Glasgow City Council
Further Assessment
2013

Local Authority Officer	Dom Callaghan
Department	Land & Environmental Services – Environment & Strategy
Address	231 George St Glasgow G1 1RX
Telephone	0141 287 6628
e-mail	dom.callaghan@glasgow.gov.uk
Report Reference number	FA2013
Date	May 2013

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 Further Assessment of Air Quality which is necessary as a consequence of the declaration and amendment of Air Quality Management Areas in the city.

In March 2012, the Executive Committee of Glasgow City Council approved a new AQMA which encompassed the entirety of the administrative area of Glasgow. This AQMA was declared in respect of breaches of both the daily and annual mean PM_{10} objective levels which apply in Scotland. Extensions were also made to the City Centre and Dumbarton Rd / Byres Rd AQMAs in respect of the annual mean NO_2 objective. The City Centre AQMA was amended to include breaches of the hourly mean NO_2 objective.

The decision to declare these areas as AQMAs was based on the 2010 Detailed Assessment and confirmed by monitoring results from 2010. Ongoing monitoring has shown a reduction in pollutant levels and, for the years 2011 and 2012, the objective levels are now largely being met at the locations which were declared in the 2012 orders.

Therefore Glasgow City Council believes that it would be inappropriate at this stage to proceed to the preparation of an Air Quality Action Plan in respect of the recent declarations. The purpose of an action plan is to propose methods designed to bring pollutant levels to within the objectives. In this case it is not clear that these measures are currently necessary.

Glasgow City Council propose to continue monitoring to clarify whether the downward trend in pollutant levels continues and whether the objectives continue to be met within the areas covered by the 2012 declaration.

Glasgow City Council proposes to review the situation again once monitoring data for 2013 is available. The availability of a further year of monitoring data will aid in the decision as to whether an action plan should be prepared or if the AQMAs should be revoked or amended.

Table of Contents

List of Tables

List of Figures

1.0 Introduction

1.1 Local Air Quality Management

The Environment Act 1995 requires that local authorities review the air quality within their boundaries. Where the review concludes that air quality objectives will not be met within the statutory timeframe then the local authority is required to designate an Air Quality Management Area (AQMA). Where an AQMA has been designated the local authority must undertake a Further Assessment of the air quality within the AQMA which will supplement the information which the authority has already gathered.

In March 2012, the Executive Committee of Glasgow City Council approved a new Air Quality Management Area which encompassed the entirety of the administrative area of Glasgow. This AQMA was declared in respect of breaches of both the daily and annual mean PM_{10} objective levels which apply in Scotland.

Extensions were also made to the City Centre and Dumbarton Rd / Byres Rd AQMAs in respect of the annual mean NO_2 objective. The City Centre AQMA was amended to include breaches of the hourly mean NO_2 objective.

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

Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in Scotland

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

1.3 Summary of Previous Rounds of Review and Assessment

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

This Further Assessment directly relates to the AQMA developments of March 2012.

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	Proceed 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
USA	2003	Proceed to DA 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}
Progress Report	2005	Reported on continuing monitoring and recommended new monitoring at various locations
USA	2006	Proceed to DA 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
USA	2009	Proceed to DA for NO_2 at a variety of locations and proceed to DA for PM_{10} citywide
Progress Report	2010	Highlighted exceedences of NO_2 hourly objective at Glasgow Kerbside site
Detailed Assessment	2010	Recommended extension of city centre AQMA to Bridge St 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.
USA	2012	Proceed to DA for NO_2 in the Crow Rd and Great Western Rd areas.

1.4 Aims of the Further Assessment

DEFRA's LAQM.TG(09) sets out guidance on the methodology, aims and objectives of a Further Assessment. It is intended to:

- Confirm the original assessment, and thus ensure they were correct to designate an AQMA in the first place;
- Calculate more accurately what improvement in air quality, and corresponding reduction in emissions, would be required to attain the air quality emissions within the AQMA;
- Refine their knowledge of the sources of pollution, so that the Air Quality Action Plan may be appropriately targeted;
- Take account of any new guidance issued by DEFRA and the Devolved Administrations, or any new policy developments that may come to light since declaration of the AQMA;
- Take account of any new local developments that were not fully considered within the earlier review and assessment work;
- Carry out additional monitoring to support the conclusion to declare the AQMA; Corroborate the assumptions on which the AQMA has been

based, and to check that the original designation is still valid, and does not need amending in any way; and

- Respond to any comments made by statutory consultees in respect of the Detailed Assessment.

1.5 Citywide PM_{10} Air Quality Management Area

The 2006 Updating and Screening Assessment stated,

"Concentrations of PM10 were last considered in Glasgow during the Detailed Assessment and Progress Report of 2005. It was considered in both these reports that there may be exceedences of the air quality objectives for PM10 due in 2010 at locations across the city. However, it was concluded that there was a requirement to conduct further monitoring to validate dispersion modelling results prior to declaration of one or more AQMAs."

The 2008 Progress Report included monitoring results and future year projections of PM10 in respect of the objectives due to come into effect in 2010. These showed that the objectives were likely to be exceeded at a variety of locations. These observations were based on partial year results from the recently located FDMS TEOMs and the existing stations. Further monitoring resulted in these conclusions being repeated in the 2009 USA and the decision made to proceed to a Detailed Assessment.

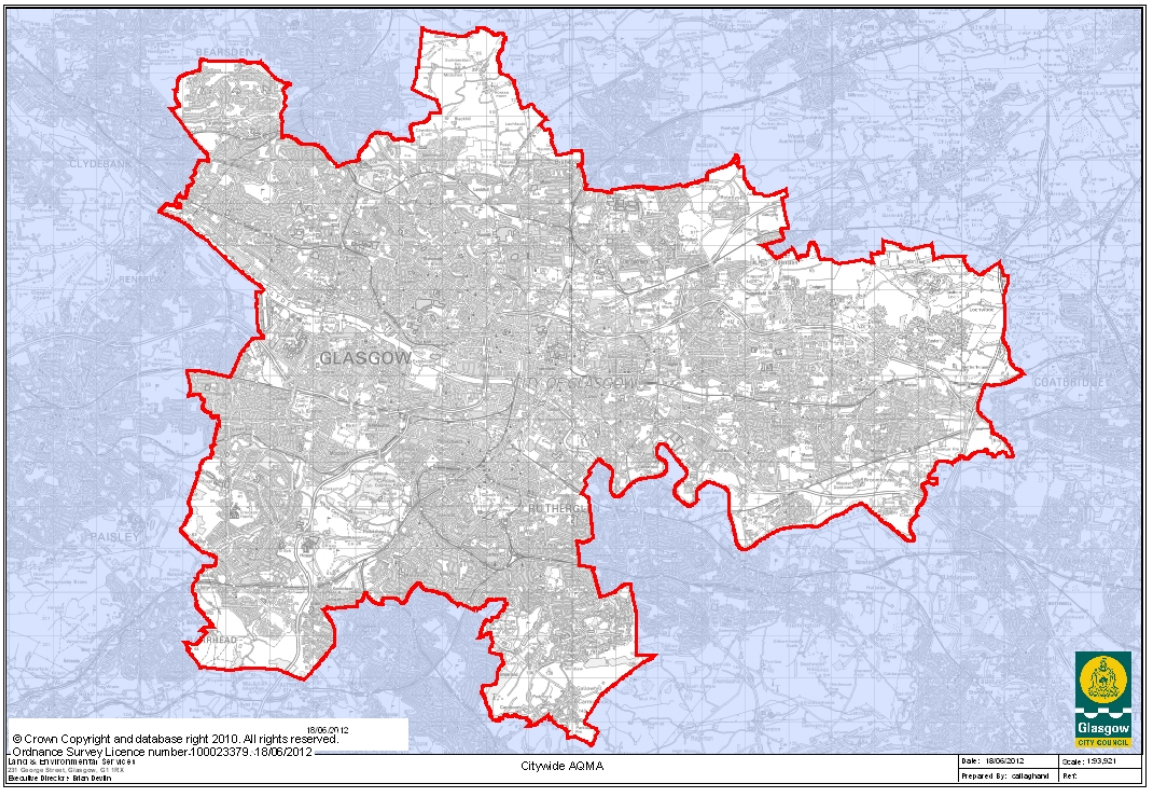
This DA was completed in 2010, however the results were inconclusive. It was felt that the uncertainties of the modelling exercise were such that further monitoring would be required to have confidence in declaring an AQMA.

However, the 2011 Progress Report showed that the objective levels were breached at almost all locations where monitoring was undertaken during 2010.

Given this continued evidence of breaches, coupled with the recommendations of the DA, it was decided that little would be gained from a further Detailed Assessment and that Glasgow should proceed to declaring an AQMA for the whole of the city.

This AQMA came into effect in March 2012.

