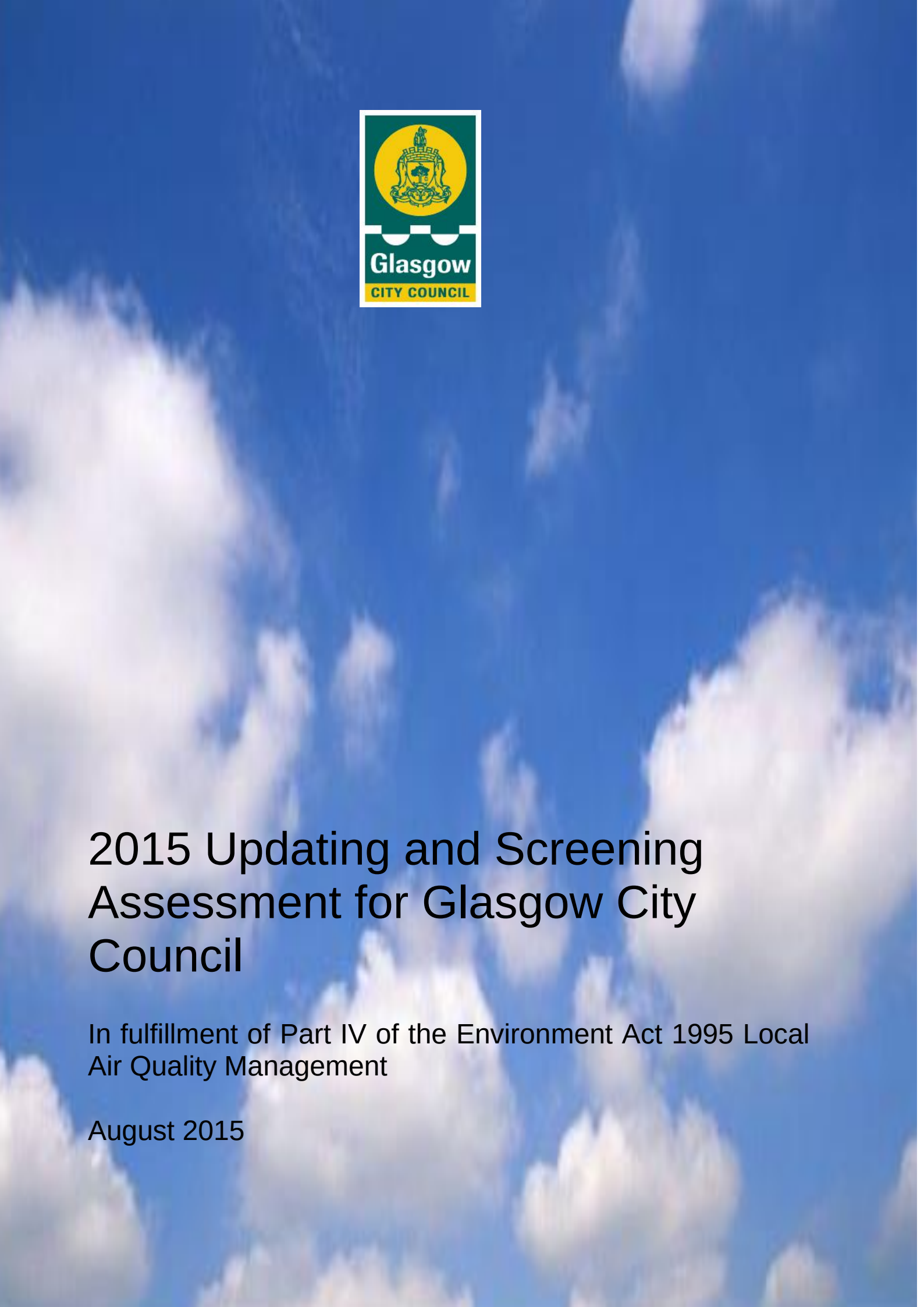

2015 Updating and Screening Assessment for Glasgow City Council

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

August 2015

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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 Updating and Screening Assessment as part of Round 6 of Review and Assessment. This Updating and Screening Assessment 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.

Glasgow City Council has examined the results from monitoring in the city. Concentrations outside of the AQMA's are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

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1.0 Introduction

1.1 Description of Local Authority Area

Glasgow City Council (GCC), serving a population of almost 600,000, 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 Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment.

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, 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 Scotland.

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene (C_6H_6)	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 (CO)	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead (Pb)	0.5 μg/m^3	Annual mean	31.12.2004
	0.25 μg/m^3	Annual mean	31.12.2008
Nitrogen dioxide (NO_2)	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 μg/m^3, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 μg/m^3	Annual mean	31.12.2010
Sulphur dioxide (SO_2)	350 μg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 μg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 μg/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 2002 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
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.

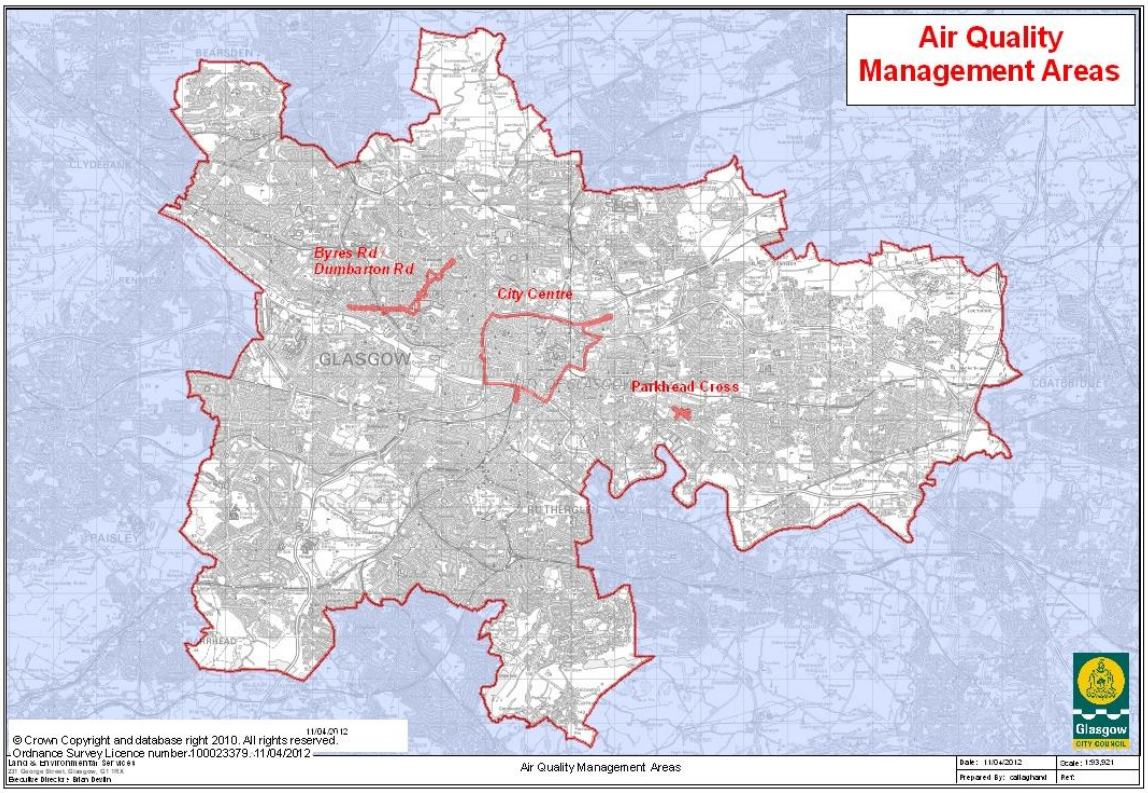
Table 1.2 Summary of Previous Rounds of Review and Assessment (Cont.)

Report	Date Produced	Outcome
Progress Report	2013	Reported on continuing monitoring, no recommendation of changes to existing AQMA's or need for progression to Detailed Assessment.
Detailed Assessment	2013	Dispersion modelling of locations highlighted by monitoring and USA 2012 as potentially exceeding NO_2 annual mean Objective showed that exceedences were unlikely. Confirmed that monitoring should continue at these locations.
Progress Report	2014	Reported on continuing monitoring, no recommendation of changes to existing AQMA's or need for progression to Detailed Assessment.
Detailed Assessment	2014	Monitoring and modelling showed widespread compliance with the objective levels and modelling predicted total compliance by 2015. Proposal to revoke the current Citywide AQMA in respect of PM_{10} in tandem with the amendment of the existing Byres Rd /Dumbarton Rd AQMA to include the PM_{10} objectives.

