



2017 Air Quality Annual Progress Report
Glasgow City Council

In fulfilment of Part IV of the
Environment Act 1995

Local Air Quality Management

September 2017

Local Authority Officer	K. Reid
Department	Sustainable Glasgow
Address	231 George Street, Glasgow. G1 1RX
Telephone	0141 287 9251
E-mail	Ken.reid@glasgow.gov.uk
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Executive Summary: Air Quality in Our Area

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 Progress Report is required as part of Glasgow City Council's Review and Assessment programme. 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.

Air Quality in Glasgow

During 2016, Glasgow City Council has measured concentrations of nitrogen dioxide above the Annual Mean Objective at two automatic monitoring stations within existing Air Quality Management Areas (AQMA's) and at multiple locations, by diffusion tube, within the existing City Centre AQMA. The Hourly Mean Objective was not exceeded at any of the automatic monitoring stations.

Neither the Annual Mean Objective for PM₁₀ nor the Daily Mean Objective was exceeded at any monitoring location during 2016.

For Scottish Local Authorities particulates at PM_{2.5} have now been prescribed in regulation with an Annual Mean Objective of 10µg/m³ by 2020 this objective was not exceeded at any monitoring location during 2016.

During 2016 Glasgow City Council revoked the citywide AQMA for PM₁₀ Annual Mean. In conjunction with this revocation the existing Byres Road and Dumbarton Road AQMA was amended in respect of the Annual Mean PM₁₀ Objective.

Actions to Improve Air Quality

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 on going. 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 programme is shown in Table 2.2.

Measures recently introduced by the council include the Glasgow ECO Stars Fleet Recognition Scheme, which aims to promote best practise for fleet operators and city car club. The Council continues to promote and facilitate improvements in sustainable transport through investment in cycling infrastructure.

Glasgow City Council's Strategic Plan for Cycling 2016 - 2025 was recognised as a category winner courtesy of the Scottish Transport Awards.

This plan has included introducing the West City Way; a safe route segregated from traffic between Kelvingrove Park and Central Station, and the South West City Way, a 2km stretch of segregated cycle route from Pollokshields to the city centre via the Tradeston footbridge.

Local Priorities and Challenges

During November 2015 the Scottish Government launched the Cleaner Air for Scotland (CAFS) strategy which is intended to shape the direction taken in Scotland to achieve compliance with the air quality objectives. This strategy incorporates actions on a range of related subjects such as transport, health, legislation, place making, communication and climate change.

As part of the strategy there will be a National Low Emission Framework (NLEF) which will seek to set out the methodology for actions and interventions intended to reduce the emission of pollutants. This will be informed by a National Modelling Framework (NMF) which will help local authorities to identify and quantify the pollution sources in their areas.

Glasgow remains an active participant in national discussions and working groups aimed at establishing a framework for the implementation of LEZs in Scotland. Glasgow has undertaken the initial traffic assessments and modelling work to evaluate the potential for pollution reduction in the city centre. The Council has previously stated its interest in a local LEZ as a potential policy option for improving air quality in the city. During 2016, the Scottish Government also published their CAFS Progress Report, which provides further detail on this work.

<http://www.gov.scot/Publications/2017/06/2881>

How to Get Involved

Information relating to Local Air Quality Management (LAQM) and AQMA's in Glasgow is available via the Glasgow Council website. This information includes Air Quality Action Plans, Progress Reports and Detailed Assessments.

<https://www.glasgow.gov.uk/index.aspx?articleid=18863>

The website also contains links to the national Air Quality in Scotland webpage where the public can access both real time and historical monitoring data in addition to registering to receive text/email alerts where poor air quality is forecast.

<http://www.scottishairquality.co.uk/>

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1. Local Air Quality Management

This report provides an overview of air quality in Glasgow during 2016. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) 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 an exceedence is considered likely the local authority must 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. This Annual Progress Report (APR) summarises the work being undertaken by Glasgow City Council to improve air quality and any progress that has been made.

Table 1.1 – Summary of Air Quality Objectives in Scotland

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
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
Particulate Matter (PM ₁₀)	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
Particulate Matter (PM _{2.5})	10 µg/m ³	Annual mean	31.12.2020
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
Benzene	3.25 µg/m ³	Running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m ³	Running annual mean	31.12.2003
Carbon Monoxide	10.0 mg/m ³	Running 8-Hour mean	31.12.2003
Lead	0.25 µg/m ³	Annual Mean	31.12.2008

2. Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedence or likely exceedence of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) setting out measures it intends to put in place in pursuit of the objectives.

A summary of AQMAs declared by Glasgow City Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at:

<https://www.glasgow.gov.uk/index.aspx?articleid=18863>

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	Description	Action Plan
City Centre AQMA	<p>NO₂ Annual Mean</p> <p>PM₁₀ Annual Mean</p> <p>NO₂ Hourly Mean</p>	Glasgow	<p>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 NO₂ Objective.</p> <p>In 2007 the area covered by this AQMA was extended and declared in respect of the annual mean PM₁₀ Objective.</p> <p>In 2012 a further extension of the AQMA was declared and the order amended in respect of the hourly mean NO₂ Objective.</p>	<p>Glasgow City Council Air Quality Action Plan 2009</p> <p>https://www.glasgow.gov.uk/CHttpHandler.ashx?id=32447&p=0</p>

AQMA Name	Pollutants and Air Quality Objectives	City / Town	Description	Action Plan
Parkhead Cross AQMA	NO ₂ Annual Mean	Glasgow	<p>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.</p> <p>This area was declared in 2007 in respect of the annual mean NO₂ Objective.</p>	<p>Glasgow City Council Air Quality Action Plan 2009</p> <p>https://www.glasgow.gov.uk/CHttpHandler.ashx?id=32447&p=0</p>
Byres Road and Dumbarton Road AQMA	<p>NO₂ Annual Mean</p> <p>PM₁₀ Annual Mean</p>	Glasgow	<p>This AQMA extends 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.</p> <p>This area was declared an AQMA in 2007 in respect of the annual mean NO₂ Objective.</p> <p>In 2012 the area covered by this AQMA was extended northwards along Queen Margaret Drive to the junction with Oban Drive.</p> <p>In 2016 this AQMA was amended in respect of the annual mean PM₁₀ Objective.</p>	<p>Glasgow City Council Air Quality Action Plan 2009</p> <p>https://www.glasgow.gov.uk/CHttpHandler.ashx?id=32447&p=0</p>

2.2 Progress and Impact of Measures to Address Air Quality in Glasgow

Glasgow City Council has taken forward a number of measures during the current reporting year of 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. More detail on these measures can be found in the Air Quality Action Plan. Generally the measures included in the AQAP are not considered finite and will evolve over time.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Vehicle Idling Council will expand programme of vehicle idling enforcement	Public Information	Regular scheduled patrols to enforce and/or educate regarding vehicle idling	Public Health LES		2003 onwards		Low	Council continues to promote awareness and benefits in regard to reduction of vehicle idling via billboards and advertising campaign on PSV vehicles and bus stops.	Ongoing	1 FPN issued during 2016.
2	Emission Testing	Public Information	Council will continue a programme of roadside emission testing	Public Health LES		2003 onwards		Low	30000+ vehicles tested	Ongoing	3519 vehicles tested 28 FPN's issued during 2016
3	Low Emission Zones	Promoting Low Emission Transport	The Council will undertake a detailed feasibility study with a view to introducing LEZs in Glasgow	Sustainable Glasgow LES	2009	2009-2010		Medium	Feasibility study into LEZs in Glasgow was completed in 2010.	Completed 2010	

Glasgow City Council

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
3	Low Emission Zones	Promoting Low Emission Transport		Sustainable Glasgow LES		2014		Medium	Trial of LEZ camera technology completed.	Completed 2014	
3	Low Emission Zones	Promoting Low Emission Transport	Cleaner Air for Scotland (CAFS) National Low Emission Framework (NELF)	Scottish Government GCC are a partner authority on the CAFS Governance Group	2015			Medium	2016 CAFS Progress Report published	Ongoing	
4	Cleaner Taxis	Vehicle Fleet Efficiency	Council will prepare an emissions strategy to reduce emissions from taxi and private hire vehicles Proposals to limit the maximum age and increase the emission testing frequency for taxis researched and discussed with interested parties	Sustainable Glasgow LES	2009			Low/Medium	Taxis have been preferentially selected for roadside emissions testing. Liaison with Taxi Operators Association and Licensing authority with regard to emission limits, maximum age and eco-driver training.	Ongoing	

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Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
5	Council Workplace Travel Plan	Promoting Travel Alternatives	Council will prepare a workplace travel plan for all employees	Glasgow City Council	2009	2011		Low	The travel plan has been completed, however it is a living document, tasks have no finite life span	Ongoing	
5	Council Workplace Travel Plan	Promoting Travel Alternatives	Travel Plan was relaunched in an updated form.	Glasgow City Council		2014		Low	Cycling Infrastructure improvements Lift share, car share facility for GCC Pool bike scheme Site Bike Scheme Cycle to work scheme Improvements at council premises including secure parking facilities.	Ongoing	

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Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
6	Car Clubs	Alternatives to Private Vehicle Use	The Council will make on street spaces available for car club vehicles.	Glasgow City Council	2009	2010 Onwards		Low	Car club has 35 vehicles including 3 fully electric in operation within Glasgow located on street on 42 council provided bays.	Ongoing	2016 also saw the introduction of dedicated car club electric vehicle charge points.
7	Public Service Vehicles	Vehicle Fleet Efficiency	<p>The Council will pursue the use of traffic regulation conditions to control bus emissions within AQMAs.</p> <p>The Quality Partnership Scheme in the city requires that buses have to meet set emission standards by pre-agreed dates on certain routes.</p>	Glasgow City Council	2009	2012		Medium	<p>From January 2014 100% of each operator's streamline journeys within Glasgow City boundary will be operated with vehicles meeting EURO 3 emission engine standard for particulates (PM10).</p> <p>From June 2014 a minimum of 20% of total scheduled journeys within City Centre AQMA to be operated with vehicles meeting full Euro4 emission standards.</p>	2019	

Glasgow City Council

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
7	Public Service Vehicles	Vehicle Fleet Efficiency	<p>The Council will pursue the use of traffic regulation conditions to control bus emissions within AQMAs.</p> <p>The Quality Partnership Scheme in the city requires that buses have to meet set emission standards by pre-agreed dates on certain routes.</p>	Glasgow City Council	2009	2015		Medium	The implementation of the Fastlink route linking the City Centre and the new Southern General Hospital introduced emission standards. Initially Euro IV or V, becoming a minimum of Euro V on all sections by 2018.	2021	
7	Public Service Vehicles	Vehicle Fleet Efficiency	<p>The Council will pursue the use of traffic regulation conditions to control bus emissions within AQMAs</p> <p>The Quality Partnership Scheme in the city requires that buses have to meet set emission standards by pre-agreed dates on certain routes.</p>	Glasgow City Council	2009			Medium	A Scottish Government funded study of bus emissions in the city centre was incorporated into the upcoming NMF study for Glasgow. The results for this including detailed analysis of public service vehicle contributions to air pollution in Glasgow have been incorporated into the pollution models being used for the current LEZ scenario testing being undertaken.		