Figure 1.1 Citywide AQMA



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

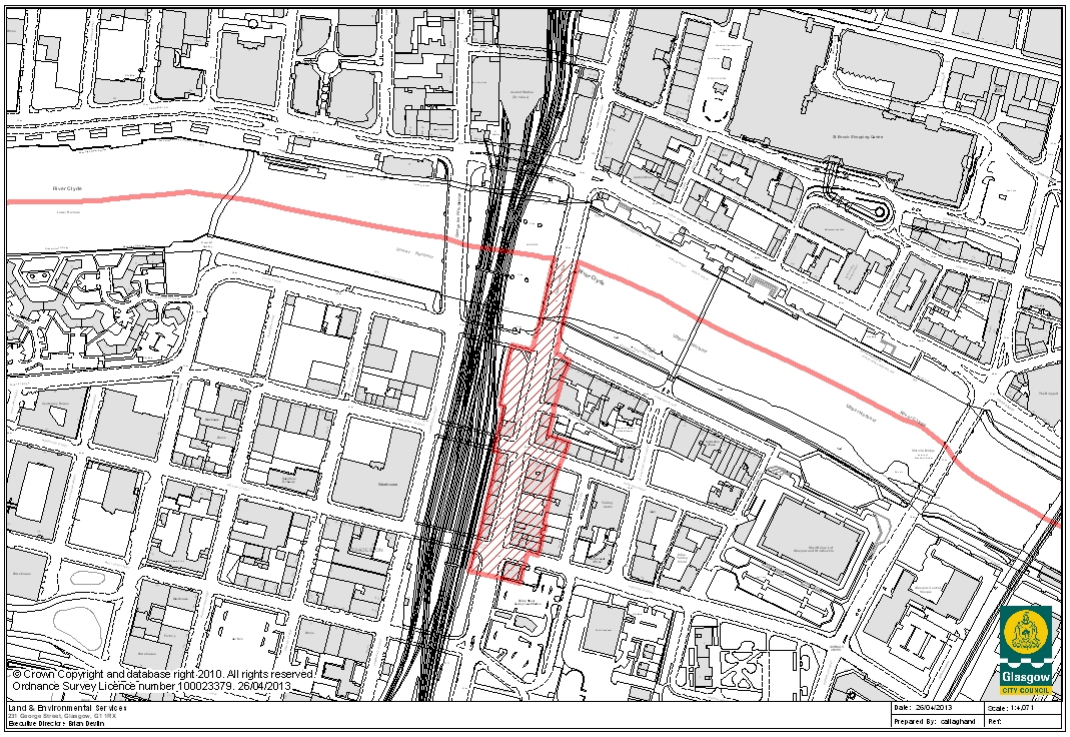
1.6 AQMA Extensions

The 2010 Detailed Assessment stated,

"The results of the modelling exercise also indicate that the 40µg/m^3 annual mean objective for NO_2 will be exceeded in 2010 in Bridge Street but is likely to be met in Queen Margaret Drive north of Hamilton Drive …. It is recommended that the City Centre AQMA is extended to include Bridge Street and monitoring is continued in Queen Margaret Drive."

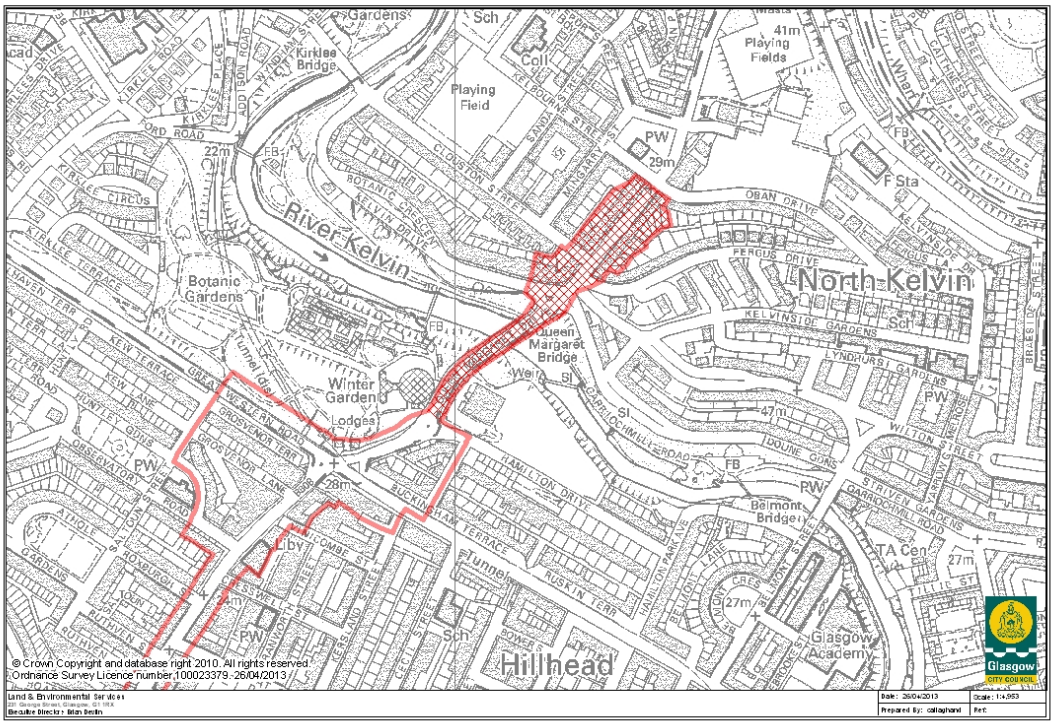
The annual mean measured by diffusion tube at both locations in 2010 registered exceedences of the objective. As such, it was decided that areas of Bridge Street and Queen Margaret Drive would be incorporated into the City Centre and the Byres Rd / Dalmarnock Rd AQMAs respectively.

Figure 1.2 City Centre AQMA extension



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

Figure 1.3 Byres Rd / Dumbarton Rd AQMA extension



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

2.0 New Local Policies and Developments

2.1 New Local Policies

2.1.1 Air Quality and Planning Guidance

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

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

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

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

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

2.1.3 Policy on the Introduction of Biomass Installations

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

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

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

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

2.2 New Local Developments

2.2.1 Polmadie Recycling Centre

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

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

2.2.2 Gorbals District Heating

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

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

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

3.0 Air Quality Monitoring

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Glasgow City Council operates an extensive monitoring network across the city to measure ambient levels of air pollutants.

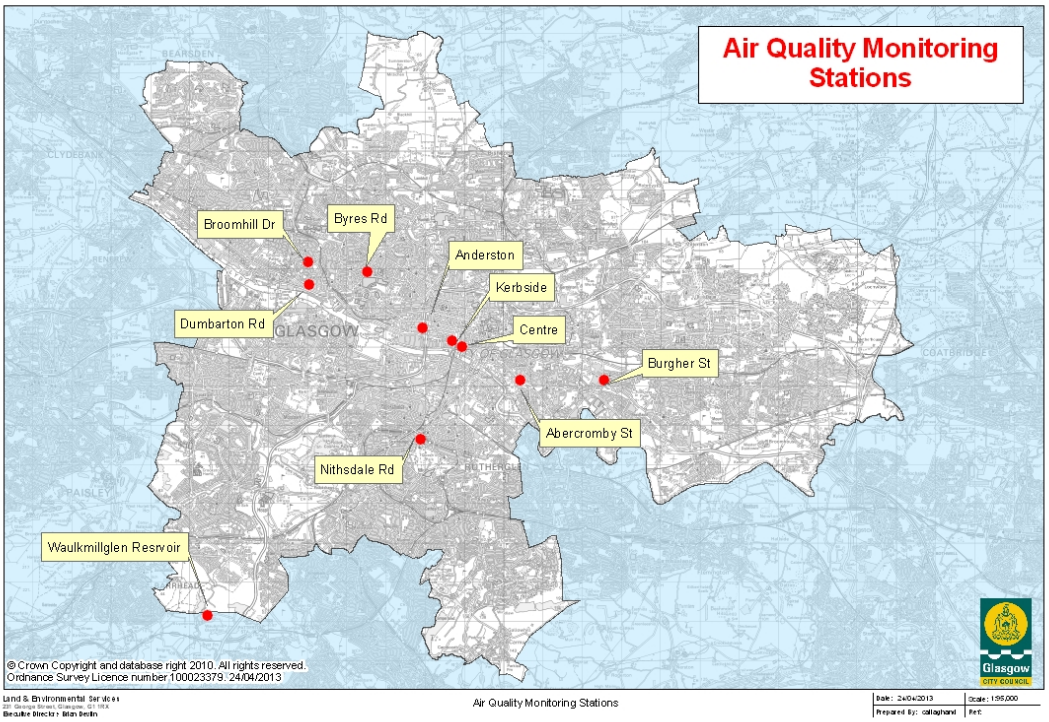
Automated monitoring equipment is located at ten sites with two of the units (Glasgow Kerbside and Glasgow Centre) forming part of the Department for Environment, Food and Rural Affairs (DEFRA) Automated Urban and Rural Network (AURN).

