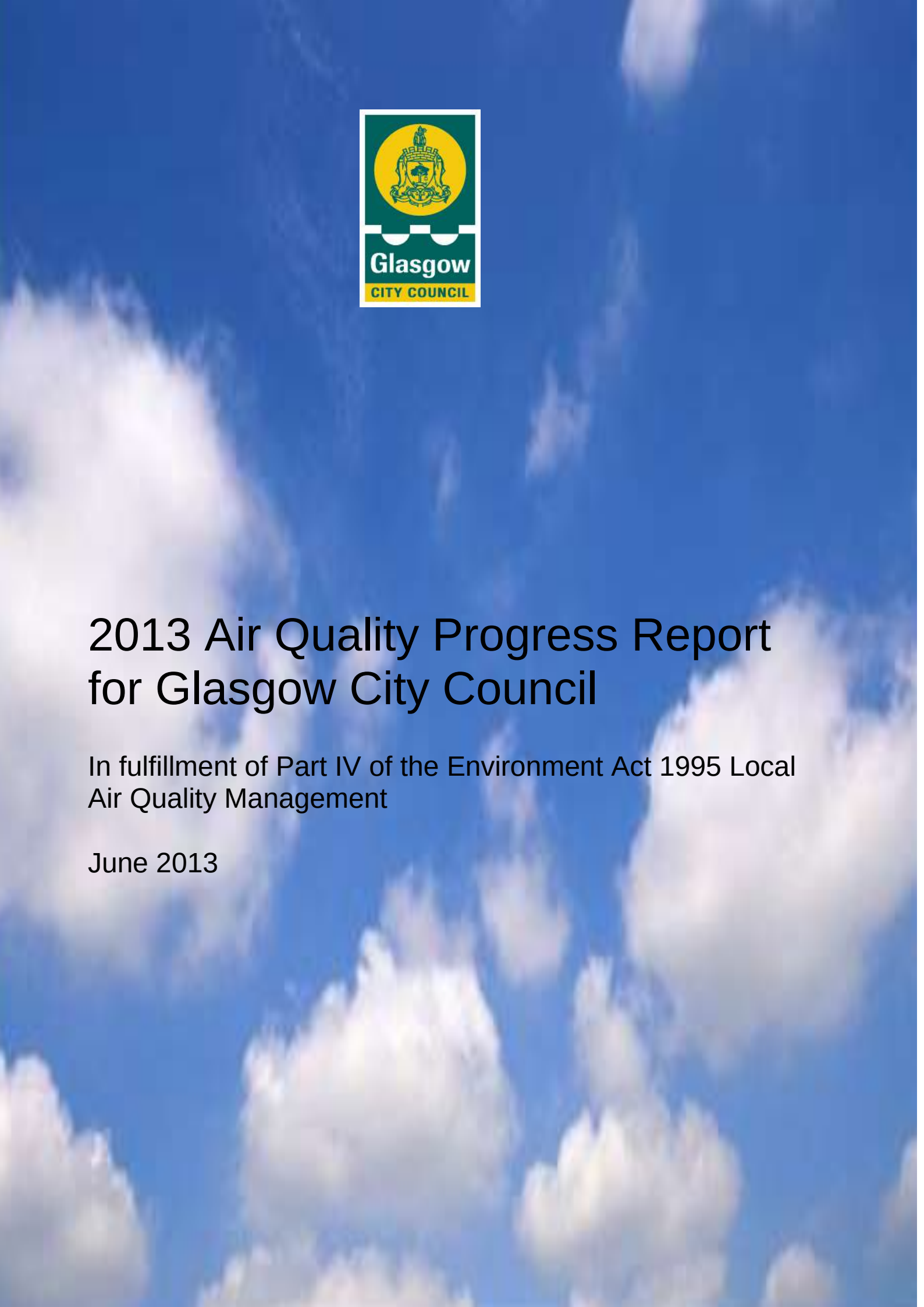

2013 Air Quality Progress Report for Glasgow City Council

In fulfillment of Part IV of the Environment Act 1995 Local Air Quality Management

June 2013

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Executive Summary

Local Authorities are required to regularly review and assess the air quality within their area of responsibility. This Review and Assessment process is the basis of local air quality management and is intended to compare current and future concentrations of key air pollutants against the objectives detailed in the regulations as part of the National Air Quality Strategy. This report comprises Glasgow City Council's Progress Report as part of Round 5 of review and Assessment. This Progress Report has looked in detail at the new monitoring data available since the last round of review and assessment as well as considering the impact from various potential sources of pollution.

Previous rounds of review and assessment have shown the potential for exceedences of the Objectives included in the Air Quality Regulations at a number of locations outwith the existing Air Quality Management Areas.

During 2012, Glasgow City Council has not measured concentrations of nitrogen dioxide above the Annual Mean Objective at any relevant locations outwith the existing City Centre AQMA, neither has the Hourly Mean Objective been exceeded at any of the automatic monitoring stations across the city.

The Annual Mean Objective for PM_{10} has also been exceeded at one of the city centre monitoring stations; the same station, Glasgow Kerbside may also have exceeded the Daily Mean Objective although data capture at this location was low, only 55%. The same objective was exceeded at one other location within the city; Glasgow Nithsdale Road. The source of this exceedence however was likely to have been building works adjacent to the monitoring station. The AQMA previously declared for PM_{10} encompasses the entire city and therefore includes both these locations.

The M74Completion opened in June 2011, extending the M74 through to the M8 motorway immediately west of the Kingston Bridge in Glasgow city centre. The Environmental Statement for this scheme concluded that a marginal non compliance with annual air quality objectives at some locations was possible. Monitoring and modelling being carried out on behalf of Transport Scotland as part of the Project Evaluation shall identify if any of these locations require further investigation.

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1.0 Introduction

1.1 Description of Local Authority Area

Glasgow City Council, serving a population of around 590,000, is Scotland's largest local authority. As the largest city in Scotland, Glasgow is a centre for business, manufacturing and retail. As such, the city attracts a large daily influx of people and traffic from the surrounding areas.

The city of Glasgow lies at the western end of the Clyde Valley which takes its name from the river which runs through the city. The Glasgow area is bounded both north and south by low hill ranges which can adversely affect air quality.

Glasgow in many ways typifies the modern developed city where road traffic tends to be the major air quality concern, superseding a long industrial heritage. The Glasgow area contains an extensive motorway network with traffic travelling to and through the area on the M8, M74, M77 and M80 motorways.

1.2 Purpose of Progress Report

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 Scotland are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre, $\mu g/m^3$ (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 Scotland.

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene (C_3H_6)	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	3.25 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide (CO)	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead (Pb)	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide (NO_2)	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 $\mu g/m^3$	Annual mean	31.12.2010
Sulphur dioxide (SO_2)	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

Glasgow's first AQMA was declared in 2004 for NO_2 within the City Centre area. Since that time further assessments have concluded that the boundary of the original AQMA required to be increased and that new AQMAs were required for Parkhead Cross and the Byres Road / Dumbarton Road areas, both declared 2007. At this time the City Centre AQMA was also amended to include the annual mean PM_{10} objective. In March 2012 further extensions were made to the City Centre and Byres Road / Dumbarton Road AQMAs, additionally the City Centre area was declared in respect of the hourly mean NO_2 objective. At this time the whole of the Glasgow area was also declared an AQMA in respect of the daily and annual mean PM_{10} objectives.

Table 1.2 shows a summary of the previous rounds of review and assessment and a brief description of the outcomes from each.

Table 1.2 Summary of Previous Rounds of Review and Assessment

Report	Date Produced	Outcome
Stage I	1998	Proceeded to Stage II for CO. Proceed to Stage III for NO_2 and PM_{10}
Stage II	2000	Concluded that levels of CO and SO_2 will meet Objectives
Stage III	2001	Recommended an AQMA be declared for the city centre for NO_2
Updating and Screening Assessment	2003	Proceeded to Detailed Assessment for NO_2, SO_2 and PM_{10}
Stage IV	2004	Confirmed city centre AQMA declared for NO_2
Detailed Assessment	2005	Recommended AQMA's be declared for NO_2 at Parkhead Cross and Dumbarton Rd / Byres Rd. Extension of city centre AQMA to Royston Rd and recommended declaration of the city centre as an AQMA for PM_{10}

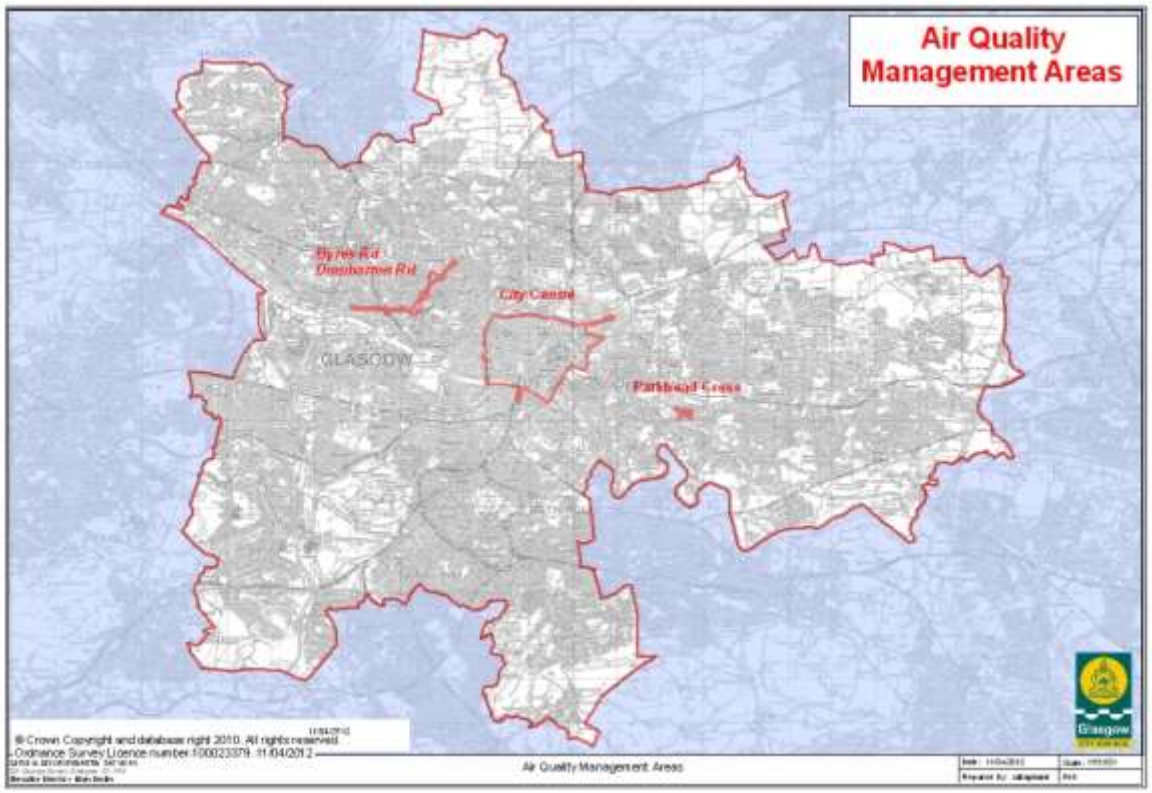
Table 1.2 Summary of Previous Rounds of Review and Assessment (Cont.)

