2014 Air Quality Progress Report for Belfast City Council

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

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Executive Summary

Belfast City Council has completed this 2014 Air Quality Progress Report 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 undertaking this report, 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. The review will also identify locations where ambient air quality has improved and exceedences are no longer occurring.

Belfast City Council has 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. Both automatic and passive nitrogen dioxide monitoring is undertaken throughout Belfast to continually review the situation. 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 2014.

Monitored levels of benzene and sulphur dioxide remain well below the objectives and show no reason for concern.

There have been no monitored exceedences of Air Quality Strategy Objectives for any other ambient pollutant in recent years across the city, and no new sources have been identified which would have the potential to change this therefore no other pollutants will be considered in this report.

Several new developments have occurred throughout Belfast since the 2013 Progress Report. These developments were identified during the planning application process and where necessary an air quality assessment was requested. The impact of these developments was then assessed and any necessary development specific mitigation measures were identified.

Belfast City Council and relevant partners are in the process of developing a new air quality action plan for the city that contains a manageable number of proven air quality mitigation measures. The measures will be quantified in relation to health benefits and will demonstrate how their successful implementation will deliver compliance with the nitrogen dioxide Limit Value.

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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 1st January 2010 but unfortunately this was not achieved at all locations across the city.

Where member states failed to meet the 2010 deadline, the Commission afforded them the opportunity to apply for a time extension by submitting further action plans and supporting scientific evidence to show that nitrogen dioxide limit values would be achieved by the time extension compliance date of 2015. Based on both monitored and modelled exceedences of the Westlink Corridor, a time extension application was submitted for the Belfast Metropolitan Urban Area by Defra on behalf of the DoE(NI). On the 25th June 2012 the Commission rejected both the time extension notification and the government's Air Quality Action Plan for the Belfast Metropolitan Urban Area on the grounds that it did not fully assess whether compliance with the annual NO_2 limit value could be achieved by 1st 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 Progress 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.

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

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 microgrammes per cubic metre μg/m^3 (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

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

Pollutant	Concentration Measured as		Date to be achieved by
Benzene	16.25 μg/m^3	Running annual mean	31.12.2003
	3.25 μg/m^3	Running annual mean	31.12.2010
1,3-Butadiene	2.25 μg/m^3	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 μg/m^3	Annual mean	31.12.2004
	0.25 μg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	200 μg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 μg/m^3	Annual mean	31.12.2005

Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu g/m^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, 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.

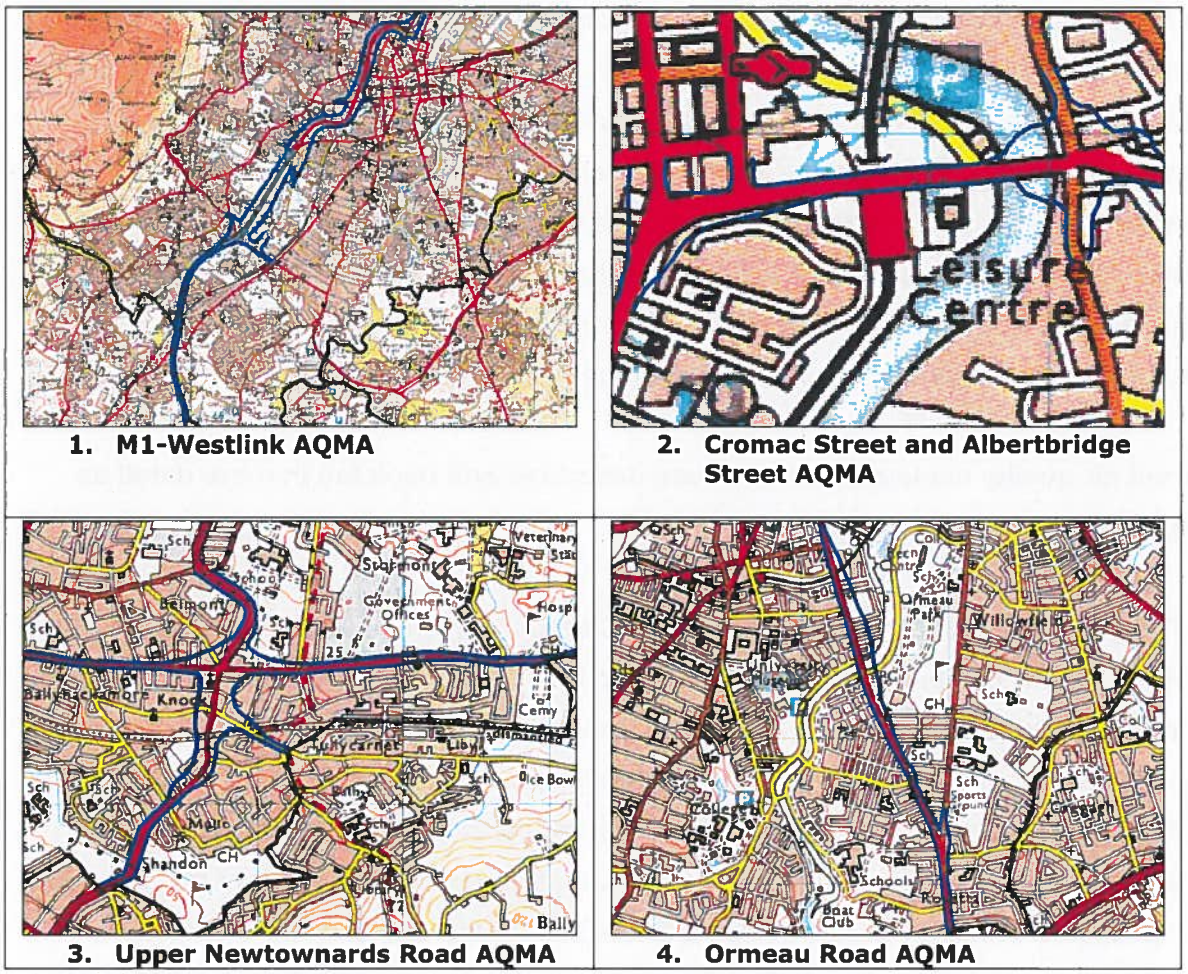
The M1-Westlink AQMA was declared on the basis that annual and hourly-mean nitrogen dioxide concentrations would exceed the 2005 Air Quality Strategy objectives. In addition, particulate matter annual and 24-hour mean concentrations were predicted also to exceed relevant objectives in this location. 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.

Figure 1.1 Map of AQMA Boundaries



1. M1-Westlink AQMA
2. Cromac Street and Albertbridge Street AQMA
3. Upper Newtownards Road AQMA
4. Ormeau Road AQMA

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.

Ambient air quality monitored results as presented in recent reports including the 2012 Updating and Screening Assessment and the 2013 Progress Report have identified sustained improvements in particulate matter within the M1 Motorway / A12 Westlink air quality management area. The Council and its relevant authority partners will consider revocation for this pollutant during 2013.

The current stage in the Review and Assessment process is to conduct a Progress Report. This report follows Guidance LAQM.TG(09) issued by DEFRA and intends to identify any significant changes that have occurred since the previous stage of R&A which may have the potential to affect the localised air quality.

For reference and additional background information, historical Belfast City Council air quality review and assessment reports are listed in the following table, and are available to download from the Department of Environment for Northern Ireland 'Northern Ireland Air' website.

Table 1.2 Historical Belfast City Council Air Quality Reports.

Title	Publication date
2013 Progress Report	April 2013
2012 Updating and Screening Assessment	April 2012
2011 Progress Report	April 2011
2010 Detailed Assessment	September 2010
2010 Progress Report	April 2010
2009 Updating and Screening Assessment	April 2009
2008 Progress Report	April 2008
2007 Detailed assessment	April 2007
2007 Progress Report	April 2007

*All Historical Belfast City Council Air Quality Reports are available at:
http://www.airqualityni.co.uk/reports.php?n_action=dc_report

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

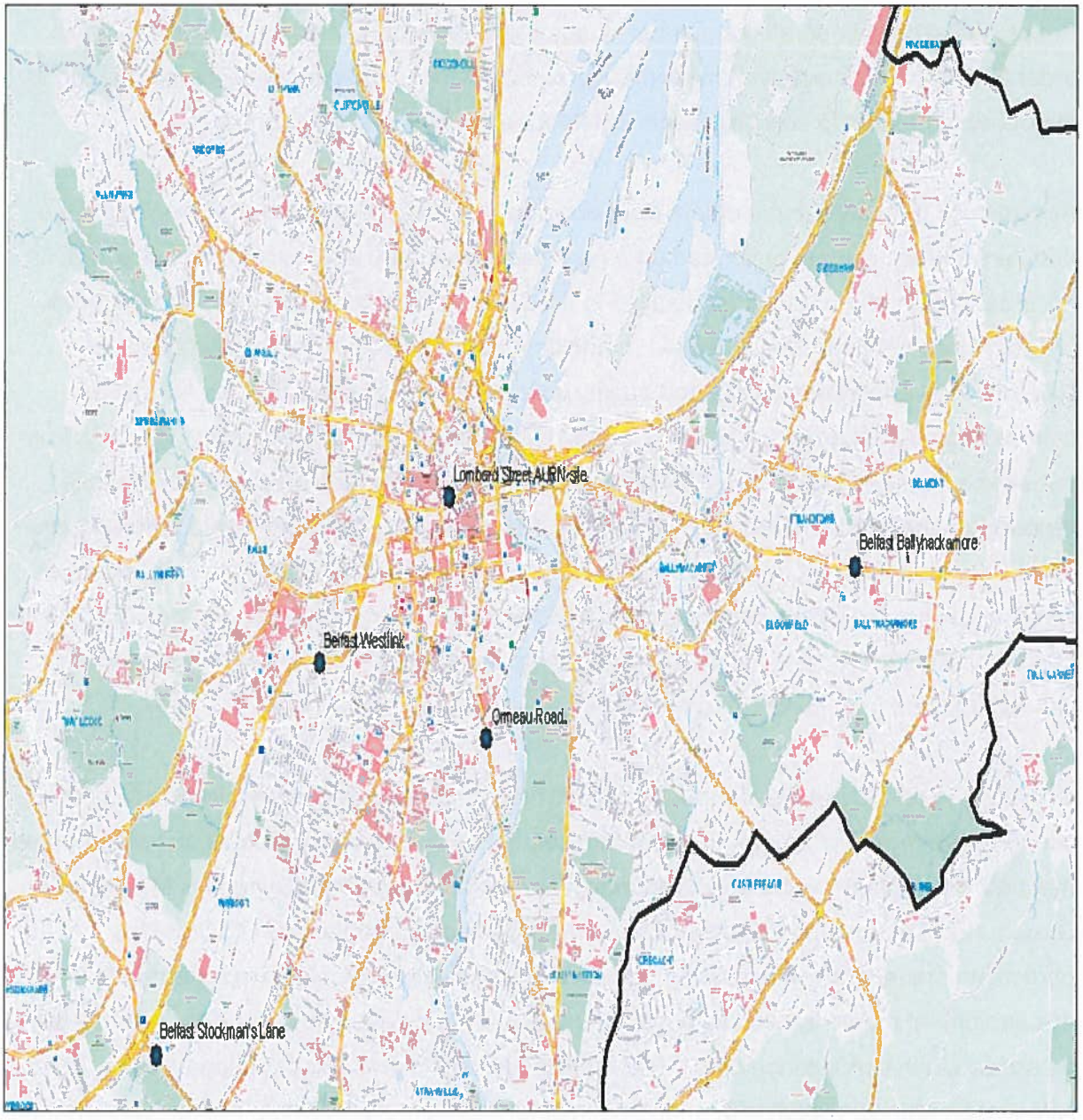
Belfast City Council operates a number of automatic monitoring stations across the city in order to inform its air quality management processes and to provide real time information to the public in relation to pollution levels within our air quality management areas.