Instruments at these sites are calibrated according to the specific site guidelines by the Local Site Operators and 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 on the Scottish Government funded air quality website at: http://www.scottishairquality.co.uk

PM_{10} is monitored at all of these locations and, with the exception of the Waulkmillglen Reservoir site, they are all within the new PM_{10} AQMA.

The monitoring stations Glasgow Kerbside, Glasgow Centre and Glasgow Anderston are all located within the City Centre AQMA. This AQMA was amended to include the declaration in respect of PM_{10} in 2007.

Figure 3.1 Map of Automatic Monitoring Sites



PM_{10} is also monitored at two locations using Osiris particulate monitors. These devices use light scattering techniques to measure particles across a range of sizes. The accuracy of these instruments is not as high as that for the TEOM units used elsewhere, however, they provide a very good indication of PM_{10} levels and are widely used for screening assessments. These units were located at sites which were identified as potentially exceeding the annual mean PM_{10} objective within the 2010 Detailed Assessment.

3.1.2 Non-Automatic Monitoring Sites

Glasgow City Council operates a non-automatic monitoring network of diffusion tubes which measure 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 nitrogen dioxide 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. Triplicate tubes are co-located with the automatic NO_2 analysers at Glasgow Centre, Glasgow Kerbside and Glasgow Anderston. Concentrations detected by these tubes were compared against those recorded through chemiluminescent detection over the same sampling period and a bias-correction factor determined using the guidance outlined in LAQM.TG(09). Diffusion tubes utilised by Glasgow City Council are prepared and analysed by Glasgow City Council's Scientific Services. 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. Results from the bias study conducted by Glasgow City Council were combined with others conducted on tubes analysed by the laboratory to give a laboratory specific factor. For the 2012 annual means a bias correction factor of 0.95 was used.

Glasgow operates an NO_2 diffusion tube in each of the AQMA extensions for direct comparison with the annual mean objective. There are also a large number of tubes in the City Centre AQMA which can serve as an indication of the likelihood of exceedences of the hourly objective.

More details of the QA/QC process for NO_2 diffusion tubes are given in Appendix A

3.2 New Monitoring Data

Table 3.1 Results of Automatic Monitoring for PM_{10}: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture 2012 %	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m^3				
					2008	2009	2010	2011	2012
Glasgow Kerbside	Kerbside	Y	55	Y	23	26	29	18	24
Glasgow Centre	Urban Centre	Y	61	Y	16	25	21	17	16
Glasgow Anderston	Urban Background	Y	78	Y	14	20	16	16	14
Glasgow Byres Rd	Roadside	Y	81	Y	18	19	23	24	13
Glasgow Dumbarton Rd	Roadside	Y	64	Y	-	-	-	-	18
Glasgow Abercromby St	Roadside	Y	93	Y	19	18	21	18	14
Glasgow Broomhill	Roadside	Y	95	Y	19	18	19	18	15
Glasgow Nithsdale Rd	Roadside	Y	95	Y	21	17	21	18	17
Glasgow Waulkmillglen Reservoir	Rural	N	78	Y	11	11	16	12	11
Glasgow Burgher St	Roadside	Y	97	Y	-	-	-	-	15

Note: 18 µg/m^3 may or may not be an exceedence depending on rounding.

Trend graphs are shown below for those monitoring locations within the City Centre and Citywide AQMAs for which five years of data exist. These generally show a downward trend in monitored PM10 levels.

