.92)	2011 (Bias Adjustment Factor = 0.81)
Chichester Street	Roadside	N	-	40	40	**56**	39
Cromac Street and Ormeau Avenue	Kerbside	N	-	39	34	**41**	33
Ormeau Road (junction with Ravenhill Road)	Roadside	Y	-	25	26	33	25
Upper Newtownards Road & Hollywood Road	Roadside	Y	-	27	30	29	26
Crumlin Road	Roadside	N	-	31	33	36	31
228 Antrim Road	Roadside	N	-	34	34	**41**	37
Shore Road (M2 Junction 1 end)	Kerbside	N	-	26	29	31	29
Shore Road (Ivan Street end)	Roadside	N	-	35	36	37	30
North Circular Road	Kerbside	N	-	22	21	29	23
Woodstock Road	Kerbside	N	-	-	-	-	26
Beersbridge Road	Kerbside	N	-	-	-	-	28
York Street	Kerbside	N	-	-	-	40	35

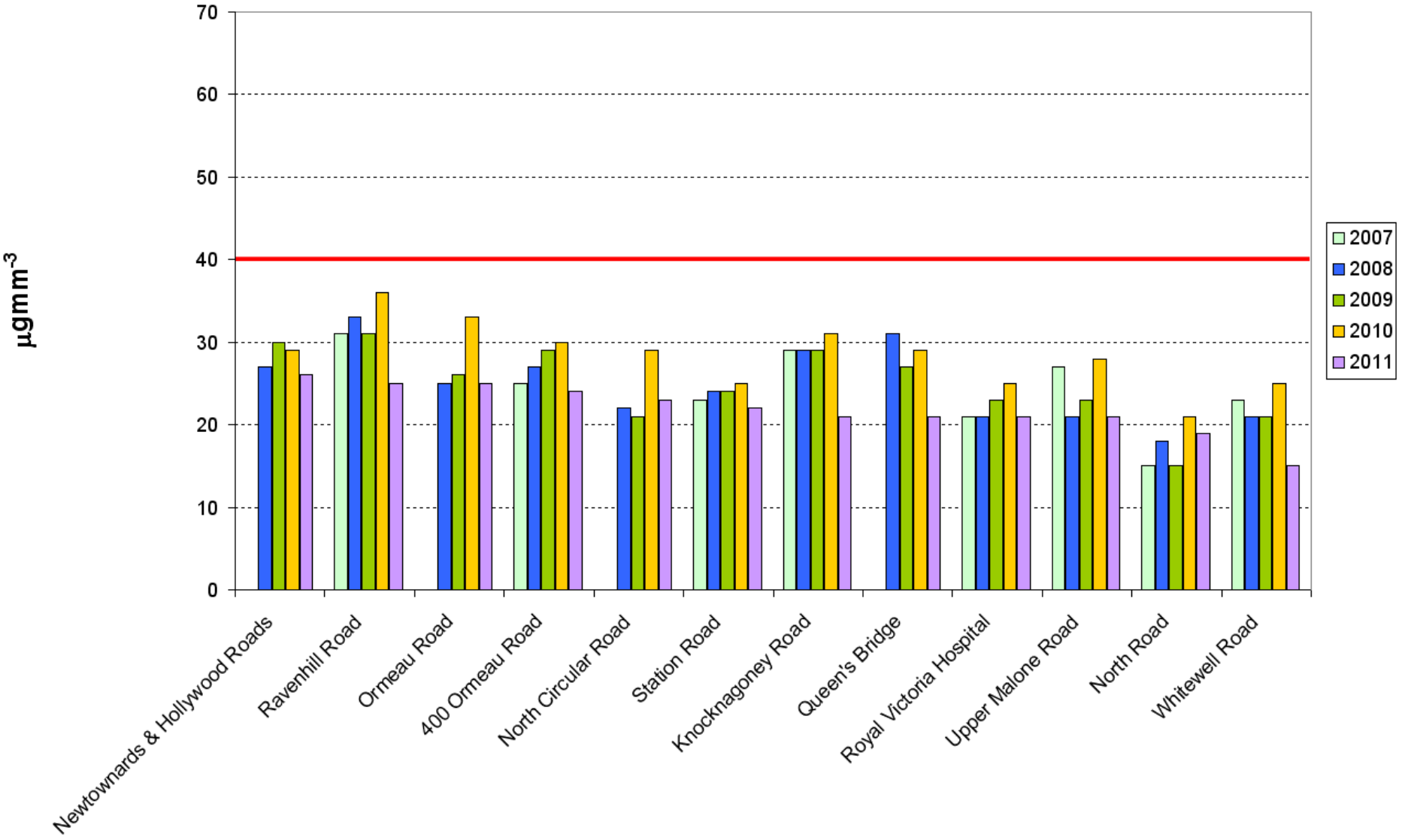
Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) μg/m^3				
			2007* (Bias Adjustment Factor = 0.79)	2008* (Bias Adjustment Factor = 0.80)	2009* (Bias Adjustment Factor = 0.87)	2010* (Bias Adjustment Factor = 0.92)	2011 (Bias Adjustment Factor = 0.81)
Rosetta Court	Roadside	Y	-	-	-	-	28
Strand Walk	Roadside	N	-	-	-	-	30
St. Anne's Square	Roadside	N	-	-	-	-	26
Custom House Square	Roadside	N	-	-	-	-	33

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites

The following graphs shows trends in nitrogen dioxide diffusion tube data from 2007 where data exists. In addition, the sites have been ranked by 2011 annual mean in order to make the data easier to review.




70
60
50
40
30
20
10
0
µgmm-3
2007
2008
2009
2010
2011
Victoria Street
Grosvenor Road and Falls Road
Cromac Street and Ormeau Avenue
College Square East
301 Ormeau Road
Crumlin Road
Shore Road (Ivan Street end)
Lombard Street
Shore Road (M2 Junction 1 end)
Donegall Road
Falls Road and Glen Road
Milner Street
Lisburn Road


µgmm-3
70
60
50
40
30
20
10
0
2007
2008
2009
2010
2011
Newtownards & Hollywood Roads
Ravenhill Road
Ormeau Road
400 Ormeau Road
North Circular Road
Station Road
Knocknagoney Road
Queen's Bridge
Royal Victoria Hospital
Upper Malone Road
North Road
Whitewell Road

2.2.2 PM_{10}

As a result of a historic reliance upon solid fuel for domestic heating, Belfast used to experience frequent exceedences of the 24-hour and annual mean objectives for particulate matter (PM_{10}) across the city. However, with completion of the city's smoke control programme and the widespread availability of natural gas to all sectors, domestic and industrial emissions of particulate matter have decreased significantly since around 2000. As a result, the council was able to decommission its Belfast East Clara Street particulate matter monitoring site in 2007.

However, as domestic and industrial emissions have been addressed, emissions of particulate matter from road transport along the M1 Motorway and A12 Westlink corridor have gained in prominence. Upon completion of the council's first review and assessment of air quality in 2004, it was concluded that the M1 Motorway and A12 Westlink corridor should be declared as an air quality management area on the basis of modelled and monitored exceedences of the 24-hour and annual mean objectives for particulate matter.