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 Ricardo-AEA, quality assurance and quality control services are provided by NPL 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. 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. The Westlink Roden Street site is equipped with a 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 Progress Report have already been corrected to the reference equivalent.

A location map for monitoring sites relative to the Greater Belfast area can be found below in Figure 2.1; smaller scale location maps are provided in Appendix C and further site details are provided in Table 2.1.

Figure 2.1 Map of Automatic Monitoring Sites



Note: All locations are approximate and for reference purposes only.

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road	Does this location represent worst-case exposure?
Belfast Centre	Urban Centre	X 333898	Y 374358	NO_2 SO_2 CO O_3 PM_{10}, $PM_{2.5}$	Chemiluminescence UV Fluorescence, IR Absorption, UV Absorption, TEOM with FDMS	N	Y (6.8m)	30m	Y
Belfast Ormeau Road	Roadside	X 334272	Y 373012	NO_2	Chemiluminescence	Y	Y(10m)	3m	Y
Belfast Ballyhackamore	Roadside	X 337911	Y 373972	NO_2	Chemiluminescence	Y	Y(10m)	1.5m	Y
Belfast Stockman's Lane	Roadside	X 331010	Y 371252	NO_2 PM_{10}	Chemiluminescence TEOM with FDMS	Y	Y(20m)	2m	Y
Belfast Westlink Roden street	Roadside	X 332617	Y 373431	NO_2 PM_{10}	Chemiluminescence Beta Attenuation Monitor	Y	Y(20m)	5m	Y

2.1.2 Non-Automatic Monitoring

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 operate 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.

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, Westlink and Stockmans 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 2013 data are included in Appendix A to this report. The outputs also show monthly nitrogen dioxide monitoring data for each diffusion tube site for 2013 where available.

Figure 2.2 Map Non-Automatic Monitoring Sites

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Royal Victoria Hospital	Urban Background	X332522	Y373708	NO_2	N	1.93	N/A	Y
Black's Road	Roadside	X329782	Y369522	NO_2	Y	>60	2.42	Y
61 Cromac Street	Roadside	X334220	Y373853	NO_2	Y	13	2.7	Y
Ravenhill Road	Roadside	X335014	Y373942	NO_2	Y	4.7	5.5	Y
Queen's Bridge	Roadside	X334570	Y374393	NO_2	N	13	2.4	Y
North Road	Urban Background	X337551	Y374151	NO_2	N	On School Wall	>300	Y
Donegall Square South	Roadside	X333837	Y373950	NO_2	N	25	5.15	Y
Short Strand	Roadside	X334980	Y374254	NO_2	N	30	1.14	Y
301 Ormeau Road	Roadside	X334503	Y372176	NO_2	Y	0	8.63	Y
Knock Road	Roadside	X338718	Y373918	NO_2	Y	30	1.48	Y
Great George's Street	Kerbside	X333981	Y375102	NO_2	Y	25	0.5	Y
Lisburn Road	Roadside	X332114	Y371492	NO_2	N	5	1.5	Y
Shaftesbury Square	Kerbside	X333594	Y373283	NO_2	N	20	1	Y
Lombard Street	Urban Centre	X333898	Y374358	NO_2	N	3.6	30	Y
Albert Clock	Roadside	X334212	Y374489	NO_2	N	3.6	2.4	Y
Stockman's Lane	Roadside	X331007	Y371254	NO_2	Y	20	1.75	Y
Ballyhackamore	Roadside	X337911	Y373972	NO_2	Y	9.4	2.91	Y
Whitewell Road	Roadside	X333563	Y380450	NO_2	N	35	13	Y

Donegall Road	Kerbside	X333022	Y373122	NO_2	N	1.96	0.82	Y
Grosvener Road and Falls Road	Roadside	X332252	Y373878	NO_2	N	30	3.06	Y
Falls Road and Andersonstown	Roadside	X330716	Y372519	NO_2	N	15	2.8	Y
Station Road	Roadside	X337252	Y375555	NO_2	N	20.1	2.41	Y
Upper Malone Road	Roadside	X332478	Y370289	NO_2	N	10	2	Y
Great Victoria Street	Roadside	X333548	Y373772	NO_2	N	1	3	Y
College Square East	Roadside	X333498	Y374241	NO_2	N	1.5	2	Y
Chichester Street	Roadside	X334147	Y374123	NO_2	N	1	2	Y
Cromac & Ormeau Avenue	Kerbside	X334085	Y373542	NO_2	Y	2.5	0.75	Y
Glenmachan Street	Roadside	X331999	Y372881	NO_2	Y	3	2	Y
Creche on M1/Westlink	Suburban	X333006	Y374061	NO_2	Y	10	20	Y
Ormeau Road (junction with Ravenhill Road)	Roadside	X334943	Y371342	NO_2	Y	3	2	Y
Upper Newtownards Road & Hollywood Road	Roadside	X336519	Y374233	NO_2	N	2	3	Y
Crumlin Road	Roadside	X333195	Y375279	NO_2	N	2	2	Y
228 Antrim Road	Roadside	X333288	Y376143	NO_2	N	3	2	Y
Shore Road (Ivan Street end)	Roadside	X334174	Y376384	NO_2	N	2	4	Y
York Street	Roadside	X334212	Y375614	NO_2	N	5	2	Y
2 Rosetta Court	Roadside	X334963	Y371167	NO_2	N	8	8	Y
St. Anne's Close	Roadside	X329773	Y369915	NO_2	N	1	10	Y
Queens Square	Kerbside	X334208	Y374507	NO_2	N	2	0.5	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

Tables 2.3a and 2.3b summarise recent monitoring data from the Council's nitrogen dioxide automatic analysers for 2013 and preceding years from 2011. In all cases, exceedences of the Air Quality Strategy Objectives are highlighted in bold. In addition, 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 site continue to remain below the 40 μ/gm^{-3} annual mean objective for nitrogen dioxide as denoted by the solid red line on the graph.

Belfast Ormeau Road site experienced extensive problems with the air conditioning which prevented the monitoring equipment working to full capacity. As this has been a reoccurring problem a decision was made to upgrade the site. Taking account of procurement requirements and liaison with NIE this upgrade took a considerable length of time to the point that data capture from this site was so low it was not considered reliable to report the data from this site for 2013. The council will continue to monitor the Ormeau Road air quality management area until a more definitive understanding of nitrogen dioxide levels and trends emerge.

From the data in Table 2.3a, it can be seen that concentrations along the Upper Newtownards Road have remained consistent from 2011 to the extent that the nitrogen dioxide annual mean objective has now been achieved along the Upper Newtownards Road. 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 completion of significant structural improvements to the M1 Motorway and A12 Westlink corridor, nitrogen dioxide concentrations along Stockmans Lane continue to exceed significantly the 40 $\mu g/m^{-3}$ annual mean objective for nitrogen dioxide with levels typically averaging around 58 $\mu g/m^{-3}$. 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 as most of these properties have gardens facing onto the roadway thereby providing for short-term relevant public exposure.

Concentrations monitored at Westlink Roden Street site continue to remain below the 40 µg/m^{-3}, however the levels have risen by 5µg/m^{-3} over the previous three years. The council will continue to monitor the Westlink Corridor/M1 air quality management area until a more definitive understanding of nitrogen dioxide levels and trends emerge.