Glasgow City Council

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
8	Boiler Emissions	Promoting Low Emission Plants	The Council will raise awareness and provide information to assist in energy efficiency in the home and workplace	Glasgow City Council	2010	2011 onwards		Low	<p>Biomass Guidance produced 2011 addressing boiler emissions</p> <p>Glasgow Home Energy Advice Team (G-HEAT) has been established to provide independent advice on energy related issues to householders in the city</p> <p>Attention of developers continues to be drawn to biomass guidance at the planning stage</p>	Ongoing	
9	Planning Guidance	Policy Guidance and Development Control	The Council will produce revised planning guidance	Glasgow City Council	2010	2012		Medium	Guidance complete and available on council website		

Glasgow City Council

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
9	Planning Guidance	Policy Guidance and Development Control	Glasgow City Council is in the process of replacing its current Planning Guidance with more formal Supplementary Planning Guidance in respect of air quality (SPG).	Glasgow City Council	2015			Medium		Ongoing	
10	Air Quality Information	Public Information	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	Glasgow City Council	2010			Low	All air quality review and assessment reports are available on the GCC website. Further reports, guidance documents and links to be added when complete. Daily Update of Air Quality Data now also published on the GCC website. Appropriate VMS messaging now in place on Transport Scotland motorway VMS network.	Ongoing	

Glasgow City Council

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
10	Air Quality Information	Public Information	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	Glasgow City Council	2016	2016		Low	The Council secured funding to install two CityTrees in city centre Air Quality Management Area. These installations contain information on and links to air quality information sources.	2017	
11	Construction Sites	Policy Guidance and Development Control	The Council will produce a code of practice for construction / demolition contractors	Glasgow City Council	2011	2012		Low	Guidance produced and available on Council web site	2012	
12	Fire Reduction	Public Information	The Council will investigate multi agency strategic level actions aimed at reducing the number of fires and harmful emissions	Glasgow City Council	2011	2011		Low	The Council have promoted and facilitated educational visits to schools to highlight the dangers of fires and fire starting to children.	2011	

Glasgow City Council

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
13	Cycling Strategy	Promoting Travel Alternatives	Air Quality grants will be sourced for funding cycling improvements in the city.	Glasgow City Council	2011	Ongoing		Low	Grants have been obtained from Scottish Govt. and used for provision of cycling infrastructure such as bike shelters and stances across the city. Continued investment in cycling infrastructure including community centred projects and secure bike storage at schools.	Ongoing	During 2016 a further 100 cycle racks plus secure cycle shelters at various locations across the city were installed. Glasgow City Council's Strategic Plan for Cycling 2016 - 2025 was recognised as a category winner courtesy of the Scottish Transport Awards.

Glasgow City Council

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
14	Bus Retro-fit Scheme	Promoting Low Emission Transport	<p>Grant funding to retro-fit Buses with new exhaust tech to reduce harmful emissions.</p> <p>Grant of ~ £250k agreed from Scottish Government</p> <p>Discussions with bus operators / SPT / Retrofit companies and procurement</p>	Glasgow City Council / Strathclyde Partnership for Transport	2011			Low	<p>Follow up proposals rejected by bus companies.</p> <p>Funding redirected towards joint purchase with SPT of 2 fully electric buses for use on Route 100 to Transport museum.</p>	Completed	<p>Working with the commercial and bus sectors, the Energy Saving Trust and the Low Carbon Vehicle Partnership, the Scottish Gov is to introduce an Engine Retrofitting Centre in Scotland to support the delivery of LEZs. GCC will assist in delivery of this significant for piece of work.</p>

Glasgow City Council

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
15	Tree Planting		The Council will investigate the potential for a programme of tree planting as a means of city centre PM10 reduction	Glasgow City Council	2016	2016		Low	Programme of tree planting within the city continues The Council also secured funding to install two CityTrees in city centre Air Quality Management Area. These installations are comprised of moss and vascular plants and facilitate the introduction of greening into hard stand areas.	2017	
16	CARBOTRAF	Traffic Management	EU funded project to bring about real-time reduction in traffic pollution through active traffic management.	Glasgow City Council Graz Austria Air Monitors UK	2011	2014		Low	Demonstrator in two cities to show relationship between black carbon and real time traffic management.	Completed	

Glasgow City Council

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
17	Promote Greener Vehicles		The Council will investigate the potential for reduced rate street parking for electric and hybrid vehicles	Glasgow City Council	2012	2012		Low	Glasgow City Council has introduced a network of public charging points, presently 93 each point is capable of simultaneously charging 2 vehicles. Charging points have also been provided within council car parking facilities.	Ongoing	Whilst parking charges now apply, the electricity is provided free of charge.
18	Leading by Example		<p>The Council will demonstrate best practice in the operation of its vehicle fleet</p> <p>The Council have introduced a fleet of electric vehicles through a government backed scheme and trained staff in the efficient use of these vehicles.</p>	Glasgow City Council				Low	<p>Expanded the use of electric vehicles within the fleet including new Nissan Leaf vehicles.</p> <p>'Fuel Efficient Driver' training recently undertaken by 120 members of staff, who regularly drive on business.</p> <p>Council currently has a total of 18 electric vehicles.</p>	Ongoing	The vehicle procurement framework is being reviewed allowing renewed emphasis to be placed on zero and low emissions vehicles.

Glasgow City Council

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
18	Leading by Example		<p>The Council will demonstrate best practice in the operation of its vehicle fleet</p> <p>The Glasgow ECO Stars Fleet Recognition Scheme is being promoted by Glasgow City Council. The scheme is designed to raise awareness with both public and private organisations of the important role they can play in helping to improve air quality</p>	Glasgow City Council		2014		Low	<p>The scheme has been operating since September 2014 and has currently recruited 87 members encompassing approximately 5500 fleet vehicles including two of the largest bus companies operating within Glasgow.</p>	Ongoing	<p>The Glasgow ECOStars scheme will be extended to include Taxi operators.</p>

3. Air Quality Monitoring Data and Comparison with Air Quality Objectives

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how local concentrations of the main air pollutants compare with the objectives.

Glasgow undertook automatic (continuous) monitoring at 12 sites during 2016. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at:

<http://www.scottishairquality.co.uk/>

Maps showing the locations of the monitoring sites are available at:

<https://www.glasgow.gov.uk/index.aspx?articleid=17623>

Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Glasgow undertook non-automatic (passive) monitoring of Nitrogen Dioxide at 110 sites and Benzene at 4 sites during 2016. Table A.2 in Appendix A shows the details of the sites.

Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

3.2 Individual pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for annualisation and bias. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO₂)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

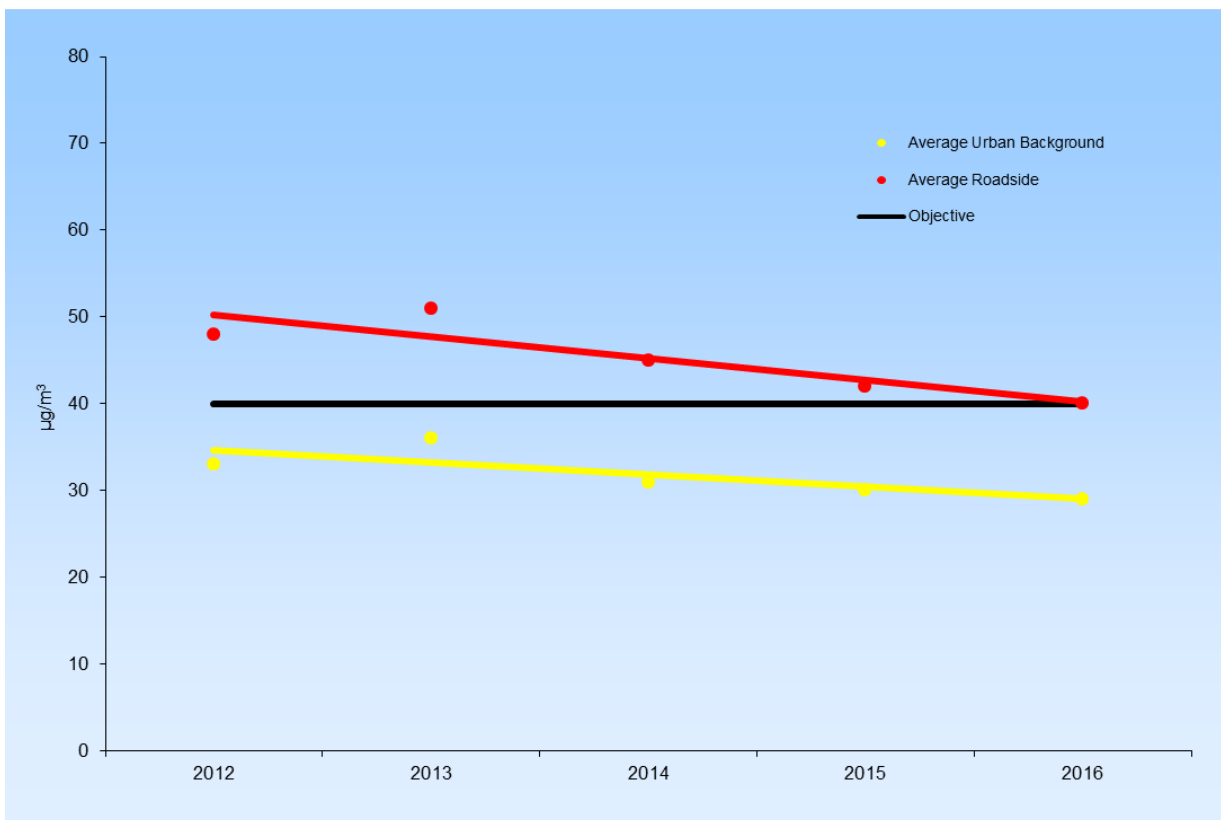
Additionally, for diffusion tubes, the full 2016 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year.