Figure 3.2 Glasgow Kerbside PM_{10} trend

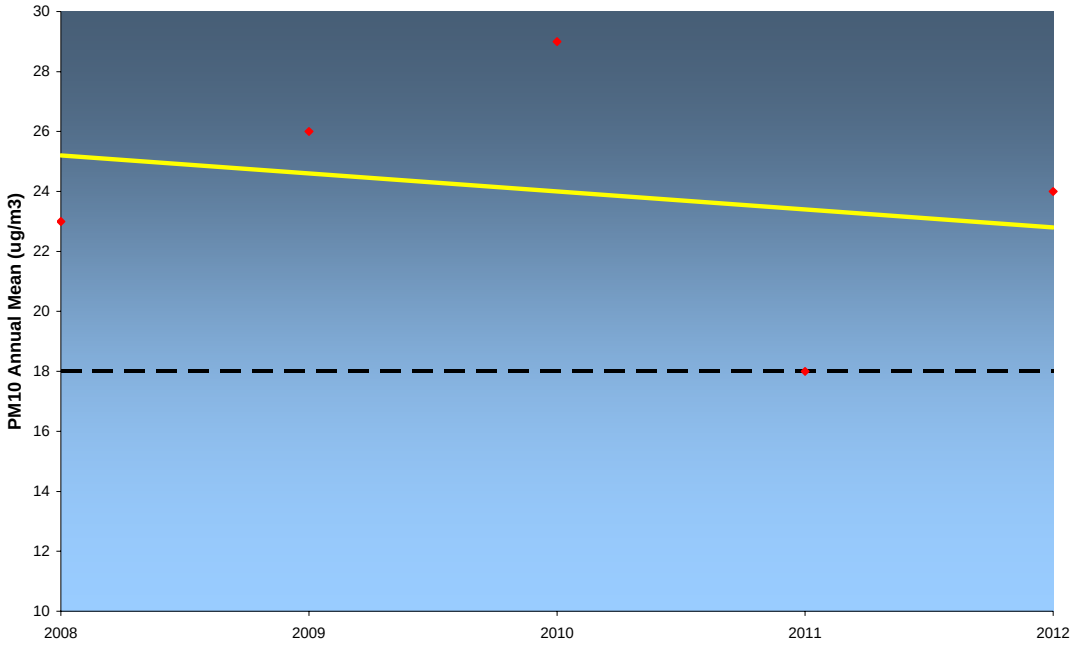


Figure 3.3 Glasgow Centre PM_{10} trend

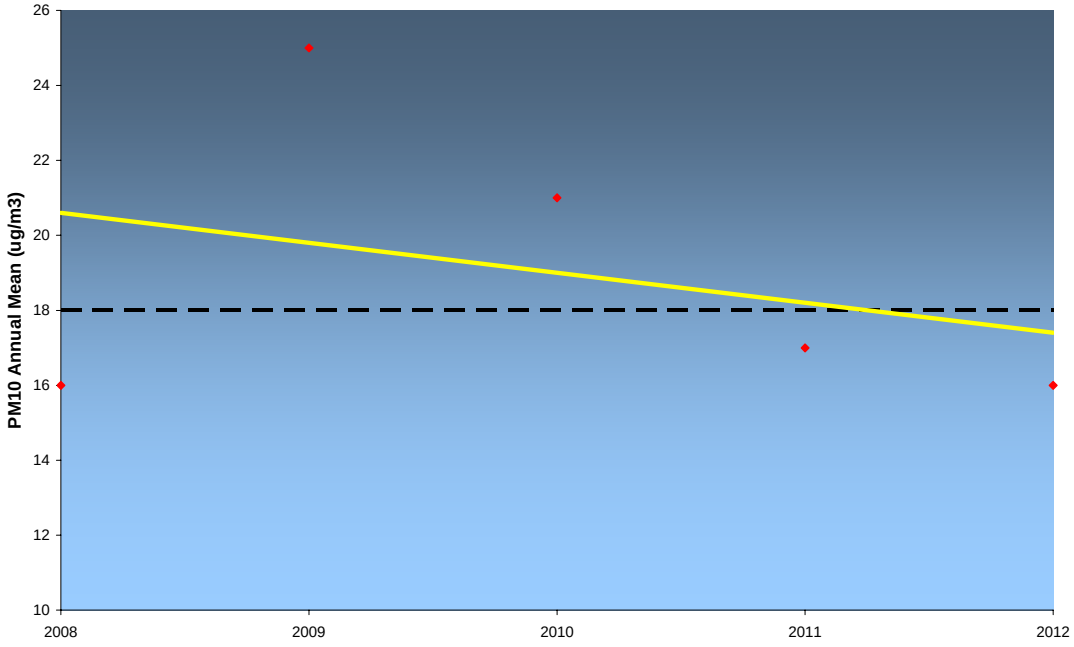


Figure 3.4 Glasgow Anderston PM_{10} trend

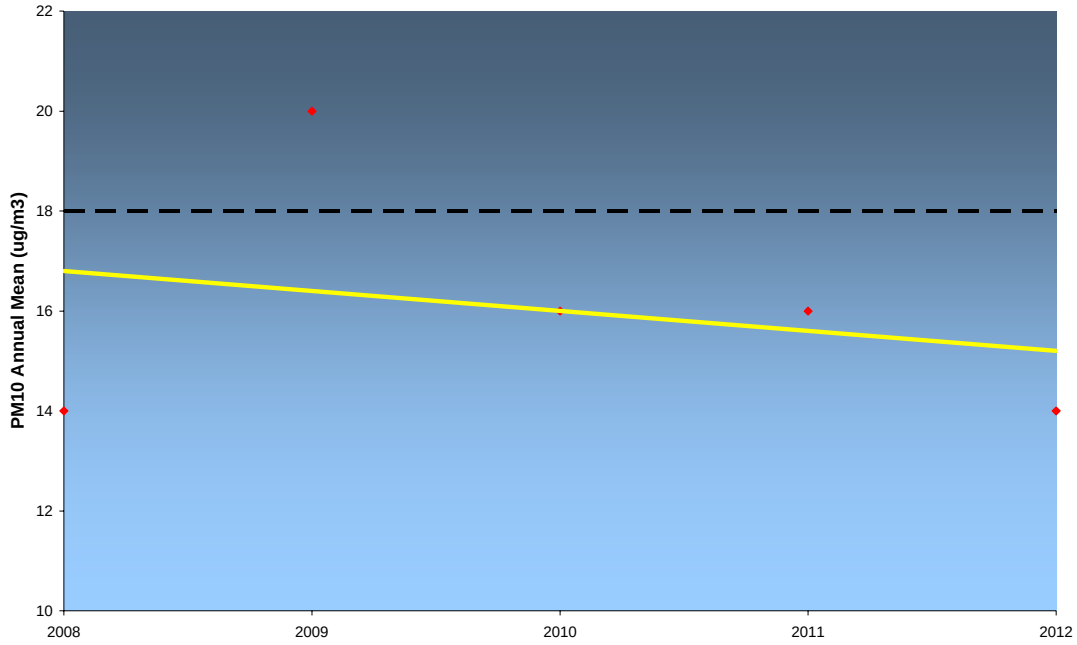


Figure 3.5 Glasgow Byres Rd PM_{10} trend

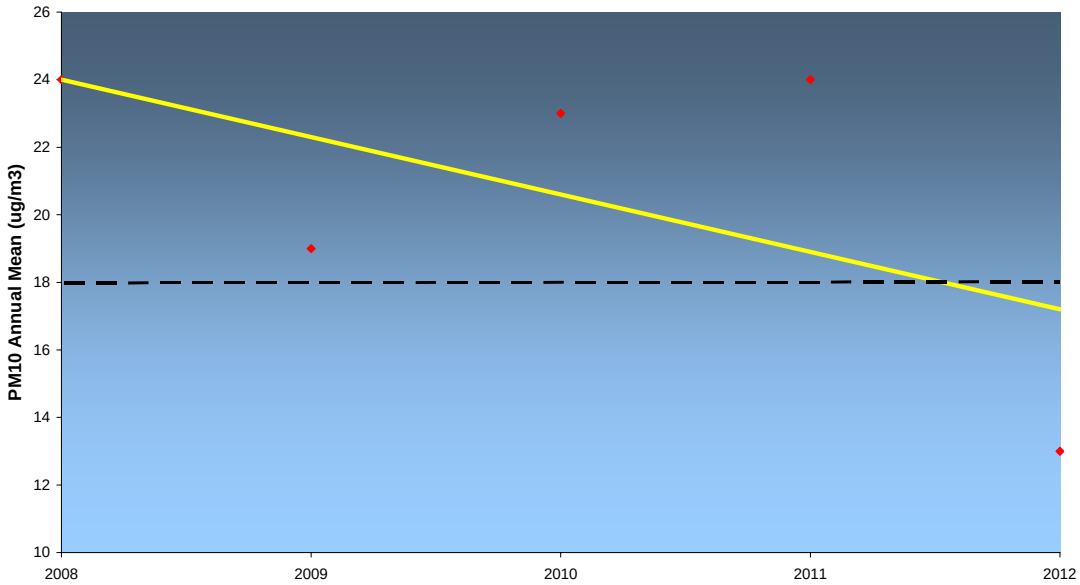


Figure 3.6 Glasgow Abercromby St PM_{10} trend

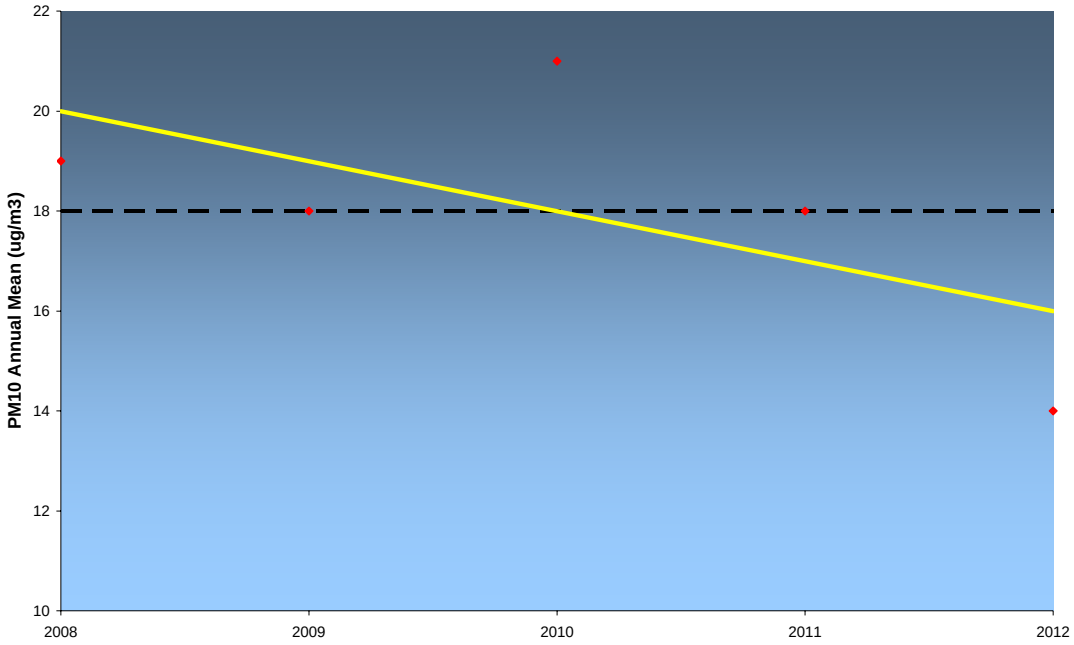


Figure 3.7 Glasgow Broomhill PM_{10} trend

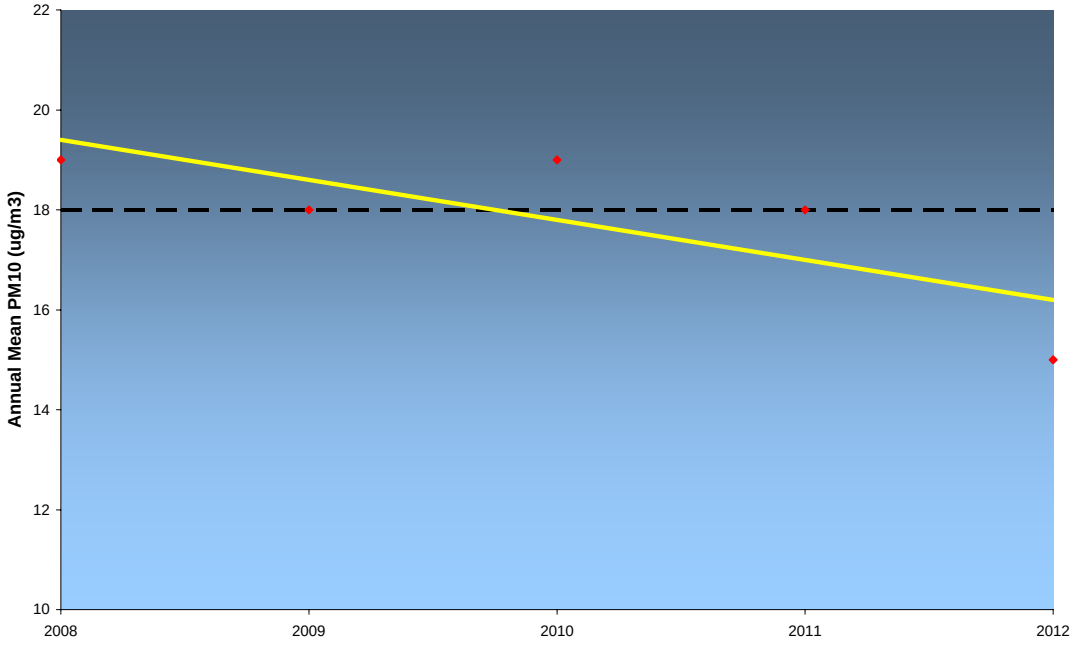
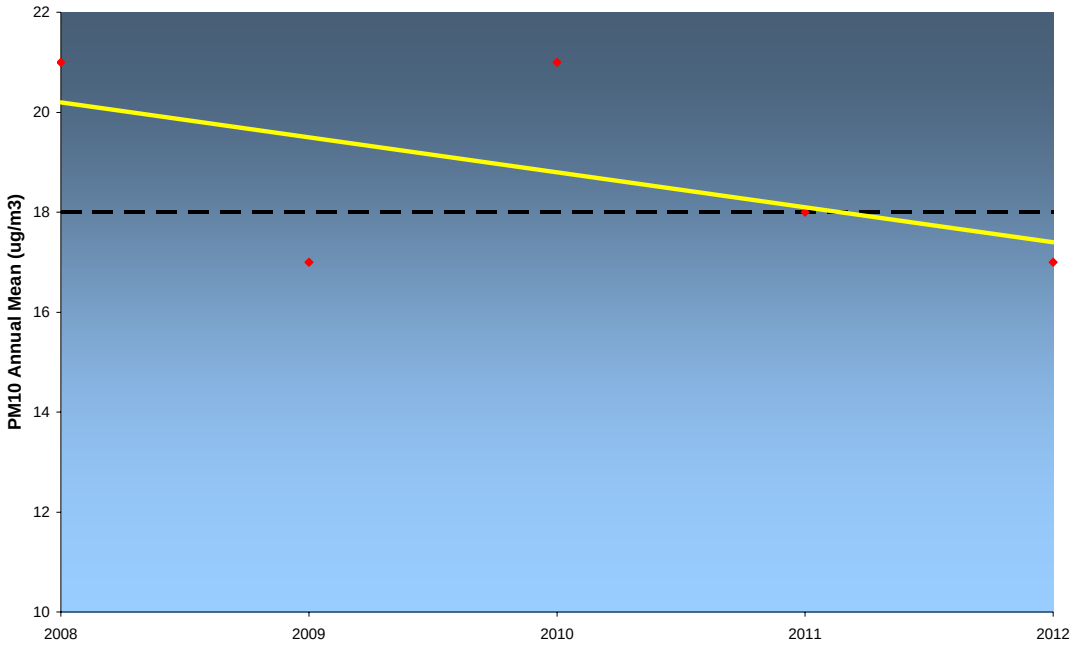


Figure 3.8 Glasgow Nithsdale Rd PM_{10} trend



The results show a general downward trend in annual mean PM_{10} levels. However, the graph below shows the recent trend in annual mean PM10 levels from the Glasgow Waulkmillglen monitoring station. This station is in a rural location and shows a relatively flat trend in PM10 levels. This indicates that the downward trend observed at locations within the city is due to a reduction in local emissions rather than a reduction in the background levels.

Figure 3.9 Glasgow Waulkmillglen PM_{10} trend

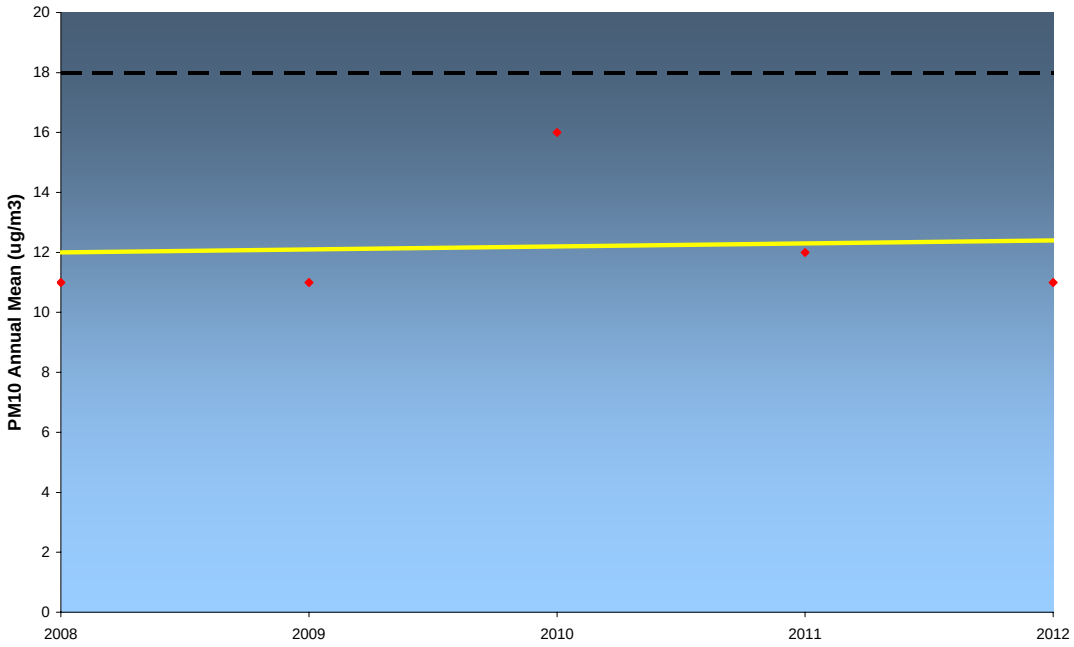


Table 3.2 Results of Automatic Monitoring for PM_{10} using Osiris