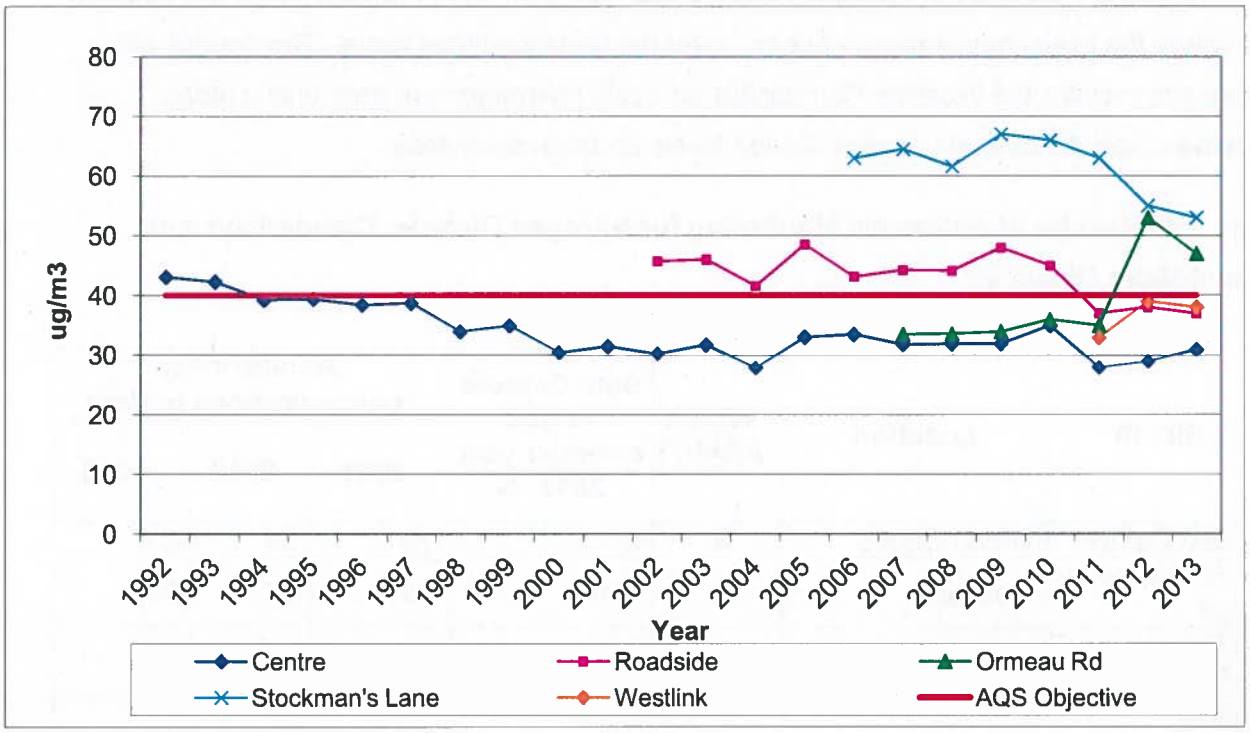
Table 2.3a Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for full calendar year 2013 %	Annual mean concentrations (µg/m^3)		
				2011	2012	2013
Belfast Centre	Urban Centre	N	97	28	29	31
Belfast Ormeau Road	Roadside	Y	N/A	35	**53**	**N/A**
Belfast Ballyhackamore	Roadside	Y	93	37	38	37
Belfast Stockman's Lane	Roadside	Y	99	**63**	**58**	**53**
Belfast Westlink Roden Street	Roadside	Y	97	33	39	38

Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Data Capture for full calendar year 2013 %	Number of Exceedences of hourly mean (200 µg/m^3)		
				2011	2012	2013
Belfast Centre	Urban Centre	N	97	0	5	2
Belfast Ormeau Road	Roadside	Y	N/A	0	3	N/A
Belfast Ballyhackamore	Roadside	Y	93	0	3	0
Belfast Stockman's Lane	Roadside	Y	99	40	**32**(227)	13
Belfast Westlink Roden Street	Roadside	Y	97	3	13	2

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Automatic Monitoring Sites.



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 40 diffusion tubes at relevant locations across the city. Location details for these tubes have been provided in Table 2.2 of this report while the data from these tubes for 2013 and preceding years has been summarised in Table 2.4 below.

In terms of the outcome of the 2013 nitrogen dioxide diffusion tube monitoring, it is noted that the concentrations have slightly increased from last year at all locations with the exception of Station Road. Annual mean exceedences during 2013 occurred at Black's Road, Cromac Street, Knock Road, Great George's Street, Stockmans Lane and York Street all of which are located within an existing air quality management area and have been the subject of mitigation measures for some time. Exceedences also occurred at a number of monitoring locations in and around the city centre not currently declared as air quality management areas including Short Strand, Albert Clock, Great Victoria Street, Chichester Street and Queens Square.

These exceedences are considered to be short term and can be attributed to the ongoing road works throughout the city centre and wider area associated with Belfast on the Move (creation of bus lanes as infrastructure for the introduction of Belfast Rapid Transit). It is not considered practical to undertake further assessment on all of these locations until the works are complete, however in relation to relevant receptors the Defra NO_2 distance calculator was used to confirm that concentrations were below the objective at Queens Square apartments beside the Albert Clock (Appendix D). Further assessment using the distance calculator was also used to confirm that concentrations were below the objective at relavent receptors in relation to exceedences identified at the Upper Malone Road monitoring location (Appendix D).

With regard to addressing these exceedence issues, we have already highlighted the 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 new 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 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture for full calendar year 2013 %	Annual mean concentrations ($\mu g/m^3$)		
				2011	2012	2013
1	Royal Victoria Hospital	N	92	21	22	24
2	Black's Road	Y	92	40	40	**43**
3	61 Cromac Street	Y	92	36	36	**45**
4	Ravenhill Road	Y	83	25	29	32
5	Queen's Bridge	N	92	23	30	33
6	North Road	N	75	18	16	17
7	Donegall Square South	N	83	36	35	38
9	Short Strand	N	92	40	**43**	**47**
10	301 Ormeau Road	Y	92	31	31	35
12	Knock Road	Y	92	38	40	**46**
13	Great George's Street	Y	92	**45**	**48**	**52**
14	Lisburn Road	N	92	27	27	28
15	Shaftesbury Square	N	92	36	34	38
16,19,20	Lombard Street	N	92	29	29	31
17	Albert Clock	N	92	40	39	**47**

21,22,56	Stockman's Lane	Y	92	**64**	**59**	**55**
23,24,32	Ballyhackamore	Y	92	39	37	37
25	Whitewell Road	N	75	16	19	23
26	Donegall Road	N	83	28	35	39
27	Grosvenor Road and Falls	N	83	34	30	34
28	Falls and Andersonstown	N	75	29	29	31
30	Station Road	N	83	22	24	23
31	Upper Malone Rd	N	92	21	39	**44**
33	Great Victoria Street	N	92	37	39	**42**
34	College Square East	N	83	32	33	39
35	Chichester Street	N	83	39	**47**	**46**
36	Cromac & Ormeau Avenue	Y	83	33	32	33
37	Glenmachan Street	Y	92	38	37	40
38	Crèche on M1/Westlink	Y	83	31	31	34
39	Ormeau Road (junction with Ravenhill Road)	Y	67	25	25	29
40	Upper Newtownards Road & Hollywood Road	N	92	26	27	29
41	Crumlin Road	N	83	31	32	34
42	228 Antrim Road	N	92	37	34	37
44	Shore Road (Ivan Street end)	N	83	30	30	33
59	York Street	Y	92	40	**41**	**47**
60	2 Rosetta Court	N	92	28	29	34
62	St Annes	N	92	26	27	30
63	Queen's Square	N	92	33	37	**41**

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 Tables 2.5a, 2.5b and in Figure 2.4.

In terms of exceedences of the 40 $\mu g/m^{-3}$ particulate matter annual mean objective, historical data (not included in this report) 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 in recent years.

Reflecting upon the particulate matter 24-hour mean objective data, as summarised in Table 2.5b, the data has remained comfortably below the objective at all sites during 2011, 2012 and 2013.

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.

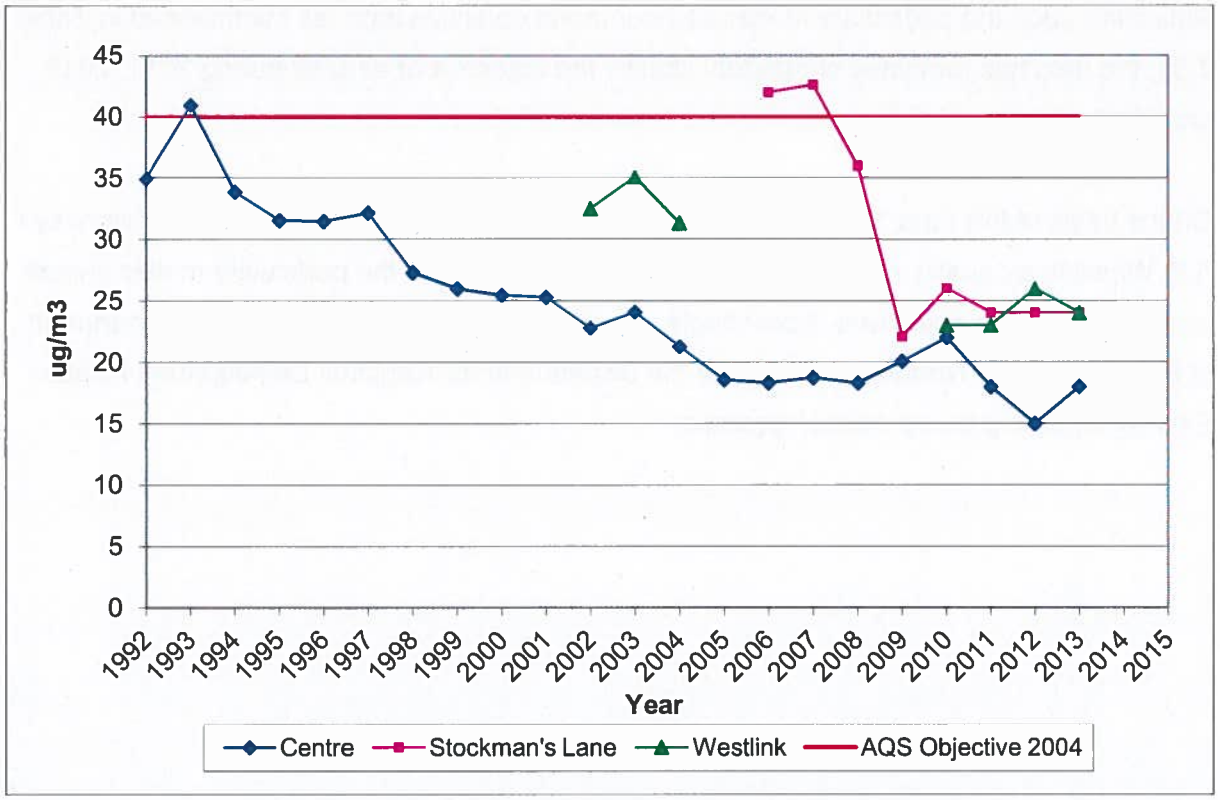
Table 2.5a Results of PM_{10} Automatic Monitoring: Comparison with Annual Mean Objective.

Site ID	Location	Within AQMA?	Data Capture for full calendar year 2013 %	Annual mean concentrations (µg/m^3)		
				2011	2012	2013
	Belfast Centre	N	74	18	15	18
	Belfast Stockman's Lane	Y	92	24	24	24
	Belfast Westlink	Y	76	23	26	23

Table 2.5b Results of PM_{10} Automatic Monitoring: Comparison with 24-hour Mean Objective.

Site ID	Location	Within AQMA?	Data Capture 2013 %	Number of Exceedences of daily mean objective (50 µg/m^3)		
				2011	2012	2013
	Belfast Centre	N	74	10(39)	7	6(31)
	Belfast Stockman's Lane	Y	92	6(41)	2(33)	12
	Belfast Westlink	Y	76	11	11	14(43)

Figure 2.4 Trends in Annual Mean Particular Matter PM10 Concentration Measured at Automatic Monitoring Sites.