Report	Date Produced	Outcome
Progress Report	2005	Reported on continuing monitoring and recommended new monitoring at various locations
Updating and Screening Assessment	2006	Proceeded to Detailed Assessment for NO_2 in a variety of areas. Recommended new monitoring of PM_{10} at various locations
Detailed Assessment	2007	Recommended additional NO_2 monitoring at locations of concern
Further Assessment	2008	Confirmed ongoing exceedences of the objectives in the declared AQMA's
Progress Report	2008	Confirmed ongoing exceedences of the objectives in the declared AQMA's and predicted likely exceedences of PM_{10} objectives for 2010
Updating and Screening Assessment	2009	Proceeded to Detailed Assessment for NO_2 at a variety of locations and for PM_{10} citywide
Progress Report	2010	Highlighted exceedences of NO_2 hourly objective at Glasgow Kerbside site
Detailed Assessment	2010	Recommended extension of city centre AQMA to Bridge Street for NO_2. Recommended further monitoring city wide for PM_{10} and Queen Margaret Drive for NO_2
Progress Report	2011	Confirmed exceedences at Bridge St and QMD for NO_2 and citywide for PM_{10}. Recommended new AQMA's be declared.
Updating and Screening Assessment	2012	Proceeded to Detailed Assessment for NO_2 in the Crow Road and Great Western Road areas.
Further Assessment	2013	Recommended not to proceed to an action plan in regard to the AQMA's declared in 2011 until monitoring data for 2013 becomes available.

1.5 Air Quality Management Areas

Glasgow City Council has declared three Air Quality Management Areas for Nitrogen Dioxide across the city and also for the entire Glasgow area for the daily and annual mean Particulate PM_{10} objectives. The areas are shown in Figure 1.1

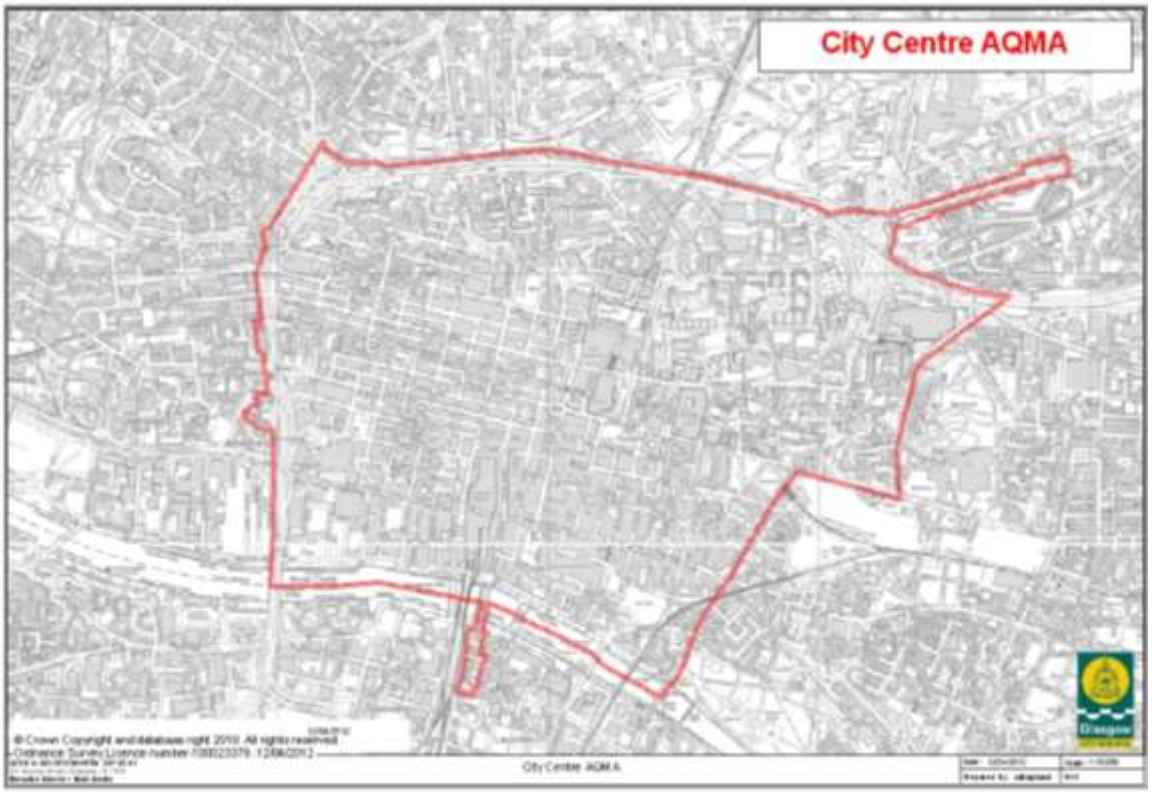
Figure 1.1 Map of AQMA Boundaries



1.5.1 City Centre Air Quality Management Area

The city centre area has been extensively developed with a large number of multi-storey properties for both commercial and residential use. The city centre AQMA is loosely bound by the M8 motorway to the west and north (with slight protrusions at North Street and Royston Road), by High Street and Saltmarket to the east and by the river Clyde to the south. This area was declared an AQMA in 2004 in respect of the annual mean NO_2 objective. In 2007 the area covered by this AQMA was extended and declared in respect of the annual mean PM_{10} objective. In 2012 a further extension of the AQMA was declared and the order amended in respect of the NO_2 hourly mean objective. The area is shown in Figure 1.2

Figure 1.2 City Centre Air Quality Management Area

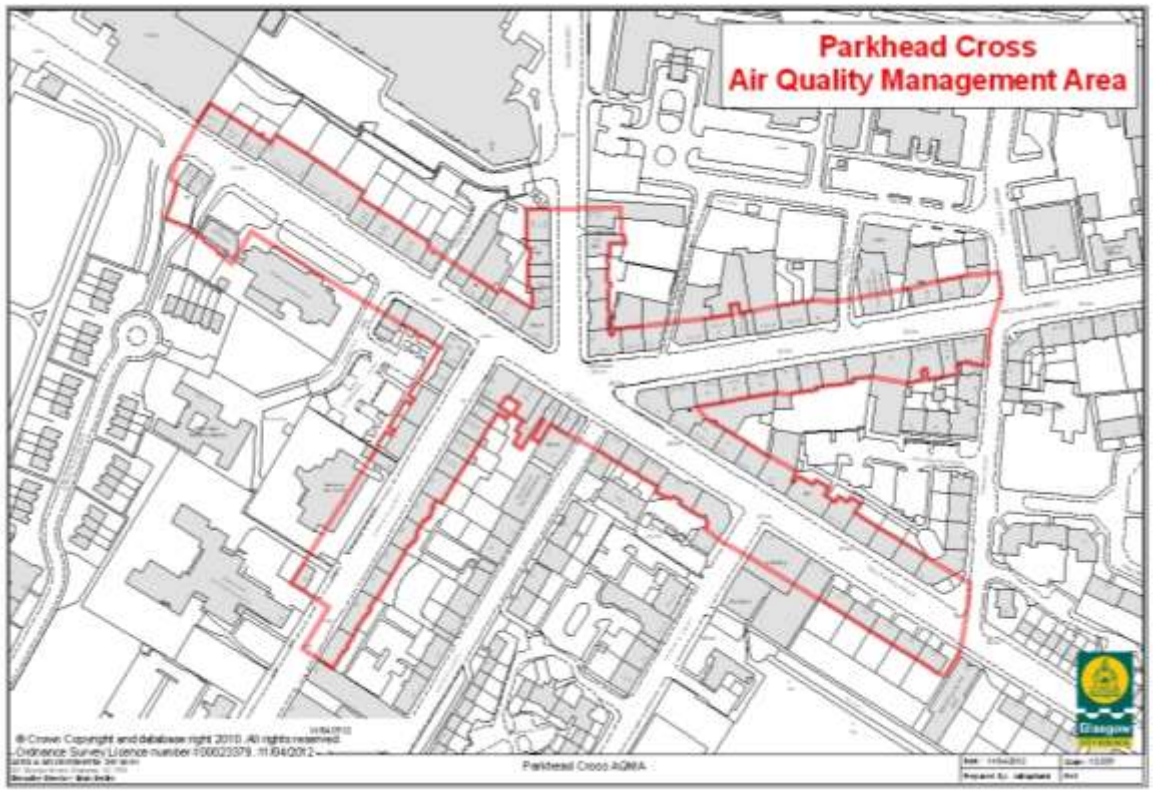


The detailed street listing for this AQMA can be found in the 1st March 2012 order.

1.5.2 Parkhead Cross Air Quality Management Area

Parkhead Cross is formed by the convergence of five roads in Glasgow's east end. The roads are Westmuir Street, Tollcross road, Springfield Road, Duke Street and Gallowgate. The area is a mixture of commercial and residential properties within mostly tenement properties. This area was declared in respect of the annual mean NO_2 objective. The area is shown in Figure 1.3.

Figure 1.3 Parkhead Cross Air Quality Management Area

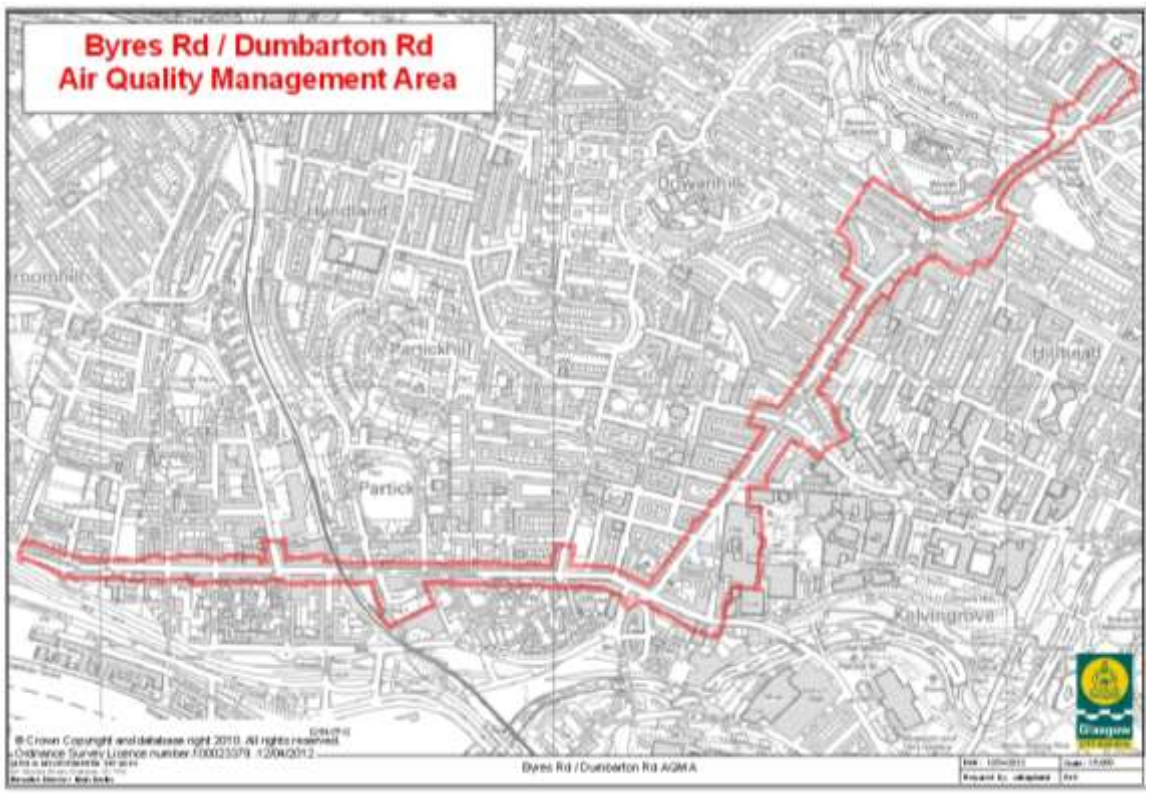


The detailed street listing for this AQMA can be found in the 1st July 2007 order.