During 2016, Glasgow City Council has measured concentrations of NO₂ above the Annual Mean Objective at two automatic monitoring stations, Kerbside (GLA4) and Dumbarton Road (GL9) these are both within existing Air Quality Management Areas (AQMA's). The Annual Mean Objective was also exceeded at several locations, by diffusion tube, within the existing City Centre AQMA.

The underlying trend across the City Centre AQMA continues to suggest an overall drop in NO₂ concentrations.

Figure 3.1 Trends in Annual Mean Nitrogen Dioxide Concentration Within City Centre AQMA (Diffusion Tube) Comparison with Annual Mean Objective (40µg/m³)



The Hourly Mean Objective was not exceeded at any of the automatic monitoring stations. One diffusion tube location (CC13) returned an annual mean >60µg/m³ (65µg/m³) which indicates a possible exceedence of the Hourly Mean Objective at this location. Note however, that CC13 is approx. 100m from the automatic

monitoring station on Hope St. (GLA4) with a common pollutant source, i.e. traffic using Hope St. Whilst annual mean concentrations at these two locations are generally similar, see Table A.3. The exceedences of the Hourly Mean Objective measured at GLA4 have not exceeded the objective limit (18 hours) in recent years.

3.2.2 Particulate Matter (PM₁₀)

Table A.5 in Appendix A compares the ratified and adjusted monitored PM₁₀ annual mean concentrations for the past 5 years with the air quality objective of 18µg/m³.

Table A.6 in Appendix A compares the ratified continuous monitored PM₁₀ daily mean concentrations for the past 5 years with the air quality objective of 50µg/m³, not to be exceeded more than 7 times per year.

Neither the Annual Mean Objective for PM₁₀ nor the Daily Mean Objective was exceeded at any monitoring location during 2016.

During 2016 Glasgow City Council revoked the citywide AQMA for PM₁₀ Annual Mean. In conjunction with this revocation the existing Byres Road and Dumbarton Road AQMA was amended in respect of the Annual Mean PM₁₀ Objective.

3.2.3 Particulate Matter (PM_{2.5})

Table A.7 in Appendix A compares the ratified and adjusted monitored PM_{2.5} annual mean concentrations for the past 5 years with the air quality objective of 10µg/m³.

For Scottish Local Authorities particulates at PM_{2.5} have now been prescribed in regulation with an Annual Mean Objective of 10µg/m³ by 2020 this objective was not exceeded at any monitoring location during 2016.

3.2.4 Benzene (C₆H₆)

Table A.8 in Appendix A shows the monitored C₆H₆ annual mean concentrations with the air quality objective of 3.25µg/m³.

3.2.5 Carbon Monoxide (CO) and Sulphur Dioxide (SO₂)

Monitoring of these pollutants has been discontinued in Glasgow. Monitoring of CO was discontinued at Byres Road (GLA6) and Anderston (GLA5) during 2013, having previously been discontinued at the AURN stations. Monitoring of SO₂ was discontinued at the AURN Townhead (GLKP) station following the relocation from Glasgow Centre during 2013. Monitoring of SO₂ at GLA5 was suspended during 2014 due to long term renovation works, subsequently monitoring of this pollutant was not reinstated when the station was reactivated.

4. New Local Developments

4.1 Road Traffic Sources

The Clyde Waterfront and Renfrew Riverside Project (CWRRP) incorporates several elements spanning the boundary between Renfrewshire Council and Glasgow City Council. The main elements of the project which will impact traffic flows and therefore potentially affect air quality are:

- New Clyde Bridge Crossing;
- Connection of Clyde Crossing approach road at Dock Street with the A814 Glasgow Road / Dumbarton Road;
- Yoker Train Station Cycle link.

An air quality assessment has been submitted as part of the planning application process (16/01572/DC) for this project which incorporated additional baseline air quality monitoring and dispersion modelling of the projected traffic impacts in the surrounding area. The assessment concluded that it was unlikely that any air quality objectives would be breached as a result of the proposed development.

Glasgow City Council has expanded the air quality monitoring in the vicinity of the proposed new bridge crossing to verify these conclusions and this monitoring work is ongoing.

4.2 Other Transport Sources

No significant new transport sources.

4.3 Industrial Sources

No significant new industrial sources.

4.4 Commercial and Domestic Sources

A planning application for a biomass boiler system for the RDA riding school and arena was received and was subject to an air quality assessment. The assessment concluded that the impact on local air quality was likely to be insignificant.

4.5 New Developments with Fugitive or Uncontrolled Sources

No significant new developments with fugitive or uncontrolled sources.

5. Planning Applications

There have been several planning applications for residential developments within the last year which required air quality assessments due to the predicted additional vehicle movements. None of the assessments predicted significant adverse air quality impacts or new exceedances of the objectives.

An air quality assessment of the parking provision and local roads around the Queen Elizabeth University Hospital was submitted in the last year. The new expanded hospital has the potential to increase road traffic in the surrounding area and therefore impact on air quality. The assessment concluded that the new hospital would have a negligible impact on local receptors and that there would be no new exceedances of the objectives. Glasgow City Council has expanded the air quality monitoring in the vicinity of the hospital to verify these conclusions and this monitoring work is ongoing.

There have been three planning applications received for district heating / energy centre projects. The Hillpark Drive Energy Centre will serve a residential estate while the City Campus and Riverside Campus Energy Centres will serve their respective educational estate buildings. All were subject to conditions requiring an air quality assessment and none of the assessments predicted significant adverse air quality impacts or new exceedances of the objectives.

A further application for a district heating project serving the city centre campus of the University of Strathclyde has been received. An air quality assessment for this project is in the early stages and will be submitted once complete.

6. Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

Automatic analyser and diffusion tube monitoring of NO₂ indicates that concentrations are likely to continue to exceed the Annual Mean Objective at locations within the existing City Centre and Byres Road / Dumbarton Road Air Quality Management Areas. Concentrations within the Parkhead AQMA whilst below this Objective during 2016 require further monitoring prior to any progression towards revoking this AQMA. It is not considered that any further amendment to the existing AQMA's is necessary or that any new areas require more detailed investigation.

There were no exceedences of the Hourly Mean Objective at any of the automatic monitoring stations; one diffusion tube within the City Centre AQMA produced an annual mean concentration in excess of 60µg/m³. It is not considered that any further amendment to the existing AQMA's is necessary or that any new areas require more detailed analysis.

There were no exceedences of the PM₁₀ Annual Mean Objective. During 2016 Glasgow City Council revoked the city wide AQMA in conjunction with the city wide revocation the Byres Road / Dumbarton Road Air Quality Management Area was amended to include this pollutant.

There were no exceedences of the 24hour Mean Objective, neither did the 90th percentile value from those sites with <90% data capture indicate that this objective would have been exceeded.

There were no exceedences of the PM_{2.5} Annual Mean Objective.

6.2 Conclusions relating to New Local Developments

Local Developments which have required consideration have been split between traffic generating developments such as CWRRP and Queen Elizabeth University Hospital and developments where the potential for exceedences of the objectives is as a result of district heating and energy generation. None of the air quality assessments predicted significant adverse air quality impacts or new exceedences of the objectives.

6.3 Proposed Actions

Glasgow remains an active participant in national discussions and working groups aimed at establishing a framework for the implementation of LEZs in Scotland. The Scottish Government will shortly confirm which city will be chosen as the location of the initial LEZ which is scheduled to be in place by 2018.

During 2017 Glasgow anticipates progressing towards the revocation in 2018 of the existing Parkhead Cross AQMA. Monitoring continuing through 2017 is likely to confirm that measured NO₂ concentrations satisfy the compliance criteria.

Glasgow successfully obtained funding from the Scottish Governments LAQM support to initiate an instrument replacement programme to maintain the precision and reliability of the Council's monitoring network.

This funding support has also allowed Glasgow to progress a range of measures to improve air quality in the city as described in Table 2.2. Projects which are planned for 2017 include;

- The expansion of the Glasgow ECOStars scheme to include taxi operators. ECOStars has been promoted by GCC since 2014 and is designed to raise awareness of best practise in fleet management there are currently over 80 member companies with a combined fleet of approx. 5500 vehicles.
- To support the expansion of the car club partnership and enhance the provision of plug in electric vehicles. A further 5 locations will be provided to the existing parking network, 3 of these shall be dedicated to electric vehicles. The public bays adjacent to these will also be converted to public EV charge points.
- Further enhancement in facilities supporting active travel, with secure cycle parking and equipment and clothing storage provision at 3 additional locations. Glasgow City Council has been gradually improving facilities to support staff active travel. This has resulted in one of the largest percentage increases in cycling by staff. With a cycle to work scheme that in 2016 generated over £144,000 in cycle sales to the local economy in a six month period.

- Improvements in active travel facilities will also be further expanded into schools with secure cycle storage units, each accommodating 20 bikes, to be installed in 8 schools. Additionally, the ongoing project to provide cycle parking across the Glasgow area continues to surpass the targets embodied in the Local Transport Strategy with further parking infrastructure planned for 2017.