2.2.3 Sulphur Dioxide

Sulphur dioxide concentrations have been monitored at the Belfast Centre site since 1992. This continuous real time monitor is affiliated to Defra's Automatic Urban and Rural Network (AURN). The site is classed as an Urban Centre site and representative of typical population exposure in the city centre.

Previous rounds of R&A and monitored results from 2013 provided in Table 2.6 below confirm that there is no exceedence of the 15minute, the 1-hour mean and the 24-hour mean objective for sulphur Dioxide within Belfast. The last monitored exceedence was in 1998, therefore a Detailed Assessment is not considered necessary.

Table 2.6 Results of SO_2 Automatic Monitoring: Comparison with Objectives

Site ID	Location	Within AQMA?	Data Capture 2013 %	Number of Exceedences of: (µg/m^3)		
				15-minute Objective (266 µg/m^3)	1-hour Objective (350 µg/m^3)	24-hour Objective (125 µg/m^3)
	Belfast Centre	N	98	0	0	0

2.2.4 Benzene

Benzene concentrations have been monitored at the Belfast Centre and the Belfast Roadside site since 2002. Monitoring stopped at the Belfast Roadside site in October 2007. The Belfast Centre site monitors benzene exposure for the City Centre whilst the Belfast Roadside site monitored benzene concentrations experienced at a Roadside location. No exceedence of the 2010 National Air Quality Strategy Objective (3.25 $\mu g/m^{-3}$ annual mean) or the 2010 EU Limit Value (5 $\mu g/m^{-3}$ annual mean) for benzene has been monitored in Belfast since 2002.

Previous rounds of R&A and monitored results going back to 2011 provided in Table 2.7 below confirm that there is no exceedence of the running annual mean of 3.25 $\mu g\ m^{-3}$ for Benzene within Belfast. Therefore, a Detailed Assessment is not considered necessary.

Table 2.7 Results of Benzene Monitoring: Comparison with Running Annual Mean Objectives

Site ID	Location	Within AQMA?	Data Capture for full calendar year 2013 %	Running Annual mean concentrations (ug/m^3)		
				2011	2012	2013
	Belfast Centre	N	100	0.55	0.55	0.60

2.2.5 Other pollutants monitored

Previous rounds of R&A have confirmed that relevant Air Quality Objectives for carbon monoxide, 1,3-butadiene, Ozone and lead are being met throughout the city. No new sources have been identified which would have the potential to change this situation therefore these pollutants will not be considered in this report.

Summary of Compliance with AQS Objectives

Belfast City Council has examined the results from monitoring throughout the city. Measured concentrations of nitrogen dioxide above the annual mean objective at a number of locations have been identified. Local knowledge and review of the areas confirm that there is no relevant exposure currently occurring at these locations.

In summary there is no need to undertake a Detailed Assessment for exceedences of the AQS Objectives in Belfast.

3 New Local Developments

3.1 Road Traffic Sources

The following road traffic sources which may have an impact on air quality have been identified and considered:

- Narrow congested streets with residential properties close to the kerb.
- Busy streets where people may spend one hour or more close to traffic.
- Roads with a high flow of buses and/or HGVs.
- Junctions.
- New roads constructed or proposed since the last Progress Report.
- Roads with significantly changed traffic flows.
- Bus or coach stations.

Belfast City Council confirms that there has been no significant change to any of the above sources since the last Progress Report, therefore there is no need to proceed to a Detailed Assessment.

3.2 Other Transport Sources

The following additional transport sources which may have an impact on air quality have been identified and considered:

- Airports.
- Locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.
- Locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.
- Ports for shipping.

Belfast City Council confirms that there has been no significant change to any of the above sources since the last Progress Report, therefore there is no need to proceed to a Detailed Assessment.

3.3 Industrial Sources

The following industrial sources which may have an impact on air quality have been identified and considered:

- **Industrial installations:** new or proposed installations for which an air quality assessment has been carried out.
- **Industrial installations:** existing installations where emissions have increased substantially or new relevant exposure has been introduced.
- **Industrial installations:** new or significantly changed installations with no previous air quality assessment.
- Major fuel storage depots storing petrol.
- Petrol stations.
- Poultry farms.

Belfast City Council confirms that there has been no significant change to any of the above sources since the last Progress Report, therefore there is no need to proceed to a Detailed Assessment.

3.4 Commercial and Domestic Sources

The following commercial and domestic sources which may have an impact on air quality have been identified and considered:

- Biomass combustion plant – individual installations.
- Areas where the combined impact of several biomass combustion sources may be relevant.
- Areas where domestic solid fuel burning may be relevant.

Belfast City Council confirms that there has been no significant change to any of the above sources since the last Progress Report, therefore there is no need to proceed to a Detailed Assessment.

3.5 New Developments with Fugitive or Uncontrolled Sources

The following new developments with fugitive or uncontrolled sources which may have an impact on air quality have been identified and considered:

- Landfill sites.
- Quarries.
- Unmade haulage roads on industrial sites.
- Waste transfer stations etc.
- Other potential sources of fugitive particulate emissions.

Belfast City Council confirms that there has been no significant change to any of the above sources since the last Progress Report, therefore there is no need to proceed to a Detailed Assessment.

Belfast City Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

4 Planning Applications

Of the planning applications received by The Environmental Protection Unit of Belfast City Council in 2013 four new developments were identified as having the potential to have a negative impact on air quality. These proposed developments included large mixed use developments, residential developments, proposed extension to a shopping centre and redevelopment to the Windsor Park sports grounds.

Detailed air quality assessments submitted in support of these developments concluded that their individual impact would have minimal or insignificant impacts on localised air quality or the existing AQMAs. Details of these applications are provided below in Table 4.1.

Table 4.1 New Developments that had a potential to have a negative impact on air quality in the 2013 period

Location	Development description	Outcomes of air quality impact assessment	Mitigation measures proposed
Henry Place	Mixed-use development including three storey building comprising of 2 no. ground floor business units and 8 no. offices above children's daycare and teaching/training facilities.	The air quality impact assessment report concluded that although all identified residential receptor locations are currently predicted to experience NO2 concentrations in excess of the annual mean Air Quality Objectives for NO2 in both the 'do minimum' and 'do something' scenarios, the significance of impact associated with the proposed development is predicted to be negligible at all modelled receptor locations. The assessment has also demonstrated that future occupiers of the development will not be exposed to NO2 concentrations in excess of the short term Air Quality Objective as relevant to the nature of this proposal.	None required
North Belfast (former Girdwood Park Army Barracks)	Redevelopment of existing brownfield site to include community, education, business, health	The assessment has demonstrated that the proposed development will have a negligible impact on local air	Construction mitigation measures included site roads cleaning, water spraying on surfaces and roads, wheel washes,

Location	Development description	Outcomes of air quality impact assessment	Mitigation measures proposed
	recreational and residential use along with internal site layout incorporating parking, leisure and landscaping, and connections to existing road and utilities infrastructure	quality as a result of traffic-derived pollutants and future users will not be exposed to pollutant concentrations in excess of the relevant ambient air quality limit values.	and enclosed area for dry materials storage.
Airport Road	Construction and operation of a combined heat and power generating station	The assessment report predicted that ambient emissions from the proposed Combined Heat and Power Generating Station are unlikely to lead to exceedences of air quality objectives at relevant receptors.	None required
Boucher Road	Erection of single-storey drive through food retail unit	The proposed development is to be located within the Air Quality Management Area. However the report concludes that the proposed development will not lead to a significant deterioration in local air quality.	None required

5 Air Quality Planning Policies

It is important for all local authorities to think about how they can best bring air quality considerations into the planning process at the earliest possible stage and it is no longer satisfactory to simply demonstrate that a development is no worse than the existing or previous land use on a particular site.

Very little development bypasses the planning stage therefore it provides an opportunity to identify and prevent potential problems from arising in the first place an excellent example of where prevention is far better than trying to find a cure.

In light of this, Belfast City Council produced and in June 2009 launched 'Air quality and land use planning: A Belfast specific guidance note for developers and air quality consultants'. The document outlines what the Council, as a key consultee for the Planning Service, would look for in forming its opinion on a proposed development and its potential impact on air quality. If developers and consultants follow the procedures in this guidance, it will help ensure consistency in the approach to dealing with air quality and planning in Belfast.

The ultimate aim of the guidance is to speed up the planning process and encourage developers to submit appropriate air quality related information with the initial planning application. On the basis of this submitted information, Environmental Protection Unit will then be able to take into due consideration the proposed development's impact on air quality.

6 Implementation of Action Plans

In 2006, the Council, together with a range of competent authority partners including, Translink, the Department for Regional Development and the Roads Service developed and published an Air Quality Action Plan that was designed to deliver by 2010 relevant air quality standards in each Air Quality Management Area.

The action plan concluded substantially in 2010 but unfortunately, it did not deliver the required improvements in all of the designated Air Quality Management Areas. Moreover, the failure to achieve the air quality standards for nitrogen dioxide in Belfast has meant that the Department of the Environment for Northern Ireland has had to submit an application to the European Commission for a 5-year derogation to the compliance date for achieving the air quality standards for nitrogen dioxide in the Belfast Metropolitan Urban Area.

Contingent upon the granting of this 5-year derogation by the European Commission, the Council has committed to the development of a revised Air Quality Action Plan for the city that will address the outstanding nitrogen dioxide pollution 'hot spots'.

In order to help develop an updated air quality action plan for the city the Council commissioned the Transport Research Laboratory (TRL) and Transport & Travel Research Limited (TTR) to assist the Council, Competent Authorities and other partner organisations to explore and develop new air quality measures that could form the basis of a new Air Quality Action Plan for the city and act as a mechanism to deliver on a Member State agreement.

One to one meetings were held between TRL / TTR and Steering Group members in order to narrow the list of potential measures to an agreed shortlist of measures for the scoping assessment. These measures were not intended to be the final measures but were chosen to present a range of options, some of which would target 'hotspot' areas and others target the city as a whole. They were also intended to provide an indication of the impact they would have if implemented. The TRL/TTR study concluded that a package, rather than discrete measures, would need to be applied across Belfast in order to achieve the air quality objectives / limit values. The package of measures would improve road vehicle operation and promote and enable a shift onto more sustainable modes of transport.