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

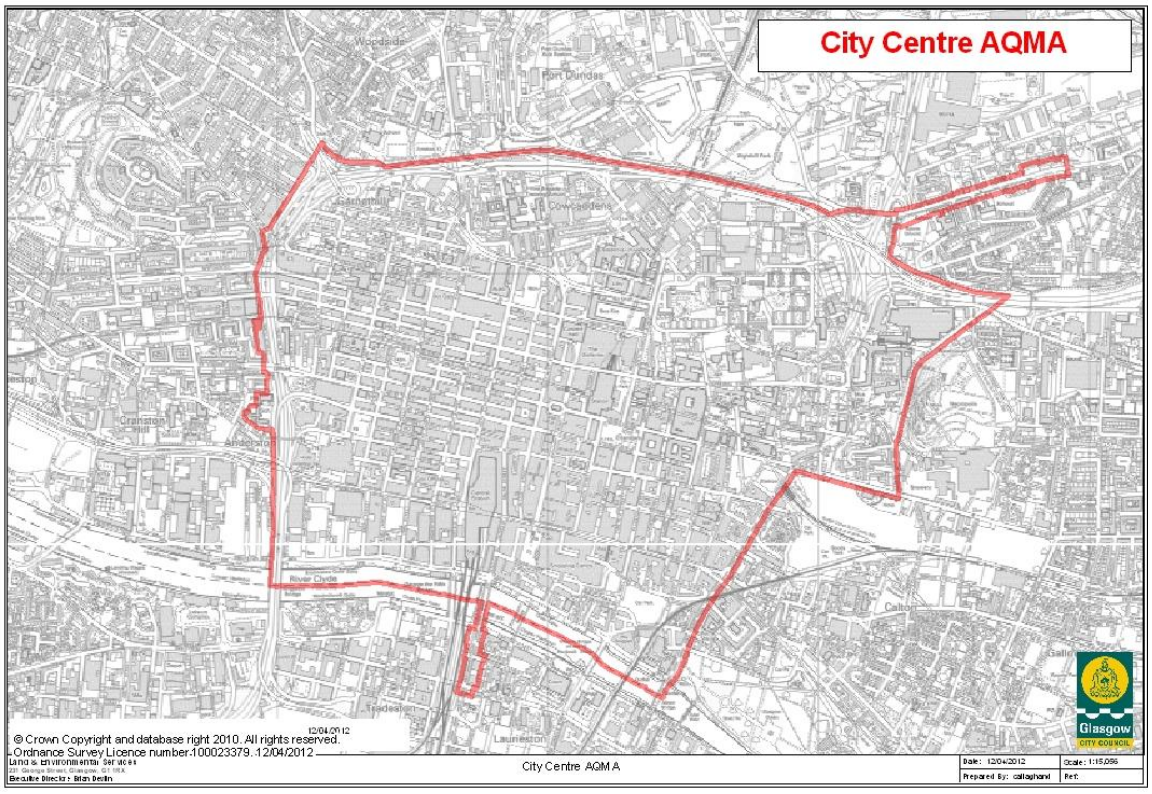
Figure 1.1 Map of AQMA Boundaries



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

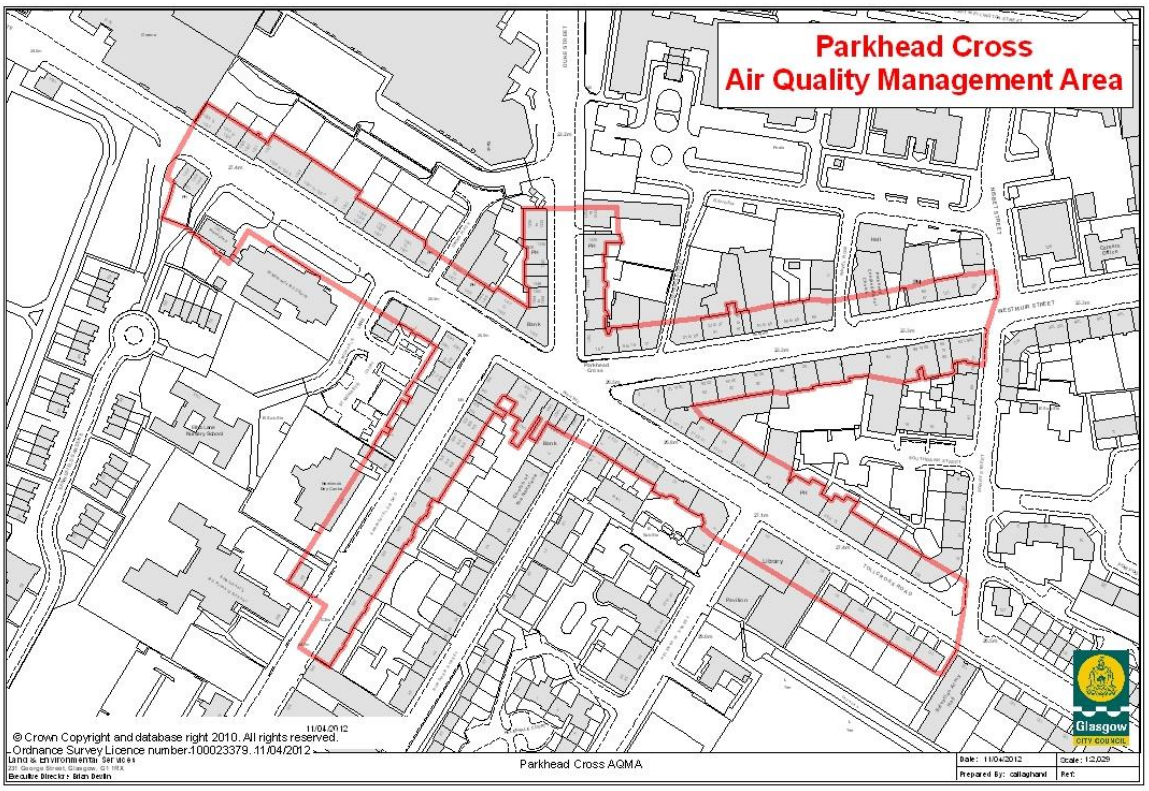


The detailed street listing for this AQMA can be found in the 1st March 2012 order.

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

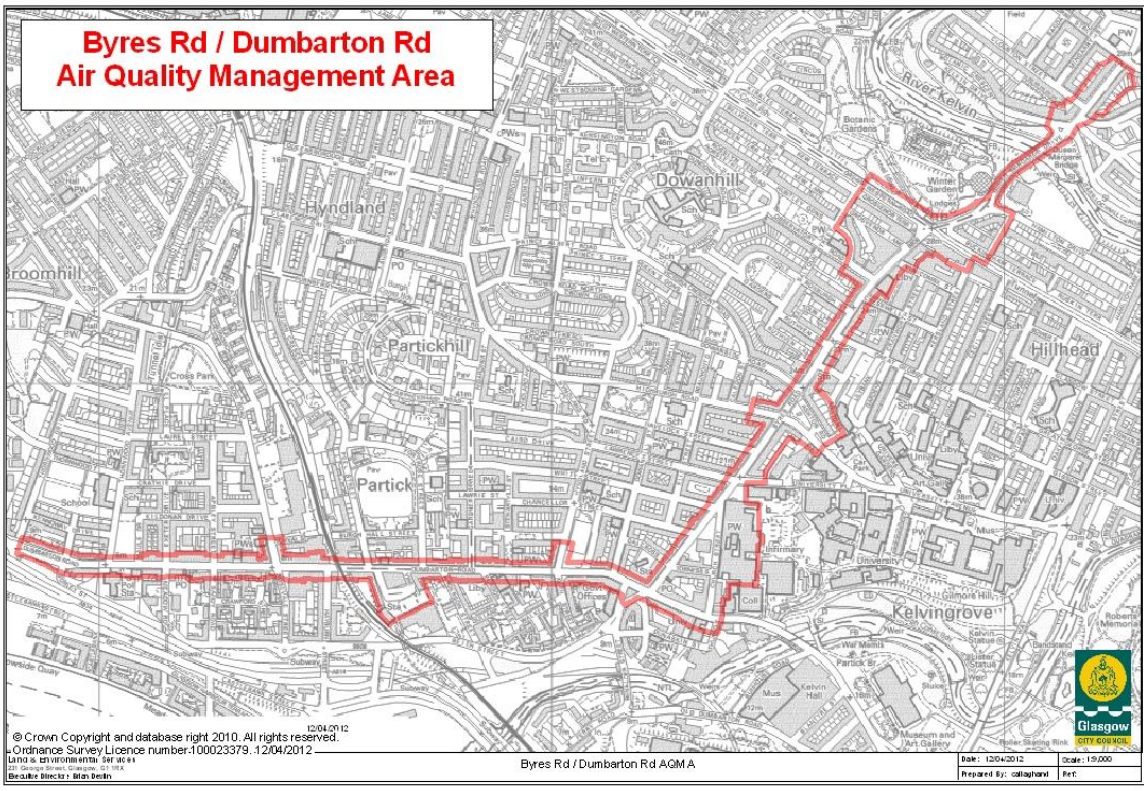


The detailed street listing for this AQMA can be found in the 1st July 2007 order.