Glasgow will introduce a Permeable Streets Programme which is intended to promote an uptake in active travel by improving the permeability of the built environment. The Permeable Streets Programme will focus on dealing with those minor infrastructure works that have a major impact on uptake but are currently out with the scope of existing funding. Targeted areas will key into existing or developing cycling infrastructure, the scope of work will include: drop kerbs, fire paths, bypasses, contraflow lanes push ups and ramp downs.

Glasgow will continue to invest in its Strategic Plan for Cycling, including the South City Way, a £6.5 million route from Victoria Road in the southside to the Merchant City. This project is 50% funded as the winning submission to the Scottish Government's first ever Community Links Plus competition.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Inlet Height (m)
GLA4	Glasgow Kerbside	Kerbside	258708	665200	NO ₂	City Centre	Chemiluminescent	0	1	3
GLKP	Glasgow Townhead	Urban Background	259675	665900	NO ₂ PM ₁₀ PM _{2.5} O ₃	City Centre	Chemiluminescent FDMS TEOM UV Photometric	0	120	3
GGWR	Glasgow Great Western Road	Roadside	258007	666649	NO ₂	No	Chemiluminescent	0	5	2
GHSR	Glasgow High Street	Roadside	260013	665346	NO ₂ PM ₁₀ PM _{2.5}	City Centre	Chemiluminescent FDMS TEOM	0	3	3
GLA5	Glasgow Anderston	Urban Background	257925	665487	NO ₂ PM ₁₀	City Centre	Chemiluminescent FDMS TEOM	0	40	3
GLA6	Glasgow Byres Road	Roadside	256526	666933	NO ₂ PM ₁₀	Byres Rd Dumbarton Rd	Chemiluminescent FDMS TEOM	0	3	3
GL9	Glasgow Dumbarton Road	Roadside	255030	666608	NO ₂ PM ₁₀	Byres Rd Dumbarton Rd	Chemiluminescent TEOM	0	3	2
GL6	Glasgow Burgher Street	Roadside	262550	664164	NO ₂ PM ₁₀	Parkhead	Chemiluminescent FDMS TEOM	0	3	2

Glasgow City Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Inlet Height (m)
GL1	Glasgow Abercromby Street	Roadside	260420	664175	PM ₁₀	No	FDMS TEOM	0	3	2
GL3	Glasgow Broomhill	Roadside	255030	667195	PM ₁₀	No	FDMS TEOM	0	3	2
GL2	Glasgow Nithsdale Road	Roadside	257883	662673	PM ₁₀	No	FDMS TEOM	0	3	2
GLA7	Glasgow Waulkmillglen Reservoir	Rural	252461	658154	NO ₂ PM ₁₀ O ₃	No	Chemiluminescent TEOM UV Photometric	N/A	N/A	3

(1) 0 if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
CC01	George Square	Urban Background	259296	665389	NO ₂	Yes	N/A	30	No
CC02	Union Street	Roadside	258828	665204	NO ₂	Yes	0	3	No
CC03	Bath Street	Roadside	258374	665826	NO ₂	Yes	3	3	No
CC04	Glassford Street	Roadside	259361	665252	NO ₂	Yes	0	3	No
CC05	Buchanan Street	Roadside	259055	665468	NO ₂	Yes	0	3	No
CC06	Castle Street	Roadside	260068	665589	NO ₂	Yes	0	3	No
CC07	Hope Street 3	Kerbside	258856	665940	NO ₂	Yes	N/A	1	No
CC08	Montrose Street	Roadside	259536	665313	NO ₂	Yes	0	3	No
CC09	Cochrane Street	Roadside	259430	665316	NO ₂	Yes	0	3	No
CC10	Renfield Street	Roadside	258896	665637	NO ₂	Yes	0	3	No

Glasgow City Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
CC11	George Street	Kerbside	259551	665380	NO ₂	Yes	N/A	1	No
CC12	North Street	Roadside	257906	665672	NO ₂	Yes	N/A	3	No
CC13	Hope Street 1	Roadside	258730	665322	NO ₂	Yes	0	3	No
CC14	Gordon Street	Roadside	258756	665346	NO ₂	Yes	N/A	3	No
CC15	Heilanmans Umbrella North	Roadside	258770	665120	NO ₂	Yes	0	3	No
CC16	Saltmarket	Roadside	259545	664739	NO ₂	Yes	0	3	No
CC17	High Street	Roadside	259732	664991	NO ₂	Yes	0	3	No
CC18	Dobbies Loan	Urban Background	259415	666194	NO ₂	Yes	0	3	No
CC19	Cathedral Bridge	Roadside	259136	665661	NO ₂	Yes	N/A	3	No
CC20	Dundasvale Street	Urban Background	258820	666306	NO ₂	Yes	0	15	No

Glasgow City Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
CC21	Royston Road	Roadside	260429	666264	NO ₂	Yes	5	3	No
CC22	St Mungo Avenue	Urban Background	259392	665866	NO ₂	Yes	0	5	No
CC23	Brown Street	Roadside	258336	665122	NO ₂	Yes	0	3	No
CC24	Broomielaw	Roadside	258562	664933	NO ₂	Yes	N/A	3	No
CC25	McLeod Street	Urban Background	260077	665481	NO ₂	Yes	0	8	No
CC26	Sauchiehall Street	Urban Background	258639	665852	NO ₂	Yes	N/A	N/A	No
CC27	Kennedy Path	Urban Background	259701	665983	NO ₂	Yes	0	10	No
GE01	Westmuir Street	Roadside	262589	664139	NO ₂	Yes	0	3	No
GE02	Hillcrest Road	Roadside	265075	662001	NO ₂	No	5	3	No
GE03	Main Street (Bridgeton)	Roadside	260650	663319	NO ₂	No	0	5	No
GE04	Westercraigs	Urban Background	260942	665226	NO ₂	No	0	15	No

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
GE05	Inveresk Lane	Urban Background	264163	664856	NO ₂	No	0	20	No
GE06	Sacone SW	Urban background	263920	664569	NO ₂	No	0	20	No
GE07	Easterhouse	Roadside	267005	666217	NO ₂	No	0	5	No
GE08	Dunn Street	Urban Background	261305	663928	NO ₂	No	0	5	No
GE09	Springfield Road	Roadside	261823	663468	NO ₂	No	0	3	No
GE10	Tollcross Park	Roadside	263864	663544	NO ₂	No	0	3	No
GE11	79 Tollcross Road	Roadside	262668	664115	NO ₂	Yes	0	3	No
GE12	101 Westmuir Street	Roadside	262732	664229	NO ₂	Yes	0	3	No
GE13	1341 Duke Street	Roadside	262545	664241	NO ₂	Yes	0	3	No
GE14	St Michaels Lane	Roadside	262472	664214	NO ₂	Yes	0	3	No

Glasgow City Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
GE15	902 Springfield Road	Roadside	262467	664141	NO ₂	Yes	0	3	No
GN01	Springburn Road	Roadside	260541	669268	NO ₂	No	0	6	No
GN02	Kippen Street	Urban Background	259731	668488	NO ₂	No	5	3	No
GS01	Mossie Road	Roadside	257235	662064	NO ₂	No	3	3	No
GS02	Bridge Street	Roadside	258702	664480	NO ₂	Yes	3	3	No
GS03	St Andrews Drive	Urban Background	256229	662587	NO ₂	No	0	N/A	No
GS04	Haggs Road	Roadside	256295	661792	NO ₂	No	0	3	No
GS05	Pollokshaws Road	Roadside	255864	661180	NO ₂	No	0	5	No
GS06	Oxford Street	Roadside	258798	664570	NO ₂	No	0	3	No
GS07	Dougrie Road	Roadside	260203	659128	NO ₂	No	N/A	3	No

Glasgow City Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
GS08	Aikenhead Road	Roadside	259225	662579	NO ₂	No	0	6	No
GS09	Langside Primary School	Roadside	257138	661617	NO ₂	No	5	3	No
GS10	Paisley Road West	Roadside	255599	664313	NO ₂	No	0	3	No
GS11	Sutherland Avenue	Urban Background	256343	663153	NO ₂	No	10	5	No
GS12	Mallaig Place	Urban background	253989	665298	NO ₂	No	20	6	No
GS13	Govanhill Street	Roadside	258678	662901	NO ₂	No	3	3	No
GS14	Invergarrie Road	Urban Background	253821	658590	NO ₂	No	5	3	No
GS15	Mosspark Boulevard	Urban Background	255436	663274	NO ₂	No	0	15	No
GS16	Silverburn	Roadside	253047	661349	NO ₂	No	0	5	No
GS17	Urrdale Road	Urban Background	255826	664118	NO ₂	No	0	N/A	No

Glasgow City Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
GS18	Paisley Rd West 2	Roadside	257415	664616	NO ₂	No	0	3	No
GS19	Hampden	Urban Background	259038	661285	NO ₂	No	0	3	No
GS20	45 Clifford Street	Roadside	256262	664308	NO ₂	No	0	3	No
GS21	608 Scotland Street West	Roadside	256948	664270	NO ₂	No	0	1	No
GS22	17 Kilbride Street	Roadside	259732	663032	NO ₂	No	0	3	No
GS23	2 Myrtle Drive	Roadside	259246	661979	NO ₂	No	0	3	No
GS24	183 Crossloan Road	Roadside	254724	665407	NO ₂	No	0	3	No
GS25	234 Berryknowes Road	Urban Background	253542	664443	NO ₂	No	0	15	No
GS26	64 Minard Road	Roadside	257256	662295	NO ₂	No	0	3	No
GS27	Battlefield Road	Roadside	258084	661642	NO ₂	No	0	3	No