1.5.3 Byres Road and Dumbarton Road Air Quality Management Area

Byres Road and Dumbarton Road are at the heart of Glasgow's west end and comprise a mixture of residential and commercial properties within mostly tenement type buildings. The Area covers from the junction of Byres Road and Great Western Road south to Dumbarton Road and west along Dumbarton Road as far as Thornwood Drive roundabout. This area was declared an AQMA in 2007 in respect of the annual mean NO_2 objective. In 2012 the area covered by this AQMA was extended northwards along Queen Margaret Drive to the junction with Oban Drive. The area is shown in Figure 1.4

Figure 1.4 Byres Road and Dumbarton Road Air Quality Management Area

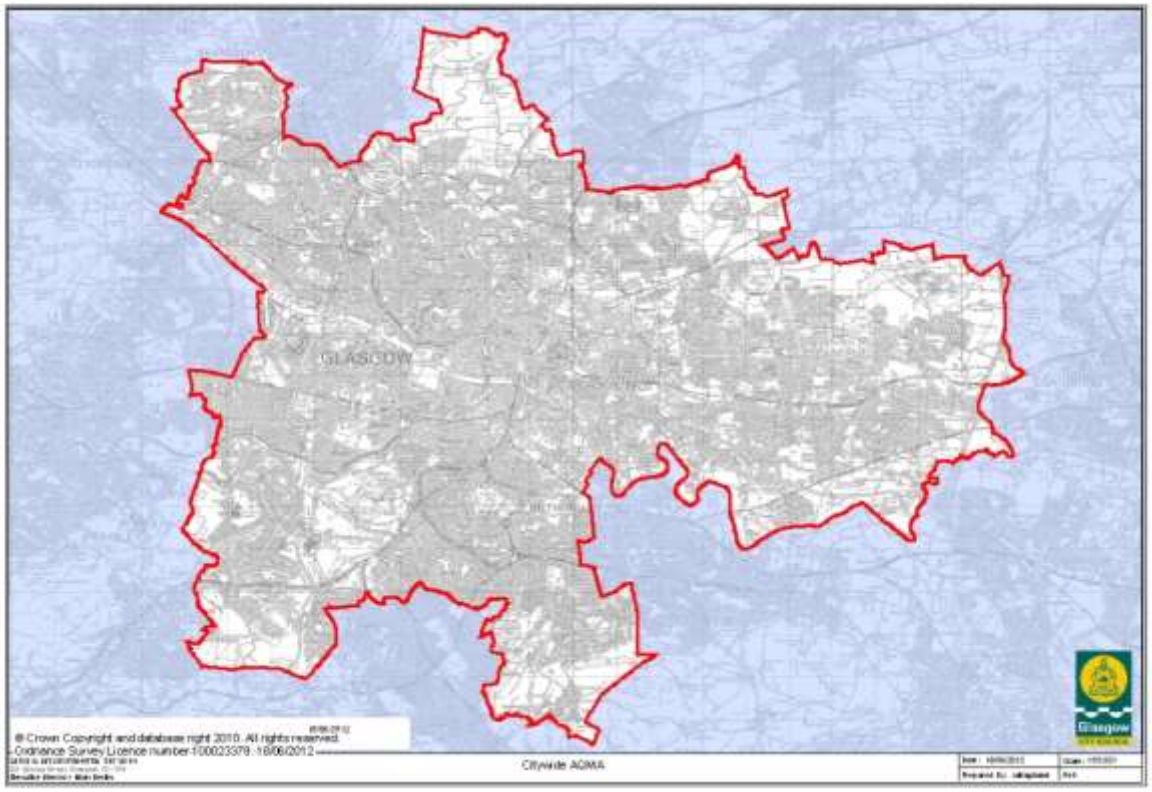


The detailed street listing for this AQMA can be found in the 1st March 2012 order.

1.5.4 Citywide Air Quality Management Area

The Citywide AQMA was declared in 2012 as a result of monitoring results showing exceedences of both the annual mean PM_{10} objective and the daily mean PM_{10} objective. Since these exceedences occurred at multiple locations across the city it was decided that the most effective strategy would be to declare the entirety of the city as an AQMA in respect of these Objectives.

Figure 1.5 Citywide Air Quality Management Area



The detailed street listing for this AQMA can be found in the 1st March 2012 order.

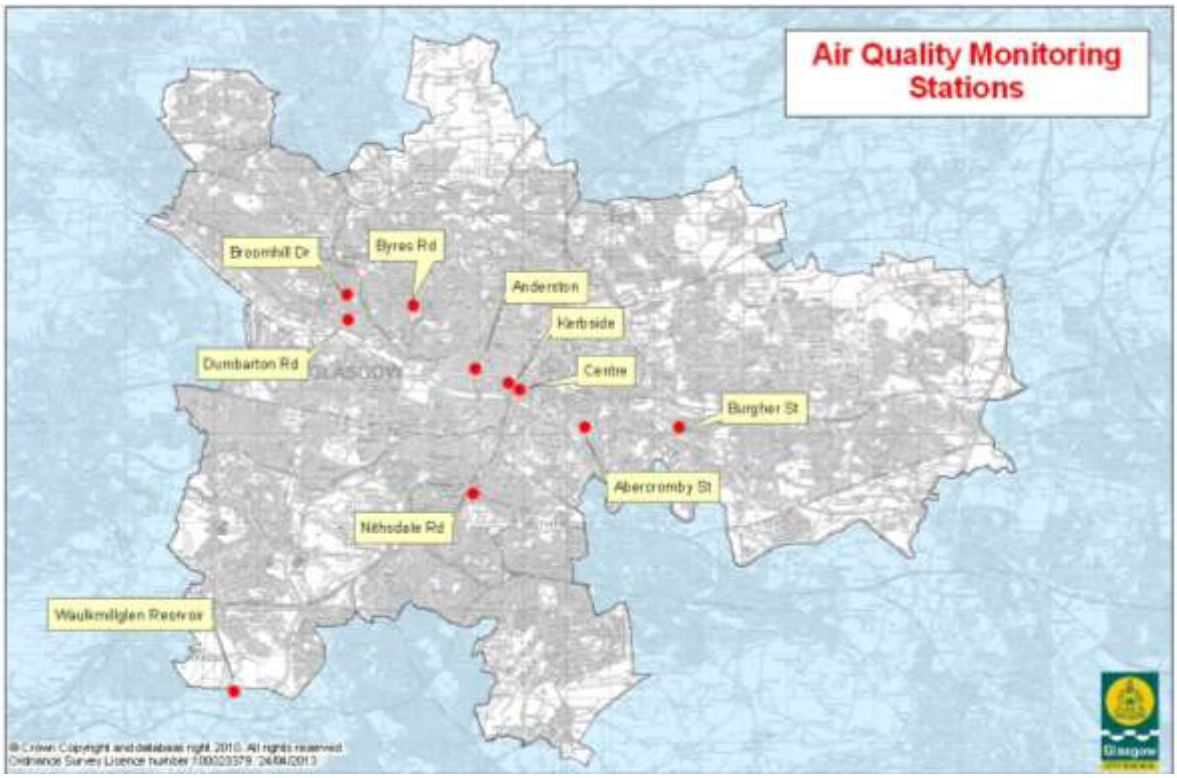
2.0 Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Glasgow City Council operates an extensive monitoring network across the city to measure ambient levels of air pollutants. During 2012, automated monitoring equipment was located at ten sites. Currently only one location Glasgow Kerbside, forms part of the Department for Environment, Food and Rural Affairs (DEFRA) Automated Urban and Rural Network (AURN). Monitoring has been discontinued at Glasgow Centre which was previously included in the AURN. DEFRA are currently in the process of relocating the Glasgow Centre station to another suitable location within the city centre area. The data obtained from Glasgow Centre prior to the station being removed has been included in Section 2.2 Comparison of Monitoring Results with Air Quality Objectives. During 2012, the monitoring station located at Battlefield was also relocated to a new position on Dumbarton Road within the Byres Road / Dumbarton Road AQMA.

Figure 2.1 Locations of Automatic Monitoring Sites



2.1.1 Automatic Monitoring Sites (Cont.)

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case Location?
Glasgow Kerbside	Kerbside	258708 665200	NO_2 PM_{10} $PM_{2.5}$	City Centre	Yes	1m	Yes
Glasgow Centre	Urban Centre	258902 665028	NO_2 PM_{10} $PM_{2.5}$ CO O_3 SO_2	City Centre	Yes	1m	Yes
Glasgow Anderston	Urban Background	257925 665487	NO_2 PM_{10} CO SO_2	City Centre	Yes	N/A	No
Glasgow Byres Road	Roadside	256526 666933	NO_2 PM_{10} CO	Byres Dumbarton	Yes	3m	Yes
Glasgow Dumbarton Road	Roadside	255030 666608	NO_2 PM_{10}	Byres Dumbarton	Yes	3m	Yes
Glasgow Burgher Street	Roadside	262550 664164	NO_2 PM_{10}	Parkhead	Yes	3m	Yes
Glasgow Abercromby Street	Roadside	260420 664175	PM_{10}	Citywide	Yes	3m	Yes
Glasgow Broomhill	Roadside	255030 667195	PM_{10}	Citywide	Yes	3m	Yes
Glasgow Nithsdale Road	Roadside	257883 662673	PM_{10}	Citywide	Yes	3m	Yes
Glasgow Waulkmillglen Reserviour	Rural	252520 658095	NO_2 PM_{10} O_3	No	No	N/A	No

2.1.1 Automatic Monitoring Sites (Cont.)

Equipment located at the sites measure a variety of air pollutants including NO_2, CO, SO_2 and Particulates. Instruments at these sites are calibrated by the Local Site Operators according to the specific site guidelines, audits are carried out every six months by AEA Technology. All of the automatic air quality data gathered is independently ratified by AEA Technology and made available for viewing by the public at the Scottish Government funded air quality website at: http://www.scottishairquality.co.uk

The automatic monitoring sites at Waulkmillglen and Dumbarton Road measure PM_{10} by standard TEOM, and the results expressed using the Volatile Correction Model adjustment, the other sites measure PM10 using FDMS TEOMs

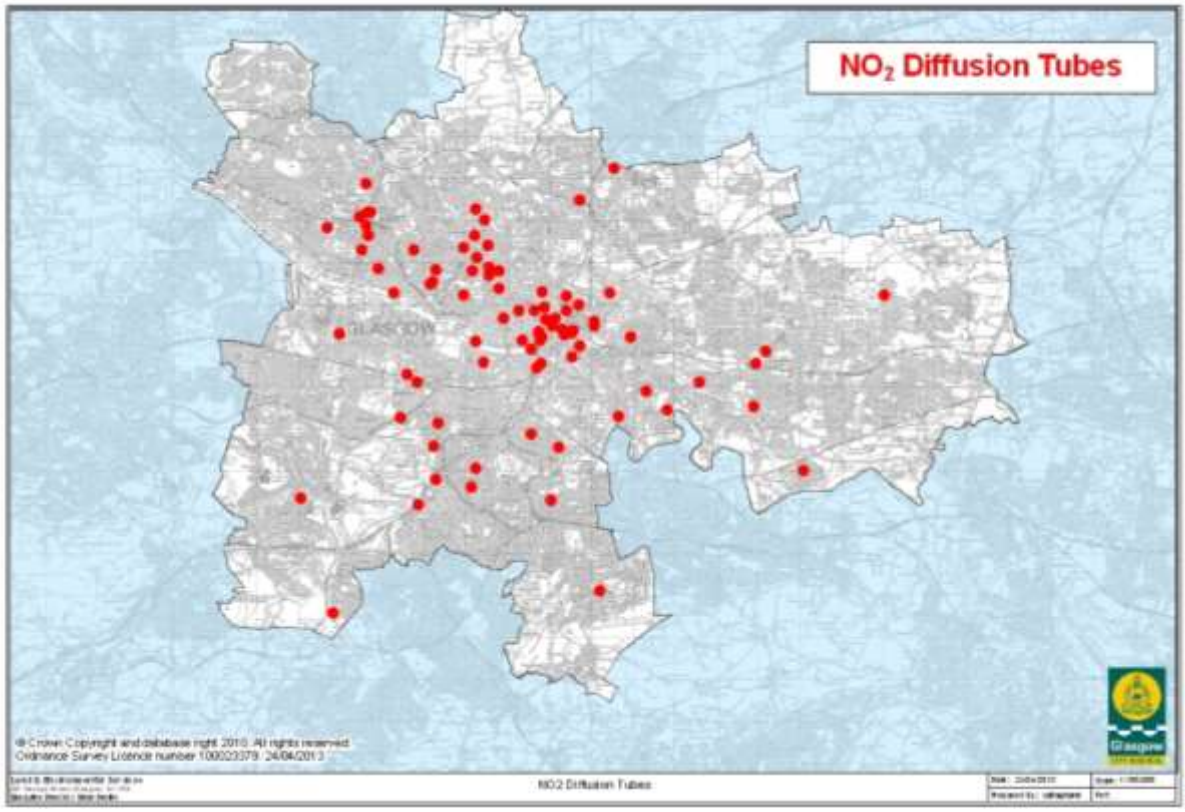
Glasgow City Council has also introduced several Osiris particulate monitors into the monitoring network across the city to measure particulate levels at areas of interest. Monitors were located at two sites during 2012. These locations Sauchiehall Street and Maryhill Road had been highlighted in the 2010 Detailed Assessment as potentially exceeding the Annual Mean Objective.