Site Name	Within AQMA?	Gravimetric Equivalent	% Valid Data Capture 2012	Annual Mean Concentration ($\mu g/m^3$)
Sauchiehall Street	Y	Y	65	16
Maryhill Road	Y	Y	85	14

Table 3.3 Results of Automatic Monitoring for PM_{10}: Comparison with 24-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture 2012 %	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m^3)				
					2008	2009	2010	2011	2012
Glasgow Kerbside	Kerbside	Y	55	Y	10	18	25	0 (28)	7 (59)
Glasgow Centre	Urban Centre	Y	61	Y	0	21	7 (80)	2	3 (39)
Glasgow Anderston	Urban Background	Y	78	Y	1	12	4 (45)	2 (25)	3 (39)
Glasgow Byres Rd	Roadside	Y	81	Y	1	2	9	2 (40)	3 (37)
Glasgow Dumbarton Rd	Roadside	Y	64	Y	-	-	-	-	2 (39)
Glasgow Abercromby St	Roadside	Y	93	Y	9	7	9 (60)	9	4
Glasgow Broomhill	Roadside	Y	95	Y	8	7	9	6	6
Glasgow Nithsdale Rd	Roadside	Y	95	Y	7	6	10 (57)	6	9
Glasgow Waulkmillglen Reservoir	Rural	N	78	Y	0	0	4	0 (20)	0 (29)
Glasgow Burgher St	Roadside	Y	97	Y	-	-	-	-	4

If the period of valid data is less than 90%, the 98th percentile of hourly means is in brackets

Table 3.4 Results of Diffusion Tube Monitoring of NO_2

	Annual Mean NO2 (ug/m3)				
	2008	**2009**	**2010**	**2011**	**2012**
Queen Margaret Drive 2	41.5	38.9	41.1	35.5	31.2
Bridge St	50.2	43.3	43.0	38.9	34.8