Glasgow City Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
GS28	128 Mennock Road	Roadside	259871	660618	NO ₂	No	0	3	No
GS29	187 Castlemilk Drive	Roadside	260268	658856	NO ₂	No	0	3	No
GS30	Govan Road	Roadside	254021	665943	NO ₂	No	0	2	No
GS31	Govan Road (Hospital)	Roadside	253865	666006	NO ₂	No	2	2	No
GS32	Harland Street	Roadside	253139	667333	NO ₂	No	2	3	No
GS33	Partick Bus Station	Roadside	255692	667333	NO ₂	Yes	0	2	No
GS34	1220 Govan Road	Roadside	254372	665902	NO ₂	No	0	2	No
GS35	Sheildhall Road	Roadside	253554	665176	NO ₂	No	0	3	No
GW01	Dumbarton Road	Roadside	256209	666525	NO ₂	Yes	3	3	No
GW02	Lawrence Street	Roadside	256295	666816	NO ₂	Yes	5	2	No

Glasgow City Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
GW03	Cooperswell Street	Roadside	256154	666478	NO ₂	Yes	0	4	No
GW04	Finnieston Street	Roadside	257235	665108	NO ₂	No	N/A	3	No
GW05	Queen Margaret Drive	Roadside	257435	668015	NO ₂	No	N/A	3	No
GW06	Napiershall Street	Roadside	257790	666791	NO ₂	No	0	4	No
GW07	Queen Margaret Drive 2	Roadside	257216	667639	NO ₂	Yes	0	3	No
GW08	Queen Margaret Drive 3	Roadside	257012	667433	NO ₂	Yes	0	3	No
GW09	Anniesland Cross	Roadside	254613	668886	NO ₂	No	0	15	No
GW10	Balshagray Avenue	Roadside	254498	667291	NO ₂	No	0	10	No
GW11	Thornwood Drive	Roadside	254903	666855	NO ₂	No	0	3	No
GW12	Belmont Street	Roadside	257533	667418	NO ₂	No	N/A	3	No

Glasgow City Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
GW13	Glasgow Harbour	Urban Background	255287	666276	NO ₂	No	0	30	No
GW14	Crow Road	Roadside	254640	668203	NO ₂	No	0	3	No
GW15	Hyndland Road	Roadside	255764	667297	NO ₂	No	0	4	No
GW16	Park Road	Roadside	257555	666896	NO ₂	No	0	3	No
GW17	Crow Road 2	Roadside	254606	667894	NO ₂	No	0	3	No
GW18	Maryhill Road	Roadside	257243	668285	NO ₂	No	0	3	No
GW19	Scotstoun	Urban Background	253592	667771	NO ₂	No	0	>10	No
GW20	Kelvingrove Park	Roadside	256950	666229	NO ₂	No	N/A	3	No
GW21	Milner Road	Roadside	254456	668108	NO ₂	No	0	3	No
GW22	Gibson Street	Roadside	257166	666787	NO ₂	No	0	3	No
GW23	Woodlands Road	Roadside	257550	666697	NO ₂	No	0	3	No

Glasgow City Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
GW24	Arlington Street	Roadside	257796	666378	NO ₂	No	0	3	No
GW25	Poplar Avenue	Roadside	254662	667636	NO ₂	No	0	3	No
GW26	Great Western Road	Roadside	257255	667112	NO ₂	No	0	3	No
GW27	1031 Maryhill Road	Roadside	257352	668122	NO ₂	No	0	5	No
GW28	MHR Shawpark Street	Roadside	257075	668502	NO ₂	No	0	5	No
GW29	1428 Maryhill Road	Roadside	257243	668285	NO ₂	No	0	3	No
GW30	South Street	Roadside	253193	667219	NO ₂	No	0	2	No
GW31	Great George Street	Roadside	256663	667100	NO ₂	No	0	3	No
CCB1	Heilanman's Umbrella North	Roadside	258770	665121	C ₆ H ₆	No	0	3	No

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?
CCB2	Hope Street	Kerbside	258738	665167	C ₆ H ₆	No	3	1	No
GWB1	Ochiltree Avenue	Roadside	254839	669295	C ₆ H ₆	No	3	5	No
GSB1	Pollokshaws Road	Roadside	255869	661185	C ₆ H ₆	No	3	3	No

(1) 0 if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
GLA4	Kerbside	Automatic	99	99	<u>72</u>	<u>65</u>	<u>66</u>	60	<u>65</u>
GLKP	Urban Background	Automatic	98	98	-	-	27	26	26
GGWR	Roadside	Automatic	93	93	-	-	31	31	32
GHSR	Roadside	Automatic	90	90	-	-	-	32	34
GLA5	Urban Background	Automatic	93	93	33	28	18	-	20
GLA6	Roadside	Automatic	94	94	39	44	41	38	38
GL9	Roadside	Automatic	92	92	-	46	38	41	45
GL6	Roadside	Automatic	82	82	34	28	27	27	33
GLA7	Rural	Automatic	93	93	12	11	11	9	11
CC01	Urban Background	Diffusion Tube	83	83	41	48	41	38	30

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
CC02	Roadside	Diffusion Tube	83	83	<u>63</u>	<u>65</u>	<u>61</u>	<u>65</u> *	49
CC03	Roadside	Diffusion Tube	92	92	44	53	44	39	40
CC04	Roadside	Diffusion Tube	100	100	44	54	46	42	37
CC05	Roadside	Diffusion Tube	100	100	45	48	41	39	39
CC06	Roadside	Diffusion Tube	100	100	34	35	29	27	29
CC07	Kerbside	Diffusion Tube	92	92	50	59	52	48	43
CC08	Roadside	Diffusion Tube	92	92	39	47	38	35	36
CC09	Roadside	Diffusion Tube	92	92	38	38	39	34	32
CC10	Roadside	Diffusion Tube	75	75	60	59	56	57	46
CC11	Kerbside	Diffusion Tube	100	100	45	47	41	39	40
CC12	Roadside	Diffusion Tube	92	92	26	33	30	22	23

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
CC13	Roadside	Diffusion Tube	100	100	<u>73</u>	<u>87</u>	<u>67</u>	<u>63</u>	<u>65</u>
CC14	Roadside	Diffusion Tube	100	100	-	<u>75</u>	<u>68</u>	<u>67</u>	58
CC15	Roadside	Diffusion Tube	100	100	<u>68</u>	<u>78</u>	<u>64</u>	<u>69</u>	60
CC16	Roadside	Diffusion Tube	100	100	42	37	37	32	31
CC17	Roadside	Diffusion Tube	75	75	49	46	43	40	45
CC18	Urban Background	Diffusion Tube	100	100	31	28	26	24	24
CC19	Roadside	Diffusion Tube	92	92	53	57	47	46	45
CC20	Urban Background	Diffusion Tube	100	100	-	31	32	30	29
CC21	Roadside	Diffusion Tube	100	100	45	43	34	34	35
CC22	Urban Background	Diffusion Tube	100	100	34	35	28	28	29
CC23	Roadside	Diffusion Tube	92	92	31	33	27	23	24

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
CC24	Roadside	Diffusion Tube	92	92	40	47	41	41	37
CC25	Urban Background	Diffusion Tube	100	100	35	35	30	31	31
CC26	Urban Background	Diffusion Tube	100	100	51	43	36	35	31
CC27	Urban Background	Diffusion Tube	100	100	27	30	24	25	29
GE01	Roadside	Diffusion Tube	100	100	39	39	33	32	35
GE02	Roadside	Diffusion Tube	100	100	21	24	19	16	17
GE03	Roadside	Diffusion Tube	100	100	23	25	21	20	19
GE04	Urban Background	Diffusion Tube	92	92	24	24	20	18	17
GE05	Urban Background	Diffusion Tube	100	100	18	17	16	15	15
GE06	Urban background	Diffusion Tube	100	100	21	21	16	16	15
GE07	Roadside	Diffusion Tube	100	100	20	19	24	16	17

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
GE08	Urban Background	Diffusion Tube	100	100	20	20	23	19	18
GE09	Roadside	Diffusion Tube	92	92	25	21	20	20	22
GE10	Roadside	Diffusion Tube	100	100	30	25	19	16	19
GE11	Roadside	Diffusion Tube	92	92	-	-	-	25	24
GE12	Roadside	Diffusion Tube	100	100	-	-	-	27	26
GE13	Roadside	Diffusion Tube	100	100	-	-	-	24	23
GE14	Roadside	Diffusion Tube	100	100	-	-	-	37	39
GE15	Roadside	Diffusion Tube	100	100	-	-	-	24	26
GN01	Roadside	Diffusion Tube	100	100	22	31	24	21	22
GN02	Urban Background	Diffusion Tube	100	100	22	23	19	18	20
GS01	Roadside	Diffusion Tube	100	100	26	37	26	23	25

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
GS02	Roadside	Diffusion Tube	100	100	39	35	31	30	31
GS03	Urban Background	Diffusion Tube	100	100	18	19	17	17	16
GS04	Roadside	Diffusion Tube	92	92	32	30	24	22	28
GS05	Roadside	Diffusion Tube	100	100	20	25	24	27	24
GS06	Roadside	Diffusion Tube	100	100	29	31	28	25	24
GS07	Roadside	Diffusion Tube	83	83	20	19	16	22	18
GS08	Roadside	Diffusion Tube	100	100	27	29	22	18	23
GS09	Roadside	Diffusion Tube	83	83	22	22	16	15	20
GS10	Roadside	Diffusion Tube	92	92	33	28	29	25	27
GS11	Urban Background	Diffusion Tube	100	100	18	18	15	13	13
GS12	Urban background	Diffusion Tube	92	92	19	23	19	19	18

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
GS13	Roadside	Diffusion Tube	92	92	26	28	24	23	23
GS14	Urban Background	Diffusion Tube	100	100	17	17	14	13	14
GS15	Urban Background	Diffusion Tube	100	100	25	25	22	22	21
GS16	Roadside	Diffusion Tube	100	100	23	23	17	14	19
GS17	Urban Background	Diffusion Tube	100	100	31	32	26	22	24
GS18	Roadside	Diffusion Tube	92	92	37	40	33	30	32
GS19	Urban Background	Diffusion Tube	100	100	18	21	16	16	19
GS20	Roadside	Diffusion Tube	100	100	-	-	24	24	27
GS21	Roadside	Diffusion Tube	100	100	-	-	27	27	28
GS22	Roadside	Diffusion Tube	100	100	-	-	20	20	21
GS23	Roadside	Diffusion Tube	100	100	-	-	18	16	20