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

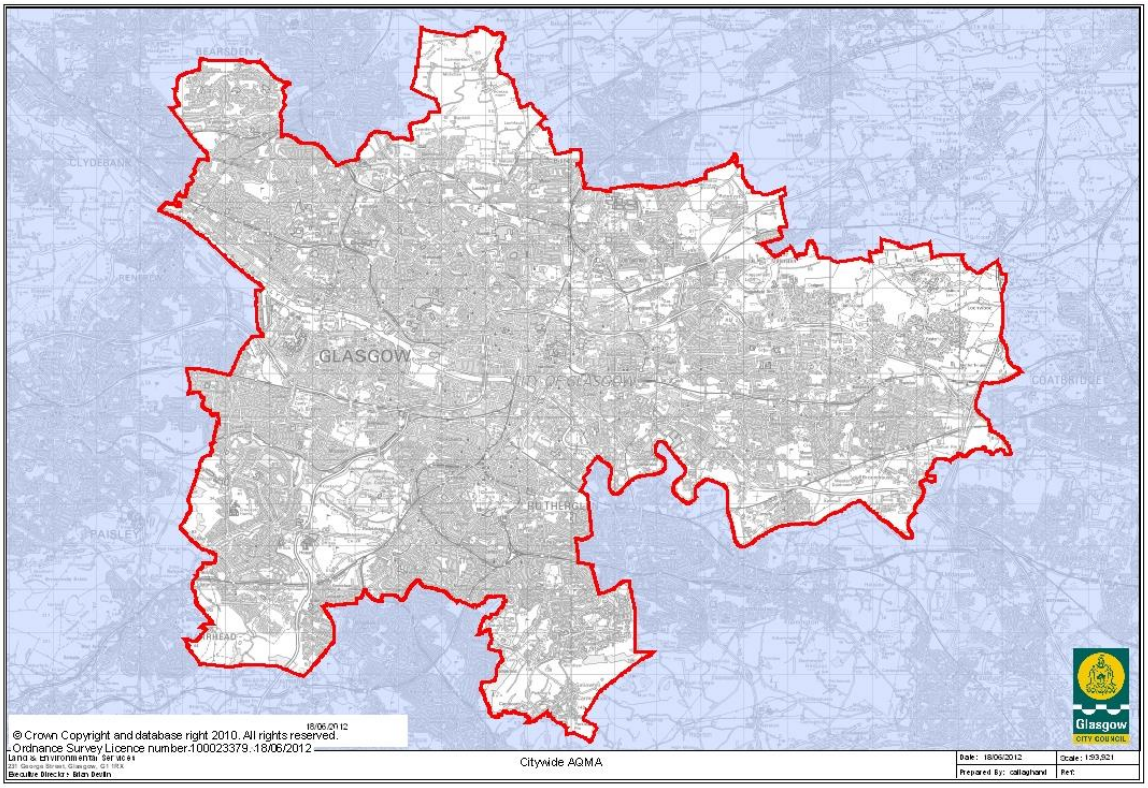


The detailed street listing for this AQMA can be found in the 1st March 2012 order.

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.

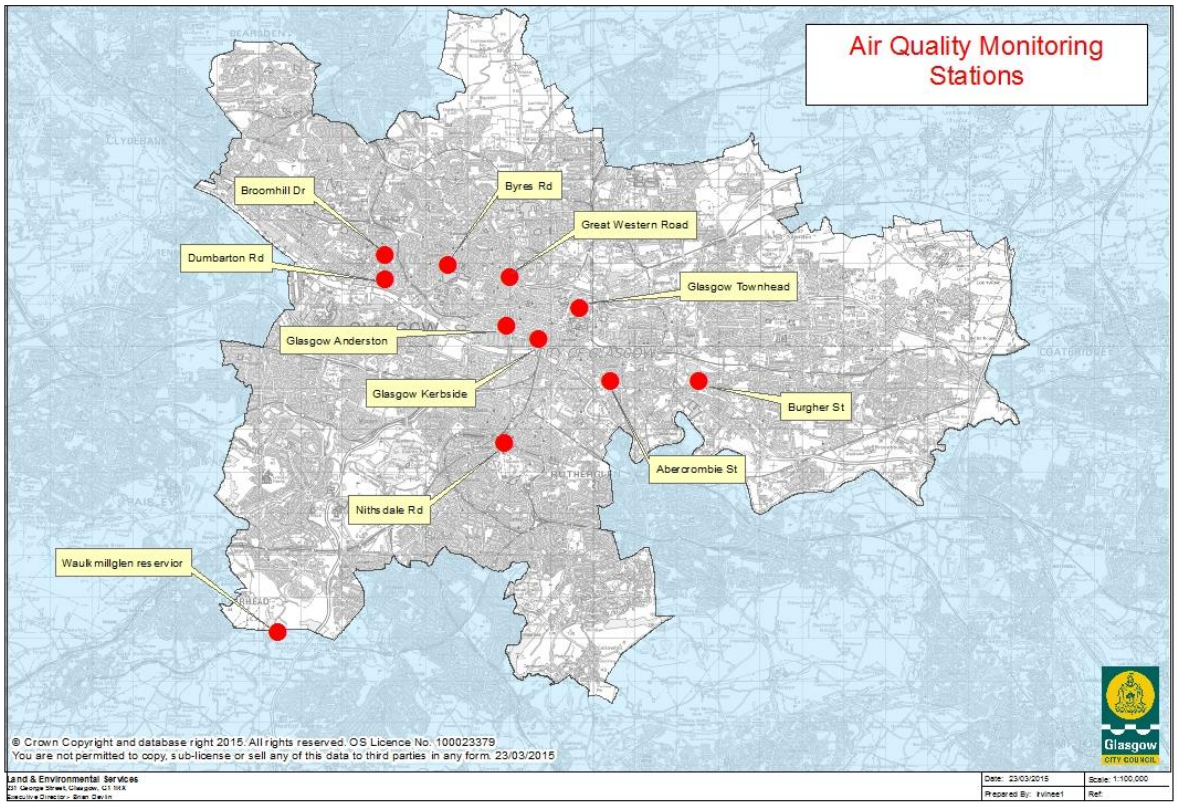
2.0 Monitoring Data

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 2014, automated monitoring equipment was located at twelve sites. Four of which, Glasgow Kerbside, Townhead, Great Western Road and High Street form part of the Department for Environment, Food and Rural Affairs (DEFRA) Automated Urban and Rural Network (AURN). The monitoring station at Townhead was previously located at Glasgow Centre where monitoring was discontinued during 2012. Monitoring commenced at Townhead during 2013 and at Great Western Road during 2014. No results are included from High Street which was installed towards the end of 2014.

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	City Centre	Yes	1m	Yes
Glasgow Townhead	Urban Background	259675 665900	NO_2 PM_{10} $PM_{2.5}$ O_3	City Centre	Yes	120m	No
Glasgow Great Western Road	Roadside	258007 666649	NO_2	No	Yes	5m	Yes
Glasgow High Street	Roadside	260013 665346	NO_2 PM_{10} $PM_{2.5}$	City Centre	Yes	3m	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

2.1.1 Automatic Monitoring Sites (Cont.)

Table 2.1 Details of Automatic Monitoring Sites (Cont.)

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case Location?
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

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

The Council also operates a mobile monitoring station, equipped with instrumentation to measure NO_2, CO and Particulates (PM_{10}). During 2014 (January – May) the mobile monitoring station was located adjacent to Argyle Street (Finnieston).

Table 2.2 Details of Mobile Monitoring Station Measurements

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case Location?
Corunna Street	Kerbside	257111 665873	NO_2 CO	No	No	<1m	Yes

2.1.1 Automatic Monitoring Sites (Cont.)

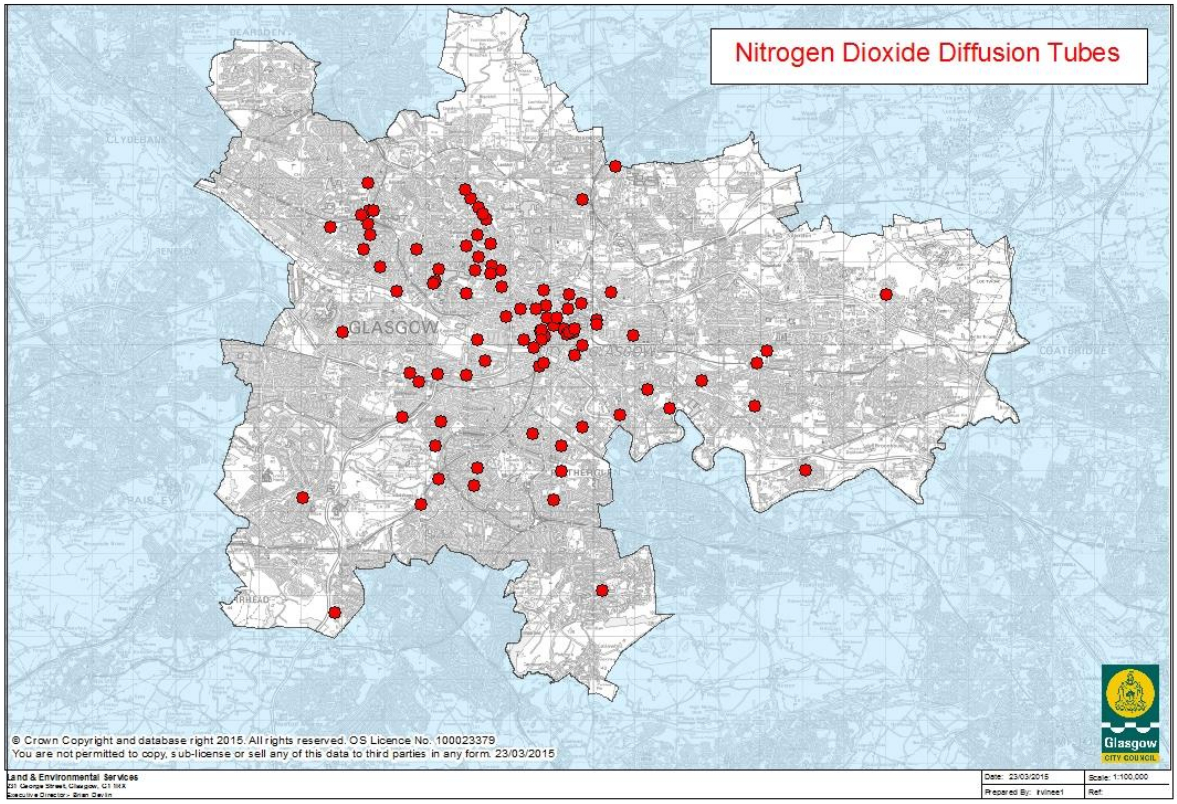
GCC has also introduced several Osiris particulate monitors into the monitoring network to measure particulate levels at areas of interest. Monitors were located at two locations during 2014. These locations had been highlighted in the 2010 Detailed Assessment as potentially exceeding the Annual Mean Objective.