As embodied in the subsequent 2006 Air Quality Action Plan for Belfast, a range of structural improvements, designed to relieve traffic congestion, have been completed for the M1 Motorway and A12 Westlink. As a result, monitored levels of particulate matter have declined over recent years within this air quality management area. This monitoring data is summarised and reviewed in the tables 2.7, 2.8 and in figure 2.5.

Table 2.7 Results of Automatic Monitoring of PM_{10}: Comparison with Annual Mean Objective.

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %[a]	Valid Data Capture 2011 %[b]	Confirm Gravimetric Equivalent (Y or N)	Annual Mean Concentration µg/m^3				
						2007*[c]	2008*[c]	2009*[c]	2010*[c]	2011[c]
Belfast Centre Lombard Street	Urban Centre	N	61%	61%	Y	19	-	20	-	-
Belfast Stockman's Lane	Roadside	Y	88%	88%	Y	**43**	36	22	26	24
Belfast Westlink Roden Street	Roadside	Y	96%	96%	Y	-	-	-	23	23

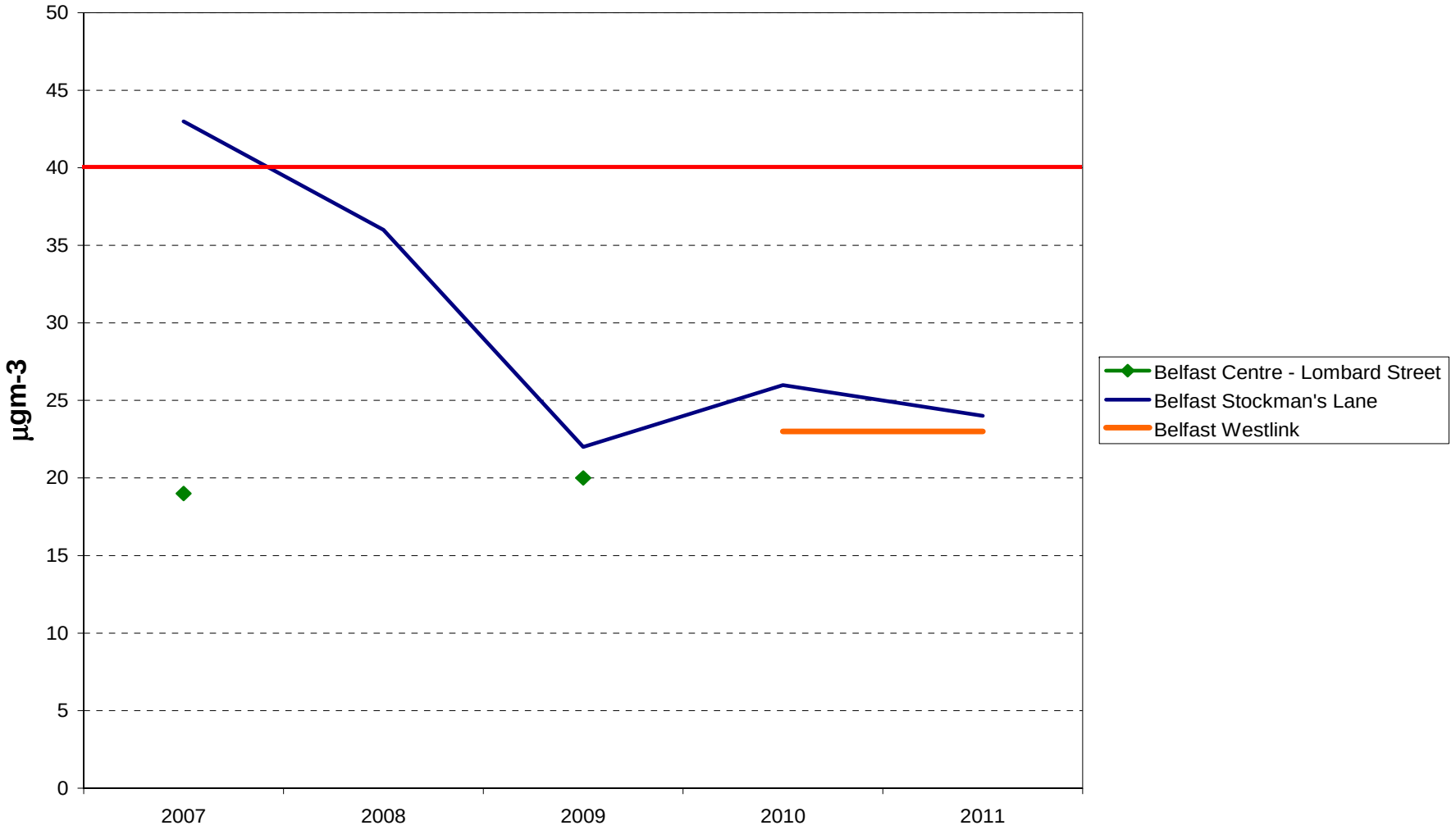
[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.
* Optional

Table 2.8 Results of Automatic Monitoring for PM_{10}: Comparison with 24-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %[a]	Valid Data Capture 2011 %[b]	Confirm Gravimetric Equivalent (Y or N)	Number of Exceedences of 24-Hour Mean (50 µg/m^3)				
						2007*	2008*	2009*	2010*	2011
Belfast Centre Lombard Street	Urban Centre	N	61%	61%	Y	5	1	3	10	10
Belfast Stockman's Lane	Roadside	Y	88%	88%	Y	**105**	14	1	18	6
Belfast Westlink Roden Street	Roadside	Y	96%	96%	Y	-	-	-	10	11

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] if data capture is less than 90%, include the 90th percentile of 24-hour means in brackets
* Optional

Figure 2.5 Trends in Annual Mean PM_{10} Concentrations at Belfast monitoring sites.



In terms of exceedences of the 40 μgm^{-3} particulate matter annual mean objective, historical data for the Stockman's Lane monitoring site shows an exceedence in 2007 but a rapid decline thereafter, meaning that since 2008, there have been no further exceedences of the annual mean objective at this location. Monitoring data from the Belfast Westlink site at Roden Street, which was established in 2010 and is located also within the M1 Motorway / A12 Westlink air quality management area, indicates no exceedences during 2010 and 2011.

Reflecting upon the particulate matter 24-hour mean objective data, as summarised in table 2.8, the data indicates that there were 105 exceedences at Stockman's Lane during 2007; the objective provides for a maximum of 35 per annum. However, as with the annual mean at this location, the number of exceedences of the 24-hour mean objective declined sharply during 2008 and has remained comfortably below the objective during 2009, 2010 and 2011. Equivalent data from the Belfast Westlink Roden Street site revealed that there were no breaches of the particulate matter 24-hour mean objective during 2010 and 2011.