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
GS24	Roadside	Diffusion Tube	67	67	-	-	-	22	23 *
GS25	Urban Background	Diffusion Tube	92	92	-	-	-	22	25
GS26	Roadside	Diffusion Tube	100	100	-	-	-	20	21
GS27	Roadside	Diffusion Tube	92	92	-	-	-	26	29
GS28	Roadside	Diffusion Tube	100	100	-	-	-	21	21
GS29	Roadside	Diffusion Tube	100	100	-	-	-	12	14
GS30	Roadside	Diffusion Tube	92	92	-	-	-	-	34
GS31	Roadside	Diffusion Tube	92	92	-	-	-	-	35
GS32	Roadside	Diffusion Tube	100	100	-	-	-	-	24
GS33	Roadside	Diffusion Tube	100	100	-	-	-	-	26
GS34	Roadside	Diffusion Tube	92	92	-	-	-	-	26

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
GS35	Roadside	Diffusion Tube	92	92	-	-	-	-	25
GW01	Roadside	Diffusion Tube	100	100	33	32	28	26	30
GW02	Roadside	Diffusion Tube	100	100	25	26	21	19	21
GW03	Roadside	Diffusion Tube	100	100	23	28	23	21	23
GW04	Roadside	Diffusion Tube	100	100	32	36	29	26	29
GW05	Roadside	Diffusion Tube	100	100	27	27	25	24	26
GW06	Roadside	Diffusion Tube	100	100	30	33	27	27	28
GW07	Roadside	Diffusion Tube	100	100	36	40	35	25	26
GW08	Roadside	Diffusion Tube	100	100	31	34	33	34	30
GW09	Roadside	Diffusion Tube	100	100	26	30	23	23	23
GW10	Roadside	Diffusion Tube	100	100	25	29	31 *	24	26

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
GW11	Roadside	Diffusion Tube	92	92	18	21	18	17	19
GW12	Roadside	Diffusion Tube	100	100	21	21	18	18	16
GW13	Urban Background	Diffusion Tube	100	100	25	26	21	20	24
GW14	Roadside	Diffusion Tube	100	100	37	33	34	28	32
GW15	Roadside	Diffusion Tube	92	92	27	33	26	21	21
GW16	Roadside	Diffusion Tube	100	100	31	36	28	24	27
GW17	Roadside	Diffusion Tube	100	100	28	34	30	26	26
GW18	Roadside	Diffusion Tube	58	58	40	41	34	30	28 *
GW19	Urban Background	Diffusion Tube	100	100	19	22	20	16	19
GW20	Roadside	Diffusion Tube	92	92	29	25	23	23	23
GW21	Roadside	Diffusion Tube	92	92	-	20	16	16	18

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
GW22	Roadside	Diffusion Tube	100	100	-	32	27	30	28
GW23	Roadside	Diffusion Tube	100	100	-	31	28	23	28
GW24	Roadside	Diffusion Tube	100	100	-	31	23	22	24
GW25	Roadside	Diffusion Tube	100	100	-	29	25	21	24
GW26	Roadside	Diffusion Tube	83	83	-	37	30	25 *	30
GW27	Roadside	Diffusion Tube	100	100	-	37	32	30	30
GW28	Roadside	Diffusion Tube	100	100	-	34	30	28	24
GW29	Roadside	Diffusion Tube	100	100	-	29	26	19	24
GW30	Roadside	Diffusion Tube	100	83	-	-	-	-	25
GW31	Roadside	Diffusion Tube	100	75	-	-	-	-	27

Notes: Exceedences of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedence of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%. Annualised results marked *

See Appendix C for details.

Table A.4 – 1-Hour Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ 1-Hour Means > 200µg/m ³ ⁽³⁾				
					2012	2013	2014	2015	2016
GLA4	Kerbside	Automatic	99	99	17	12	11	4	4
GLKP	Urban Background	Automatic	98	98	-	-	0	0	2
GGWR	Roadside	Automatic	93	93	-	-	0(119)	0	0
GHSR	Roadside	Automatic	90	90	-	-	-	0(110)	6
GLA5	Urban Background	Automatic	93	93	4	42	0(55)	-	0
GLA6	Roadside	Automatic	94	94	7 (168)	4 (164)	7 (162)	0	2
GL9	Roadside	Automatic	92	92	-	0 (141)	0 (117)	0	3
GL6	Roadside	Automatic	82	82	0 (153)	1	0	0	0 (141)
GLA7	Rural	Automatic	93	93	0 (109)	0	0	0(92)	0

Notes: Exceedences of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 90%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM₁₀ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	PM ₁₀ Annual Mean Concentration (µg/m ³) ⁽³⁾				
				2012	2013	2014	2015	2016
GLKP	Urban Background	97	97	-	-	13	12	12
GHSR	Roadside	93	93	-	-	-	16	13
GLA5	Urban Background	69	69	14	16	18	-	15
GLA6	Roadside	98	98	13	13	11	10	12
GL9	Roadside	98	98	18	19	17	17	15
GL6	Roadside	73	73	15	17	16	16	16
GL1	Roadside	94	94	14	16	17	14	14
GL3	Roadside	93	93	15	15	15	15	15
GL2	Roadside	91	91	17	18	15	14	13
GLA7	Rural	65	65	11	12	13	11	9

Notes: Exceedences of the PM₁₀ annual mean objective of 18µg/m³ are shown in **bold**.

- (1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
- (2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).
- (3) All means have been “annualised” as per LAQM.TG(16), valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.6 – 24-Hour Mean PM₁₀ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	PM ₁₀ 24-Hour Means > 50µg/m ³ (3)				
				2012	2013	2014	2015	2016
GLKP	Urban Background	97	97	-	-	0(31)	0(33)	0
GHSR	Roadside	93	93	-	-	-	0	0
GLA5	Urban Background	69	69	3(39)	2	0(42)	-	0(22)
GLA6	Roadside	98	98	3(37)	0(31)	0(24)	0	2
GL9	Roadside	98	98	2(39)	1	0	3	0
GL6	Roadside	73	73	4	3	3	3	0(22)
GL1	Roadside	94	94	4	2	0(34)	1	0
GL3	Roadside	93	93	6	0	0	2	2
GL2	Roadside	91	91	9	3(43)	2(36)	1	0
GLA7	Rural	65	65	0(29)	0	0(22)	0(34)	0(16)

Notes: Exceedences of the PM₁₀ 24-hour mean objective (50µg/m³ not to be exceeded more than 7 times/year) are shown in **bold**.

- (1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
- (2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).
- (3) If the period of valid data is less than 90%, the 90.4th percentile of 24-hour means is provided in brackets.

Table A.7 – Annual Mean PM_{2.5} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	PM _{2.5} Annual Mean Concentration (µg/m ³)				
				2012	2013	2014	2015	2016
GLKP	Urban Background	95	95	-	-	7	7	7
GHSR	Roadside	94	94	-	-	-	8	8

Notes: Exceedences of the PM_{2.5} annual mean objective of 10µg/m³ are shown in **bold**.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Table A.8 – Annual Mean Benzene (C₆H₆) Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2016 (%) ⁽²⁾	C ₆ H ₆ Annual Mean Concentration µg/m ³
CCB1	Roadside	67	67	0.8
CCB2	Kerbside	75	75	0.6
GWB1	Roadside	75	75	0.6
GSB1	Roadside	75	75	0.7

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Appendix B: Full Monthly Diffusion Tube Results