Based on the recommendations from the TRI / TTR report we aim to develop a comprehensive Air Quality Action Plan that draws upon all forms of air quality and transport

planning activities, including sustainable transport options as well as engineering solutions. The measures will be quantified in relation to health benefits and will demonstrate how their successful implementation will deliver compliance with the nitrogen dioxide Limit Value.

7 Conclusions and Proposed Actions

7.1 Conclusions from New Monitoring Data

Belfast City Council has presented a range of monitoring data within this Progress 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. There were no monitored exceedences for any of the air quality strategy objectives for sulphur dioxide, benzene and particulate matter during 2013.

Nevertheless, 2013 monitoring data for nitrogen dioxide confirms continuing exceedences of the annual mean and hourly objectives for nitrogen dioxide in the vicinity of Stockmans 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, automatic monitoring site at Westlink / 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 $\mu g/m^{-3}$. However, the last three years have demonstrated a sharp decrease in nitrogen dioxide levels to the extent that the annual mean objective was achieved at Ballyhackamore (37 and 38 $\mu g/m^{-3}$) during 2011, 2012 and 2013. 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.

Although not within air quality management areas, during 2013 other significant increases in nitrogen dioxide annual mean concentrations were observed at Donegal Road and Chichester Street, all of which are located within or close to the city centre region and likely to be attributed to the ongoing Belfast on the Move scheme. A significant increase is also evident at Upper Malone Road (Site ID31), this site had previously been know as House of Sport in previous report but re-located to a more representative location in 2012, resulting in the noted increase.

Therefore, in conclusion, it is considered that our 2013 monitoring data supports the continuing need for all our existing air quality management areas for the time being, and we will continue to monitor closely ambient nitrogen dioxide levels within all the 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.

7.2 Conclusions relating to New Local Developments

Of the planning applications received and reviewed in 2013 it was concluded they would have no significant negative impact on existing local air quality. In addition no significant changes in local circumstances were identified within Belfast which would require more detailed consideration. It is therefore not considered necessary to proceed to a 'Detailed Assessment' based on new local developments or potential sources.

7.3 Proposed Actions

Monitoring data presented in this report would indicate it is not necessary to proceed to a Detailed Assessment for any pollutant. A number of diffusion tube monitoring sites both within and outside AQMAs exceed the nitrogen dioxide (NO_2) annual mean objective of 40µg/m^3, however, relevant exposure does not occur in the locations outside the existing AQMAs therefore no further action is necessary.

An extensive nitrogen dioxide monitoring network exists throughout Belfast and currently captures all areas of potential concern, therefore it is not envisaged the existing network will be increased unless a change in local circumstances is identified. Nitrogen dioxide continues to be identified as the biggest problem with road traffic as the main source.

In terms of forwards actions, the council has already engaged with the Department of Environment for Northern Ireland, the Department for Regional Development Roads Service and other relevant authorities regarding the development of a new air quality action plan for the city. The new Action Plan will draw upon all forms of air quality and transport planning activities, including sustainable transport options as well as engineering solutions. The measures will be quantified in relation to health benefits and will demonstrate how their successful implementation will deliver compliance with the nitrogen dioxide Limit Value.

Under the Local Air Quality Management Review and Assessment process the next course of action for Belfast City Council will be to submit an Update and Screening Assessment in 2015.

8 References

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 Council, 2012, Belfast Update and Screening Assessment, April 2012.
http://www.airqualityni.co.uk/reports.php

Belfast City Council, 2013, Belfast Progress Report, April 2013.
http://www.airqualityni.co.uk/reports.php

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

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

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 has appointed NPL 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). NPL staff visit our sites on a six-monthly basis and compare the performance of our analysers against a range of laboratory grade standards. NPL 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	03/01/2013	29/01/2013	47.4	44.8	44.5	46	1.6	4	4.0	41.47	99	Good	Good
2	29/01/2013	07/03/2013	37.5	33.0	39.2	37	3.2	9	7.9	46.28	87	Good	Good
3	07/03/2013	03/04/2013	30.1	30.9	30.4	30	0.4	1	1.1	31.73	95	Good	Good
4	03/04/2013	30/04/2013	26.0	26.9	26.5	26	0.5	2	1.2	27.03	99	Good	Good
5	30/04/2013	30/05/203								22	99		Good
6	30/05/2013	02/07/2013	30.3	29.8	30.1	30	0.3	1	0.6	26	99	Good	Good
7	03/07/2013	07/08/2013	31.2	29.9	31.5	31	0.8	3	2.1	24	99	Good	Good
8	07/08/2013	04/09/2013	26.5	25.9	24.9	26	0.8	3	2.0	19	92	Good	Good
9	04/09/2013	04/10/2013	25.9	29.5	29.6	28	2.1	7	5.2	23	99	Good	Good
10	04/10/2013	29/10/2013	34.4	35.6	34.0	35	0.8	2	2.0	32	99	Good	Good
11	29/10/2013	04/12/2013	43.7	34.0	46.0	41	6.4	16	15.9	42.81	100	Good	Good
12	04/12/2013	09/01/2014	35.7	34.1	35.5	35	0.9	3	2.3	30.5	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

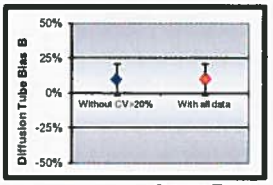
(Check average CV & DC from Accuracy calculations)

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

Precision: 11 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 11 periods of data	
Bias factor A	0.94 (0.85 - 1.05)
Bias B	6% (-5% - 17%)
Diffusion Tubes Mean:	33 μgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	31 μgm^{-3}
Data Capture for periods used:	97%
Adjusted Tubes Mean:	31 (28 - 35) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.94 (0.85 - 1.05)
Bias B	6% (-5% - 17%)
Diffusion Tubes Mean:	33 μgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	31 μgm^{-3}
Data Capture for periods used:	97%
Adjusted Tubes Mean:	31 (28 - 35) μgm^{-3}



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Version 03 - November 2006

Adjustment of SINGLE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tube Measurements																Adjusted measurement (95% confidence interval) with all the data 11 periods used in this calcuations
Site Name/ID	Periods													Raw Mean	Valid periods	Bias Factor A 0.94 (0.85 - 1.05) Bias B 6% (-5% - 17%)
	1	2	3	4	5	6	7	8	9	10	11	12	13			Tube Precision: 5 Automatic DC: 97%
1. RVH	40.6	25.6	24.9	19.4		18.9	24.0	18.2	19.9	24.8	33.6	28.5		25.3	11	Adjusted with 95% CI 24 (21 - 27)
2. Blacks Rd	52.2	48.2	33.7	41.0		39.9	35.4	48.4	37.9	46.7	63.3	57.3		45.8	11	Adjusted with 95% CI 43 (39 - 48)
3. 61 Cromac Str	57.9	48.0	49.9	47.6		42.6	40.9	40.1	45.1	55.1	57.4	39.1		47.6	11	Adjusted with 95% CI 45 (40 - 50)
4. Ravenhill Rd	45.9	37.4	35.1	26.1		35.6	27.8	25.3	32.0	35.6	43.6			34.4	10	Adjusted with 95% CI 32 (29 - 36)
5. Queens Bridge	46.2	46.3	16.6	36.1		34.9	33.5	26.5	35.7	37.2	44.2	28.3		35.0	11	Adjusted with 95% CI 33 (30 - 37)
6. North Road	26.0	25.8		14.3		13.2	12.1	12.5	16.5	21.2	21.2	15.1		17.8	10	Adjusted with 95% CI 17 (15 - 19)
7. Donegal Sq. South	50.1		38.2	37.7		43.9	35.2	36.8	34.6	45.9	46.9	33.7		40.3	10	Adjusted with 95% CI 38 (34 - 42)
9. Short Strand	60.9	60.9	41.4	40.2		44.5	43.0	44.8	47.8	46.5	71.3	46.1		49.8	11	Adjusted with 95% CI 47 (42 - 52)
10. 301 Ormeau Rd	45.7	36.3	28.6	31.0		34.5	31.7	38.8	36.7	41.7	45.7	39.3		37.3	11	Adjusted with 95% CI 35 (32 - 39)
12. Knock Rd	81.7	57.2	41.5	39.9		45.4	37.5	42.0	51.1	46.8	59.2	33.2		48.7	11	Adjusted with 95% CI 46 (41 - 51)
13. Gr Georges Str	76.8	68.1	62.6	53.8		55.5	56.0	37.8	46.4	52.3	62.4	40.6		55.7	11	Adjusted with 95% CI 52 (47 - 58)
14. Lisburn Rd	35.2	32.6	27.4	24.5		27.9	25.9	26.1	27.8	31.2	39.2	33.8		30.1	11	Adjusted with 95% CI 28 (26 - 32)
15. Shaftesbury Sq	50.6	44.1	33.9	35.5		38.6	36.5	35.9	40.1	43.4	56.0	34.1		40.8	11	Adjusted with 95% CI 38 (35 - 43)
17. Albert Clock	64.5	53.8	45.4	42.2		70.1	38.7	37.1	40.6	48.3	66.3	47.1		50.4	11	Adjusted with 95% CI 47 (43 - 53)
25. Whitewell Rd	31.6	30.4		22.5		25.5	24.6	15.0	24.3	29.1	19.2			24.7	9	Adjusted with 95% CI 23 (21 - 26)
26. Donegal Rd	45.1	53.2		58.4		33.6	28.1	31.4	36.8	43.8	44.1	38.3		41.3	10	Adjusted with 95% CI 39 (35 - 43)
27. Grovesner Rd	48.7	35.9	33.9	31.4		32.9	28.2	31.9		35.2	45.6	39.3		36.3	10	Adjusted with 95% CI 34 (31 - 38)
28. Falls and Andytown	46.8		41.0	29.6			26.4	24.0	25.7	34.9	36.7	30.7		32.9	9	Adjusted with 95% CI 31 (28 - 34)
30. Station Rd	32.5	29.7	21.3	21.3		21.3	16.7	19.3	20.5	24.4	34.5			24.1	10	Adjusted with 95% CI 23 (21 - 25)
31 Newforge Lane	61.7	54.1	47.2	45.1		43.7	33.8	38.5	52.1	51.8	56.2	34.7		47.2	11	Adjusted with 95% CI 44 (40 - 50)
33 Great Victoria Street	50.9	51.4	34.8	42.3		40.6	38.0	42.7	42.3	45.2	60.1	41.4		44.5	11	Adjusted with 95% CI 42 (38 - 47)
34 College Square East	48.3	54.5	44.8	32.3			35.4	31.6	39.2	47.4	44.3	37.5		41.5	10	Adjusted with 95% CI 39 (35 - 44)
35 Chichester Street	51.0	61.4	49.2			47.3	43.3	41.4	49.7	56.4	58.3	27.4		48.5	10	Adjusted with 95% CI 46 (41 - 51)
36 Cromac/Ormeau Avenue	43.8	39.3	31.1	31.0		31.4		32.3	31.9	37.1	43.3	32.8		35.4	10	Adjusted with 95% CI 33 (30 - 37)
37 Westlink/Glennochan Str	56.5	46.2	37.4	35.2		36.7	34.9	39.2	37.8	48.5	60.2	40.8		43.0	11	Adjusted with 95% CI 40 (37 - 45)