Table 2.3 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?
Maryhill Road	Urban Background	257522 667756	Citywide	Yes	>10m	No
Paisley Road West	Roadside	253349 663843	Citywide	Yes	3m	Yes

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 a national site. Concentrations obtained by both methods were compared over the same sampling period and a national factor for GSS determined. For 2014 a bias correction factor of 0.83 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.

2.1.2 Non-Automatic Monitoring Sites (cont.)

Table 2.4 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 2.4 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 2.4 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 2.4 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 2.4 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
Milner Road	Roadside	254456 668108	No	No	3m	No
Gibson Street	Roadside	257166 666787	No	Yes	3m	Yes
Woodlands Road	Roadside	257550 666697	No	Yes	3m	Yes
Arlington Street	Roadside	257796 666378	No	Yes	3m	No
Poplar Avenue	Roadside	254662 667636	No	Yes	3m	Yes
Great Western Road	Roadside	257255 667112	No	No	3m	Yes
1031 Maryhill Road	Roadside	257352 668122	No	Yes	5m	Yes
MHR Shawpark Street	Roadside	257075 668502	No	Yes	5m	Yes

2.1.2 Non-Automatic Monitoring Sites (cont.)

Table 2.4 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?
1428 Maryhill Road	Roadside	257243 668285	No	No	3m	Yes
45 Clifford Street	Roadside	256262 664308	No	Yes	3m	Yes
608 Scotland Street West	Roadside	256948 664270	No	Yes	<1m	Yes
17 Kilbride Street	Roadside	259732 663032	No	Yes	3m	Yes
2 Myrtle Drive	Roadside	259246 661979	No	Yes	3m	Yes

In addition to monitoring NO_2 levels, Glasgow City Council also monitors Benzene by diffusion tube at four sites across the city. This analysis is also conducted by the GSS laboratory.

Table 2.5 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	No	Yes	3m	Yes
Hope Street	Kerbside	258738 665167	No	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 eight locations; the Kerbside, Townhead and Great Western Road AURN sites, Anderson, Byres Road, Dumbarton Road, Burgher Street and Waulkmillglen reservoir. Objectives have been set for both the Annual Mean and an Hourly Mean. Table 2.6 shows the measured annual mean at these locations over the last five years. Great Western Road was commissioned during June 2014.

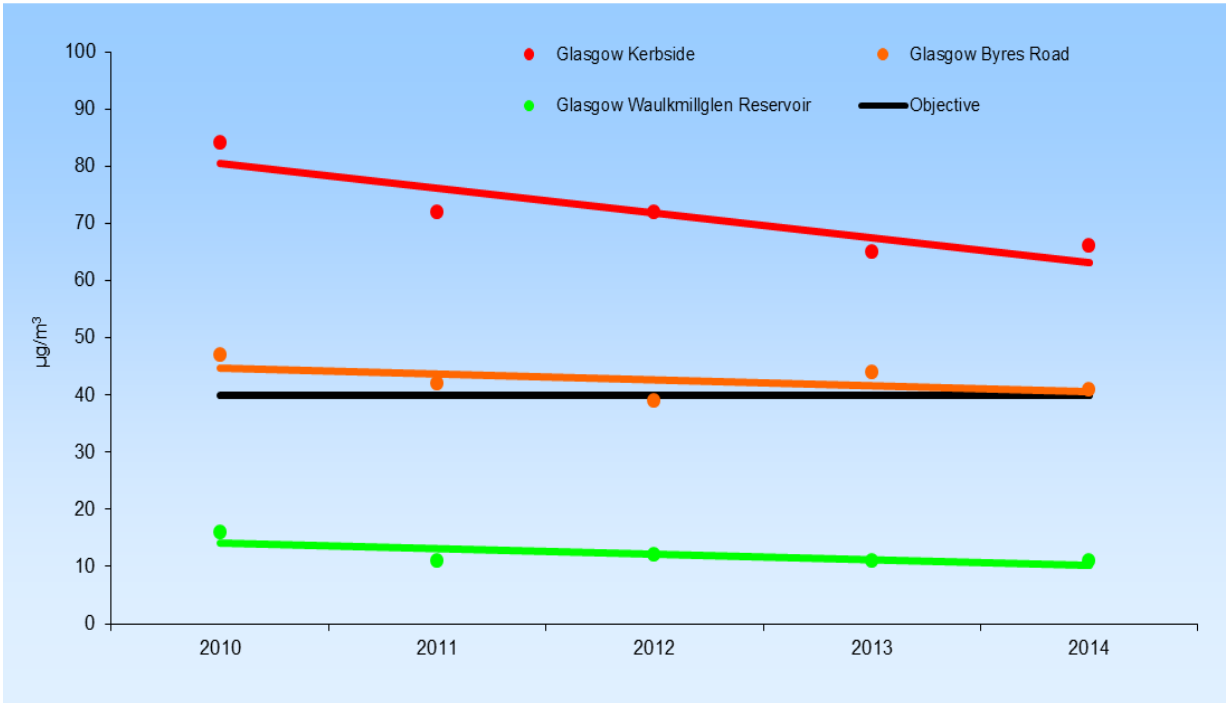
Table 2.6 Results of Automatic Monitoring for Nitrogen Dioxide Comparison with Annual Mean Objective (40μg/m^3)

Site Name	Within AQMA?	Relevant Public Exposure	Valid Data Capture 2014 %	Annual Mean Concentration μg/m^3				
				2010	2011	2012	2013	2014
Glasgow Kerbside	City Centre	Yes	93	84	72	72	65	66
Glasgow Townhead	City Centre	Yes	99	-	-	-	-	27
Glasgow Great Western Road	No	Yes	57	-	-	-	-	31
Glasgow Anderston	City Centre	Yes	35	38	36	33	28	18
Glasgow Byres Road	Byres / Dumbarton	Yes	72	47	42	39	44	41
Glasgow Dumbarton Road	Byres / Dumbarton	Yes	87	-	-	-	46	38
Glasgow Burgher Street	Parkhead	Yes	97	-	35	34	28	27
Glasgow Waulkmillglen Reservoir	No	No	91	16	11	12	11	11

2.2.1.1 Automatic Monitoring Data (Cont.)

During 2014 the Annual Mean Objective was exceeded at Glasgow Kerbside and Byres Road. Figure 2.3 following, displays the five year trend at these locations. Glasgow Kerbside whilst showing a gradual improvement has continually exceeded the Annual Mean Objective, Byres Road appears as an improving trend slightly above the Objective. Data capture rates during 2014 at both Byres Road and Dumbarton Road (marginal) were below the 90% target. Monitoring at Anderston was suspended during April 2104 due to extended building works affecting the power supply to the station.

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



2.2.1.1 Automatic Monitoring Data (Cont.)

Table 2.7 shows the number of exceedences of the 200µg/m^3 hourly objective over the last five years. During 2014, the permitted number of exceedences (18) of the Objective was not breached at any of the automatic monitoring locations.

Table 2.7 Results of Automatic Monitoring for Nitrogen Dioxide Comparison with Hourly Mean Objective

Site Name	Within AQMA for Relevant Objective?	Relevant Public Exposure	% Valid Data Capture 2014	Number of Exceedences of Hourly Mean Objective (200 µg/m^3) (99.8th Percentile of Hourly Means) if % Valid Data Capture < 90%				
				2010	2011	2012	2013	2014
Glasgow Kerbside	City Centre	Yes	93	97	31	17	12	11
Glasgow Townhead	City Centre	Yes	99	-	-	-	-	0
Glasgow Great Western Road	No	Yes	57	-	-	-	-	0(119)
Glasgow Anderston	City Centre	Yes	35	16(204)	4	4	42	0(55)
Glasgow Byres Road	No	Yes	72	14	0(145)	7 (168)	4 (164)	7 (162)
Glasgow Dumbarton Road	No	Yes	87	-	-	-	0 (141)	0 (117)
Glasgow Burgher Street	No	Yes	97	-	52(338)	0 (153)	1	0
Glasgow Waulkmillglen Reservoir	No	No	91	0	0	0 (109)	0	0

Table 2.8 following shows the Nitrogen Dioxide data gathered from the mobile unit (Jan – May) mean value and the 99.8th percentile of hourly means.