Table 2.2 Details of Osiris Particulate Monitoring Sites

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst-case Location?
Sauchiehall Street	Roadside	257605 666020	Citywide	Yes	3m	No
Maryhill Road	Urban Background	257522 667756	Citywide	Yes	>10m	No

2.1.2 Non-Automatic Monitoring Sites

Figure 2.2 Locations of Nitrogen Dioxide Diffusion Tubes



Glasgow City Council operates an extensive network of diffusion tubes measuring NO_2 levels at almost 100 sites around the city. NO_2 diffusion tubes represent a simple, effective and low cost method of monitoring ambient concentrations of NO_2 in a large number of locations.

However, NO_2 concentration data provided by diffusion tubes is limited to fairly long-term exposure. Tubes are generally exposed for periods of a month, annual mean concentrations determined and compared with the annual mean objective. Furthermore, the accuracy of diffusion tubes can vary depending on the preparation methodology, handling procedures and the identity of the analysing laboratory. To correct for this possible bias in tube data, results are corrected using information gained from co-location studies. Diffusion tubes utilised by Glasgow City Council are prepared and analysed by Glasgow City Council's Scientific Services (GSS). Triplicate tubes were co-located with automatic NO_2 analysers in Glasgow and both East and West Dunbartonshire. Concentrations obtained by both methods were compared over the same sampling period and a national factor for GSS determined. For 2012 a bias correction factor of 0.95 was calculated. This laboratory participates in both the WASP scheme and the field intercomparison exercise managed by AEA. The laboratory also follows the procedures set out in the Harmonisation Practical Guidance.

In addition to monitoring NO_2 levels, Glasgow City Council also monitor benzene by diffusion tube at four sites across the city. These analyses are also conducted by the GSS laboratory.

2.1.2 Non-Automatic Monitoring Sites (cont.)

Table 2.3 Details of Non - Automatic Nitrogen Dioxide Monitoring Sites

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst-case Location?
George Square	Urban Background	259296 665389	Yes	No (30m)	30m	No
Union Street	Roadside	258828 665204	Yes	Yes	3m	Yes
Bath Street	Roadside	258262 665851	Yes	No (3m)	3m	Yes
Glassford Street	Roadside	259361 665252	Yes	Yes	3m	Yes
Buchanan Street	Roadside	259055 665468	Yes	Yes	3m	No
Castle Street	Roadside	260068 665589	Yes	Yes	3m	No
Hope Street 3	Kerbside	258856 665940	Yes	No (5m)	1m	No
Montrose Street	Roadside	259536 665313	Yes	Yes	3m	Yes
Cochrane Street	Roadside	259430 665316	Yes	Yes	3m	Yes
Renfield Street	Roadside	258896 665637	Yes	Yes	3m	Yes
George Street	Kerbside	259551 665380	Yes	No (3m)	1m	Yes
North Street	Roadside	257906 665672	Yes	No (15m)	3m	No
Hope Street 1	Roadside	258730 665322	Yes	Yes	3m	Yes
Gordon Street	Roadside	258756 665346	Yes	No (5m)	3m	No
Heilanmans Umbrella North	Roadside	258770 665120	Yes	Yes	3m	Yes
Saltmarket	Roadside	259545 664739	Yes	Yes	3m	Yes
High Street	Roadside	259732 664991	Yes	Yes	3m	Yes

2.1.2 Non-Automatic Monitoring Sites (cont.)

Table 2.3 Details of Non - Automatic Nitrogen Dioxide Monitoring Sites (Cont.)

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst-case Location?
Dobbies Loan	Urban Background	259415 666194	Yes	Yes	3m	No
Cathedral Bridge	Roadside	259136 665661	Yes	No (10m)	3m	No
Dundasvale Street	Urban Background	258820 666306	Yes	Yes	15m	No
Royston Road	Roadside	260429 666264	Yes	No (5m)	3m	No
St Mungo Avenue	Urban Background	259392 665866	Yes	Yes	5m	Yes
Brown Street	Roadside	258336 665122	Yes	Yes	3m	No
Broomielaw	Roadside	258562 664933	Yes	No (5m)	3m	No
McLeod Street	Urban Background	260077 665481	Yes	Yes	8m	No
Sauchiehall Street	Urban Background	258639 665852	Yes	No (10m)	N/A	No
Kennedy Path	Urban Background	259701 665983	Yes	Yes	10m	No
Dumbarton Road	Roadside	256209 666525	Yes	No (3m)	3m	Yes
Lawrence Street	Roadside	256295 666816	Yes	No (5m)	2m	No
Cooperswell Street	Roadside	256154 666478	Yes	Yes	4m	Yes
Westmuir Street	Roadside	262589 664139	Yes	Yes	3m	Yes
Mosside Road	Roadside	257235 662064	No	No (3m)	3m	Yes
Bridge Street	Roadside	258702 664480	Yes	No (3m)	3m	Yes
Finnieston Street	Roadside	257235 665108	No	No (5m)	3m	Yes

2.1.2 Non-Automatic Monitoring Sites (cont.)

Table 2.3 Details of Non - Automatic Nitrogen Dioxide Monitoring Sites (Cont.)

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst-case Location?
Hillcrest Road	Roadside	265075 662001	No	No (5m)	3m	No
St Andrews Drive	Urban Background	256229 662587	No	Yes	N/A	No
Haggs Road	Roadside	256295 661792	No	Yes	3m	Yes
Pollokshaws Road	Roadside	255864 661180	No	Yes	5m	No
Queen Margaret Drive	Roadside	257435 668015	No	No (20m)	3m	Yes
Napiershall Street	Roadside	257790 666791	No	Yes	4m	Yes
Queen Margaret Drive 2	Roadside	257216 667639	Yes	Yes	3m	Yes
Queen Margaret Drive 3	Roadside	257012 667433	Yes	Yes	3m	No
Oxford Street	Roadside	258798 664570	No	Yes	3m	No
Anniesland Cross	Roadside	254613 668886	No	Yes	15m	No
Balshagray Avenue	Roadside	254498 667291	No	Yes	10m	No
Dougrie Road	Roadside	260203 659128	No	No (20m)	3m	Yes
Main Street (Bridgeton)	Roadside	260650 663319	No	Yes	5m	Yes
Aikenhead Road	Roadside	259225 662579	No	Yes	6m	Yes
Langside Primary School	Roadside	257138 661617	No	No (5m)	3m	No
Thornwood Drive	Roadside	254903 666855	No	Yes	3m	No
Springburn Road	Roadside	260541 669268	No	Yes	6m	Yes

2.1.2 Non-Automatic Monitoring Sites (cont.)

Table 2.3 Details of Non - Automatic Nitrogen Dioxide Monitoring Sites (Cont.)

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst-case Location?
Paisley Road West	Roadside	255599 664313	No	Yes	3m	Yes
Sutherland Avenue	Urban Background	256343 663153	No	No (10m)	5m	No
Belmont Street	Roadside	257533 667418	No	No (5m)	3m	Yes
Mallaig Place	Urban background	253989 665298	No	No (20m)	6m	No
Govanhill Street	Roadside	258678 662901	No	No (3m)	3m	No
Westercraigs	Urban Background	260942 665226	No	Yes	15m	No
Inveresk Lane	Urban Background	264163 664856	No	Yes	20m	No
Kippen Street	Urban Background	259731 668488	No	No (5m)	3m	No
Sacone SW	Urban background	263920 664569	No	Yes	20m	No
Invergarrie Road	Urban Background	253821 658590	No	No (5m)	3m	No
Easterhouse	Roadside	267005 666217	No	Yes	5m	No
Dunn Street	Urban Background	261305 663928	No	Yes	5m	No
Glasgow Harbour	Urban Background	255287 666276	No	Yes	30m	No
Mosspark Boulevard	Urban Background	255436 663274	No	Yes	15m	No
Crow Road	Roadside	254640 254730	No	Yes	3m	Yes
Silverburn	Roadside	253047 661349	No	Yes	5m	No
Hyndland Road	Roadside	255764 667297	No	Yes	4m	No

2.1.2 Non-Automatic Monitoring Sites (cont.)

Table 2.3 Details of Non - Automatic Nitrogen Dioxide Monitoring Sites (Cont.)

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst-case Location?
Urrdale Road	Urban Background	255826 664118	No	Yes	N/A	No
Park Road	Roadside	257555 666896	No	Yes	3m	Yes
Springfield Road	Roadside	261823 663468	No	Yes	3m	No
Paisley Rd West 2	Roadside	257415 664616	No	Yes	3m	Yes
Crow Road 2	Roadside	254606 667894	No	Yes	3m	Yes
Maryhill Road	Roadside	257243 668285	No	Yes	3m	Yes
Scotstoun	Urban Background	253592 667771	No	Yes	>10m	No
Hampden	Urban Background	259038 661285	No	Yes	3m	No
Kelvingrove Park	Roadside	256950 666229	No	No	3m	No
Tollcross Park	Roadside	263864 663544	No	Yes	3m	No

Table 2.4 Details of Non - Automatic Benzene Monitoring Sites

Site Name	Site Type	OS Grid Ref	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst-case Location?
Heilanmans Umbrella North	Roadside	258770 665121	Yes	Yes	3m	Yes
Hope Street	Kerbside	258738 665167	Yes	No (3m)	<1m	Yes
Ochiltree Avenue	Roadside	254839 669295	No	No (3m)	5m	Yes
Pollokshaws Road	Roadside	255869 661185	No	No (3m)	3m	Yes

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

2.2.1.1 Automatic Monitoring Data

Nitrogen dioxide is monitored using automatic analysers at six locations; the Kerbside AURN site, Glasgow Anderson, Byres Road, Burgher Street, Dumbarton Road and Waulkmillglen reservoir. Objectives have been set for both the Annual Mean and an Hourly Mean. Table 2.5 shows the measured annual mean at these locations over the last five years. Data obtained from Glasgow Centre prior to the station being removed has been included, no data was obtained for NO_2 at Dumbarton Road.