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

Adjustment of SINGLE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tube Measurements																Adjusted measurement (95% confidence interval) with all the data 11 periods used in this calcuations
Site Name/ID	Periods													Raw Mean	Valid periods	Bias Factor A 0.94 (0.85 - 1.05) Bias B 6% (-5% - 17%)
	1	2	3	4	5	6	7	8	9	10	11	12	13			Tube Precision: 5 Automatic DC: 97%
38 Creche on M1/Westlink	53.1	38.1	58.7	31.0			32.1	22.7	30.2	39.5	31.2	30.0		36.7	10	Adjusted with 95% CI 34 (31 - 39)
39 Ormeau Rd/Ravenhill Rd	33.7	33.1	29.7	23.7		30.8	29.6	26.3		36.1				30.4	8	Adjusted with 95% CI 29 (26 - 32)
40 Hollywood Rd Arches	44.0	37.1	30.3	26.0		23.8	25.3	23.1	24.1	33.2	37.3	31.0		30.5	11	Adjusted with 95% CI 29 (26 - 32)
41 Crumlin Rd	46.1		44.1	32.9		32.4	35.8	28.2	37.4	40.2	37.6	28.8		36.3	10	Adjusted with 95% CI 34 (31 - 38)
42 228 AntrimRd	49.3	42.9	46.2	34.9		36.5	31.5	29.3	38.4	43.7	39.7	40.3		39.3	11	Adjusted with 95% CI 37 (33 - 41)
44 Shore Rd (Ivan St. End)	45.5	43.0	35.2	33.5		30.7	33.3	27.0	33.6	37.5		32.0		35.1	10	Adjusted with 95% CI 33 (30 - 37)
59 York Street	64.8	60.9	52.8	40.3		39.5	42.6	32.5	42.2	59.7	58.7	56.6		50.0	11	Adjusted with 95% CI 47 (43 - 53)
60 2 Rosetta Court	46.6	46.6	41.0	31.7		29.2	30.9	30.7	33.1	34.2	41.3	27.8		35.7	11	Adjusted with 95% CI 34 (30 - 37)
62 St Anne's	40.6	37.3	36.4	30.0		28.4	30.8	23.5	31.0	31.0	31.5	30.3		31.9	11	Adjusted with 95% CI 30 (27 - 33)
63 Queen's Sq	54.9	52.1	56.3	37.9		40.6	40.0	29.4	34.2	44.8	45.4	40.0		43.2	11	Adjusted with 95% CI 41 (37 - 45)

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

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 available sampling periods in 2013. In

addition, the precision checks were also deemed 'good' for all sampling periods. The overall bias factor was calculated as 0.94.

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.

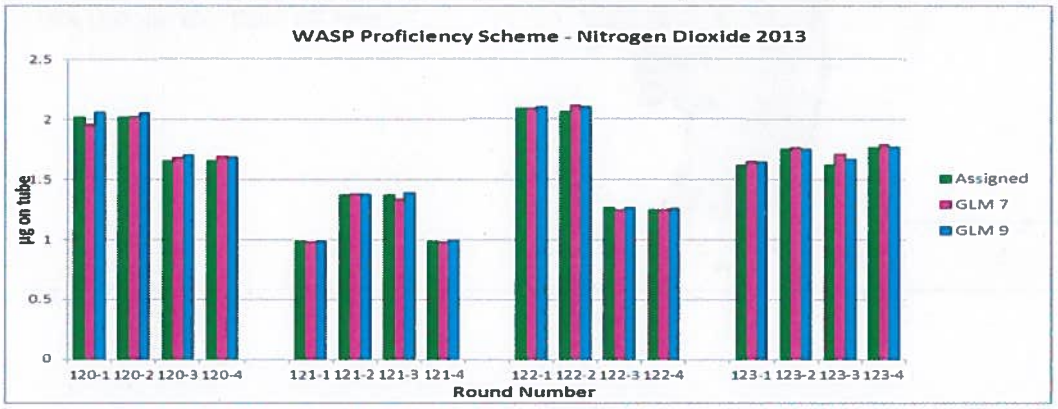
For the 2013 sampling period, Gradko's performance was assessed as follows:

gradko environmental

Nitrogen Dioxide WASP Results

Methods: GLM 7 – Camspec M550 Spectrophotometer, GLM 9 – QuAAtro Continuous Flow analyser

WASP Proficiency Scheme - Nitrogen Dioxide 2013								
Date	Round	Assigned value	Camspec M550 - GLM 7			QuAAtro - GLM 9		
			Measured concentration	z-Score	% Bias	Measured concentration	z-Score	% Bias
Feb-13	120-1	2.02	1.956	-0.4	-3.2%	2.063	0.3	2.1%
Feb-13	120-2	2.02	2.026	0	0.3%	2.059	0.3	1.9%
Feb-13	120-3	1.66	1.681	0.2	1.3%	1.711	0.4	3.1%
Feb-13	120-4	1.66	1.698	0.3	2.3%	1.692	0.3	1.9%
May-13	121-1	0.99	0.984	-0.1	-0.6%	0.988	0	-0.2%
May-13	121-2	1.37	1.379	0.1	0.7%	1.380	0.1	0.7%
May-13	121-3	1.37	1.339	-0.3	-2.3%	1.392	0.2	1.6%
May-13	121-4	0.99	0.980	-0.1	-1.0%	0.995	0.1	0.5%
Aug-13	122-1	2.10	2.098	-0.01	-0.1%	2.113	0.19	0.6%
Aug-13	122-2	2.07	2.125	0.35	2.7%	2.108	0.24	1.8%
Aug-13	122-3	1.27	1.253	-0.19	-1.3%	1.269	-0.02	-0.1%
Aug-13	122-4	1.25	1.249	-0.05	-0.1%	1.263	0.10	1.0%
Nov-13	123-1	1.62	1.656	0.32	2.2%	1.649	0.26	1.8%
Nov-13	123-2	1.76	1.770	0.1	0.6%	1.760	0.02	0.0%
Nov-13	123-3	1.62	1.717	0.78	6.0%	1.672	0.41	3.2%
Nov-13	123-4	1.77	1.796	0.2	1.5%	1.777	0.08	0.4%



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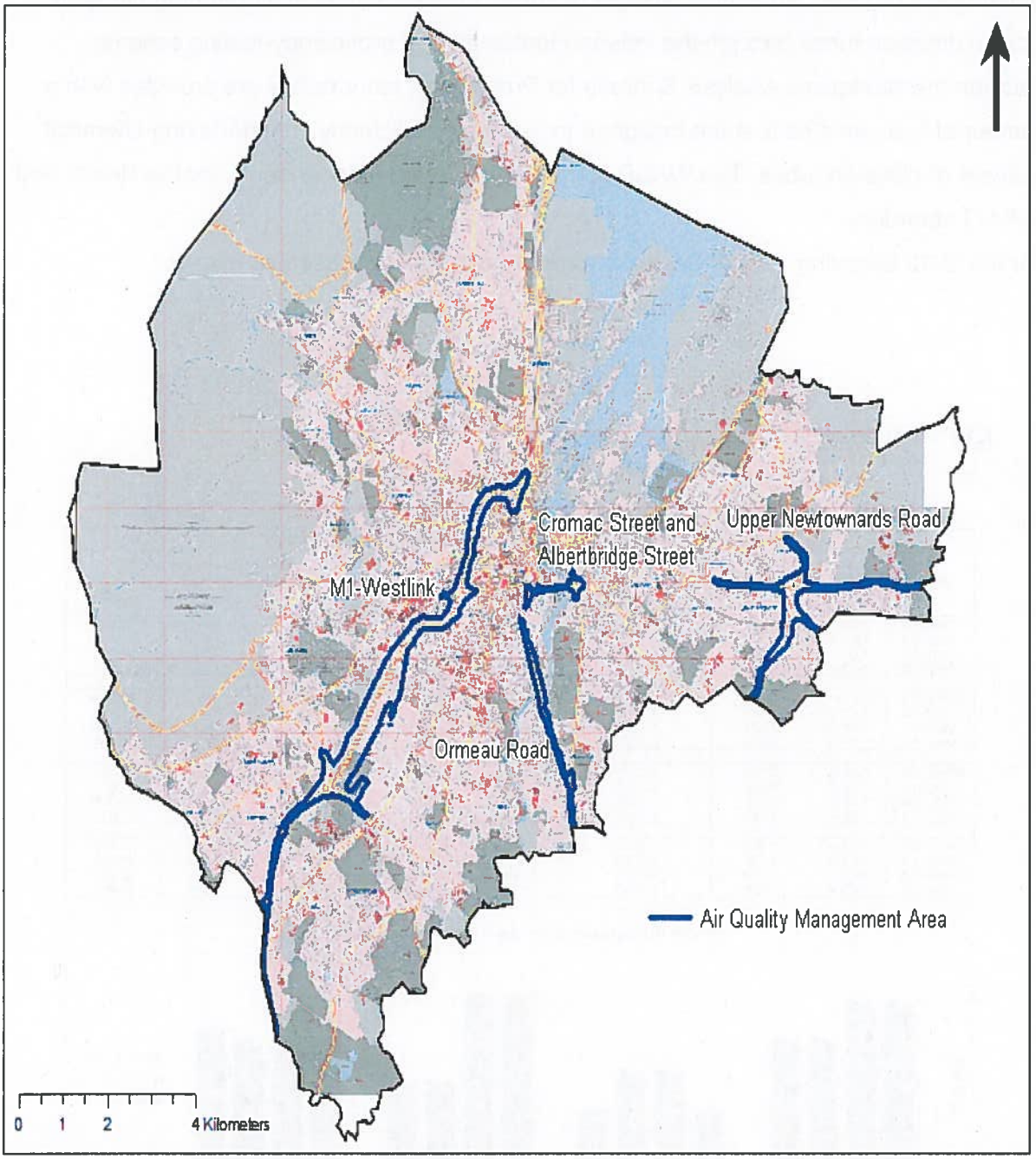
Appendix B: Belfast City Council Air Quality Management Area Location Map