On the basis of this data, the council considers it is appropriate to revoke the M1 Motorway / A12 Westlink air quality management area for exceedences of the particulate matter annual and 24-hour mean objectives. Accordingly, the council intends to liaise with the Department of Environment for Northern Ireland and the Department for Regional Development Roads Service regarding the revocation process.

2.2.3 Sulphur Dioxide.

As a result of a historic reliance upon solid fuel for domestic heating, Belfast City used to experience frequent and widespread exceedences of the 15-minute, 1-hour and 24-hour mean objectives for sulphur dioxide. However, with completion of the city's smoke control programme and the widespread availability of natural gas to all sectors, levels of sulphur dioxide have decreased dramatically since 2000. By way of amplification, there have been no exceedences of any sulphur dioxide objective in the city since 2002. Indeed, sustained low levels of sulphur dioxide have meant that the council has been able to terminate ambient monitoring at all locations with the exception of the Belfast Centre AURN site at Lombard Street. No air quality management areas have been declared for sulphur dioxide across Belfast.

Recent sulphur dioxide monitoring data from the Belfast Centre site is summarised in table 2.9. As indicated, no exceedence of any objective was observed during 2011. Table 3.0 illustrates that recent annual mean sulphur dioxide levels at the Belfast Centre AURN site remain typically around 3-4 μgm^{-3}.

Table 2.9 Results of Automatic Monitoring of SO_2: Comparison with Annual Mean Objective.

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %[a]	Valid Data Capture 2011 %[b]	Number of Exceedences (percentile in bracket µg/m^3)[c]		
					15-minute Objective (266 µg/m^3)	1-hour Objective (350 µg/m^3)	24-hour Objective (125 µg/m^3)
Belfast Centre Lombard Street	Urban Centre	N	99%	99%	0	0	0

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] if data capture is less than 90%, include the relevant percentile in brackets

Table 3.0 Results of Automatic Monitoring of SO_2: Annual mean levels for the Belfast Centre Lombard Street site.

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %[a]	Valid Data Capture 2011 %[b]	Annual Mean Concentration µg/m^3				
					2007*[c]	2008*[c]	2009*[c]	2010*[c]	2011[c]
Belfast Centre Lombard Street	Urban Centre	N	99%	99%	4	4	3	4	2

2.2.4 Benzene.

Under the auspices of the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, two air quality objectives have been established for benzene, both assessed as running annual means. For the United Kingdom as a whole, a running annual mean objective of 16.25 μgm^{-3} to be achieved by 31 December 2003 has been established however, local authorities in Scotland and Northern Ireland have introduced a more stringent running annual mean objective of 3.25 μgm^{-3} to be achieved by 31 December 2010.

Reflecting upon running annual mean monitoring data for the Belfast Centre AURN site over recent years (table 3.1), reveals that levels of benzene are significantly and consistency below the 3.25 μgm^{-3} objective. For this reason, no air quality management area has been declared for benzene within Belfast. By implication, these annual mean levels comply also with the 5.0 μgm^{-3} European Commission annual mean limit value for benzene which entered force on 1 January 2010.

Table 3.1 Results of monitoring for benzene: Annual mean levels for the Belfast Centre Lombard Street site 2008 – 2011.

Site ID	Site type	Within AQMA?	Valid Data Capture 2011 %	Running annual mean concentrations (μgm^{-3})			
				2008	2009	2010	2011
Belfast Centre	Urban Centre	N	100	0.61	0.65	0.79	0.57

2.2.5 Summary of Compliance with Air Quality Strategy Objectives.

Belfast City Council has examined the 2011 monitoring results and historical data for ambient air quality within its district where available. Concentrations of ambient pollutants, as prescribed in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, outside of existing Air Quality Management Areas are all below the objectives at relevant locations and therefore, it is the council's view that there is no need to proceed to a detailed assessment for any such monitored pollutant at this time.

However, the council will continue to monitor ambient conditions across the city in order to confirm that recent improvements in air quality are sustained and that those locations where poor air quality persists are addressed.

3 Road Traffic Sources.

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb.

It should be noted that in Northern Ireland, the Department for Regional Development and its Road Service Agency has responsibility for the transport planning and maintenance of the road network. Accordingly, the Roads Service maintains and improves the road network and infrastructure in order to keep it safe, effective and reliable. In the earlier rounds of the review and assessment process, the council obtained a copy of the Belfast road transportation model which comprised traffic data for around 5,600 road nodes across the city. In addition, the council has bolstered this data through supplementary traffic counts in congested streets and we have sought to undertake monitoring at these locations through the use of diffusion tubes and automatic analysers. For this reason, we believe that we have a good understanding of traffic and development control patterns across the city and, on this basis, we believe that there are no newly identified congested streets with a vehicle flow above 5,000 vehicles per day and residential properties close to the kerb that have not been adequately considered either in previous rounds of the review and assessment process or by monitoring. Consequently….

Belfast City Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of review and assessment.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic.

Referring to the screening assessment for roadside locations where the 1 hour mean objective for nitrogen dioxide might be exceeded, it is noted that the screening checklist, as outlined in the government's technical guidance LAQM.TG(09), requires local authorities to identify initially narrow congested streets with traffic flows around or in excess of 5,000 vehicles AADT. The local authority is recommended then to proceed to diffusion tube monitoring at relevant locations. For Belfast, these locations

are generally restricted to the city centre. In our September 2010 detailed review and assessment report, we completed a series of modelling studies for the city centre that identified exceedences of the annual mean objective for nitrogen dioxide. In the Chichester Street, Great Victoria Street and Victoria Street areas, where members of the public might reasonably be expected to spend 1 hour or more close to the kerbside, modelled annual mean nitrogen dioxide levels were predicted to be a maximum of 48 μgm^{-3}. However, ambient diffusion tube monitoring data for these locations for 2011 revealed maximum annual mean concentrations of up to 40 μgm^{-3}. On this basis, and referring to the technical guidance, it is assumed that since there are no annual mean nitrogen dioxide concentrations equal to, or greater than 60 μgm^{-3}, there are no locations within the city centre where the 1-hour mean objective for nitrogen dioxide is breached. This supposition is supported broadly by considering 2011 nitrogen dioxide annual statistics for the Belfast Centre AURN monitoring site, which indicate that there were no recorded exceedences of the 1-hour nitrogen dioxide mean objective during 2011. Indeed, the highest monitored hourly mean nitrogen dioxide level was 195 μgm^{-3}. In addition, the council confirms that there are no new busy street locations that have not been addressed previously, and where people may spend 1 hour or more close to traffic. By way of conclusion….

Belfast City Council confirms that there are no new / newly identified busy streets where people may spend 1 hour or more close to traffic.