Table 2.8 Results of Mobile Station Monitoring for Nitrogen Dioxide

Site Name	Within AQMA?	Relevant Public Exposure	Valid Data Capture 2014 %	Annual Mean Concentration µg/m^3	Number of Exceedences of Hourly Mean Objective (200 µg/m^3) (99.8th Percentile of Hourly Means) if % Valid Data Capture < 90%
Mobile Station Corunna Street	No	No	100 (Jan – May)	32	0(113)

2.2.1.2 Non Automatic Monitoring Data

Monitoring for NO_2 by diffusion tube is currently carried out at 28 locations within the City Centre Air Quality Management Area the results of which are shown in Table 2.9 below. Figure 2.4 following shows five year trends based on the average value from those tubes classified as urban background and roadside.

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

Site Name	Data Collection 2014 (%)	Annual Mean Concentration (μg/m^3) (Bias Adjustment)				
		2010 (1.10)	2011 (0.94)	2012 (0.95)	2013 (0.96)	2014 (0.83)
George Square	100	52	44	41	48	41
Union Street	75	72	64	63	65	61
Bath Street	100	56	51	44	53	44
Glassford Street	100	51	48	44	54	46
Buchanan Street	83	59	46	45	48	41
Castle Street	83	40	35	34	35	29
Hope Street 3	100	61	55	50	59	52
Montrose Street	75	47	42	39	47	38
Cochrane Street	92	54	42	38	38	39
Renfield Street	100	60	59	60	59	56
George Street	100	51	47	45	47	41
North Street	83	40	30	26	33	30
Hope Street 1	92	91	76	73	87	67

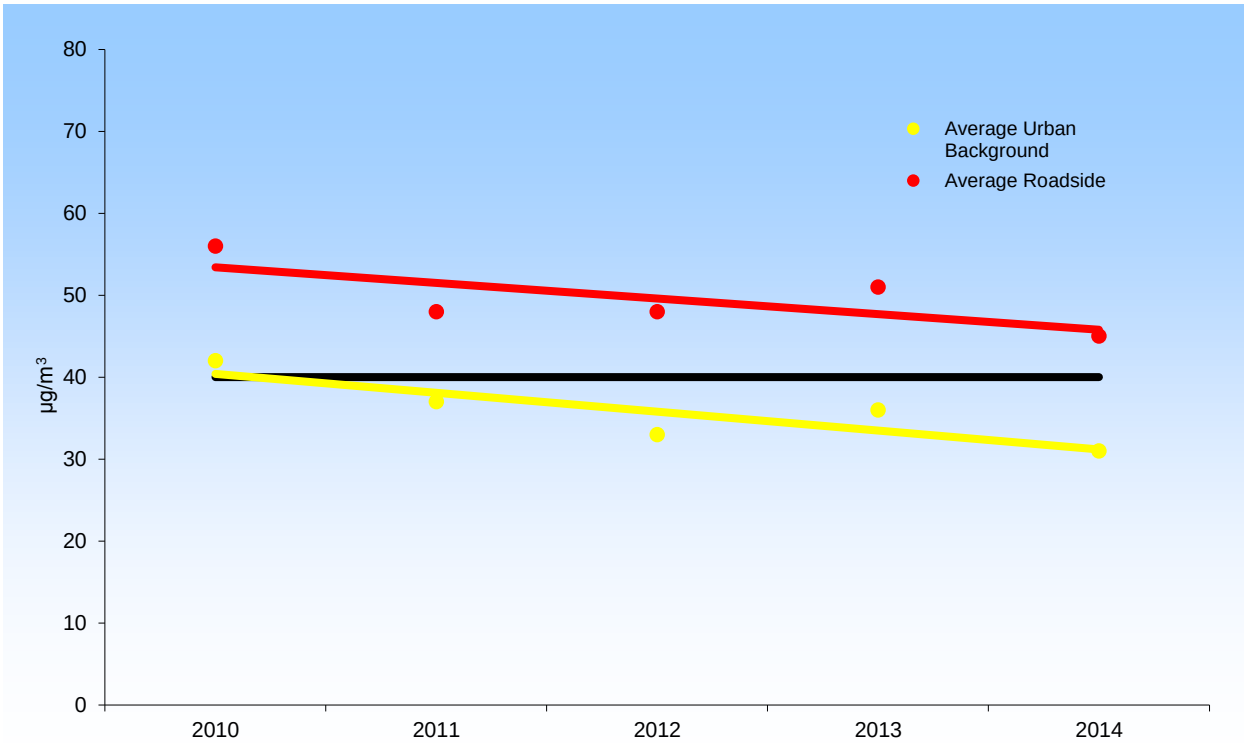
2.2.1.2 Non Automatic Monitoring Data (Cont.)

Table 2.9 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 2014 (%)	Annual Mean Concentration (μg/m^3) (Bias Adjusted)				
		2010 (1.10)	2011 (0.94)	2011 (0.94)	2013 (0.96)	2014 (0.83)
Gordon Street	100	-	-	-	75	68
Heilanmans Umbrella North	92	84	68	68	78	64
Saltmarket	92	48	42	42	37	37
High Street	83	57	49	49	46	43
Dobbies Loan	100	33	31	31	28	26
Cathedral Bridge	100	59	53	53	57	47
Dundasvale Street	100	39	-	-	31	32
Royston Road	100	44	45	45	43	34
St Mungo Avenue	100	42	34	34	35	28
Brown Street	92	38	31	31	33	27
Broomielaw	100	51	40	40	47	41
McLeod Street	100	40	35	35	35	30
Sauchiehall Street	100	51	51	51	43	36
Kennedy Path	100	37	27	27	30	24
Bridge Street	100	43	39	39	35	31

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 NO_2 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 2014 the results of which are shown in Table 2.10.

Table 2.10 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 2014 (%)	Annual Mean Concentration (μg/m^3) (Bias Adjusted)				
		2010 (1.10)	2011 (0.94)	2012 (0.95)	2013 (0.96)	2014 (0.83)
Dumbarton Road	100	37	32	33	32	28
Lawrence Street	100	31	26	25	26	21
Cooperswell Street	100	32	27	23	28	23
Queen Margaret Drive 3	83	46	42	36	40	35
Queen Margaret Drive 2	83	41	36	31	34	33

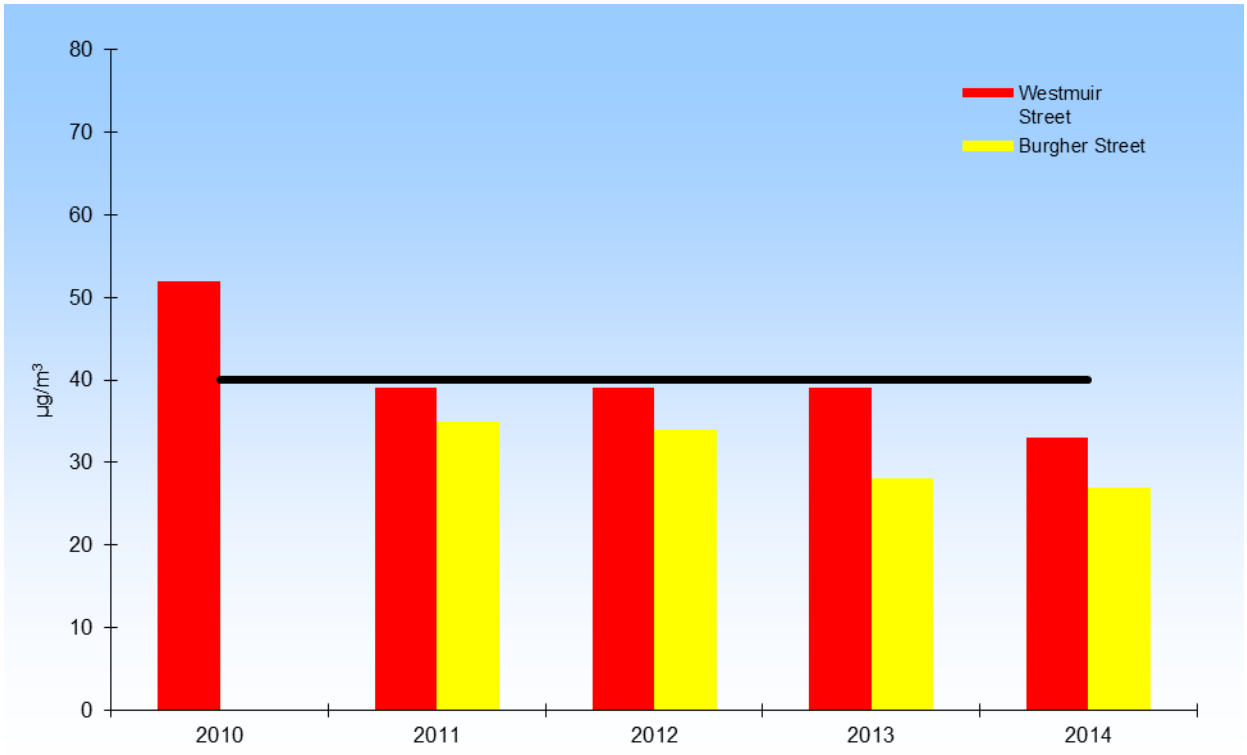
2.2.1.2 Non Automatic Monitoring Data (Cont.)