Table 2.5 Results of Automatic Monitoring for Nitrogen Dioxide Comparison with Annual Mean Objective (40μg/m^3)

Site Name	Within AQMA?	Relevant Public Exposure	Valid Data Capture 2012 %	Annual Mean Concentration μg/m^3				
				2008	2009	2010	2011	2012
Glasgow Kerbside	City Centre	Yes	91	82	78	84	72	72
Glasgow Centre	City Centre	Yes	61	35	42	44	34	32
Glasgow Anderston	City Centre	Yes	95	32	36	38	36	33
Glasgow Byres Road	Byres / Dumbarton	Yes	87	43	40	47	42	39
Glasgow Burgher Street	Parkhead	Yes	86	-	-	-	35	34
Glasgow Waulkmillglen Reservoir	No	No	64	12	12	16	11	12

During 2012 the only location where the Annual Mean Objective was exceeded was Glasgow Kerbside. Figure 2.3 following, displays the five year trend at these locations. Whilst Glasgow Kerbside continually breaches the Annual Mean Objective, the trend displayed at Byres Road now shows NO_2 concentrations dropping below the Objective.

2.2.1.1 Automatic Monitoring Data (Cont.)

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

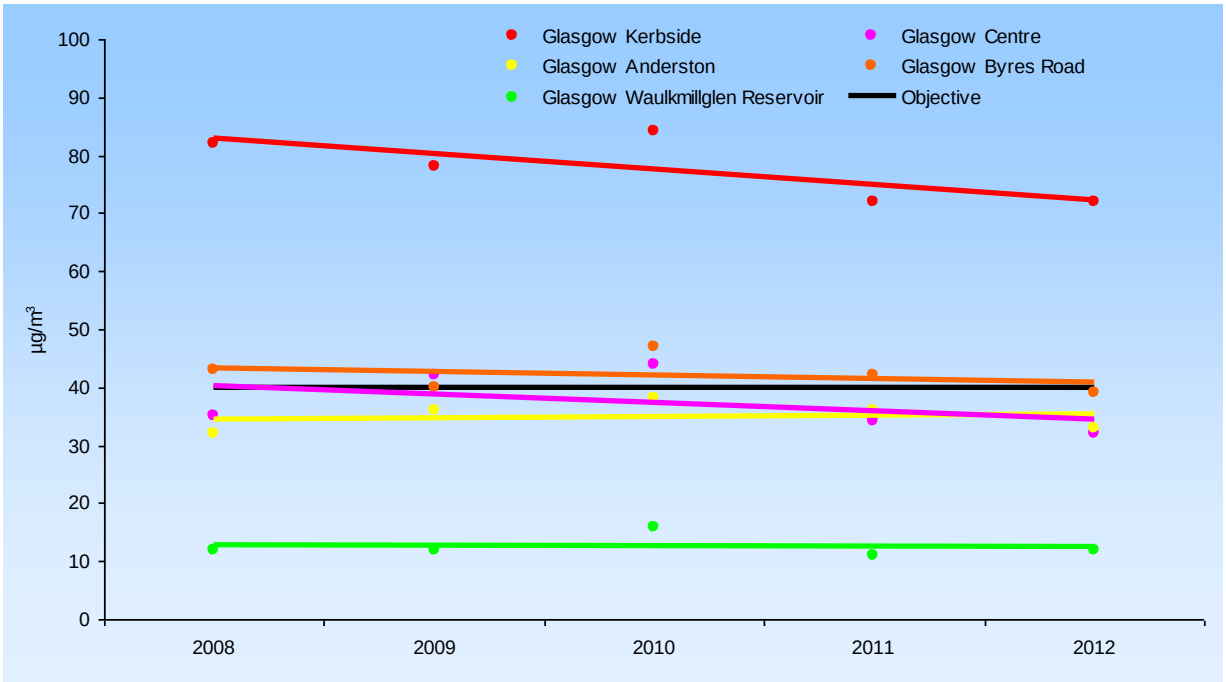


Table 2.6 shows the number of exceedences of the 200µg/m^3 hourly objective over the last five years. During 2012, the permitted number of exceedences (18) of the Objective was not exceeded.

Table 2.6 Results of Automatic Monitoring for Nitrogen Dioxide Comparison with Hourly Mean Objective

Site Name	Within AQMA?	Relevant Public Exposure	% Valid Data Capture 2012	Number of Exceedences of Hourly Mean Objective (200 µg/m^3) (99.8th Percentile of Hourly Means) if % Valid Data Capture < 90%				
				2008	2009	2010	2011	2012
Glasgow Kerbside	City Centre	Yes	91	72	57	97	31	17
Glasgow Centre	City Centre	Yes	61	0 (175)	48	56	0	0 (132)
Glasgow Anderston	City Centre	Yes	95	1 (137)	4	16(204)	4	4
Glasgow Byres Road	Byres / Dumbarton	Yes	87	6	0	14	0(145)	7 (168)
Glasgow Burgher Street	Parkhead	Yes	86	-	-	-	52(338)	0 (153)
Glasgow Waulkmillglen Reservoir	No	No	64	0 (87)	0	0	0	0 (109)

2.2.1.2 Non Automatic Monitoring Data

Monitoring for NO2 by diffusion tube is currently carried out at 27 locations within the City Centre Air Quality Management Area the results of which are shown in Table 2.7 below. Figure 2.4 following shows five year trends based on the average value from those tubes classified as urban background and roadside.

Table 2.7 Results of Diffusion Tube Monitoring for Nitrogen Dioxide Within City Centre AQMA Comparison with Annual Mean Objective (40μg/m^3)

Site Name	Data Collection 2012 (%)	Annual Mean Concentration (μg/m^3) (Bias Adjustment)				
		2008 (0.87)	2009 (1.09)	2010 (1.10)	2011 (0.94)	2012 (0.95)
Union Street	100	66	61	72	64	63
Bath Street	92	60	53	56	51	44
Glassford Street	100	67	51	51	48	44
Buchanan Street	92	-	-	59	46	45
Castle Street	100	40	32	40	35	34
Hope Street 3	67	62	57	61	55	50
Montrose Street	83	41	42	47	42	39
Cochrane Street	50	-	44	54	42	38
Renfield Street	92	66	54	60	59	60
George Street	83	57	53	51	47	45
North Street	83	44	40	40	30	26
Hope Street 1	83	83	64	91	76	73

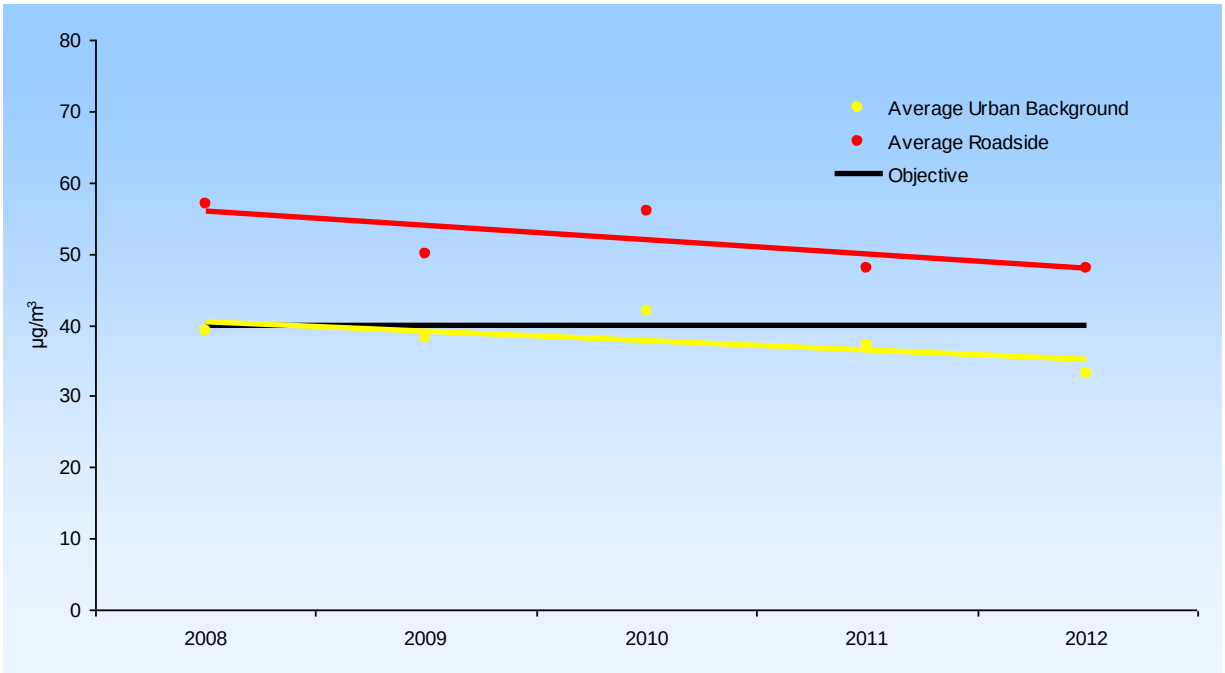
2.2.1.2 Non Automatic Monitoring Data (Cont.)

Table 2.7 Results of Diffusion Tube Monitoring for Nitrogen Dioxide Within City Centre AQMA (cont.) Comparison with Annual Mean Objective (40μg/m^3)

Site Name	Data Collection 2012 (%)	Annual Mean Concentration (μg/m^3) (Bias Adjusted)				
		2008 (0.87)	2009 (1.09)	2010 (1.10)	2011 (0.94)	2012 (0.95)
Gordon Street	67	-	-	-	-	70
Heilanmans Umbrella North	100	91	76	84	68	59
Saltmarket	100	47	43	48	42	36
High Street	100	58	54	57	49	43
Dobbies Loan	92	31	32	33	31	28
Cathedral Bridge	50	59	60	59	53	100
Dundasvale Street	67	35	36	39	-	34
Royston Road	92	49	42	44	45	34
St Mungo Avenue	100	35	38	42	34	31
Brown Street	92	40	32	38	31	28
Broomielaw	67	54	51	51	40	33
McLeod Street	100	39	39	40	35	35
Sauchiehall Street	92	51	46	51	51	38
Kennedy Path	100	36	31	37	27	27
Bridge Street	100	50	43	43	39	35

2.2.1.2 Non Automatic Monitoring Data (Cont.)

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentration Within City Centre AQMA Comparison with Annual Mean Objective (40μg/m^3)



Monitoring for NO2 by diffusion tube is currently carried out at 5 locations within the Byres Road / Dumbarton Road City Centre Air Quality Management Area. There were no exceedences of the Annual Mean Objective during 2012 the results of which are shown in Table 2.8.