3.3 Roads with a High Flow of Buses and/or HGVs.

In earlier rounds of the review and assessment process, Belfast City Council conducted screening assessments of the Belfast road network in order to identify locations with a high incidence of buses and / or heavy goods vehicles. In accordance with government's technical guidance LAQM.TG(09), an unusually high proportion can be taken to be greater than 20% heavy duty vehicles. The only part of the road network within Belfast that historically approached this criterion was the M1 Motorway / A12 Westlink corridor with approximately 15% of heavy duty vehicles. On this basis, a detailed review and assessment was completed and this corridor was designated as an air quality management area for both short and longer-term exceedences of the nitrogen dioxide and particulate matter objectives. This air quality

management area has been the subject of mitigation measures as part of the Air Quality Action Plan for Belfast and, as a result, the council and relevant authorities with consider revocation of the M1 Motorway / A12 Westlink AQMA for particulate matter objectives during 2012. The declaration for nitrogen dioxide will remain. Since the 2009 updating and screening assessment and 2010 detailed assessment, there have been no newly identified roads that meet the above-mentioned criterion for high flows of buses and / or HGVs. As a result…

Belfast City Council confirms that there are no new / newly identified roads with high flows of heavy-duty vehicles.

3.4 Junctions.

Belfast City Council confirms that there are no new or newly identified busy junctions or busy roads.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment.

Belfast City Council confirms that there are no new or proposed roads that meet the criteria for review and assessment at this time.

3.6 Roads with Significantly Changed Traffic Flows.

Belfast City Council confirms that there are no new / newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations.

Belfast City Council confirms that there are no relevant bus stations in the Local Authority area that have not been considered in previous rounds of the review and assessment process. The council therefore concludes that it will not be necessary to proceed to a detailed assessment.

4 Other Transport Sources.

4.1 Airports.

Belfast City Council has considered previously the air quality impact of the George Best Belfast City Airport and, on the basis of ambient monitoring data for nitrogen dioxide, concluded that an air quality management area did not need to be declared for the airport. In order to provide ongoing surety regarding the air quality impact of the airport, we have maintained a nitrogen dioxide diffusion tube at Station Road in East Belfast adjacent to the nearest residential receptors to the airport and a further diffusion tube has been located at residential properties in Knocknagoney. It should be noted that the Station Road diffusion tube is located so as to take account also of the impact of nearby road traffic on the Sydenham Bypass and of the Belfast to Bangor rail line.

Reflecting upon the annual mean data, as summarised in tables 2.5 and 2.6, it can be seen that annual mean levels of nitrogen dioxide at Station Road have remained consistently around 22-23 μgm^{-3} since 2007; comfortably below the annual mean objective of 40 μgm^{-3}. Furthermore, annual mean concentrations of nitrogen dioxide at Knocknagoney Road have typically been around 29 μgm^{-3} since 2007 with a decline to 21 μgm^{-3} observed during 2011, although this result has been annualised from 7 months of diffusion tube sampling data. Again, nitrogen dioxide levels at this location are comfortably below the annual mean objective. Therefore, we are content that any changes to airport operations over recent years have had little impact upon ambient air quality at the nearest relevant receptors. Therefore, it is considered that a further detailed assessment for this existing airport is not required at this juncture.

Belfast City Council confirms that there are no new airports within the Local Authority area.

4.2 Railways (Diesel and Steam Trains).

4.2.1 Stationary Trains.

Belfast City Council confirms that there are no new locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.2.2 Moving Trains.

Belfast City Council confirms that there are no new locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

4.3 Ports (Shipping).

Referring to the government's technical guidance regarding the treatment of ports and shipping, the screening assessment approach is to collect information regarding the number of ship movements per year, where such movements are confined to large ships, including cross-channel ferries, roll-on and roll-off vessels, container ships and cruise liners and movements number between 5,000 and 15,000 per annum. This movement data is contrasted subsequently with the potential for relevant exposure within 250 metres of the shipping berths. We have obtained activity data from the Port of Belfast who have confirmed that the number of ship movements during 2011 was around 11,000. However, an analysis of the geographic location of the Port conforms that there is little potential for relevant public exposure for 15-minute periods within 250 metres. By way of clarity, the majority of ferry terminals are now located within the Port confines at Westbank Road off Dargan Road. This area is predominantly used for industrial and commercial activities and the nearest residential properties are in excess of 2,200 metres away. Accordingly…..

Belfast City Council confirms that there are no new ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources.

5.1 Industrial Installations.

5.1.1 New or Proposed Installations for which an air quality assessment has been carried out.

In Northern Ireland, the permitting of prescribed industrial activities under the Pollution Prevention and Control Regulations (Northern Ireland) 2003 is undertaken by both local authorities and the Industrial Pollution and Radiochemical Inspectorate (IPRI) of the Department of Environment. The IPRI has responsibility for the permitting of what are defined as Part A and B processes and district councils permit Part C processes. Part A processes have the greatest capacity to pollute and as a result can impact detrimentally upon air, land and water. For this reason, they require an integrated approach to controlling whereas Part B and Part C processes are regulated for emissions to air only.

In order to complete the 2012 update and screening assessment, Belfast City Council liaised with the IPRI regarding Part A and B processes. The public register of Northern Ireland Part A and B processes is accessible on the Department of Environment website via the following web link:
www.doeni.gov.uk/niea/pollution-home/ippc/ipc-public-registers/listofpartabprocessesppc.htm

Officers from the Industrial Pollution and Radiochemical Inspectorate have confirmed that there are no new or proposed Part A or B industrial installations for which planning approval has been granted within the Belfast City Council area or nearby in a neighbouring authority. In addition, they have confirmed that there have been no significant increases in the emission profiles of any existing industrial processes or the introduction of new relevant exposure.

In relation to Part C processes, the council's Industrial Pollution Control Officer has confirmed also that there are no new or proposed Part C industrial installations for which planning approval has been granted within the Belfast City Council area or nearby in a neighbouring authority. Neither have there been significant increases in the emission profiles of existing industrial processes or the introduction of new relevant exposure. Therefore, in summation.....

Belfast City Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.1.2 Existing Installations where Emissions have increased substantially or New Relevant Exposure has been introduced.

Belfast City Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment.

Belfast City Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.2 Major Fuel (Petrol) Storage Depots.

There is a major fuel storage depot within the Local Authority area, but its impact has been considered in previous updating and screening and review and assessment reports.

5.3 Petrol Stations.

Referring to the screening methodology for petrol stations as outlined in the government's local air quality management technical guidance LAQM.TG(09), the qualifying criteria for petrol stations include an annual throughput of more than 2,000,000 litres and proximity to a busy road. Of the three new or reopened petrol stations in Belfast identified since the last updating and screening assessment, only the Sainsbury's petrol station at the Kennedy Centre meets the throughput criterion and is in proximity to the busy Falls Road. However, it is understood that the station is equipped with Stage 2 vapour recovery to reduce VOC emissions associated with filling vehicles with petrol and, as a consequence, the guidance states that this petrol station can be ignored. In addition, due to the petrol station's location within the retail centre, there is no relevant exposure within 10 metres of the pumps. Accordingly…

Belfast City Council confirms that there are no new petrol stations meeting the specified criteria**.**

5.4 Poultry Farms.

Belfast City Council confirms that there are no new poultry farms meeting the specified criteria within the local authority district.

6 Commercial and Domestic Sources.

6.1 Biomass Combustion – Individual Installations.

Belfast City Council confirms that there are no new biomass combustion plants in the Local Authority area.