Monitoring for NO_2 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 2014; results from this location are shown in Table 2.11. 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 2.11 Results of Diffusion Tube Monitoring for Nitrogen Dioxide Within Parkhead Cross AQMA Comparison with Annual Mean Objective (40μg/m^3)

Site Name	Data Collection 2014 (%)	Annual Mean Concentration (μg/m^3) Bias Adjusted				
		2010 (1.10)	2011 (0.94)	2012 (0.95)	2013 (0.96)	2014 (0.83)
Westmuir Street	100	52	39	39	39	33

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 out with Air Quality Management Areas. The Annual Mean Objective was not exceeded at any location during 2014; monitoring results are shown in Table 2.12.

Table 2.12 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 2014 (%)	Annual Mean Concentration (μg/m^3) Bias Adjusted				
		2010 (1.10)	2011 (0.94)	2012 (0.95)	2013 (0.96)	2014 (0.83)
Mosside Road	100	37	29	26	37	26
Finnieston Street	100	39	35	32	36	29
Hillcrest Road	100	26	19	21	24	19
St Andrews Drive	100	24	22	18	19	17
Haggs Road	92	36	36	32	30	24
Pollokshaws Road	100	29	32	20	25	24
Queen Margaret Drive	100	34	30	27	27	25
Napiershall Street	100	40	31	30	33	27
Oxford Street	100	37	34	29	31	28
Anniesland Cross	92	35	34	26	30	23
Balshagray Avenue	58	33	26	25	29	31 *
Dougrie Road	92	25	20	20	19	16
Main Street (Bridgeton)	100	28	23	23	25	21
Aikenhead Road	100	31	23	27	29	22
Langside Primary School	100	25	18	22	22	16
Thornwood Drive	58	29	21	18	21	18
Springburn Road	83	37	30	22	31	24

2.2.1.2 Non Automatic Monitoring Data (Cont.)

Table 2.12 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 2014 (%)	Annual Mean Concentration (μg/m^3) Bias Adjusted				
		2010 (1.10)	2011 (0.94)	2012 (0.95)	2013 (0.96)	2014 (0.83)
Paisley Road West	100	42	31	33	28	29
Sutherland Avenue	100	23	16	18	18	15
Belmont Street	100	31	23	21	21	18
Mallaig Place	100	29	23	19	23	19
Govanhill Street	100	32	28	26	28	24
Westercraigs	100	26	22	24	24	20
Inveresk Lane	92	28	18	18	17	16
Kippen Street	100	27	29	22	23	19
Sacone SW	100	27	21	21	21	16
Invergarrie Road	92	23	18	17	17	14
Easterhouse	100	22	20	19	24	16
Dunn Street	100	31	20	20	23	19
Glasgow Harbour	100	34	28	25	26	21
Mosspark Boulevard	92	30	27	25	25	22
Crow Road	100	45	44	37	33	34
Silverburn	92	23	21	23	23	17
Hyndland Road	100	35	31	27	33	26
Urrdale Road	100	41	31	31	32	26
Park Road	92	-	40	31	36	28

2.2.1.2 Non Automatic Monitoring Data (Cont.)

Table 2.12 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 2014 (%)	Annual Mean Concentration (μg/m^3) Bias Adjusted				
		2010 (1.10)	2011 (0.94)	2012 (0.95)	2013 (0.96)	2014 (0.83)
Springfield Road	75	-	30	25	21	20
Paisley Road West 2	100	-	-	37	40	33
Crow Road 2	100	-	-	28	34	30
Maryhill Road	100	-	-	40	41	34
Scotstoun	100	-	-	19	22	20
Hampden	92	-	-	18	21	16
Kelvingrove Park	83	-	-	29	25	23
Tollcross Park	100	-	-	30	25	19
Milner Road	92	-	-	-	20	16
Gibson Street	100	-	-	-	32	27
Woodlands Road	92	-	-	-	31	28
Arlington Street	100	-	-	-	31	23
Poplar Avenue	100	-	-	-	29	25
Great Western Road	67	-	-	-	37	30
1031 Maryhill Road	100	-	-	-	37	32
MHR Shawpark Street	100	-	-	-	34	30
1428 Maryhill Road	100	-	-	-	29	26
45 Clifford Street	83	-	-	-	-	24
608 Scotland Street West	83	-	-	-	-	27

2.2.1.2 Non Automatic Monitoring Data (Cont.)

Table 2.12 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 2014 (%)	Annual Mean Concentration (μg/m^3) Bias Adjusted				
		2010 (1.10)	2011 (0.94)	2012 (0.95)	2013 (0.96)	2014 (0.83)
17 Kilbride Street	75	-	-	-	-	20
2 Myrtle Drive	75	-	-	-	-	18

* Annualised data

2.2.2 Particulate Material at PM_{10}

Particulate Material (PM_{10}) is monitored using automatic analysers at ten locations across Glasgow, the Kerbside and Townhead AURN sites, 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 2.13 shows the measured annual mean at these locations over the last five years.

Table 2.13 Results of PM_{10} Automatic Monitoring Comparison with Annual Mean Objective (18 μg/m^3)

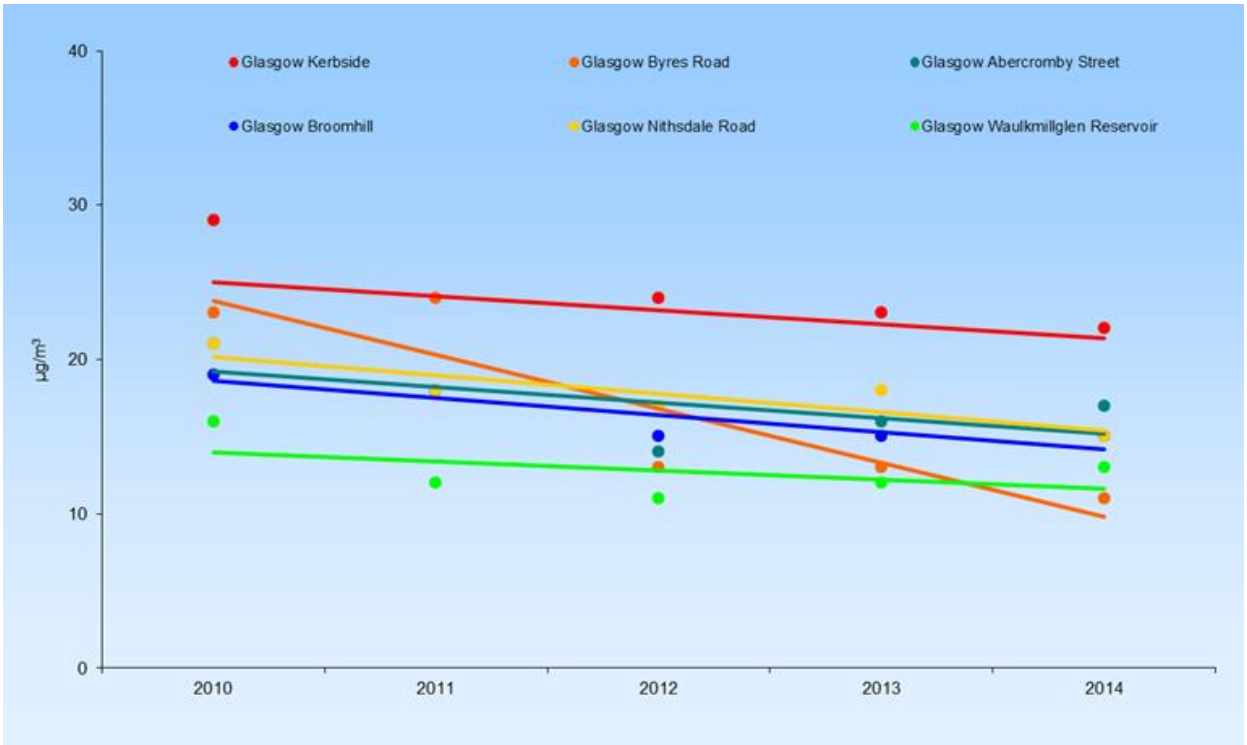
Site Name	Within AQMA?	Gravimetric Equivalent	% Valid Data Capture 2014	Annual Mean Concentration (μg/m^3)				
				2010	2011	2012	2013	2014
Glasgow Kerbside	Yes	Yes	71	29	18	24	23	22
Glasgow Townhead	Yes	Yes	80	-	-	-	-	13
Glasgow Anderston	Yes	Yes	45	16	16	14	16	18
Glasgow Byres Road	Yes	Yes	60	23	24	13	13	11
Glasgow Dumbarton Road	Yes	Yes	96	-	-	18	19	17
Glasgow Burgher Street	Yes	Yes	98	-	-	15	17	16
Glasgow Abercromby Street	Yes	Yes	81	21	18	14	16	17
Glasgow Broomhill	Yes	Yes	99	19	18	15	15	15
Glasgow Nithsdale Road	Yes	Yes	61	21	18	17	18	15
Glasgow Waulkmillglen Reservoir	No	Yes	31	16	12	11	12	13

During 2014, the Annual Mean Objective was exceeded at one location, Glasgow Kerbside AURN. There were % data capture issues at most locations, with only the stations at Dumbarton Road, Burgher Street and Broomhill achieving the target of 90% data capture. Generally where there was a problem with % data capture at GCC monitoring stations the cause was temperature control related.

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 2.14 below, neither of the two Osiris monitoring locations exceeded the Annual Mean Objective.