Figure 3.10 Queen Margaret Drive 2 NO_2 trend

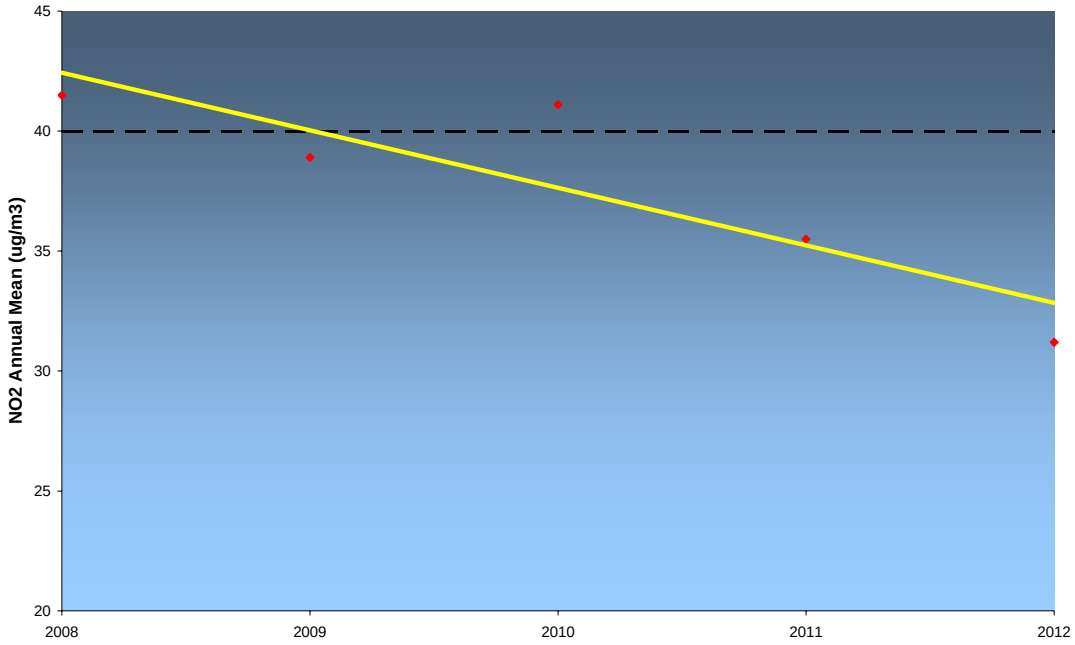


Figure 3.11 Bridge St NO_2 trend

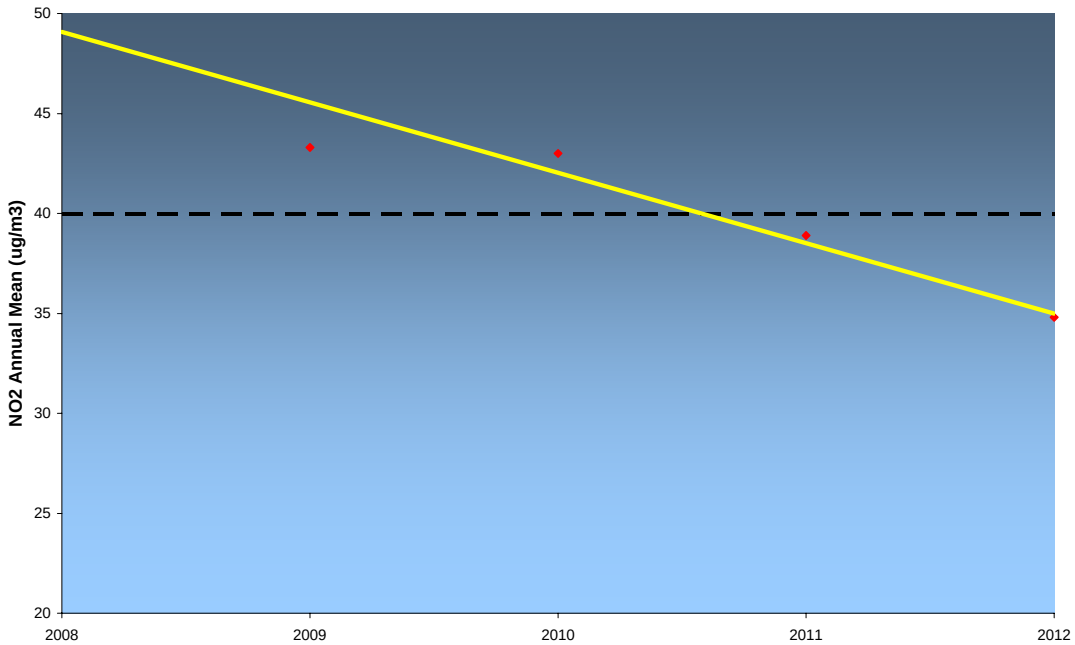


Table 3.5 Results of Automatic Monitoring of NO_2 within the City Centre AQMA

Site ID	Site Type	Within AQMA?	Valid Data Capture 2012 %	Number of Exceedences of Hourly Mean (200 µg/m^3)				
				2008	2009	2010	2011	2012
Glasgow Kerbside	Kerbside	Y	91	72	57	97	31	17
Glasgow Centre	Urban Centre	Y	61	0 (175)	48	56	0	0 (105)
Glasgow Anderston	Urban Background	Y	95	1 (137)	4	16 (204)	4	4

If the period of valid data is less than 90%, the 99.8th percentile of hourly means is in brackets

LAQM TG(09) states: "Previous research carried out on behalf of DEFRA and the Devolved Administrations identified a relationship between the annual mean and the 1-hour mean objective, such that exceedences of the latter were considered unlikely where the annual mean was below 60 µg/m^3." Annual mean NO_2 measurements by diffusion tube exceeding 60 µg/m^3 were recorded at four locations within the City Centre AQMA for 2012. This indicates that there is a possibility of exceedences of the hourly mean objective at these locations.

4.0 Source Apportionment

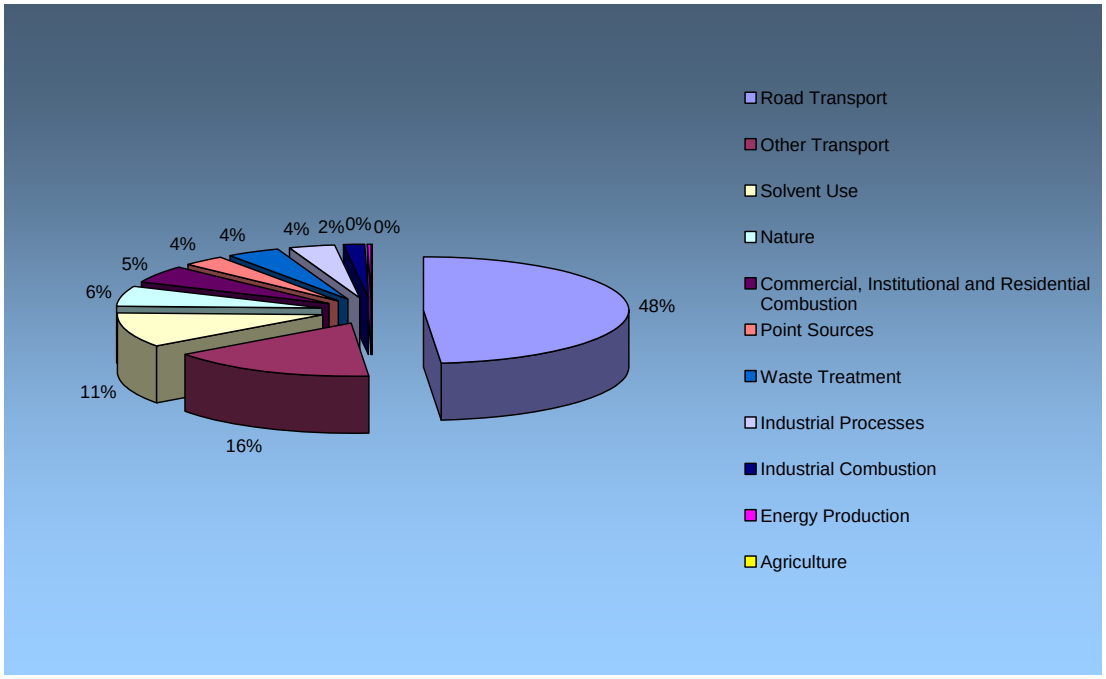
One of the main purposes of the Further Assessment is to refine the knowledge of the sources of pollution, so that any subsequent Air Quality Action Plan may be appropriately targeted. In the case of small geographical areas of exceedence this can usually be accomplished through air quality modelling. However, in the case of a city wide AQMA there can be a large difference in the pollutant sources across different areas.

The 2010 Detailed Assessment undertook modelling of traffic at a number of locations around the city. Given the high degree of uncertainty in the modelling output, coupled with recent monitoring results which show a large decrease in pollutant concentrations, it would not be appropriate at this time to repeat the modelling exercises with the same inputs. Instead, emissions and background concentration figures have been taken from a variety of sources in an attempt to better understand the sources of air pollutants within Glasgow.