Table 2.8 Results of Diffusion Tube Monitoring for Nitrogen Dioxide Within the Byres Road / Dumbarton Road AQMA Comparison with Annual Mean Objective (40μg/m^3)

Site Name	Data Collection 2012 (%)	Annual Mean Concentration (μg/m^3) (Bias Adjusted)				
		2008 (0.87)	2009 (1.09)	2010 (1.10)	2011 (0.94)	2012 (0.95)
Dumbarton Road	92	38	40	37	32	33
Lawrence Street	92	33	30	31	26	25
Cooperswell Street	92	33	27	32	27	23
Queen Margaret Drive 3	100	39	45	46	42	36
Queen Margaret Drive 2	100	42	39	41	36	31

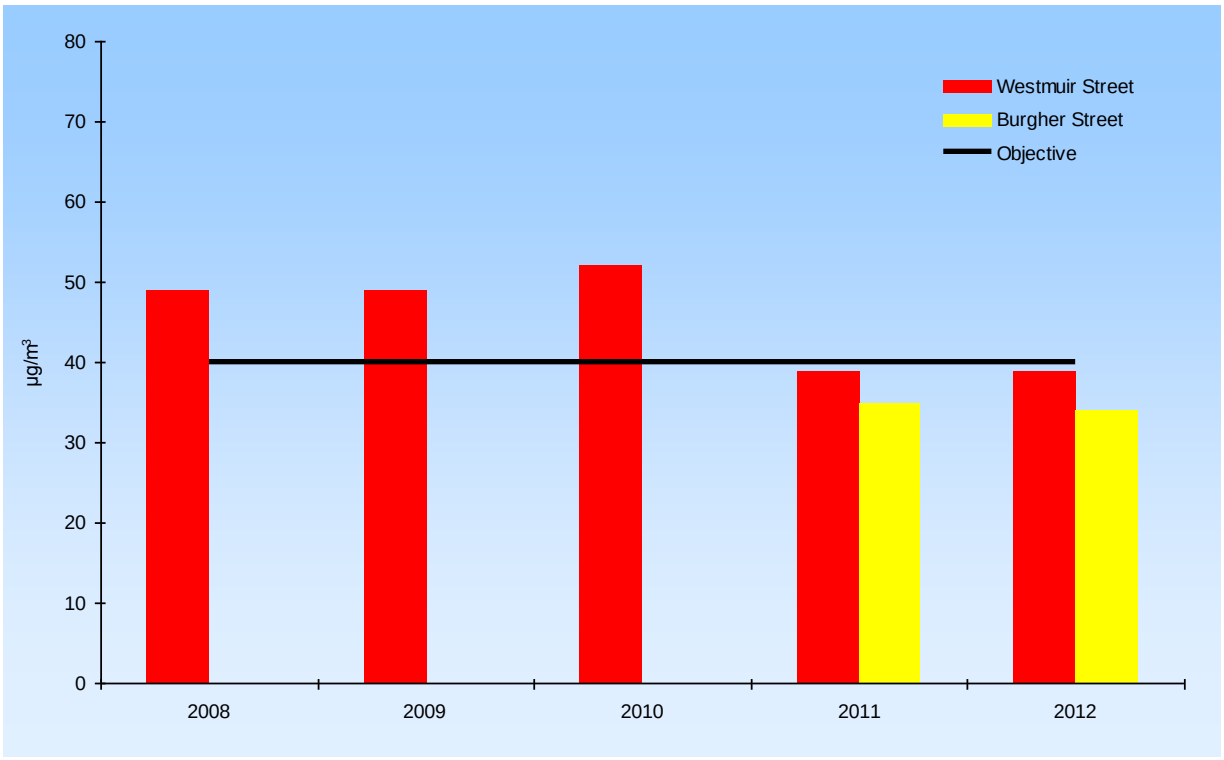
2.2.1.2 Non Automatic Monitoring Data (Cont.)

Monitoring for NO2 by diffusion tube is currently carried out at a single location within the Parkhead Cross Air Quality Management Area. The Annual Mean Objective was not exceeded during 2012, results from this location are shown in Table 2.9. For comparison Figure 2.5 also shows the annual mean concentration from the automatic monitoring station at Burgher Street which is also located within this AQMA.

Table 2.9 Results of Diffusion Tube Monitoring for Nitrogen Dioxide Within Parkhead Cross AQMA Comparison with Annual Mean Objective (40μg/m^3)

Site Name	Data Collection 2012 (%)	Annual Mean Concentration (μg/m^3) Bias Adjusted				
		2008 (0.87)	2009 (1.09)	2010 (1.10)	2011 (0.94)	2012 (0.95)
Westmuir Street	100	49	49	52	39	39

Figure 2.5 Annual Mean Nitrogen Dioxide Concentrations Within Parkhead Cross AQMA Comparison with Annual Mean Objective (40μg/m^3)



2.2.1.2 Non Automatic Monitoring Data (Cont.)

Monitoring for NO_2 by diffusion tube is extensively carried out across the Glasgow Area at locations outwith Air Quality Management Areas. The Annual Mean Objective was not exceeded at any of these locations during 2012; monitoring results are shown in Table 2.10.

Table 2.10 Results of Diffusion Tube Monitoring for Nitrogen Dioxide Outwith the Existing AQMA's Comparison with Annual Mean Objective (40μg/m^3)

Site Name	Data Collection 2012 (%)	Annual Mean Concentration (μg/m^3) Bias Adjusted				
		2008 (0.87)	2009 (1.09)	2010 (1.10)	2011 (0.94)	2012 (0.95)
Mosside Road	100	35	36	37	29	26
Finnieston Street	92	48	37	39	35	32
Hillcrest Road	100	22	26	26	19	21
St Andrews Drive	100	22	21	24	22	18
Haggs Road	100	36	36	36	36	32
Pollokshaws Road	100	27	27	29	32	20
Queen Margaret Drive	100	32	35	34	30	27
Napiershall Street	100	37	35	40	31	30
Oxford Street	100	32	38	37	34	29
Anniesland Cross	100	39	29	35	34	26
Balshagray Avenue	100	30	32	33	26	25
Dougrie Road	100	23	23	25	20	20
Main Street (Bridgeton)	100	25	27	28	23	23
Aikenhead Road	100	29	27	31	23	27
Langside Primary School	75	22	24	25	18	22
Thornwood Drive	100	25	26	29	21	18
Springburn Road	100	30	31	37	30	22

2.2.1.2 Non Automatic Monitoring Data (Cont.)

Table 2.10 Results of Diffusion Tube Monitoring for Nitrogen Dioxide Outwith the Existing AQMA's (cont.) Comparison with Annual Mean Objective (40μg/m^3)

Site Name	Data Collection 2012 (%)	Annual Mean Concentration (μg/m^3) Bias Adjusted				
		2008 (0.87)	2009 (1.09)	2010 (1.10)	2011 (0.94)	2012 (0.95)
Paisley Road West	100	37	33	42	31	33
Sutherland Avenue	100	21	20	23	16	18
Belmont Street	100	26	28	31	23	21
Mallaig Place	100	29	27	29	23	19
Govanhill Street	100	30	31	32	28	26
Westercraigs	83	27	25	26	22	24
Inveresk Lane	100	20	20	28	18	18
Kippen Street	83	21	28	27	29	22
Sacone SW	100	21	22	27	21	21
Invergarrie Road	100	16	19	23	18	17
Easterhouse	100	21	20	22	20	19
Dunn Street	59	26	23	31	20	20
Glasgow Harbour	100	27	28	34	28	25
Mosspark Boulevard	100	26	28	30	27	25
Crow Road	100	-	-	45	44	37
Silverburn	100	-	23	23	21	23
Hyndland Road	100	-	32	35	31	27
Urrdale Road	100	-	-	41	31	31
Park Road	100	-	-	-	40	31

2.2.1.2 Non Automatic Monitoring Data (Cont.)

Table 2.10 Results of Diffusion Tube Monitoring for Nitrogen Dioxide Outwith the Existing AQMA's (cont.) Comparison with Annual Mean Objective (40μg/m^3)

Site Name	Data Collection 2012 (%)	Annual Mean Concentration (μg/m^3) Bias Adjusted				
		2008 (0.87)	2009 (1.09)	2010 (1.10)	2011 (0.94)	2012 (0.95)
Springfield Road	92	-	-	-	30	25
Paisley Road West 2	100	-	-	-	-	37
Crow Road 2	92	-	-	-	-	28
Maryhill Road	58	-	-	-	-	40
Scotstoun	83	-	-	-	-	19
Hampden	67	-	-	-	-	18
Kelvingrove Park	50	-	-	-	-	29
Tollcross Park	50	-	-	-	-	30

2.2.2 Particulate Material at PM_{10}

Particulate Material (PM_{10}) is monitored using automatic analysers at nine locations across Glasgow, the Kerbside AURN site, the air quality stations at Glasgow Anderson, Byres Road, Burgher Street, Dumbarton Road and Waulkmillglen reservoir and three Particulate (PM_{10}) only locations at Abercromby Street, Broomhill and Nithsdale Road. Objectives have been set for both the Annual Mean and a 24 Hour Mean. Table 2.11 shows the measured annual mean at these locations over the last five years. Data obtained from Glasgow Centre prior to the station being removed has been included.

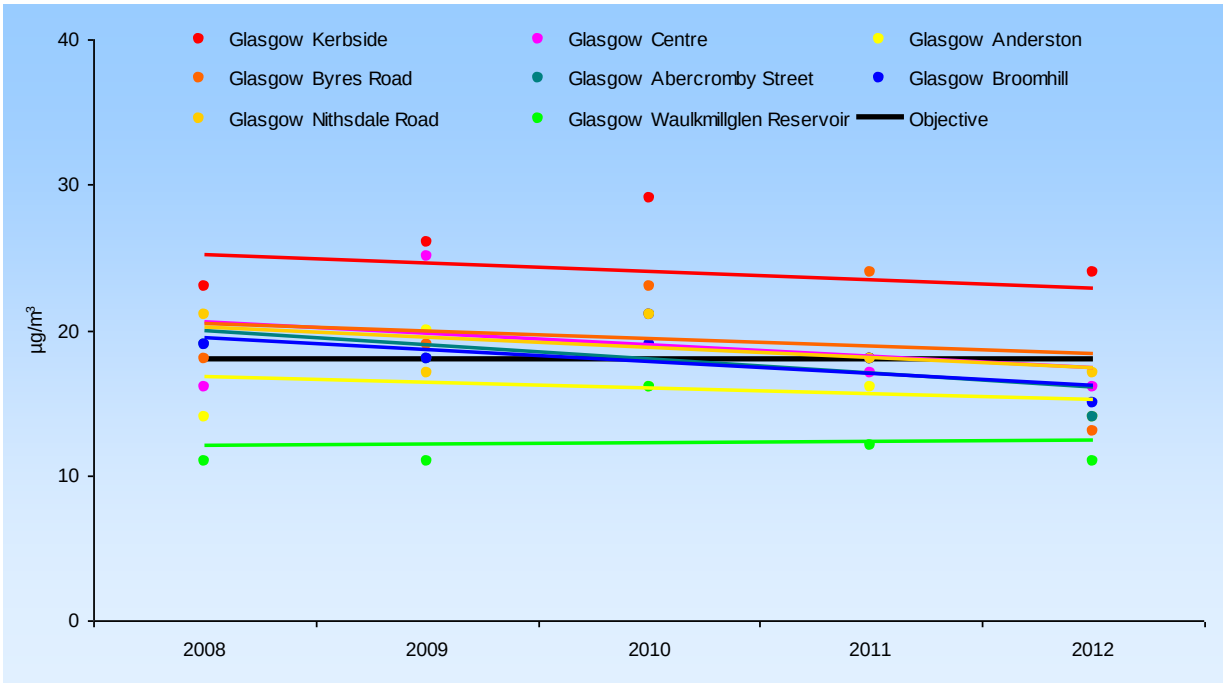
Table 2.11 Results of PM_{10} Automatic Monitoring Comparison with Annual Mean Objective (18 μg/m^3)

Site Name	Within AQMA?	Gravimetric Equivalent	% Valid Data Capture 2012	Annual Mean Concentration (μg/m^3)				
				2008	2009	2010	2011	2012
Glasgow Kerbside	Yes	Yes	55	23	26	29	18	24
Glasgow Centre	Yes	Yes	61	16	25	21	17	16
Glasgow Anderston	Yes	Yes	78	14	20	16	16	14
Glasgow Byres Road	Yes	Yes	81	18	19	23	24	13
Glasgow Dumbarton Road	Yes	Yes	64	-	-	-	-	18
Glasgow Burgher Street	Yes	Yes	97	-	-	-	-	15
Glasgow Abercromby Street	Yes	Yes	93	19	18	21	18	14
Glasgow Broomhill	Yes	Yes	95	19	18	19	18	15
Glasgow Nithsdale Road	Yes	Yes	95	21	17	21	18	17
Glasgow Waulkmillglen Reservoir	No	Yes	78	11	11	16	12	11

During 2012, the Annual Mean Objective was exceeded at one location, Glasgow Kerbside. The % data capture however at this site was only 55%. Figure 2.6 following, shows the generally decreasing trend at these locations over the previous five year period.