6.2 Biomass Combustion – Combined Impacts.

Belfast City Council confirms that there are no new biomass combustion plants in the Local Authority area.

6.3 Domestic Solid-Fuel Burning.

Belfast City Council confirms that there are no new areas of significant domestic solid fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources.

Belfast City Council confirms that there are no new relevant potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions.

8.1 Conclusions from new monitoring data.

Belfast City Council has presented a range of monitoring data within this updating and screening report that addresses a number of the pollutants prescribed within the United Kingdom Air Quality Strategy. Although these pollutants are routinely measured across the city, the council's focus remains principally upon addressing existing air quality management areas and upon those areas of the city centre where traffic congestion might lead to further exceedences of the nitrogen dioxide annual mean and hourly objectives. By way of amplification, there were no monitored exceedences for any of the air quality strategy objectives for sulphur dioxide, benzene and particulate matter during 2011.

Nevertheless, 2011 monitoring data for nitrogen dioxide confirms continuing exceedences of the annual mean and hourly objectives for nitrogen dioxide in the vicinity of Stockman's Lane, which is located within the M1 Motorway / A12 Westlink air quality management area. Similar exceedences of the annual mean objective were recorded at Great George's Street near to the end of the A12 Westlink where it joins with the M2 and M3 motorways. However, the newly installed monitoring site at Roden Street indicates compliance with both annual and hourly mean objectives for nitrogen dioxide along this section of the A12 Westlink, suggesting that the recent structural improvements have reduced the number of exceedences locations along the M1 Motorway / A12 Westlink to a series of nitrogen dioxide 'hot spots'.

Historical monitoring data for the Upper Newtownards Road air quality management area have revealed sustained exceedences of the nitrogen dioxide annual mean objective. For example, since 2007 annual mean concentrations have typically been around 45 μgm^{-3}. However, 2011 data has demonstrated a sharp decrease in nitrogen dioxide levels to the extent that the annual mean objective was achieved at Ballyhackamore (37 μgm^{-3}) and at the Knock Road junction (38 μgm^{-3}) during 2011. The magnitude of the decrease in nitrogen dioxide levels along the Upper Newtownards Road was beyond the year-on-year reductions that might have been predicted using Defra's forward projection factors. In addition, the Belfast City Air

Quality Action Plan was completed substantially during 2010 and, therefore, it is unclear whether the additional improvements in ambient conditions can be ascribed fully to the Action Plan. Accordingly, the reductions in ambient nitrogen dioxide levels within this air quality management area are welcomed, however, the council will continue to maintain its monitors in this location in order to determine whether the decrease is sustained over coming years.

2011 monitoring data continues to confirm that nitrogen dioxide levels within the Ormeau Road air quality management area are in compliance with the annual mean objective for nitrogen dioxide, leading the council to conclude that there is potential to revoke this air quality management area during 2012. However, 2012 provisional monitoring data from the nitrogen dioxide automatic monitoring site located on the Ormeau Road at Shaftesbury Avenue has shown a sharp increase over comparable 2011 months. Monthly mean levels in January, February and March 2011 were 43, 36 and 38 μgm^{-3} whereas equivalent 2012 monthly mean concentrations were 42, 50 and 49 μgm^{-3} respectively. We acknowledge that our 2012 has still to be ratified and that it represents only a small portion of the overall 2012 monitoring year, however, the council considers it prudent to maintain the Ormeau Road air quality management area until a more definitive understanding of recent nitrogen dioxide level and trends emerges.

During 2011, nitrogen dioxide levels also decreased substantially within the Cromac Street air quality management area. Along Cromac Street, annual mean levels since 2007 have typically been around 44 μgm^{-3} but during 2011, annual mean levels decreased to 36 μgm^{-3}. At Short Strand, also within this air quality management area, recent annual mean levels of nitrogen dioxide were comfortably above the objective but during 2011, they decreased to 40 μgm^{-3}; in compliance with the objective.

Although not within air quality management areas, during 2011 other significant decreases in nitrogen dioxide annual mean concentrations were observed at Donegal Square South, Chichester Street, the Albert Clock, Victoria Street and Great Victoria Street, all of which are located within the city centre region. Despite previous breeches of the annual mean objective at these locations, all attained the objective during 2011.

Therefore, in conclusion, it is considered that our 2011 monitoring data supports the continuing need for all our existing air quality management areas for the time being, although we will continue to monitor closely ambient nitrogen dioxide levels within the Ormeau Road air quality management area. Furthermore, our monitoring data confirms that no further air quality management areas need to be declared for the city at this time.

8.2 Conclusions from Assessment of Sources.

The assessment of new or altered sources of air pollution for 2011 has led the council to conclude that there are no new roads or road junctions within the city that require a detailed assessment. In addition, there are no new roads that have a significant proportion of heavy-duty vehicles or significantly changed traffic flows. No new bus stations have been constructed in the city and it is the council's view that the air quality impact of the George Best Belfast City Airport is well understood at relevant receptors through ambient monitoring data. There are no new locations in the city where stationary or moving trains are likely to detrimentally impact upon relevant receptors and the location of Port of Belfast means also that shipping is unlikely to impact detrimentally upon relevant receptors.

There are no new permitted industrial processes within Belfast and existing processes have not significantly increased their emissions profiles. Furthermore, no new relevant exposure has been introduced in the vicinity of the permitted processes.

No new major fuel storage depots have been established within Belfast since the last round of review and assessment and, of the few new petrol stations that have opened, the only one with a significant throughput is excluded from a detailed assessment through the lack of relevant exposure and the presence of emission abatement equipment.

There are no poultry farms within the city and neither is the council aware of any biomass combustion plants. In addition, the council is not aware of any siginficant new areas of domestic solid fuel use.

Finally, the council is not aware of any new sources of significant fugitive particulate matter emission within the city confines.

8.3 Proposed Actions.

By way of conclusion, the 2012 Updating and Screening Assessment has not identified the need to proceed to a detailed assessment for any pollutant under consideration.

Furthermore, Belfast City Council has already highlighted that it operates an expansive air quality monitoring network across the city for nitrogen dioxide and other ambient pollutants. On this basis, the council is content that existing monitoring locations provide a detailed representation of pollution levels the city and, as a consequence, does not need to be expanded at this time.

With regard to our four existing air quality management areas, it is considered that the recent decline in ambient nitrogen dioxide levels in some of the air quality management areas will need to be maintained for a number of years before we could consider the possibility of revocation. In addition, the situation within the Ormeau Road air quality management area has recently become unclear since ambient nitrogen dioxide levels up until 2012 supported the case for revocation. However, the unexpected elevated nitrogen dioxide levels in the early part of 2012 make this decision uncertain. Accordingly, we will continue to monitor nitrogen dioxide levels within the Ormeau Road air quality management area during the remainder of 2012 as well as liaising with the Department of Environment for Northern Ireland and the Department for Regional Development Roads Service before reaching a revocation decision. The continuing elevated nitrogen dioxide concentrations monitored at locations within the M1 Motorway / A12 Westlink corridor mean that this air quality management area will likely need to be maintained up to, and possibly beyond, 1 January 2015 when the revised deadline for achieving European Commission limit values for nitrogen dioxide will have elapsed.