4.1 National Atmospheric Emissions Inventory

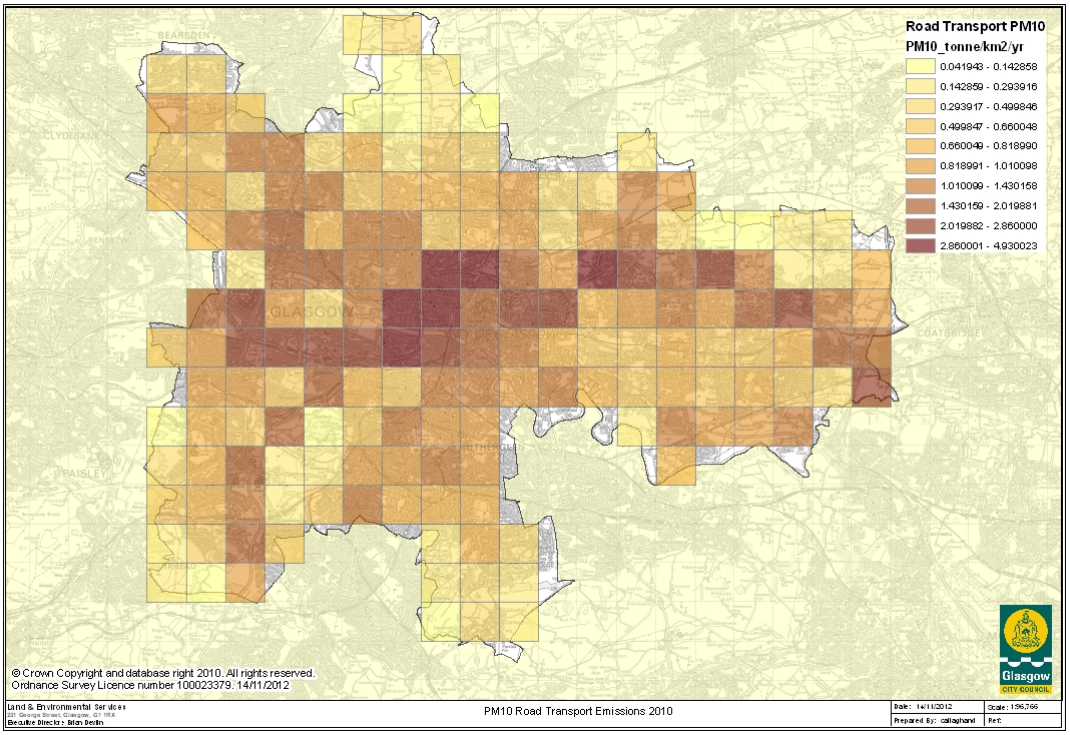
The National Atmospheric Emissions Inventory compiles estimates of emissions to the atmosphere from a variety of different sectors such as power production, traffic sources, household emissions, agriculture and industrial processes. Emissions of pollutants are given in the form of emissions of pollutants in each 1x1km sector for the whole of the UK. From this data it is possible to produce maps of total emissions on a pollutant basis and on a geographical basis. It is also possible to break down total emissions into the relevant sectors as shown in Figure 4.1

Figure 4.1 PM_{10} Emissions by Sector in Glasgow 2010



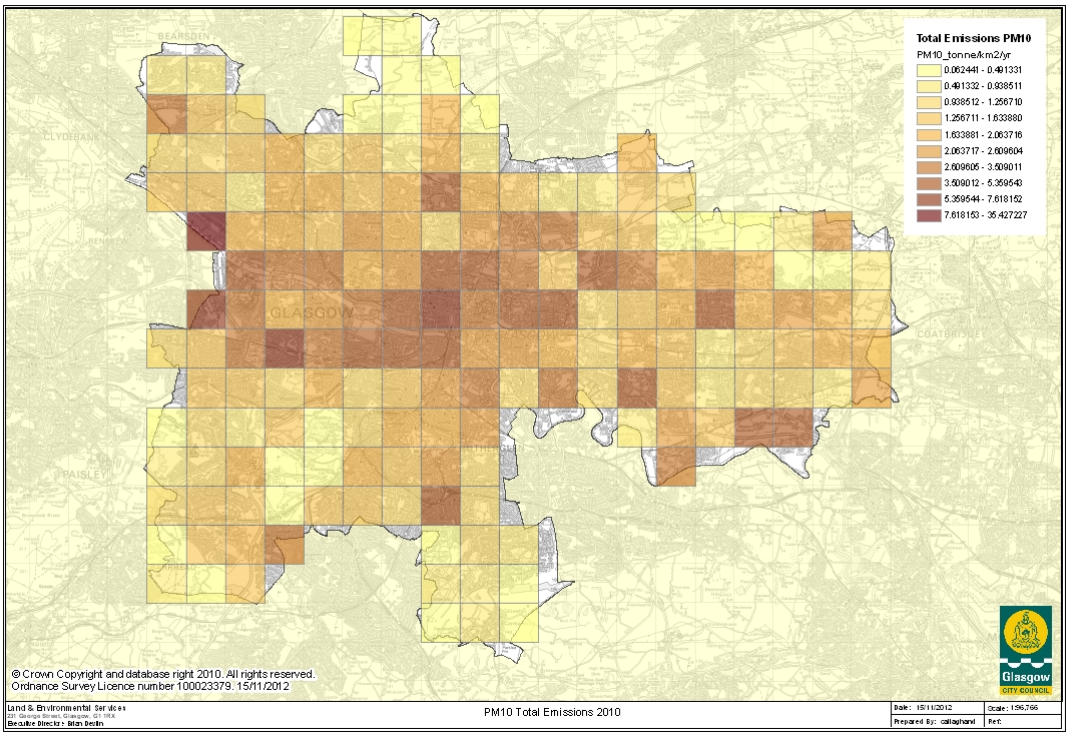
The chart shows that road transport accounts for almost half of all PM_{10} emissions in the Glasgow area. Overlaying traffic emissions onto a map of Glasgow gives a visual representation of the areas where traffic emissions are highest. It can be seen that the emissions of PM_{10} are most pronounced following the motorway network and the city centre area.

Figure 4.2 Mapped Road Transport Emissions of PM_{10} in 2010



Mapping PM_{10} emissions from all sources yields a similar pattern in that the road network and city centre dominate emissions.

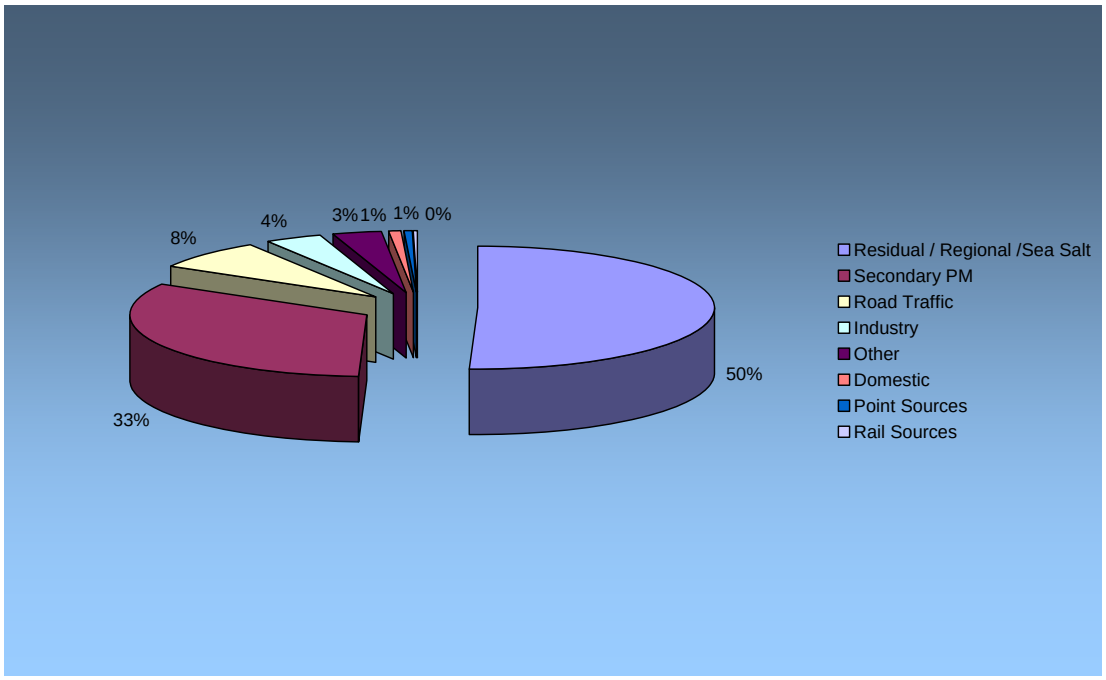
Figure 4.3 Mapped Total Emissions of PM_{10} in 2010



4.2 DEFRA Background Pollutant Maps

In a similar fashion to the NAEI maps, DEFRA produce maps of background pollutant concentrations in each 1x1km area for the whole of the UK. For PM_{10} the background maps are broken down into sector contributions which include regional sources, secondary sources, road traffic, industry etcetera. From this data it is possible to break down background PM_{10} concentrations into the relevant sections as shown in Figure 4.4