Table 2.14 Results of Osiris PM_{10}, Monitoring Comparison with Annual Mean Objective (18 μg/m^3)

Site Name	Within AQMA?	Gravimetric Equivalent	% Valid Data Capture 2013	Annual Mean Concentration (μg/m^3)
Maryhill Road	Yes	Yes	62	13
Paisley Road West	Yes	Yes	55	15

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

During 2014, there were no exceedences of the Daily Mean Objective, as described previously there were % data capture issues at most locations, with only the stations at Dumbarton Road, Burgher Street and Broomhill achieving the target of 90% data capture. Table 2.15 shows the exceedences of the Daily Mean Objective over the last five years.

Table 2.15 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 2014	Number of Exceedences of Daily Mean Objective (98^{th} Percentile of Daily Means) if % Valid Data Capture < 90%				
				2010	2011	2012	2013	2014
Glasgow Kerbside	Yes	Yes	71	25	0(28)	7(59)	4(50)	3(49)
Glasgow Townhead	Yes	Yes	80	-	-	-	-	0(31)
Glasgow Anderston	Yes	Yes	45	4(45)	2(25)	3(39)	2	0(42)
Glasgow Byres Road	Yes	Yes	60	9	2(40)	3(37)	0(31)	0(24)
Glasgow Dumbarton Road	Yes	Yes	96	-	-	2(39)	1	0
Glasgow Burgher Street	Yes	Yes	98	-	-	4	3	3
Glasgow Abercromby Street	Yes	Yes	81	9(60)	9	4	2	0(34)
Glasgow Broomhill	Yes	Yes	99	9	6	6	0	0
Glasgow Nithsdale Road	Yes	Yes	61	10(57)	6	9	3(43)	2(36)
Glasgow Waulkmillglen Reservoir	No	Yes	31	4	0(20)	0(29)	0	0(22)

2.2.3 Sulphur Dioxide

Sulphur Dioxide is measured at only one location, Glasgow Anderston. Monitoring of this pollutant was not reinstated at the Townhead AURN site following the relocation from Glasgow Centre. There were no exceedences of the Objectives for SO_2 at Anderston during 2014 prior to monitoring being suspended (April).

Table 2.16 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 2014	Number of Exceedences of : (maximum measured)		
		15 minute Objective	1 hour Objective	24 hour Objective
Glasgow Anderston	44	0 (59μg/m^3)	0 (27μg/m^3)	0 (9μg/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 2.17 below.

Table 2.17 Results of Diffusion Tube Monitoring for Benzene Comparison with Annual Mean Objective (3.25μg/m^3)

Site Name	% Valid Data Capture 2014	Annual Mean Concentration (μg/m^3)
Heilanmans Umbrella North	83	0.7
Hope Street	83	0.6
Ochiltree Avenue	83	0.8
Pollokshaws Road	67	0.8

2.2.5 Carbon Monoxide

The only location where Carbon Monoxide was measured within Glasgow during 2014, was via the mobile unit at Corunna Street, monitoring was discontinued at Byres Road and Anderston during 2013, having earlier also been discontinued at the AURN stations.

Table 2.18 Results of Monitoring for Carbon Monoxide Comparison with 8 hour Running Mean Objective (10mg/m^3)

Site Name	% Valid Data Capture During (Monitoring Period)	Maximum 8 hour Running Mean Concentration (mg/m^3)
Corunna Street (Mobile)	74 (Jan – May)	0.7

2.2.6 Ozone

Ozone is measured at two locations, Glasgow Waulkmillglen Reservoir and the Townhead AURN site. Ozone is a secondary pollutant and the highest concentrations are generally measured remotely from sources of pollution. There were 5 exceedences of the Running 8-hour Mean Objective at the rural site at Glasgow Waulkmillglen Reservoir, all occurring on the same day and 14 exceedences over 3 days at Townhead AURN during 2014.

Table 2.19 Results of Monitoring for Ozone Comparison with 8 hour Running Mean Objective (100μg/m^3)

Site Name	% Valid Data Capture 2014	Number of Exceedences of 8 hour Running Mean Objective (Number of Days) (Maximum Number Days Allowed = 10)
Glasgow Townhead	99	14(3)
Glasgow Waulkmillglen Reservoir	96	5(1)

2.2.7 Particulate Material at $PM_{2.5}$

The Scottish Government has set an Annual Mean Objective for $PM_{2.5}$. Monitoring of $PM_{2.5}$ is currently carried out at two locations, Glasgow Kerbside and Townhead AURN. Annual mean concentrations for $PM_{2.5}$ measured are shown in Table 2.20 below. Measurement of this pollutant is also carried out via Osiris. Annual mean concentrations for $PM_{2.5}$ measured by Osiris are shown in Table 2.21 following.

Table 2.20 Results of $PM_{2.5}$ Automatic Monitoring Comparison with Annual Mean Objective (12 μg/m^3)

Site Name	Gravimetric Equivalent	% Valid Data Capture 2014	Annual Mean Concentration (μg/m^3)				
			2010	2011	2012	2013	2014
Glasgow Kerbside	Yes	61	23	22	20	16	16
Glasgow Townhead	Yes	89	-	-	-	-	7

Table 2.21 Results of Osiris $PM_{2.5}$, Monitoring Comparison with Annual Mean Objective (12 μg/m^3)

Site Name	Gravimetric Equivalent	% Valid Data Capture 2013	Annual Mean Concentration (μg/m^3)
Maryhill Road	Yes	62	5
Paisley Road West	Yes	55	6

2.2.8 Summary of Compliance with AQS Objectives

Glasgow City Council has examined the results from monitoring in the city. Concentrations outside of the AQMA's are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

3.0 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

A location with a combination of high traffic volume and narrow streets is where exceedences of the objectives are most likely. Slow moving, stop/start driving can cause high emissions, with buildings on either side of the road reducing dispersion. Such locations should be assessed for potential exceedences of the air quality objectives.

Previous rounds of review and assessment have considered these streets in some detail. No new streets which meet the criteria have been identified.

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

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

There are certain locations where members of the public may be expected to spend 1-hour or more on a regular basis, such as shopping areas. These require to be assessed if they are next to a busy road where there is the potential for exceedences of the 1-hour objective for NO_2.

Glasgow has a number of locations such as these. However, the busiest streets for traffic and for shopping are currently within the existing boundary of the city centre AQMA. Therefore, these will not require to be assessed further at the present time. No new streets which meet the criteria have been identified.

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

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

Certain streets may not have an exceptionally high traffic flow, but if there are a high proportion of buses or heavy goods vehicles (HGVs), which are large emitters of NOx, there may still be elevated concentrations of pollution.

Glasgow's Fastlink, a 3.5 mile dedicated bus route linking the city centre with South Glasgow University Hospital is due for completion during 2015. Once this route is fully operational its impact on air quality will be assessed.

Glasgow City Council confirms that there are currently no new/newly identified roads with high flows of buses/HGVs.

3.4 Junctions

Busy road junctions are areas where concentrations of NO_2 can increase due to build up of traffic. Busy junctions are those with more than 5000 vehicles per day where the annual mean PM_{10} background is expected to be above 15µg/m^3. Alternatively it can be considered if there are more than 10,000 vehicles per day where the mean background level is expected to be below 15µg/m^3. It is not necessary to assess those junctions that do not have relevant exposure.

It is considered that all junctions which meet the above criteria have been evaluated in previous rounds of review and assessment.

Glasgow City Council confirms that there are no new/newly identified busy junctions/busy roads.

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

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 noncompliance with annual air quality objectives at locations close to the route and at junctions with the surface street network was possible. Monitoring and modelling was carried out on behalf of Transport Scotland as part of the Project Evaluation which is scheduled to be published in 2016. Initial analysis of the data has resulted in several additional NO_2 diffusion tubes being placed at locations adjacent to the route. Results from these tubes were within the Annual Mean Objective value during 2014.

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, was delayed until after the Commonwealth Games in 2014.There is no current start date for this work to recommence.

Glasgow City Council confirms that there are no new/proposed roads.

3.6 Roads with Significantly Changed Traffic Flows

Those roads which were previously at risk of exceeding the objectives may be subject to higher concentration of pollutants if there has been a 'large' increase in traffic flow, where 'large' is defined as,

> "..more than 25% increase in traffic flow."

The road network in Glasgow has not undergone any major changes that could lead to such an increase in traffic flow on at risk roads since the last round of review and assessment.

The recently opened South Glasgow University Hospital has the potential to increase traffic in the surrounding area. An assessment conducted in early 2013 as part of the Environmental Impact Assessment predicted negligible air quality impacts. However, the plans for parking provision at the hospital have changed and new planning applications have been submitted. These will require a new air quality assessment to reflect the changed circumstances.

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

3.7 Bus and Coach Stations

Because of the high volume of buses and coaches using bus stations on a regular basis, there is a risk of exceedences of the hourly objective for NO_2.

The main bus station in Glasgow is Buchanan Bus Station, located within the city centre AQMA. Another major bus station is Partick Bus Station, located within the Byres Rd / Dumbarton Rd AQMA. Both of these bus stations have been extensively assessed in previous rounds of review and assessment.

Whilst it is not a bus station i.e. passenger terminus, one of the largest fleet operators in the city relocated their main depot to a new facility at Gushetfaulds, capacity for 450 buses. The impact of this facility was initially assessed at the planning stage.

Glasgow City Council confirms that there are no relevant bus stations which have not previously been assessed in the Local Authority area.