In terms of forward actions, the council has already begun discussions with the Department of Environment for Northern Ireland, the Department for Regional Development Roads Service and other relevant authorities regarding the development of a supplementary air quality action plan for the city. This new action

plan will be developed to primarily address air pollution within our air quality management areas but it will seek also to preserve air quality across the city in locations where it is presently good.

9 References.

Air Quality Regulations (Northern Ireland) 2003
http://www.legislation.gov.uk/nisr/2003/342/contents/made

Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007
http://www.official-documents.gov.uk/document/cm71/7169/7169_i.asp

Belfast City Air Quality Action Plan and Air Quality Management Areas.
http://www.belfastcity.gov.uk/airquality/reports.asp#quality

Defra 'Air Quality Plans for the achievement of EU air quality limit values for nitrogen dioxide (NO_2) in the UK'.
http://uk-air.defra.gov.uk/library/no2ten/

Defra 'Workplace Analysis Scheme for Proficiency (WASP) NO2 diffusion tubes proficiency tests'.
http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html

Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air - (4^{th} Daughter Directive).
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0107:EN:NOT

Directive 2008/50/EC in respect of ambient air quality and cleaner air for Europe
Environment (Northern Ireland) Order 2002.
www.legislation.gov.uk/nisi/2002/3153/contents/made
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0050:en:NOT

Environment (Northern Ireland) Order 2002.
http://www.legislation.gov.uk/nisi/2002/3153/contents/made

Northern Ireland Air – Air Quality in Northern Ireland website
http://www.airqualityni.co.uk/

Appendices.

Appendix A: Quality assurance and quality control of monitoring data.

QA/QC of automatic monitoring data.

As highlighted in the body of this report, Belfast City Council operates a number of automatic monitoring sites across the city. In order to ensure that our data is accurate and precise, we calibrate our sites on a four-weekly basis, in accordance with the requirements of the Defra Site Operators Manual for the Automatic Urban and Rural Network, published in 2009.

For our automatic nitrogen dioxide analysers, we complete a two-point calibration using zero air and a nitric oxide span gas of certified concentration. We obtain our calibration gases under contract from Air Liquide who also provide similar gases to government owned AURN monitoring stations. By considering instrument operating parameters and the results of successive calibrations, we can make a determination regarding the ongoing performance of our analysers.

In addition, we also routinely monitor operating parameters for our particulate monitoring equipment including a Met One Instruments Beta Attenuation Monitor and a number of Filter Dynamics Measurement System (FDMS) equipped Tapered Element Oscillating Microbalances (TEOMs). The particulate sampling filters within these instruments are changed as required.

Where an instrument is found not be operating within normal operating parameters, we refer the matter promptly to Enviro Technology Services who are retained by the council to provide service and maintenance support for our equipment.

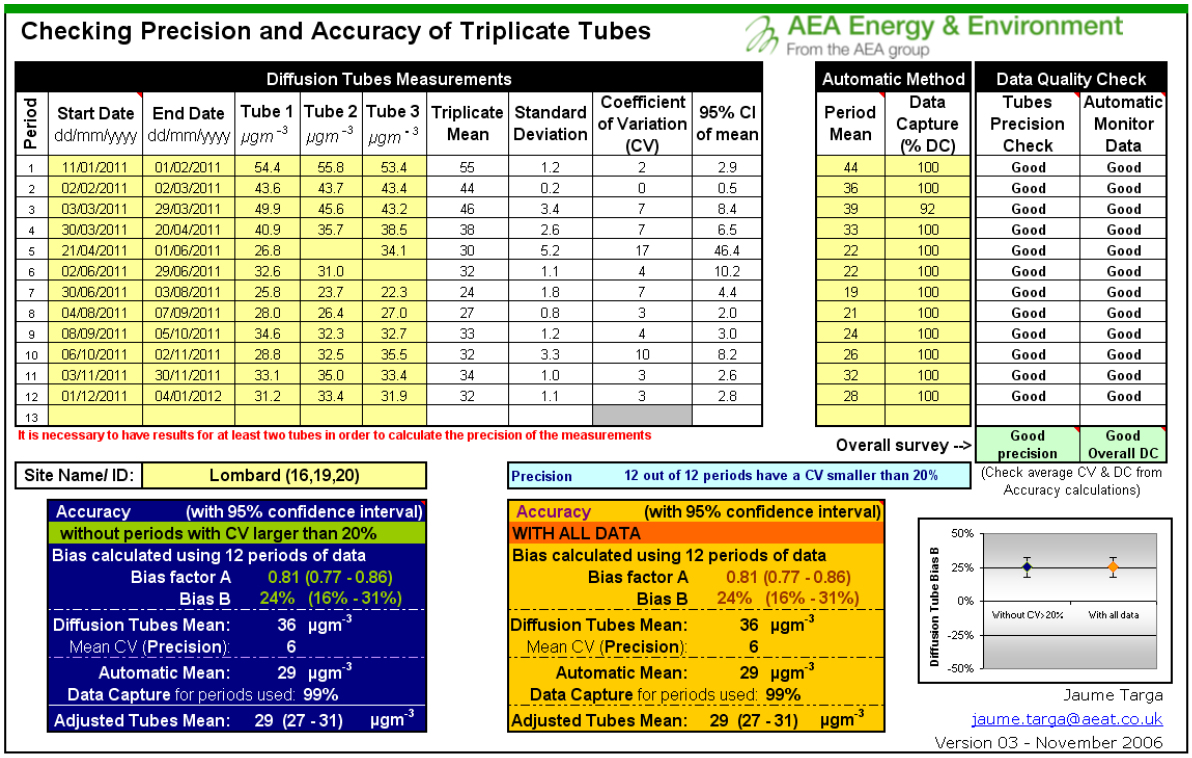
Finally the council is a member of AEA's Calibration Club which promotes and supports best practice in the application of quality control to automatic air-monitoring

data in line with the government's local air quality management technical guidance LAQM.TG(09). AEA staff visit our sites on a six-monthly basis and compare the performance of our analysers against a range of laboratory grade standards. AEA subsequently provides a series of calibration and scaling factors that are used to *correct* our automatic monitoring data. These scaling procedures enable the council to robustly compare our air quality data with Air Quality Strategy objectives and European Commission limit values.

Non automatic sampling data.

Nitrogen Dioxide Diffusion Tube Bias Adjustment Factors.