2.2.2 Particulate Material at PM_{10} (Cont.)

Figure 2.6 Trends in Annual Mean PM_{10} Concentration from Automatic Monitoring Comparison with Annual Mean Objective (18μg/m^3)



As shown in Table 2.12 below, neither of the two Osiris monitoring locations exceeded the Annual Mean Objective.

Table 2.12 Results of Osiris PM_{10}, Monitoring Comparison with Annual Mean Objective (18 μg/m^3)

Site Name	Within AQMA?	Gravimetric Equivalent	% Valid Data Capture 2012	Annual Mean Concentration (μg/m^3)
Sauchiehall Street	Yes	No	65	16
Maryhill Road	Yes	No	85	14

2.2.2 Particulate Material at PM_{10} (Cont.)

During 2012, the Daily Mean Objective was exceeded at one location, Glasgow Nithsdale Road. Whilst AEA have accepted this data as valid, the source responsible for most of the exceedences was likely to have been adjacent building work. Additionally, the 98th percentile value obtained at Glasgow Kerbside suggests that the Objective would also have been exceeded at this location if the data capture had been at least 90%. Table 2.13 shows the exceedences of the Daily Mean Objective over the last five years.

Table 2.13 Results of PM_{10} Automatic Monitoring Comparison with 24 hour Mean Objective (50 μg/m^3)

Site Name	Within AQMA?	Gravimetric Equivalent	% Valid Data Capture 2012	Number of Exceedences of Daily Mean Objective (98th Percentile of Daily Means) if % Valid Data Capture < 90%				
				2008	2009	2010	2011	2012
Glasgow Kerbside	Yes	Yes	55	10	18	25	0(28)	7(59)
Glasgow Centre	Yes	Yes	61	0	21	7(80)	2	3(39)
Glasgow Anderston	Yes	Yes	78	1	12	4(45)	2(25)	3(39)
Glasgow Byres Road	Yes	Yes	81	1	2	9	2(40)	3(37)
Glasgow Dumbarton Road	Yes	Yes	64	-	-	-	-	2(39)
Glasgow Burgher Street	Yes	Yes	97	-	-	-	-	4
Glasgow Abercromby Street	Yes	Yes	93	9	7	9(60)	9	4
Glasgow Broomhill	Yes	Yes	95	8	7	9	6	6
Glasgow Nithsdale Road	Yes	Yes	95	7	6	10(57)	6	9
Glasgow Waulkmillglen Reservoir	No	Yes	78	0	0	4	0(20)	0(29)

2.2.3 Sulphur Dioxide

Pending the relocation of the Glasgow Centre AURN station, Sulphur Dioxide is presently measured at only one location, Glasgow Anderston. There were no exceedences of the Objectives for SO_2 at this location or at Glasgow Centre prior to its removal.

Table 2.14 Results of Sulphur Dioxide Automatic Monitoring Comparison with Objectives (15 minute - 266μg/m^3), (1 hour - 350μg/m^3), (24 hour - 125μg/m^3)

Site Name	% Valid Data Capture 2012	Number of Exceedences of : (maximum measured)		
		15 minute Objective	1 hour Objective	24 hour Objective
Glasgow Anderston	79	0 (128μg/m^3)	0 (106μg/m^3)	0 (16μg/m^3)
Glasgow Centre	61	0 (45μg/m^3)	0 (35μg/m^3)	0 (10μg/m^3)

2.2.4 Benzene

Benzene is measured using diffusion tubes at four sites in Glasgow. The tubes at these sites have been in operation since early 2006. The tubes are exposed for one month at a time and then analysed. The results are shown in Table 2.15 below.

Table 2.15 Results of Diffusion Tube Monitoring for Benzene Comparison with Annual Mean Objective (3.25μg/m^3)

Site Name	% Valid Data Capture 2012	Annual Mean Concentration (μg/m^3)
Heilanmans Umbrella North	92	0.9
Hope Street	92	0.6
Ochiltree Avenue	92	0.8
Pollokshaws Road	92	0.9

2.2.5 Carbon Monoxide

Pending the relocation of the Glasgow Centre AURN station, Carbon Monoxide is presently measured at two locations in Glasgow, Anderston and Byres Road. There were no exceedences of the Objective for CO either at these locations or at Glasgow Centre prior to its removal. Table 2.16 shows CO concentrations measured at the three locations.

Table 2.16 Results of Monitoring for Carbon Monoxide Comparison with 8 hour Running Mean Objective (10mg/m^3)

Site Name	% Valid Data Capture 2012	Maximum 8 hour Running Mean Concentration (mg/m^3)
Glasgow Centre	61	1.6
Glasgow Anderston	86	2.0
Glasgow Byres Road	39	1.1

2.2.6 Ozone

Pending the relocation of the Glasgow Centre AURN station, Ozone is presently measured at one location, Glasgow Waulkmillglen Reservoir. Ozone is a secondary pollutant and the highest concentrations are generally measured remotely from sources of pollution. This is seen in Glasgow where the Glasgow Centre site observed no exceedences of the running 8-hour mean objective. In contrast, the rural site at Glasgow Waulkmillglen Reservoir had 45 exceedences of this objective during 2012.

Table 2.17 Results of Monitoring for Ozone Comparison with 8 hour Running Mean Objective (100μg/m^3)

Site Name	% Valid Data Capture 2012	Number of Exceedences of 8 hour Running Mean Objective (Maximum Number Allowed = 10)
Glasgow Centre	61	0
Glasgow Waulkmillglen Reservoir	64	45

2.2.7 Particulate Material at $PM_{2.5}$

The Scottish Government has set an Annual Mean Objective for $PM_{2.5}$. Pending the relocation of the Glasgow Centre AURN station, $PM_{2.5}$ is currently measured at one location, Glasgow Kerbside. Annual mean concentrations for $PM_{2.5}$ are shown in Table 2.18 below. Annual mean concentrations for $PM_{2.5}$ measured by Osiris are shown in Table 2.19 following.

Table 2.18 Results of $PM_{2.5}$ Automatic Monitoring Comparison with Annual Mean Objective (12 μg/m^3)

Site Name	Gravimetric Equivalent	% Valid Data Capture 2012	Annual Mean Concentration (μg/m^3)			
			2009	2010	2011	2012
Glasgow Kerbside	Yes	78	-	23	22	20
Glasgow Centre	Yes	61	12	12	10	10

Table 2.19 Results of Osiris $PM_{2.5}$, Monitoring Comparison with Annual Mean Objective (12 μg/m^3)

Site Name	Gravimetric Equivalent	% Valid Data Capture 2012	Annual Mean Concentration (μg/m^3)
Sauchiehall Street	Yes	48	5
Maryhill Road	Yes	85	5

2.2.8 Summary of Compliance with AQS Objectives

During 2012, Glasgow City Council has not measured concentrations of nitrogen dioxide above the Annual Mean Objective at any relevant locations outwith the existing City Centre AQMA. Neither has the Hourly Mean Objective been exceeded at any of the automatic monitoring stations across the city.

The Annual Mean Objective for PM_{10} has also been exceeded at one of the city centre monitoring stations; the same station Glasgow Kerbside may also have exceeded the Daily Mean Objective. This objective was exceeded at one other location within the city.

NO_2 Annual Mean Objective

The Annual Mean Objective was exceeded at the Glasgow Kerbside monitoring station and at various diffusion tube locations within the city centre AQMA. There was no exceedence of this objective at any other monitoring location.

NO_2 Hourly Mean Objective

There were no exceedences of the NO_2 Hourly Mean Objective recorded at any of the automatic monitoring stations located throughout the city. Neither was the 99.8th percentile exceeded at those locations where the percentage data capture was <90%.

PM_{10} Annual Mean Objective

The PM_{10} annual mean objective was exceeded at one monitoring location, Glasgow Kerbside. Data capture at this location during 2012 was low with 55% of the data available recorded.

It should be noted that the objective referred to above is the Annual Mean Objective for Scotland. This objective is set at 18 µg/m^3; this is significantly lower than the UK objective of 40 µg/m^3.

PM_{10} Daily Mean Objective

The 90th percentile value from the 55% data capture also makes it likely that the Glasgow Kerbside monitoring location would have exceeded the Daily Mean Objective. This objective was also exceeded at Glasgow Nithsdale Road; the source responsible for most of these exceedences was likely to have been adjacent building work.

As with the Annual Mean Objective, Scotland has adopted a significantly lower objective for the daily objective. The number of permitted exceedences of the Objective has been set at 7, the UK Objective being set at 35 exceedences.

Other Objectives

Monitoring results for carbon monoxide, sulphur dioxide and benzene continue to show that concentrations of these pollutants are within the objectives set by the Air Quality (Scotland) Regulations. The Scottish Government has set an Annual Mean Objective for $PM_{2.5}$. This objective was exceeded at Glasgow Kerbside.

3.0 New Local Policies and Developments

3.1 Policies (Air Quality Action Plan)

In response to the implementation of the AQMA's in the city, Glasgow Council produced Air Quality Action Plans in 2004 and 2009 introducing a range of measures aimed at reducing pollution in the city. The Action Plan is an evolving project, several measures such as vehicle idling enforcement, vehicle emission testing and initiatives towards cleaner taxis and passenger vehicles remain ongoing. Other measures such as a council workplace travel plan and easier public access to air quality information have been introduced. The Air Quality Action Plan in its current form is shown in Appendix A. Measures recently introduced by the council include.

3.1.1 Policy on the Introduction of Biomass Installations

Recent years have seen an increase in the uptake of biomass as a fuel source for domestic, commercial and industrial sources. While there may be some environmental benefits in the use of renewable sources of fuel, the replacement of cleaner burning sources such as gas with biomass could have negative impacts on local air quality.

In November 2010 Glasgow City Council introduced a policy on biomass installations which made the following recommendations:

- All new biomass plant should be of high quality, corresponding to the best performing units currently on the market.
- Biomass heat uptake should only be used to replace or displace existing coal and oil fired heating in urban areas.
- Uptake levels of new biomass installations should be substantially lower in AQMAs and areas of known poor air quality than in other locations.

Additionally, the policy document sets out a requirement for biomass installations in, or in close proximity to AQMAs to be assessed for a range of environmental impacts, and only approved where a detailed environmental cost benefit analysis can demonstrate an overall net positive environmental benefit and no unacceptable deterioration in air quality.

3.1.2 Air Quality and Planning Guidance

In October 2011 Glasgow City Council introduced Air Quality and Planning Guidance for developers acting within the city. This guidance is intended to inform developers of the importance with which air quality issues are taken in the planning process. It also serves to ensure a consistency in approach and that the following will be considered by the planning authority:

- Is an air quality assessment required?
- If so then has the air quality assessment produced been carried out in line with relevant guidance and agreed by the planning authority?
- How significant is the impact of the development on air quality?
- Are the proposed mitigation measures to address any air quality issues adequate?

3.1.3 Construction / Demolition Site Code of Practice for Dust and Emissions

Construction activities can give rise to a number of sources of dust and emissions. In October 2011 Glasgow City Council introduced a code of practice for developments within the city. The aim of this code of practice is to improve air quality within Glasgow through the adoption of the best possible techniques for the control of dust emissions from construction and demolition sites.

Developers within Glasgow are encouraged to reference the appropriate mitigation strategies for their particular circumstances and to commit to these strategies both within their air quality assessment and in practice.

3.2 Developments

3.2.1 Road Traffic Sources

M74Completion

The M74Completion opened in June 2011, extending the M74 through to the M8 motorway immediately west of the Kingston Bridge in Glasgow city centre, completing the motorway network around Glasgow. The M74C has several intersections within Glasgow where traffic can join/exit the surface street network. Whilst the route generally avoids residential areas, the Environment Statement concluded that a marginal non compliance with annual air quality objectives at locations close to the route and at junctions with the surface street network was possible. Monitoring and modelling being carried out on behalf of Transport Scotland as part of the Project Evaluation shall identify if any of these locations require further investigation.