Table B.1 – NO₂ Monthly Diffusion Tube Results

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
CC01	32	41	25	22	18	25	28	38	39			38	31	30	
CC02	52	52		31		34	47	53	69	58	73	35	50	49	
CC03	34	42	23	35	19	32	34	51		59	69	48	41	40	
CC04	28	31	28	48	28	28	34	42	38	48	62	43	38	37	
CC05	47	42	34	18	34	28	23	44	38	63	56	52	40	39	
CC06	31	44	15	34	18	22	19	29	27	43	47	27	30	29	
CC07	47	48		26	37	36	38	46	45	53	61	52	44	43	
CC08	41		43	43	17	23	25	37	35	50	57	40	37	36	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	CC09		45	21	45	17	31	24	34	31	26	52			42
CC10	43		26	36		38	51	51	48	64	73		48	46	
CC11	37	47	44	30	18	27	40	46	41	46	70	53	41	40	
CC12	23	21	16		16	6	10	28	24	44	46	29	24	23	
CC13	57	68	68	47	39	48	68	73	68	95	91	79	67	65	
CC14	43	44	55	30	65	50	64	65	65	80	90	70	60	58	
CC15	50	57	47	52	38	49	64	77	76	81	86	64	62	60	
CC16	25	34	27	35	18	22	28	31	32	36	61	37	32	31	
CC17	47	52	31	55		33	37		44	56	65		47	45	
CC18	23	24	22	30	12	20	15	21	24	30	43	36	25	24	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	CC19	37	35	24		30	61	43	47	48	62	69			50
CC20	30	29	27	17	18	19	19	31	34	45	50	41	30	29	
CC21	44	54	37	39	17	18	29	30	31	33	59	37	36	35	
CC22	30	47	21	32	14	18	19	32	30	34	50	34	30	29	
CC23	30	28	20	27	15	18	12	26	28	33		31	24	24	
CC24	38	27	29	42	32	29		38	38	56	47	47	38	37	
CC25	25	45	26	41	16	24	20	31	33	46	51	31	32	31	
CC26	39	31	19	18	14	31	23	34	33	50	58	40	32	31	
CC27	29	46	19	22	6	14	11	54	19	57	45	29	29	29	
GE01	31	40	21	43	22	22	31	38	43	40	58	42	36	35	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	GE02	20	29	13	11	5	12	4	15	13	27	37			24
GE03	21	26	18	18	6	12	9	15	17	29	33	32	20	19	
GE04	19	28	13	9	2	9	6	17	20	27	41		17	17	
GE05	18	23	13	15	4	6	2	13	13	21	31	23	15	15	
GE06	22	17	13	14	4	6	5	13	15	18	35	24	15	15	
GE07	15	22	14	7	5	10	7	15	16	22	33	24	16	15	
GE08	23	24	11	19	8	12	5	18	20	32	37	27	20	19	
GE09	22	31	20		15	26	4	19	18	29	38	27	23	22	
GE10	22	30	17	23	13	5	7	16	18	17	38	24	19	19	
GE11	24	34	28	32	19	5	12	22	19	32	42		24	24	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	GE12	23	31	22	31	23	16	17	22	27	32	49			32
GE13	19	28	24	25	19	9	14	21	24	30	41	27	24	23	
GE14	33	40	35	42	34	25	27	38	49	40	74	43	40	39	
GE15	21	41	25	28	22	22	13	22	23	35	43	31	27	26	
GN01	20	26	20	27	11	19	6	19	20	33	39	28	22	22	
GN02	24	25	20	15	10	15	7	18	21	31	37	26	21	20	
GS01	27	23	16	36	15	27	8	22	21	33	55	28	26	25	
GS02	32	41	19	44	14	22	23	31	27	41	54	34	32	31	
GS03	19	13	15	18	4	9	5	15	20	27	37	17	17	16	
GS04	27	43	24	32	11	13		25	22	40	55	30	29	28	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	GS05	20	35	16	18	10	18	8	31	23	37	51			25
GS06	26	20	16	21	13	24	15	28	23	34	46	30	25	24	
GS07	25	22	13	18		15	4	14		23	32	18	18	18	
GS08	31	28	21	27	13	14	10	21	20	34	46	24	24	23	
GS09	22	17		17		14	3	12	14	25	31	56	21	20	
GS10	23	34	18	32	15	20	18	29		34	61	25	28	27	
GS11	23	15	10	14	3	7	2	10	11	16	32	18	13	13	
GS12	20	19	13		9	7	4	16	16	25	44	30	18	18	
GS13	23	34	16	26	11	15		20	21	29	44	25	24	23	
GS14	18	24	15	13	2	8	2	12	12	21	27	15	14	14	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	GS15	20	32	14	24	9	13	8	20	23	37	40			23
GS16	17	22	13	28	13	17	16	13	13	27	34	22	20	19	
GS17	26	21	23	39	25	9	8	28	18	22	48	24	24	24	
GS18	31	38	25	34		20	28	35	24	36	51	36	33	32	
GS19	20	26	17	18	9	16	2	14	17	29	46	20	19	19	
GS20	19	24	21	29	24	20	12	25	29	38	52	36	27	27	
GS21	26	34	19	34	22	17	21	27	32	38	38	34	29	28	
GS22	26	26	19	24	15	12	10	13	23	27	31	30	21	21	
GS23	20	21	19	24	15	6	6	17	18	31	45	19	20	20	
GS24	28	28	19	24	16	16					39	27	24	24	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	GS25		28	24	27	21	19	11	19	25	39	37			29
GS26	25	27	23	14	17	17	5	18	19	35	36	25	22	21	
GS27	27	37	24	29	26	31	16	24	33	48		32	30	29	
GS28	17	29	21	29	19	20	9	22	3	31	37	25	22	21	
GS29	16	17	17	17	11	9	2	11	13	18	22	17	14	14	
GS30	34	44	26	43	29	6	28	29		44	62	41	35	34	
GS31	26	56	37		26	22	26	33	31	39	59	40	36	35	
GS32	26	28	24	23	20	14	12	17	27	30	46	26	24	24	
GS33	22	28	24	33	24	5	14	24	24	33	57	30	26	26	
GS34		27	25	32	15	16	17	26	22	29	56	29	27	26	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	GS35		46	23	24	16	16	11	22	22	33	43			26
GW01	41	33	25	35	16	26	19	26	31	33	54	34	31	30	
GW02	22	22	18	21	7	13	10	21	25	32	48	26	22	21	
GW03	24	23	12	26	12	22	11	20	22	32	44	37	24	23	
GW04	34	26	24	31	15	21	18	26	28	42	52	41	30	29	
GW05	35	38	14	35	15	16	8	20	25	34	47	28	26	26	
GW06	23	28	26	33	19	20	20	28	32	34	47	38	29	28	
GW07	24	22	19	31	16	15	20	25	34	35	46	31	26	26	
GW08	25	29	19	32	2	41	28	32	34	43	52	39	31	30	
GW09	29	33	16	24	11	16	10	20	24	22	47	31	24	23	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	GW10	26	20	19	28	21	23	14	24	27	42	49			33
GW11	25	24	15	20	7	13	6	15	16		42	26	19	19	
GW12	21	16	10	16	5	13	6	15	13	25	35	28	17	16	
GW13	30	29	22	25	18	11	14	19	21	31	48	27	25	24	
GW14	27	28	21	41	33	29	10	30	35	46	55	42	33	32	
GW15	23	28	21	22	5	24	2	21	21		44	29	22	21	
GW16	28	29	22	34	22	4	16	28	29	39	59	29	28	27	
GW17	22	28	27	26	27	2	12	24	25	39	48	42	27	26	
GW18	27						20	28	27	36	52	34	32	31	
GW19	24	27	20	15	12	10	6	17	15	23	36	27	19	19	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
	GW20	28	26	25	24	19	14	9	22		26	37			30
GW21	19	19		16	10	9	2	12	15	23	58	23	19	18	
GW22	23	29	24	32	22	5	23	30	30	37	46	40	28	28	
GW23	39	26	24	31	25	17	13	25	24	41	42	34	28	28	
GW24	18	24	25	27	20	18	13	20	23	28	45	33	24	24	
GW25	21	23	29	27	19	15	12	21	26	26	47	32	25	24	
GW26		24	26	39	38	26	18	29	26	37	47		31	30	
GW27	23	35	26	39	29	20	23	30	30	34	47	32	31	30	
GW28	28	31	37	29	25	6	10	25	24	32	23	29	25	24	
GW29	22	26	25	28	20	29	11	20	27	21	46	23	25	24	

Site ID	NO ₂ Mean Concentrations (µg/m ³)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted ⁽¹⁾
GW30			30	26	22	16	12	22	23	33	47	29	26	25
GW31				23	25	22	14	25	27	38	50	30	28	27

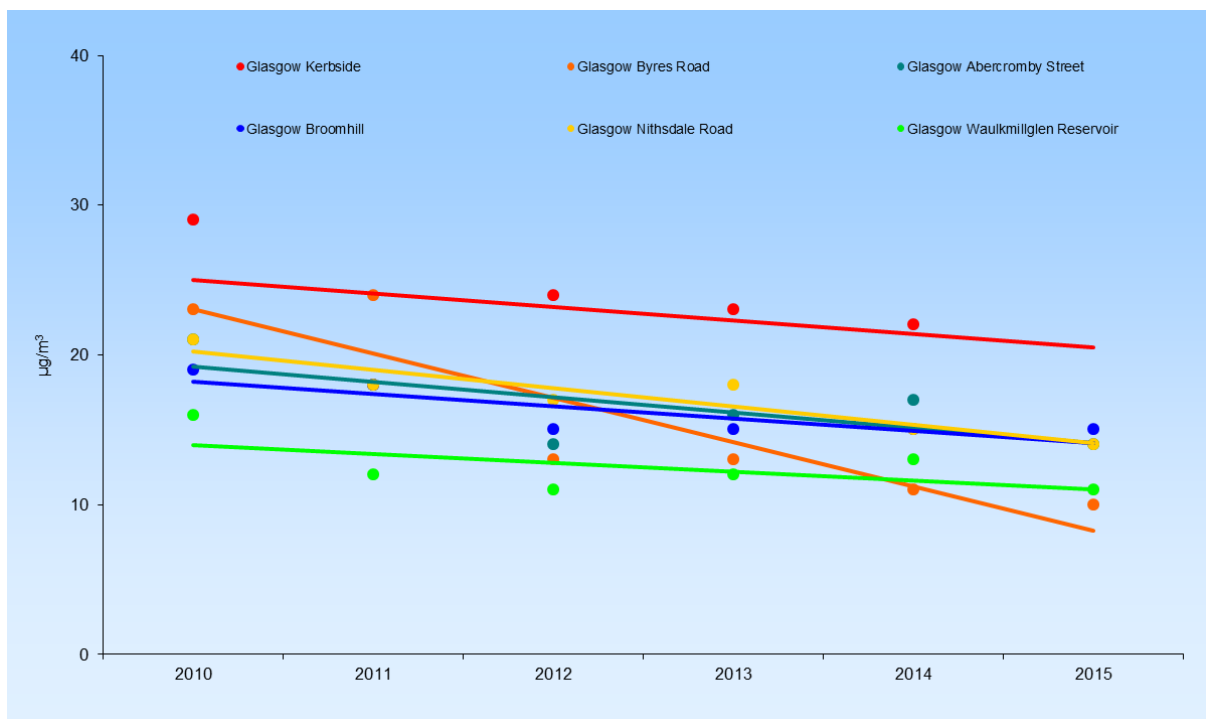
(1) See Appendix C for details on bias adjustment

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

C.1 Byres Road PM₁₀ (GLA6)

There has been a steady reduction in annual mean PM₁₀ concentrations at this location over several years, see Table A.5 and Figure C.1 following. Whilst the instrument was regularly audited and serviced during this period it was decided to examine in detail the PM₁₀ data from this location.

Figure C.1 Trends in Annual Mean PM₁₀ Concentration



Initially (December 2015) the station was moved from its location by a few metres to a more open aspect, this had no apparent impact on the measured concentration.

The mobile monitoring station, FIDAS instrument, was then co located with the Byres Rd. station (May 2016). Results from this co location study appeared to support the suspicion that the FDMS TEOM instrument was under recording PM₁₀ concentrations.

Subsequently with the agreement of the audit / data ratification body and the instrument service provider a programme of swapping out components from the FDMS TEOM instrument was initiated (July 2016). This programme subsequently

identified a component which on replacement resulted in an increase in PM₁₀ concentrations to levels similar to other monitoring locations in the city.