As in previous years, we have employed a triplicate colocation study at the Belfast Centre Lombard Street AURN monitoring site in order to obtain a local diffusion tube bias adjustment factor for *'correcting'* our diffusion tubes monitoring data. The bias adjustment factor was calculated and our data *'corrected'* using the Defra Bias Adjustment Factor Calculation spreadsheet (with a 95% confidence interval as an estimate of the uncertainty on the bias adjustment factor). Outputs from the spreadsheet are presented as follows:



Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	11/01/2011	01/02/2011	54.4	55.8	53.4	55	1.2	2	2.9	44	100	Good	Good
2	02/02/2011	02/03/2011	43.6	43.7	43.4	44	0.2	0	0.5	36	100	Good	Good
3	03/03/2011	29/03/2011	49.9	45.6	43.2	46	3.4	7	8.4	39	92	Good	Good
4	30/03/2011	20/04/2011	40.9	35.7	38.5	38	2.6	7	6.5	33	100	Good	Good
5	21/04/2011	01/06/2011	26.8		34.1	30	5.2	17	46.4	22	100	Good	Good
6	02/06/2011	29/06/2011	32.6	31.0		32	1.1	4	10.2	22	100	Good	Good
7	30/06/2011	03/08/2011	25.8	23.7	22.3	24	1.8	7	4.4	19	100	Good	Good
8	04/08/2011	07/09/2011	28.0	26.4	27.0	27	0.8	3	2.0	21	100	Good	Good
9	08/09/2011	05/10/2011	34.6	32.3	32.7	33	1.2	4	3.0	24	100	Good	Good
10	06/10/2011	02/11/2011	28.8	32.5	35.5	32	3.3	10	8.2	26	100	Good	Good
11	03/11/2011	30/11/2011	33.1	35.0	33.4	34	1.0	3	2.6	32	100	Good	Good
12	01/12/2011	04/01/2012	31.2	33.4	31.9	32	1.1	3	2.8	28	100	Good	Good
13													
										Overall survey -->		Good precision	Good Overall DC

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Lombard (16,19,20)
Precision	12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.81 (0.77 - 0.86)
Bias B	24% (16% - 31%)
Diffusion Tubes Mean:	36 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	29 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	29 (27 - 31) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.81 (0.77 - 0.86)
Bias B	24% (16% - 31%)
Diffusion Tubes Mean:	36 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	29 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	29 (27 - 31) µgm^{-3}

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Version 03 - November 2006

Adjustment of SINGLE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tube Measurements															
Site Name/ID	Periods													Raw Mean	Valid periods
	1	2	3	4	5	6	7	8	9	10	11	12	13		
1. RVH	46.8	36.0	34.6	25.0	17.2	19.6	15.0	17.2	22.8	27.0	28.8	22.7		26.1	12
2. Blacks Rd	76.1	57.1	62.4	45.0	38.7	46.3	35.2	41.7	38.7	56.5	45.3	53.4		49.7	12
3. 61 Cromac Str	65.8	41.0	59.9	41.0	40.4	42.6	32.0	38.2	41.3	51.7	43.9	36.1		44.5	12
4. Ravenhill Rd	52.8	28.7	46.8	32.3	25.3	32.7	26.6	15.2	23.6	31.2	28.6	26.3		30.8	12
5. Queens Bridge	48.5		34.1	17.9		22.6	19.5				31.3	24.0		28.3	7
6. North Road	34.7	14.7	25.4	16.0	12.2	13.5		12.9	14.9	31.3	37.2	25.4		21.6	11
7. Donegal Sq. South	68.6	42.1	54.3	53.7	39.4	40.8	29.9	36.3	38.1	45.6	44.8	34.3		44.0	12
8. Milner Str	54.9	32.8	52.0	25.4		30.0	27.4	24.3		26.2	28.7	29.4		33.1	10
9. Short Strand	68.3	41.2	68.3	45.0	44.4	46.6	34.4			49.4	45.7			49.2	9
10. 301 Ormeau Rd	52.1	42.7	44.5	38.6	33.5	35.4	27.6	35.0	39.2	44.0	34.4	36.4		38.6	12
11. 400 Ormeau Rd	44.4	31.4	41.3	32.0	25.9	28.3	22.1	24.5	26.3		30.3	21.9		29.9	11
12. Knock Rd	84.8	51.6	57.0	50.0	38.0	43.5	29.9	39.0	42.4	52.7	46.4	30.8		47.2	12
13. Gr Georges Str	75.2	59.4	71.1	50.1	56.5	49.2	54.4	54.5	47.6	48.7	61.4	37.2		55.4	12
14. Lisburn Rd	58.1	42.0		31.0		29.4	20.8	24.1	29.1	28.6		36.2		33.3	9
15. Shaftesbury Sq	70.5		57.6			39.4	29.2	35.9	42.4	43.5	36.4			44.4	8
17. Albert Clock	75.2	51.8	59.0	43.4	52.7	45.8	32.6	40.9	46.9	49.8	54.2	37.4		49.1	12
18. Victoria Str	67.6	46.2	53.6	47.3	40.4	45.8	37.0	33.1	37.7	45.1		32.3		44.2	11
25. Whitewell Rd	20.2	16.8		24.9		23.5		18.4	8.4	19.2	26.2			19.7	8
26. Donegal Rd	50.0	41.9	45.9	32.9	29.6	33.1	25.8	24.4	29.1	33.7	39.2	26.1		34.3	12
27. Grovesner Rd	61.7	54.0	46.1		42.2	34.1		31.7	37.4	38.6	43.8	35.4		42.5	10
28. Falls and Andytown	58.7	43.7	43.9				24.9	27.2	28.7	32.5		25.7		35.7	8
29. Sydenham Bypass	42.5	30.6	34.9	30.5						30.2	23.8	32.8		32.2	7
30. Station Rd	49.7	33.4	33.3	26.2	20.2		17.6	22.3		24.4	11.4	29.0		26.7	10
31 House of Sport	45.9	37.1	35.4	26.0	16.6	21.1	17.1	22.4	21.5	23.2	26.9	20.9		26.2	12

Adjusted measurement (95% confidence interval) with all the data 12 periods used in this calcuations	
Bias Factor A 0.81 (0.77 - 0.86) Bias B 24% (16% - 31%)	
Tube Precision: 6	Automatic DC: 99%
Adjusted with 95% CI	21 (20 - 22)
Adjusted with 95% CI	40 (38 - 43)
Adjusted with 95% CI	36 (34 - 38)
Adjusted with 95% CI	25 (24 - 27)
Adjusted with 95% CI	23 (22 - 24)
Adjusted with 95% CI	18 (17 - 19)
Adjusted with 95% CI	36 (34 - 38)
Adjusted with 95% CI	27 (25 - 28)
Adjusted with 95% CI	40 (38 - 42)
Adjusted with 95% CI	31 (30 - 33)
Adjusted with 95% CI	24 (23 - 26)
Adjusted with 95% CI	38 (36 - 41)
Adjusted with 95% CI	45 (43 - 48)
Adjusted with 95% CI	27 (26 - 29)
Adjusted with 95% CI	36 (34 - 38)
Adjusted with 95% CI	40 (38 - 42)
Adjusted with 95% CI	36 (34 - 38)
Adjusted with 95% CI	16 (15 - 17)
Adjusted with 95% CI	28 (26 - 30)
Adjusted with 95% CI	34 (33 - 37)
Adjusted with 95% CI	29 (27 - 31)
Adjusted with 95% CI	26 (25 - 28)
Adjusted with 95% CI	22 (21 - 23)
Adjusted with 95% CI	21 (20 - 23)