4.0 Other Transport Sources

4.1 Airports

Aircraft are significant sources of nitrogen oxide emissions, most particularly during takeoff. It is thought that they can make a significant contribution to ground-level concentrations when they are below 200m.

Glasgow International Airport is located outwith the city boundary and falls within the jurisdiction of Renfrewshire Council. Guidance suggests to,

…establish whether there is relevant exposure within 1000m of the airport boundary…

Since the airport is more than two kilometres from the city boundary, there is no relevant exposure and so emissions from aircraft take off are not predicted to have any effect on air quality in Glasgow.

Glasgow City Council confirms that there are no airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

Diesel and coal-fired railway locomotives can potentially emit large quantities of SO_2, and if these engines are stationary while running for 15-minute periods or more, then there is a risk of exceedences of the 15-minute objective. Locations where this is likely to occur include stations, depots and junctions. For this to be an issue in terms of public exposure there must be, according to the Technical Guidance, a potential for:

“regular outdoor exposure of members of the public within 15m of the stationary locomotives”.

4.2.1 Stationary Trains

It is considered unlikely that there will be any locations where diesel trains have their engines running for extended periods and where there is potential exposure for the public. Even in locations like Glasgow Central and Queen Street stations, where engines may idle occasionally, the areas where the public would wait are more than 15m from the locomotive engines. In addition, the potential exists for locomotive engines running at rail depots; however, such sites are not generally accessible to the public.

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

4.2.2 Moving Trains

The main Glasgow to Edinburgh line has been identified as a section of track that may have a large number of movements of diesel locomotives. However, there are no areas along the route identified using the national background maps where the background annual mean NO_2 concentration is above 25 $\mu g/m^3$.

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

4.3 Ports (Shipping)

Large ships, such as cross-Channel ferries or cruise ships, often use fuel oil which has a high sulphur content, and if there is a large amount of shipping traffic in the area around a port, there will be a risk of exceedences of the 15-minute objective.

Glasgow City Council confirms that there are no ports or shipping that meets the specified criteria within the Local Authority area.

5.0 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

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. This facility is scheduled to commence operations in 2016.

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

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

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

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

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

5.2 Major Fuel (Petrol) Storage Depots

Glasgow City Council confirms that there are no major fuel (petrol) storage depots within the Glasgow City Council area.

5.3 Petrol Stations

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

5.4 Poultry Farms

Glasgow City Council confirms that there are no poultry farms meeting the specified criteria.

6.0 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

Glasgow, in common with other local authorities, has seen a rise in the number of biomass installations seeking planning approval. Given the potential for increased emissions over other types of installations, Glasgow has adopted a policy on biomass which complements and builds on the advice of the Scottish Government requiring any installations to be as clean as possible. All installations entering the planning process are required to submit detailed pollution dispersion modelling as part of an air quality assessment. Furthermore they are required to submit an environmental cost benefit analysis based on the Interdepartmental Group on Costs and Benefits (IGCB) Damage Costs Calculator and to show an overall environmental benefit from biomass adoption.

Since the last round of Review and Assessment there have been one application for biomass based district heating, at Gorget Quadrant. The assessment predicted negligible or insignificant air quality impacts from the installations.

Glasgow City Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.2 Biomass Combustion – Combined Impacts

In areas where domestic solid fuel is still in widespread use, coupled with the combined effects of commercial biomass boilers, there can be a problem with PM_{10} concentrations. The growth in popularity of biomass in domestic situations, particularly the use of wood burning stoves could lead to potential problems with PM_{10}. At present within Glasgow, there is no area of 500 x 500m with sufficient numbers of small solid fuel burners to present a significant impact on PM_{10} levels.

Glasgow City Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.3 Domestic Solid-Fuel Burning

Domestic solid fuel burning, whether coal or smokeless fuels, can give rise to exceedences of the objective for SO_2. Significant coal burning is defined as any area of about 500 x 500m with more than 50 houses burning coal / smokeless fuel as their primary source of heating.

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

7.0 Fugitive or Uncontrolled Sources

Fugitive emissions from a variety of sources can give rise to elevated PM_{10} concentrations. Fugitive sources, i.e. dust have the potential to be a problem in the achievement of the PM_{10} objectives, especially in Scotland where the objective level for 2010 is lower than in the rest of the UK. It is thought that dust emissions contain around 20% PM_{10}.

The guidance on dealing with these sources is to identify potential sources, and then determine whether there are dust concerns at the facility. This assessment should be based on dust complaints about the facility, air quality assessments already carried out or a visual inspection indicating significant dust.

The only potential sources which Glasgow contains within its boundaries are landfill sites, of which there are several. These have been considered in previous rounds of review and assessment where it was concluded that they would not have a significant impact on PM_{10} concentrations.

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

8.0 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

During 2014, Glasgow City Council has measured concentrations of nitrogen dioxide above the Annual Mean Objective at several locations within existing AQMA's; there was no exceedence of the Hourly Mean Objective.

The Annual Mean Objective for PM_{10} has been exceeded at one monitoring location; there were no exceedences of the Daily Mean Objective.

NO_2 Annual Mean Objective

The Annual Mean Objective was exceeded at Glasgow Kerbside AURN and Byres Road automatic monitoring stations and at various diffusion tube locations within the city centre AQMA.

NO_2 Hourly Mean Objective

The NO_2 Hourly Mean Objective was not exceeded. The 99.8th percentile value of the objective measured at those locations where the percentage data capture was <90% did not indicate that this objective would have been exceeded.

PM_{10} Annual Mean Objective

The PM_{10} annual mean objective was exceeded at Glasgow Kerbside AURN.

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

There were no exceedences of the Daily Mean Objective, neither did the 90th percentile value from those sites with <90% data capture indicate that this objective would have been exceeded.

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. During 2014, concentrations of ozone were also within the objective set by the Regulations. The Scottish Government has set an Annual Mean Objective for $PM_{2.5}$, this objective continues to be exceeded at Glasgow Kerbside.

8.2 Conclusions from Assessment of Sources

Roads, transport, industrial and domestic sources of air pollution were considered as part of the Updating and Screening Assessment. It was shown that there are no new developments or changes to existing developments likely to lead to significant contributions to air pollution levels.

8.3 Proposed Actions

As outlined in the 2014 Detailed Assessment;

“Given the widespread compliance with the objective levels through both monitoring and modelling and the predicted total compliance evidenced by the 2015 modelling, Glasgow City Council proposes to revoke the current Citywide AQMA in respect of PM_{10} since the results show that the objective is being met in the majority of the AQMA.

However, due to recent monitored exceedences, Glasgow City Council proposes to amend the existing Byres Rd /Dumbarton Rd AQMA to include the PM_{10} objectives.”

Additionally, in response to the 2014 Progress Report, SEPA (statutory consultee), recommended that Glasgow City Council progress to a Detailed Assessment with regard to annual mean concentrations of Nitrogen Dioxide on Maryhill Road.

Glasgow City Council will undertake to revoke the citywide AQMA in respect of PM_{10} and amend the existing Byres Rd /Dumbarton Rd AQMA to include the PM_{10} Objectives and within the next 12 months produce both a Detailed Assessment for NO_2 (Maryhill Road) and a Progress Report for 2016.

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Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

Glasgow City Council conducted three local co-location studies in 2014 with triplicate tubes located with chemiluminescent nitrogen dioxide analysers. Only one of these sites met the data collection criteria for inclusion within the National Diffusion Tube Bias Adjustment Factor and was combined with other results from Glasgow Scientific Services to obtain a lab specific adjustment factor of 0.83.

PM Monitoring Adjustment

Particulate Material (PM_{10}) is monitored using automatic analysers at ten locations across Glasgow, monitoring at the Kerbside and Townhead AURN sites, the air quality stations at Anderston, Abercromby Street, Broomhill, Byres Road, Burgher Street and Nithsdale Road was carried out using FDMS TEOMS and therefore no correction was required.

PM_{10} monitoring at Dumbarton Road and Waulkmillglen was carried out using standard TEOMS which were corrected for gravimetric equivalence using the Volatile Correction Model (VCM) method.

Short-term to Long-term Data adjustment

Glasgow City Council operates an extensive network of diffusion tubes measuring NO_2 levels at almost 100 sites around the city, these tubes are changed every month. Generally where a tube is lost or damaged there is enough data available that it is not necessary to annualise the results from the site. Results from one location, Balshagray Avenue were annualised for 2014 as only one tube was recovered at this site during the first six months of the year. Monitoring data from Glasgow's Dumbarton Road station, the closest automatic site to the tube location was used in this instance.

Site	Site Type	Annual Mean ($\mu g/m^3$)	Period Mean ($\mu g/m^3$)	Ratio
Glasgow Dumbarton Road	Roadside	38	35	1.09

QA/QC of automatic monitoring

QA/QC for all automatic sites, both GCC and AURN, is carried out by AEA Technology. This includes six monthly site audits and data ratification, with the exception of the mobile unit where data continues to be ratified in house.

All stations are calibrated on a fortnightly basis with the exception of Glasgow Townhead AURN where calibrations are four weekly.

QA/QC of diffusion tube monitoring

Glasgow scientific services participate in the Workplace Analysis Scheme for Proficiency (WASP) and achieved 100% satisfactory scores in the four WASP rounds during 2014, (R124, R1, R3 and R4).

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