East End Regeneration Route

The EERR was intended to be a motorway to motorway link through Glasgow's east end, the latest completed section Phase 2 opened in April 2012. This section links the Commonwealth Games venues at Parkhead, the National Indoor Sports Arena and the athletes' village with the previously completed Phase 1 link to the M74C motorway. Construction of the final phase of the route, linking with the M8 motorway, has been delayed till after the Commonwealth Games in 2014.

3.2.2 Industrial Sources

Polmadie Recycling Centre

Planning consent has been granted for the construction and operation of a major recycling centre to be housed on the site of an existing council facility on Polmadie Road. The development included plans for a CHP plant running on anaerobic digestion derived biogass and gasifiers fuelled by non-recyclable waste. This facility will be licensed by the Scottish Environment Protection Agency and has been subject to an Environmental Impact Assessment. The EIA included modelling of impacts on a variety of pollutants including those covered by the Local Air Quality Management process. The modelling predicted negligible or imperceptible impacts at all modelled receptors.

An agreement has been reached for the provision of funding for an ambient air quality monitoring station to be sited in the area.

3.2.3 Commercial and Domestic Sources

Gorbals District Heating

Planning consent has been granted for the construction and operation of a district heating project serving five multi-storey residential blocks in the Gorbals area. This system will utilise biomass as the major energy source.

Given the recent introduction of the Council's policy on the implementation of biomass installations, this development undertook a detailed assessment of air quality impacts. The developers also undertook a detailed environmental cost benefit analysis as part of the planning process.

The air quality assessment predicted negligible impacts on air quality at all receptors.

4.0 Conclusions and Proposed Actions

4.1 New Monitoring Data

NO_2 Annual Mean Objective

Automatic analyser and diffusion tube monitoring of NO_2 indicates that concentrations of NO_2 are likely to continue to exceed the Annual Mean Objective at locations within the existing City Centre Air Quality Management Area. Concentrations within the other AQMA's whilst below this objective during 2012 require further monitoring prior to any consideration in regard to progressing to a Detailed Assessment. It is not considered that any further amendment to the existing AQMA's is required or that any new areas progress to Detailed Assessment.

NO_2 Hourly Mean Objective

Automatic Monitoring results show that the Hourly Mean Objective was not exceeded at any monitoring locations. However it is noted that several diffusion tubes within the existing City Centre Air Quality Management Area continue to produce an annual mean concentration in excess of 60$\mu g/m^3$. It is not considered that any further amendment to the existing AQMA is required or that any new areas progress to Detailed Assessment.

PM_{10} Annual Mean Objective

Monitoring results show that the PM_{10} Annual Mean Objective was exceeded at one monitoring location within the city, Glasgow Kerbside. A Further Assessment in respect of the Citywide AQMA has recently been completed, recommending that monitoring be continued to establish compliance with this objective. It is not considered that any amendment to the existing Citywide AQMA is required.

PM_{10} 24-hour Mean Objective

Monitoring results show that the PM_{10} Daily Mean Objective was exceeded at one monitoring location within the city, Glasgow Nithsdale Road. The 90^{th} percentile value calculated for Glasgow Kerbside also suggests that this monitoring location would have exceeded this objective. A Further Assessment in respect of the Citywide AQMA has recently been completed, recommending that monitoring be continued to establish compliance with this objective. It is not considered that any amendment to the existing Citywide AQMA is required.

4.2 New Local Developments

4.2.1 Road Traffic Sources

The Environment Statement for the M74Completion concluded that a marginal non compliance with annual air quality objectives at these locations was possible at locations close to the route and at junctions with the surface street network. Monitoring and modelling being carried out on behalf of Transport Scotland as part of the Project Evaluation shall identify if any of these locations require further investigation.

Appendix A Air Quality Action Plan

Measure	Lead Authority / Focus	Planning / Implementation	Progress	Progress During 2012	Completion Date
Vehicle Idling	GCC / Council will expand programme of vehicle idling enforcement	NA / 2003 onwards	Regular scheduled patrols to enforce and/or educate regarding vehicle idling	100+ “No Idling” signs erected. 5 FPN’s issued	Ongoing
Emission Testing	GCC / Council will continue a programme of roadside emission testing	NA / 2003 onwards	24000+ vehicles tested	2782 vehicles tested 27 FPN’s issued	Ongoing
Low Emission Zones	GCC / The Council will undertake a detailed feasibility study with a view to introducing LEZs in Glasgow	2009 / 2009 -10	Feasibility study into LEZs in Glasgow was completed in 2010. Concerns over the real use emissions reduction from higher Euro emission standards has restricted further progress.	Outline proposals for CWG LEZs prepared. Meetings with Cllrs to discuss proposals Trial of LEZ camera technology taking place at various locations within the city	
Cleaner Taxis	GCC / Council will prepare an emissions strategy to reduce emissions from taxi and private hire vehicles	2009 onwards / ongoing	Proposals to limit the maximum age and increase the emission testing frequency for taxis researched and discussed with interested parties	Taxis have been preferentially selected for roadside emissions testing. Further discussions with Licensing and Test centre re-taxi maximum age and increased testing.	2014

Measure	Lead Authority / Focus	Planning / Implementation	Progress	Progress During 2012	Completion Date
Council Workplace Travel Plan	GCC / Council will prepare a workplace travel plan for all employees	2009 - 10 / 2011 onwards	The travel plan has been completed, however it is a living document – tasks have no finite life span	Cycling Infrastructure improvements Liftshare car share facility for GCC Pool bike scheme Site Bike Scheme Cycle to work scheme	Ongoing
Car Clubs	GCC / The Council will make on street spaces available for car club vehicles.	2009 - 10 / 2010 ongoing	Car club has 21 vehicles including 7 hybrids in operation within Glasgow located on street in council provided bays.	New spaces provided as club expanded. Land & Environmental services now use club as a corporate member.	Ongoing with further expansion in the south side planned for 2013
Public Service Vehicles	GCC / The Council will pursue the use of traffic regulation conditions to control bus emissions within AQMAs	2009 onwards / 2009 ongoing	The Quality Partnership Scheme in the city requires that buses have to meet set emission standards by pre-agreed dates on certain routes.	90% of Streamline route buses now meet a Euro 3 standard	2014
Boiler Emissions	GCC / The Council will raise awareness and provide information to assist in energy efficiency in the home and workplace	2010 / 2011 onwards	Biomass Guidance produced 2011 addressing boiler emissions Glasgow Home Energy Advice Team (G-HEAT) has been established to provide independent advice on energy related issues to householders in the city	Attention of developers is drawn to biomass guidance at the planning stage Awareness raising continues through G-HEAT	

Measure	Lead Authority / Focus	Planning / Implementation	Progress	Progress During 2012	Completion Date
Planning Guidance	GCC / The Council will produce revised planning guidance	2010 – 11/ 2012	Guidance produced.	Guidance complete and available on council website	
Air Quality Information	GCC / The Council will provide data and information regarding current and longer term air quality monitoring on our web site and at variable message signs throughout the city	2010 onwards / 2010 ongoing	All air quality review and assessment reports are available on the GCC website. Further reports, guidance documents and links to be added when complete.	2011 Progress Report added Discussions started with Transport Scotland re-motorway network VMS Request for current AQ data on council website passed to IT	2013
Construction Sites	GCC / The Council will produce a code of practice for construction / demolition contractors	2011 / 2012	Guidance produced	Guidance completed and available on the web site	2012
Fire Reduction	GCC / The Council will investigate multi agency strategic level actions aimed at reducing the number of fires and harmful emissions	2011 / 2011	The Council have promoted and facilitated educational visits to schools to highlight the dangers of fires and fire starting to children.	SF&R visits to schools within the city.	2011

Measure	Lead Authority / Focus	Planning / Implementation	Progress	Progress During 2012	Completion Date
Cycling Strategy	GCC / Air Quality grants will be sourced for funding cycling improvements in the city	2011 onwards / 2011 ongoing	Over £250,000 grant has been obtained from Scottish Govt and used for provision of various bike shelters and stances across the city	144 bike racks at 26 on street locations. 8 secure shelters (storage for 6 bikes each) in back court areas of residential properties (by March 2013) Cycle racks for 4 schools Various improvements to cycle lanes Improvements at council premises including secure parking facilities.	Ongoing A further grant application will be submitted for 2013/14
Bus Retro-fit Scheme	GCC – SPT / Grant funding to retro-fit Buses with new exhaust tech to reduce harmful emissions	2011 onwards / 2011 ongoing	Grant of ~ £250k agreed from Scot Gov Discussions with bus operators / SPT / Retrofit companies and procurement	Initial proposals rejected by bus companies – revised proposals under review by procurement	2012
Tree Planting	GCC / The Council will investigate the potential for a programme of tree planting as a means of city centre PM10 reduction	2011 – 12 / 2012 - 13	Programme of tree planting within the city continues	Tree planting continues including 100 new trees in Kelvin Way	Ongoing
CARBOTRAF	EU – Air Monitors Ltd / EU project to bring about real-time reduction in traffic pollution through active traffic management	2011 onwards / 2011 ongoing	Participation in EU project (2 cities Glasgow and Graz, Austria)	Equipment installed within our monitoring stations – presentation given to EU panel	2014

Measure	Lead Authority / Focus	Planning / Implementation	Progress	Progress During 2012	Completion Date
Promote Greener Vehicles	The Council will investigate the potential for reduced rate street parking for electric and hybrid vehicles	2012 / 2012 -13	Glasgow City Council has introduced a network of public charging points, currently numbering 20; each point is capable of simultaneously charging 2 vehicles. Charging points have also been provided within council car parking facilities.	Commenced work on the next phase which will see the network of charging facilities expanded with the possible inclusion of dedicated free "on street" parking / charging bays and at commonwealth games legacy venues, leisure centres and car parks	2013
Leading by Example	The Council will demonstrate best practice in the operation of its vehicle fleet	Ongoing / Ongoing	The Council have introduced a fleet of electric vehicles through a government backed scheme and trained staff in the efficient use of these vehicles.	Expanded the use of electric vehicles within the fleet including new Nissan Note vehicles. Ecodriver training undertaken Council now has a total of 39 electric vehicles, some of which are let out to partner agencies	Ongoing

References

- Department of the Environment, Food and Rural Affairs (2000). Part IV The Environment Act 1995, Local Air Quality Management, Technical Guidance, LAQM.TG(09);
- The Scottish Executive (2002). Air Quality (Scotland) Amended Regulations
- Glasgow City Council (1998). Local Air Quality Management, Review and Assessment of Air Quality in Glasgow Stage 1;
- Glasgow City Council (2000). Local Air Quality Management, Review and Assessment of Air Quality in Glasgow Stage 2;
- Glasgow City Council (2001). Local Air Quality Management, Review and Assessment of Air Quality in Glasgow Stage 3;
- Glasgow City Council (2003). Local Air Quality Management, Review and Assessment of Air Quality in Glasgow Stage 4;
- Glasgow City Council (2003). Local Air Quality Management, Updating and Screening Assessment;
- Glasgow City Council (2004). Local Air Quality Action Plan;
- Glasgow City Council (2005). Local Air Quality Management, Detailed Assessment;
- Glasgow City Council (2005). Local Air Quality Management, Progress Report;
- Glasgow City Council (2007). Local Air Quality Management, Detailed Assessment;
- Glasgow City Council (2008). Local Air Quality Management, Further Assessment;
- Glasgow City Council (2008). Local Air Quality Management, Progress Report;
- Glasgow City Council (2010). Local Air Quality Management, Detailed Assessment;
- Glasgow City Council (2010). Local Air Quality Management, Progress Report;
- Glasgow City Council (2011). Local Air Quality Management, Progress Report;