The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	11/01/2011	01/02/2011	54.4	55.8	53.4	55	1.2	2	2.9	44	100	Good	Good
2	02/02/2011	02/03/2011	43.6	43.7	43.4	44	0.2	0	0.4	36	100	Good	Good
3	02/03/2011	29/03/2011	49.9	45.6	43.2	46	3.4	7	8.4	39	92	Good	Good
4	29/03/2011	20/04/2011	40.9	35.7	38.5	38	2.6	7	6.5	33	100	Good	Good
5	20/04/2011	01/06/2011	26.8		34.1	30	5.2	17	46.4	22	100	Good	Good
6	01/06/2011	29/06/2011	32.6	31.0		32	1.1	4	10.2	22	100	Good	Good
7	29/06/2011	03/08/2011	25.8	23.7	22.3	24	1.8	7	4.4	19	100	Good	Good
8	03/08/2011	07/09/2011	28.0	26.4	27.0	27	0.8	3	2.0	21	100	Good	Good
9	07/09/2011	05/10/2011	34.6	32.3	32.7	33	1.2	4	3.0	24	100	Good	Good
10	05/10/2011	02/11/2011	28.8	32.5	35.5	32	3.3	10	8.2	26	100	Good	Good
11	02/11/2011	30/11/2011	33.1	35.0	33.4	34	1.0	3	2.6	32	100	Good	Good
12	30/11/2011	04/01/2012	31.2	33.4	31.9	32	1.1	3	2.8	28	100	Good	Good
13													
											Overall survey -->	Good precision	Good Overall DC

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Lombard (16,19,20)

Precision	12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.81 (0.77 - 0.86)
Bias B	24% (16% - 31%)
Diffusion Tubes Mean:	36 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	29 μgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	29 (27 - 31) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.81 (0.77 - 0.86)
Bias B	24% (16% - 31%)
Diffusion Tubes Mean:	36 μgm^{-3}
Mean CV (Precision):	6
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Data Capture for periods used:	99%
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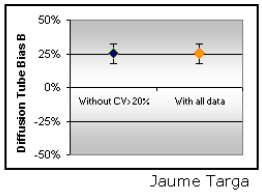

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Using the spreadsheet, we have determined that diffusion tube agreement with the automatic nitrogen dioxide analyser at the Belfast Centre AURN site for our Gradko supplied and analysed diffusion tubes was deemed 'good' for all 2011 sampling periods. In addition, the precision checks were also deemed 'good' for all sampling periods. The overall bias factor was calculated as 0.81.

Discussion of the choice of factor to use.

For those local authorities that do not wish, or are unable to undertake a triplicate diffusion tube colocation study, government publishes a database of bias adjustment factors derived from other local authority co-location studies throughout the United Kingdom. Theses factors are used subsequently to calculate a combined bias adjustment factor for a range of nitrogen dioxide diffusion tube laboratories. The latest factors were published in March 2012 and cover sampling periods up until 2011. In 2011, the government derived bias adjustment factor for Gradko Laboratories for a 20% solution of triethanolamine was 0.89. This factor compares reasonably well with the council's 2011 locally derived bias adjustment factor of 0.81. However, it should be noted that applying the government's factor to our data would have increased our diffusion tube results by around 10% and would have led to the council reporting additional breaches of the nitrogen dioxide annual mean objective at Short Strand, Knock Road, Albert Clock, Ballyhackamore, Great Victoria Street, Chichester Street and along the Antrim Road.

Workplace Analysis Scheme for Proficiency (WASP) nitrogen dioxide proficiency testing.

Government provides an additional layer of surety for local authorities operating nitrogen dioxide diffusion tubes through the independent analytical proficiency-testing scheme. Through the Workplace Analysis Scheme for Proficiency, laboratories are provided with a number of test samples that are designed to test their proficiency in undertaking chemical analysis of diffusion tubes. The WASP scheme is operated independently by the Health and Safety Laboratory.

For the 2011 sampling period, Gradko's performance was assessed as follows:

	WASP R112	WASP R113	WASP R114	WASP R115
Period	Jan -March 2011	April - June 2011	July - Sept 2011	October - December 2011
Gradko International	100%	100%	100%	37.5%

Data reported in the above table are the percentages (%) of results submitted to the laboratory that were analysed and the analysis was deemed subsequently to be satisfactory.

Short-term to Long-term Data adjustment.

Guidance for the treatment of diffusion tube monitoring data, as highlighted in table 2.5, requires that where annual mean results are based upon monitoring data of less than 9 months sampling, these means should be “annualised” in accordance with the procedures outlined in Box 3.2 of the government’s local air quality management technical guidance LAQM.TG(09).

In order to complete the annualisation process, councils are required to identify up to four nearby long-term background continuous monitoring sites for nitrogen dioxide. As there are only two such sites in Northern Ireland, we have elected to use data from both the Belfast Centre AURN (urban centre) and Derry City Council Brooke Park (urban background) sites.

Unfortunately, as the loss of diffusion tube data occurred over different periods during 2011 for different monitoring sites, it is not possible to calculate a single ‘overall’ adjustment factor. As a result, individual adjustment factors have been calculated for each diffusion tube monitoring site, commensurate with the diffusion tube exposure periods. The adjustment ratios for our sites with less than 9 months of data are summarised in the following table.

Site	Site Type	2011 Annual Mean	Diffusion tube site	2011 Period Mean for diffusion tube sampling period*	Ratio*	Average Ratio*
Belfast Centre AURN Site	Urban Centre	28.8	Queen's Bridge	31	0.93	0.92
Derry City Council Brooke Street Site	Urban Background	15.9		17.4	0.92	
Belfast Centre AURN Site	Urban Centre	28.8	Shaftesbury Square	28.4	1.02	1.01
Derry City Council Brooke Street Site	Urban Background	15.9		15.7	1.01	
Belfast Centre AURN Site	Urban Centre	28.8	Whitewell Road	29.8	0.97	0.97
Derry City Council Brooke Street Site	Urban Background	15.9		16.5	0.96	
Belfast Centre AURN Site	Urban Centre	28.8	Falls and Glen Road	29.6	0.97	0.95
Derry City Council Brooke Street Site	Urban Background	15.9		17.3	0.92	
Belfast Centre AURN Site	Urban Centre	28.8	Knocknagoney Road	34.0	0.85	0.82
Derry City Council Brooke Street Site	Urban Background	15.9		20.1	0.79	
Belfast Centre AURN Site	Urban Centre	28.8	North Circular Road	30.2	0.96	0.92
Derry City Council Brooke Street Site	Urban Background	15.9		17.8	0.89	
Belfast Centre AURN Site	Urban Centre	28.8	York Street	32.0	0.90	0.89
Derry City Council Brooke Street Site	Urban Background	15.9		18.1	0.88	

*Some numeric rounding has been applied to the data reported in this table.