As described in Table A.5 the annual mean concentration (PM₁₀) measured at Byres Rd. during 2016 was 12µg/m³, closer examination of the data shows that the mean concentration January – July was 9 µg/m³. For the period August – December the mean concentration was 15 µg/m³.

Table C.1 – Byres Road PM₁₀ Monthly Averages (µg/m³)

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GLA6	10	9	9	8	11	9	7	13	12	16	18	18

C.2 Mobile Monitoring Station

In addition to the 12 permanent static monitoring stations in the city, Glasgow also operates a mobile station which is equipped with instrumentation to monitor both NO₂ (Chemiluminescent) and Particulates (FIDAS). During 2016 this unit was initially situated on Corunna St. (continuation of monitoring from 2015), Byres Rd (C.1 previously) and from June 2016 on Northinch St. Scotstoun.

Monitoring on Northinch St. was initiated in response to local concerns in relation to a previous planning application (15/00549/DC) for the development of an energy from waste facility.

Table C.2 – Mobile Monitoring Station NO₂ Monitoring Results (µg/m³)

Site Name / Type	Within AQMA?	Monitoring Period	Valid Data Capture %	Mean Concentration µg/m ³	Number of Exceedences of Hourly Mean Objective (200 µg/m ³) (99.8 th Percentile of Hourly Means)
Corunna St Roadside	No	Jan - Apr	100	33	0(110)
Northinch St Background	No	Jun - Dec	100	16	0(63)

Table C.3 – Mobile Monitoring Station PM₁₀ Monitoring Results (µg/m³)

Site Name / Type	Within AQMA?	Monitoring Period	Valid Data Capture %	Mean Concentration µg/m³	Number of Exceedences of 24-Hour Mean Objective (50 µg/m³) (90th Percentile of 24 Hour Means)
Corunna St Roadside	No	Jan - Apr	100	10	0(18)
Northinch St Background	No	Jun - Dec	100	10	0(13)

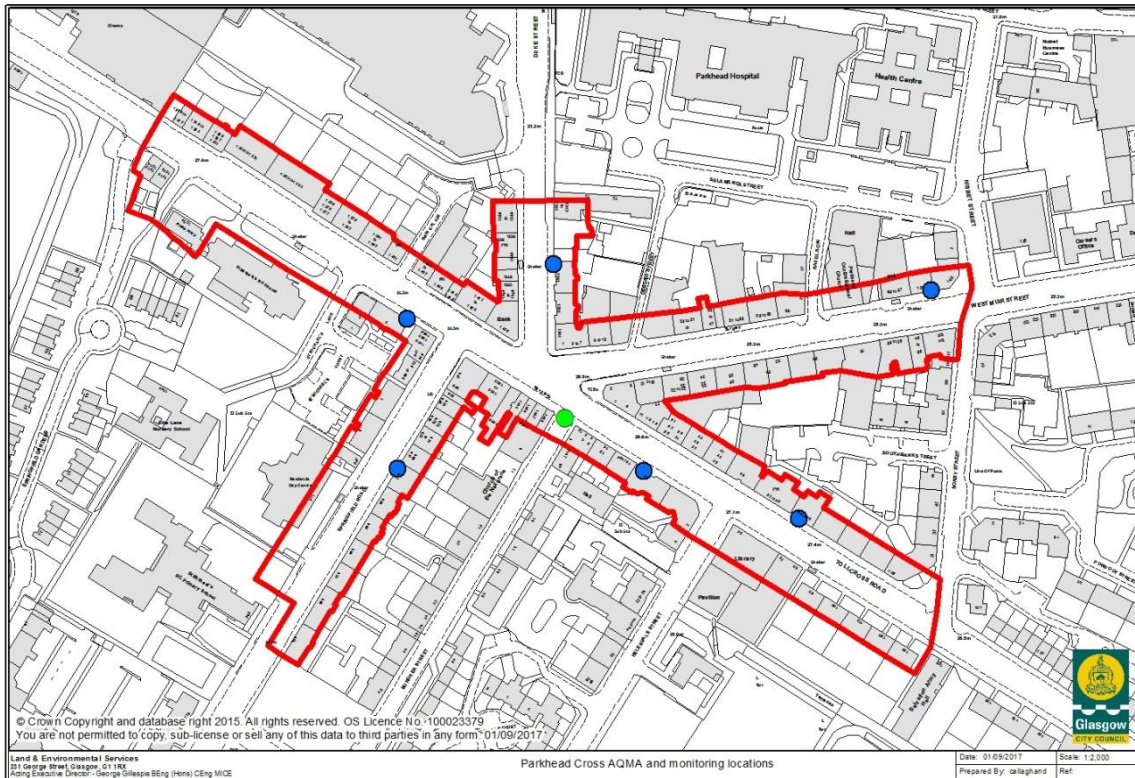
Table C.4 – Mobile Monitoring Station PM_{2.5} Monitoring Results (µg/m³)

Site Name / Type	Within AQMA?	Monitoring Period	Valid Data Capture %	Mean Concentration µg/m³
Corunna St Roadside	No	Jan - Apr	100	6
Northinch St Background	No	Jun - Dec	100	5

C.3 Parkhead Cross AQMA

The Parkhead Cross AQMA was declared in 2007 in respect of exceedances of the annual mean NO₂ objective. Figure C.2 below shows the extent of the AQMA and the locations of air quality monitoring within it.

Figure C.2 Parkhead Cross AQMA



NO₂ is measured at one automatic station, Glasgow Burgher St. (GL6 – shown in green in Figure C.2) and at six diffusion tube locations (shown in blue). Diffusion tube monitoring was increased in 2015 with a view to progressing towards revocation of this AQMA. Table C.5 below shows the results of monitoring within the AQMA since the last measured exceedance of the objective.

Table C.5 – Parkhead AQMA Annual Mean NO₂ Monitoring Results (µg/m³)

Site ID	Site Type	Monitoring Type	NO ₂ Annual Mean Concentration (µg/m ³)						
			2010	2011	2012	2013	2014	2015	2016
GL6	Roadside	Automatic	-	35	34	28	27	27	33
GE01	Roadside	Diffusion Tube	52	39	39	39	33	32	35
GE11	Roadside	Diffusion Tube	-	-	-	-	-	25	24
GE12	Roadside	Diffusion Tube	-	-	-	-	-	27	26
GE13	Roadside	Diffusion Tube	-	-	-	-	-	24	23
GE14	Roadside	Diffusion Tube	-	-	-	-	-	37	39
GE15	Roadside	Diffusion Tube	-	-	-	-	-	24	26

Exceedences of the NO₂ annual mean objective of 40µg/m³ are shown in bold.

Whilst there have been no monitored exceedances of the annual mean NO₂ objective in recent years, the extended monitoring undertaken since 2015 has shown levels close to the objective at one roadside diffusion tube (GLE14).

Given the uncertainty inherent in diffusion tube monitoring, Glasgow City Council proposes to continue with the current monitoring program through 2017. This proposal is likely to confirm three years of compliance with the objectives at all monitoring locations within the AQMA. Once this has been achieved, Glasgow City Council will review the air quality within Parkhead Cross with the intention of revoking the AQMA.

C.4 Air Quality Monitoring Data QA/QC

The 12 permanent monitoring stations in Glasgow form part of the Air Quality in Scotland monitoring network. Instruments are calibrated by the Local Site Operators according to the specific site guidelines, audits are carried out every six months by Ricardo AEA Technology. All of the automatic air quality data gathered is independently ratified by Ricardo AEA Technology and made available for viewing by the public at the Scottish Government funded air quality website at:

<http://www.scottishairquality.co.uk>

This webpage also provides access to the relevant QA/QC information relevant to LAQM report requirements. The instrument UKAS calibration certification generated by the six monthly audit programme for Glasgow's monitoring stations is available here at:

<http://www.scottishairquality.co.uk/laqm/certificates-calibration>

Individual site statistics for each monitoring station and instrument is available here at:

<http://www.scottishairquality.co.uk/laqm/statistics-pdf>

For 2016 the GSS (20% TEA in Water) annual bias adjustment used was **0.97**. The NO₂ diffusion tubes used in Glasgow Councils NO₂ diffusion tube network are provided and analysed by GCC Scientific Services. Measured NO₂ concentrations are adjusted by an annual bias adjustment value taken from the National Diffusion Tube Bias Adjustment Factor Spreadsheet. Further information on bias adjustment and laboratory proficiency (WASP) is available here at:

<http://www.scottishairquality.co.uk/laqm/tools>

There are 3 locations within the GCC network of NO₂ diffusion tube monitoring which fulfil the criteria for distance correction i.e. a single primary road source with a residential receptor set back from the measurement site. Corrected values for these locations are shown in Table C.6 following. Information and guidance on the Nitrogen Dioxide Fall off with Distance Calculator is also available here at:

<http://www.scottishairquality.co.uk/laqm/tools>

Table C.6 – Diffusion Tube Locations Corrected for Distance

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Distance to Relevant Exposure (m)	Measured Annual Mean ($\mu\text{g}/\text{m}^3$)	Corrected Annual Mean at Receptor ($\mu\text{g}/\text{m}^3$)
CC21	Royston Road	Roadside	260429	666264	5	35	30
GS09	Langside PS	Roadside	257138	661617	5	20	18
GS31	Govan Road (Hospital)	Roadside	253865	666006	2	35	32

For 2016, data capture from two diffusion tube monitoring locations GS24 and GW18 were below 75%, results from these locations have been annualised in Table A.3, in line with the method outlined in LAQM TG16 Box 7:10 Annualising NO₂ Diffusion Tube Monitoring Data.

<http://www.scottishairquality.co.uk/laqm/technical-guidance>

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
APR	Air quality Annual Progress Report
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
CAFS	Cleaner Air for Scotland
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LEZ	Low Emission Zone
NLEF	National Low Emission Framework
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide
TEOM	Tapered Element Oscillating Microbalance

References

- Department of the Environment, Food and Rural Affairs (2000). Part IV The Environment Act 1995, Local Air Quality Management, Technical Guidance, LAQM.TG(16).
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