Appendix C: Belfast City Council Air Quality Monitoring Station Details

Belfast Centre

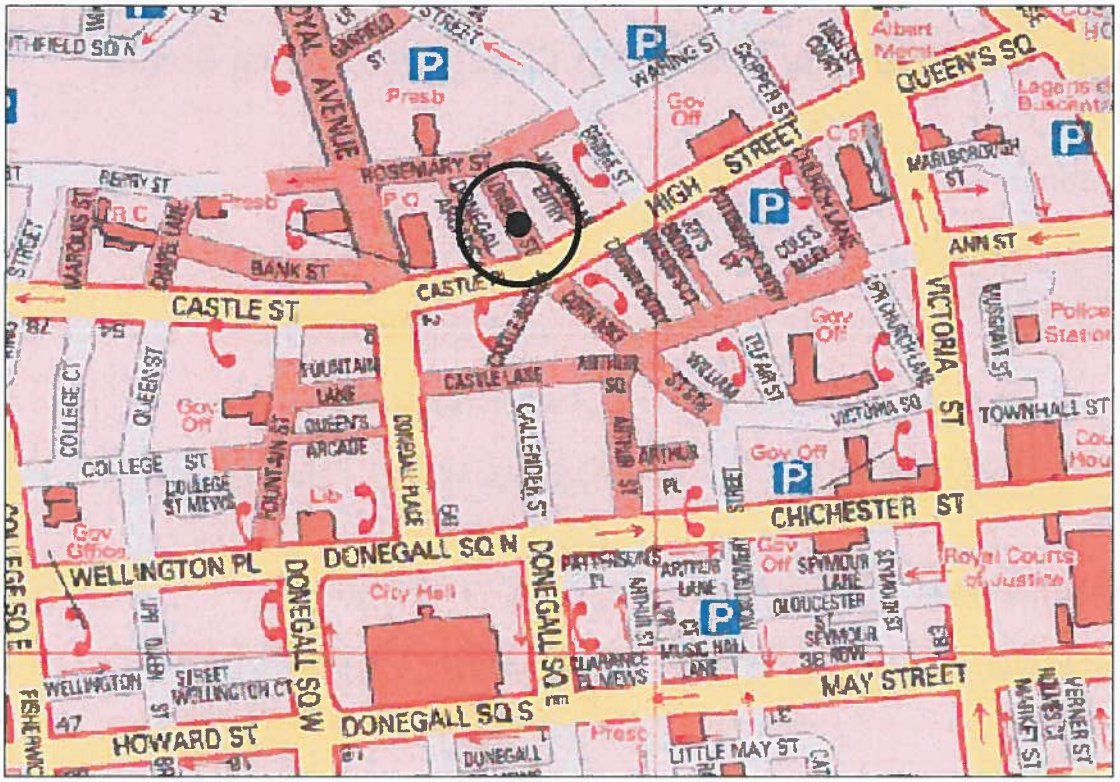
Site Name: Belfast Centre
Site Type: Urban Centre
Site Comments: Lombard St. Irish Grid Coords: J333898 374358

Monitoring Network: Non-Automatic Hydrocarbon Network

Parameter	Date Started	Date Ended
Benzene	07/05/2002	Ongoing

Monitoring Network: Northern Ireland Automatic Urban Network

Parameter	Date Started	Date Ended
Carbon monoxide	08/03/1992	Ongoing
Nitric oxide	08/03/1992	Ongoing
Nitrogen dioxide	08/03/1992	Ongoing
Ozone	08/03/1992	Ongoing
PM10 particulate matter (hourly Measured)	08/03/1992	Ongoing
PM2.5 particulate matter (hourly Measured)	01/10/2008	Ongoing
Sulphur dioxide	08/03/1992	Ongoing
Nitrogen oxides as nitrogen dioxide	08/03/1992	Ongoing
Enclosure Temperature	08/03/1992	Ongoing
Non-volatile PM10 (Hourly measured)	01/10/2008	Ongoing
Volatile PM10 (Hourly measured)	01/10/2008	Ongoing
Non-volatile PM2.5 (Hourly measured)	01/10/2008	Ongoing
Volatile PM2.5 (Hourly measured)	01/10/2008	Ongoing
Modelled Temperature	01/08/2010	Ongoing
Modelled Wind Speed	01/08/2010	Ongoing
Modelled Wind Direction	01/08/2010	Ongoing

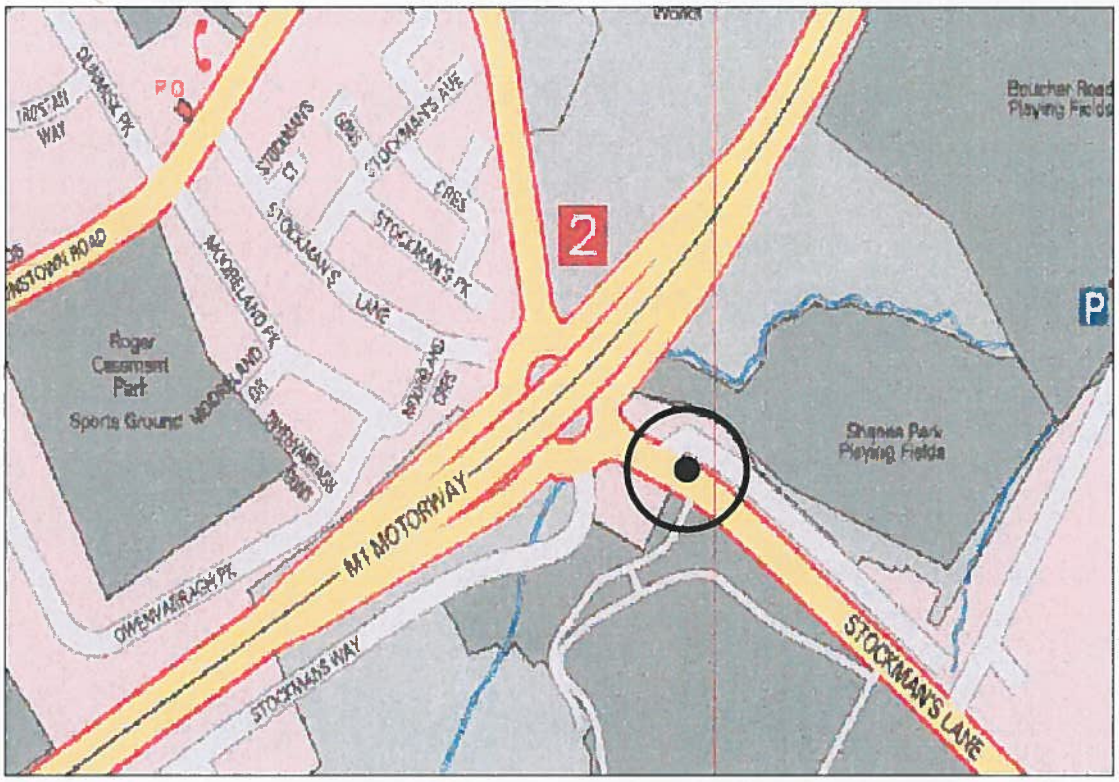

ROSEMARY ST
BANK ST
CASTLE ST
HIGH STREET
QUEEN'S SQ
ANN ST
VICTORIA ST
TOWNHALL ST
CHICHESTER ST
COLLEGE ST
WELLINGTON PL
DONEGALL SQ N
DONEGALL SQ W
DONEGALL SQ E
DONEGALL SQ S
City Hall
MAY STREET
LITTLE MAY ST
HOWARD ST
Royal Courts of Justice
Police Station

Stockmans Lane

Site Name: Belfast Stockmans Lane
Site Type: Roadside
Site Comments: Irish Grid Coords: J331004 371230

Monitoring Network: Northern Ireland Automatic Urban Network

Parameter	Date Started	Date Ended
Nitric oxide	13/04/2006	Ongoing
Nitrogen dioxide	13/04/2006	Ongoing
Nitrogen oxides as nitrogen dioxide	13/04/2006	Ongoing
PM10 particulate matter (hourly Measured)	13/04/2006	Ongoing



Upper Newtownards Road

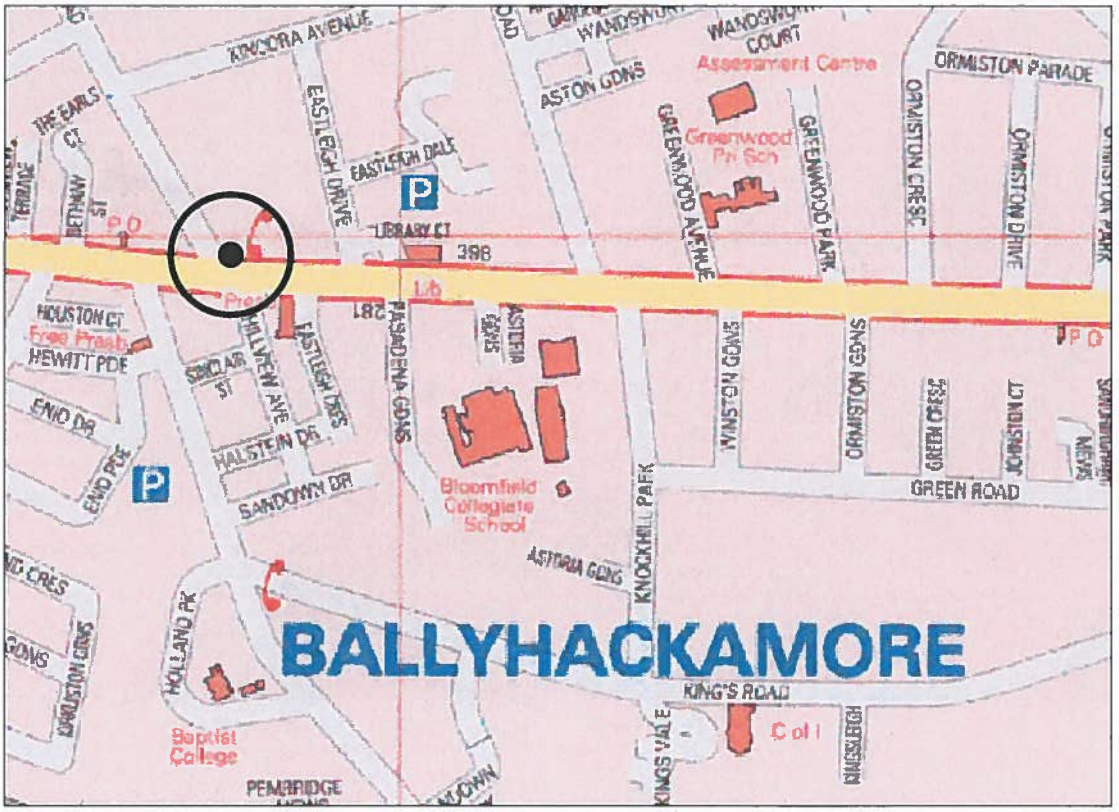
Site Name: Ballyhackamore
Site Type: Roadside
Site Comments: Irish Grid Coords: J337911 373972

Monitoring Network: Non-Automatic Hydrocarbon Network

Parameter	Date Started	Date Ended
Benzene	07/05/2002	09/10/2007

Monitoring Network: Northern Ireland Automatic Urban Network

Parameter	Date Started	Date Ended
Nitric oxide	01/04/2002	Ongoing
Nitrogen dioxide	01/04/2002	Ongoing
Nitrogen oxides as nitrogen dioxide	01/04/2002	Ongoing

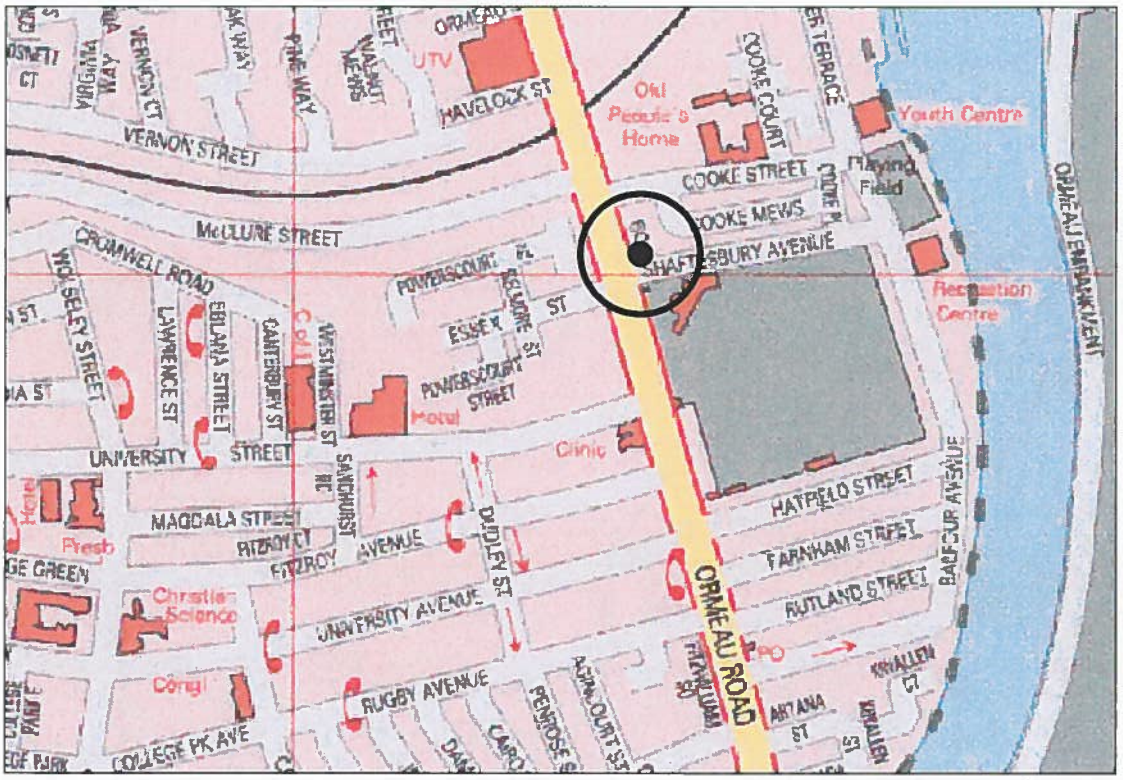


Ormeau Road

Site Name: Belfast Ormeau Road
Site Type: Roadside
Site Comments: Irish Grid Coords: J334272 373012

Monitoring Network: Northern Ireland Automatic Urban Network

Parameter	Date Started	Date Ended
Nitric oxide	24/05/2006	Ongoing
Nitrogen dioxide	24/05/2006	Ongoing
Nitrogen oxides as nitrogen dioxide	24/05/2006	Ongoing

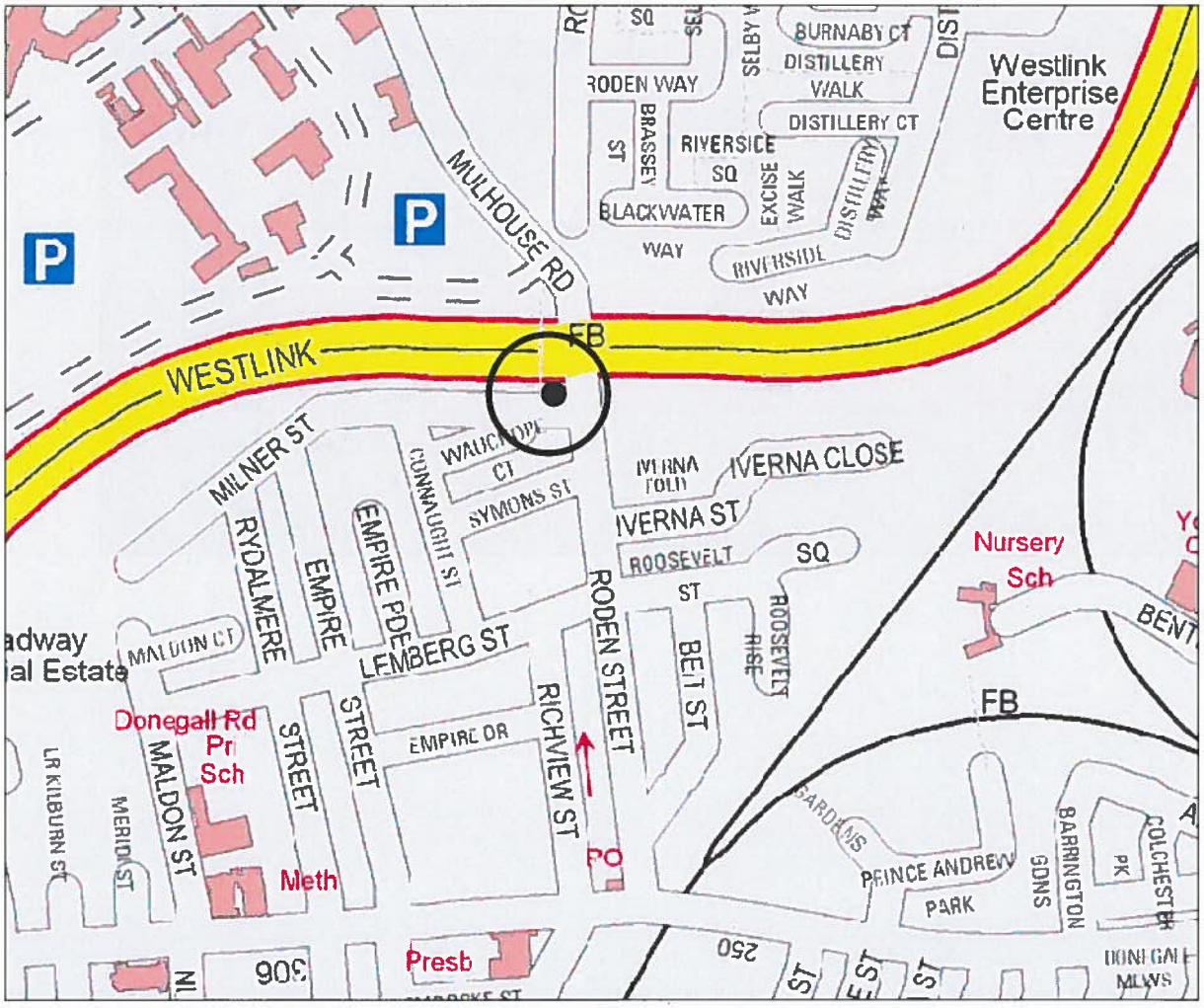


Belfast Westlink

Site Name: Belfast Westlink
Site Type: Roadside
Site Comments: Irish Grid Coords: J332546 373427

Monitoring Network: Northern Ireland Automatic Urban Network

Parameter	Date Started	Date Ended
Nitric oxide	03/03/2010	Ongoing
Nitrogen dioxide	03/03/2010	Ongoing
Nitrogen oxides as nitrogen dioxide	03/03/2010	Ongoing
PM10 particulate matter (hourly Measured)	03/03/2010	Ongoing



Appendix D: Defra NO_2 Distance Calculator Results

Queens Square Monitoring Location

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	How far from the KERB was your measurement made (in metres)?	(Note 1)	0.5	metres
Step 2	How far from the KERB is your receptor (in metres)?	(Note 1)	2	metres
Step 3	What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?	(Note 2)	27.5	$\mu g/m^3$
Step 4	What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?	(Note 2)	41	$\mu g/m^3$
Result	The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor	(Note 3)	37.7	$\mu g/m^3$

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (in practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

Issue 4 25/07/11 Created by Dr Ben Marner. Approved by Prof Duncan Laxen. Contact: benmarner@aqconsultants.co.uk

Upper Malone Road Monitoring Location

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	How far from the KERB was your measurement made (in metres)?	(Note 1)	2	metres
Step 2	How far from the KERB is your receptor (in metres)?	(Note 1)	10	metres
Step 3	What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?	(Note 2)	12	$\mu g/m^3$
Step 4	What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?	(Note 2)	44	$\mu g/m^3$
Result	The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor	(Note 3)	31.9	$\mu g/m^3$

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (in practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

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