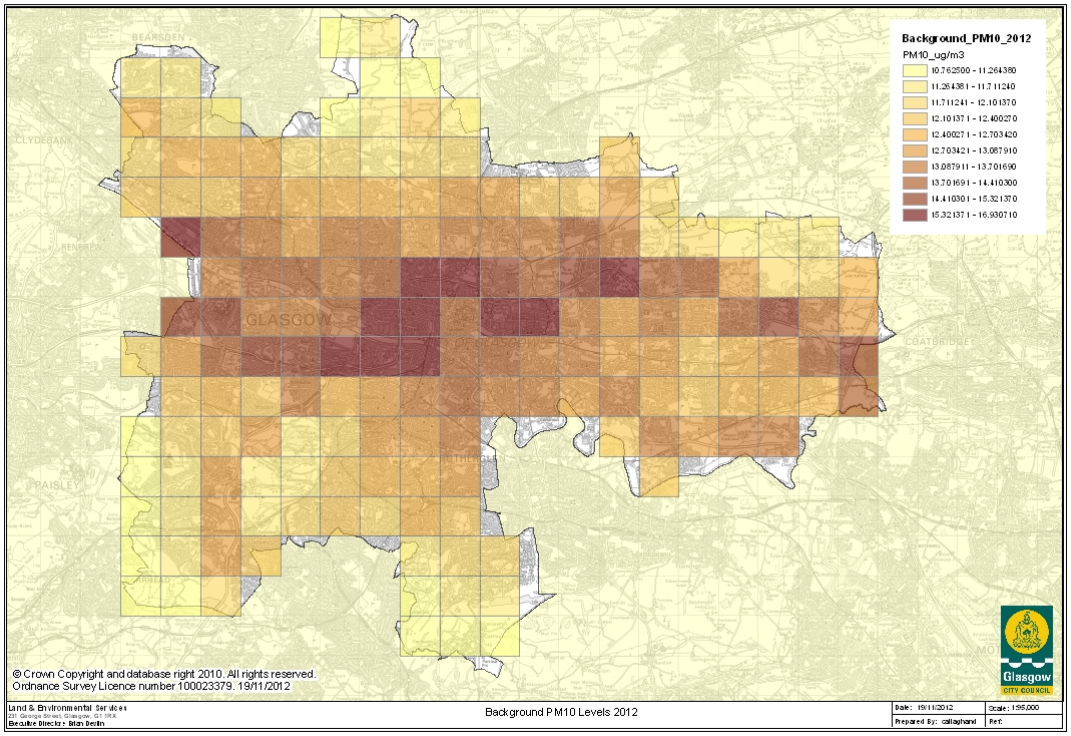
Figure 4.4 Glasgow Background PM_{10} Sources by Sector in 2012



It can be seen that background concentrations of PM_{10} in Glasgow are dominated by regional and secondary sources. The Glasgow average for background PM_{10} concentrations from road traffic sits at 8% which is in contrast to 48% of total emissions. This will of course be much higher in close proximity to busy roads but in the context of a city wide AQMA the low proportion of PM_{10} from road traffic is of significance. Additionally, motorway sources account for over 10% of the average road traffic component of background PM_{10}.

However, overlaying the data onto a map of Glasgow again shows that the road network and city centre dominate in terms of higher background concentrations.

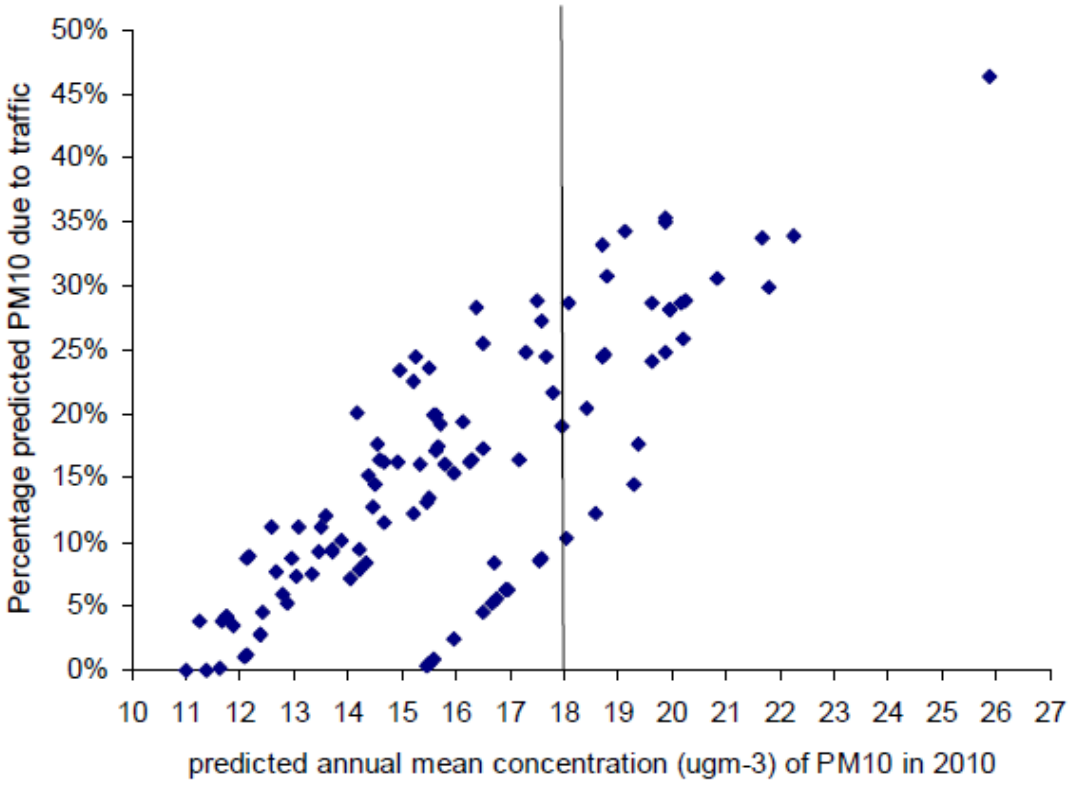
Figure 4.5 Mapped Background PM_{10} Concentrations in 2012



4.3 Detailed Assessment 2010

Extensive modelling over a number of locations within Glasgow was undertaken as part of the Detailed Assessment. At most locations, the model output predicted that traffic only contributes to a small proportion of concentrations of PM_{10} such that the predicted background concentrations have a much greater impact on predicted total levels of PM_{10} than traffic. The contribution of local traffic emissions to total predicted concentrations of PM_{10} varies from less than 1% to >40% but exceeded 15% for almost 50% of the modelled locations.

Figure 4.6 Contribution of traffic emissions to total predicted concentrations of PM_{10} in 2010

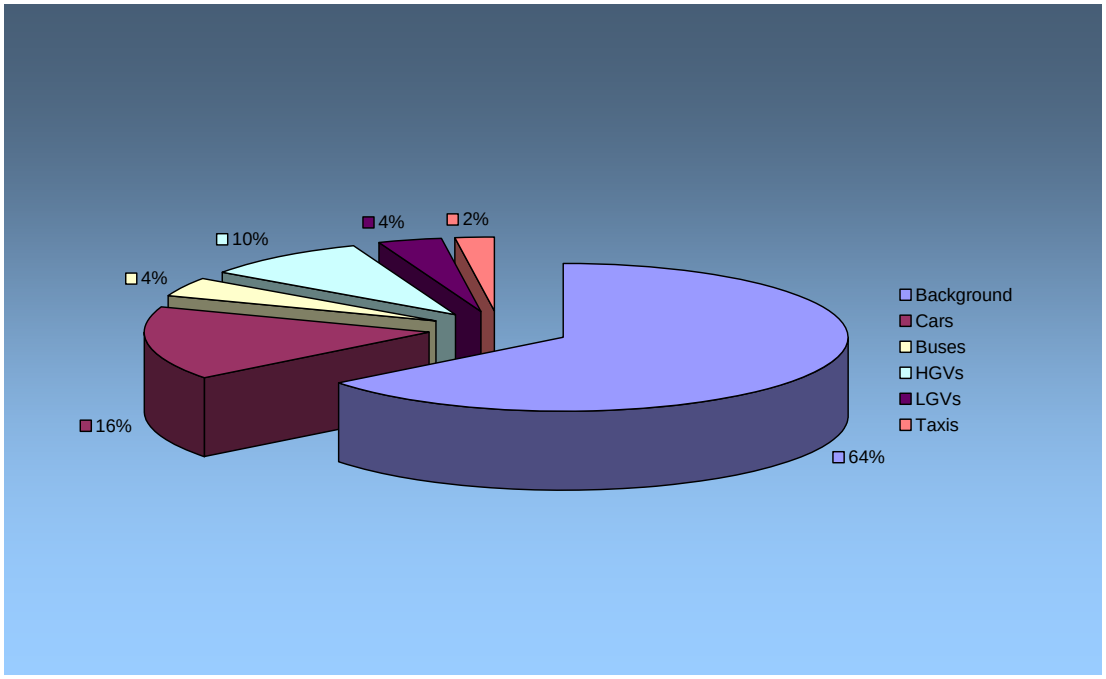


4.4 Low Emission Zone Feasibility Study

In 2010 Glasgow commissioned phase 2 of a feasibility study into the possible implementation and benefits of establishing Low Emission Zones within the city. This involved extensive modelling of both baseline conditions and scenario testing with associated source apportionment.

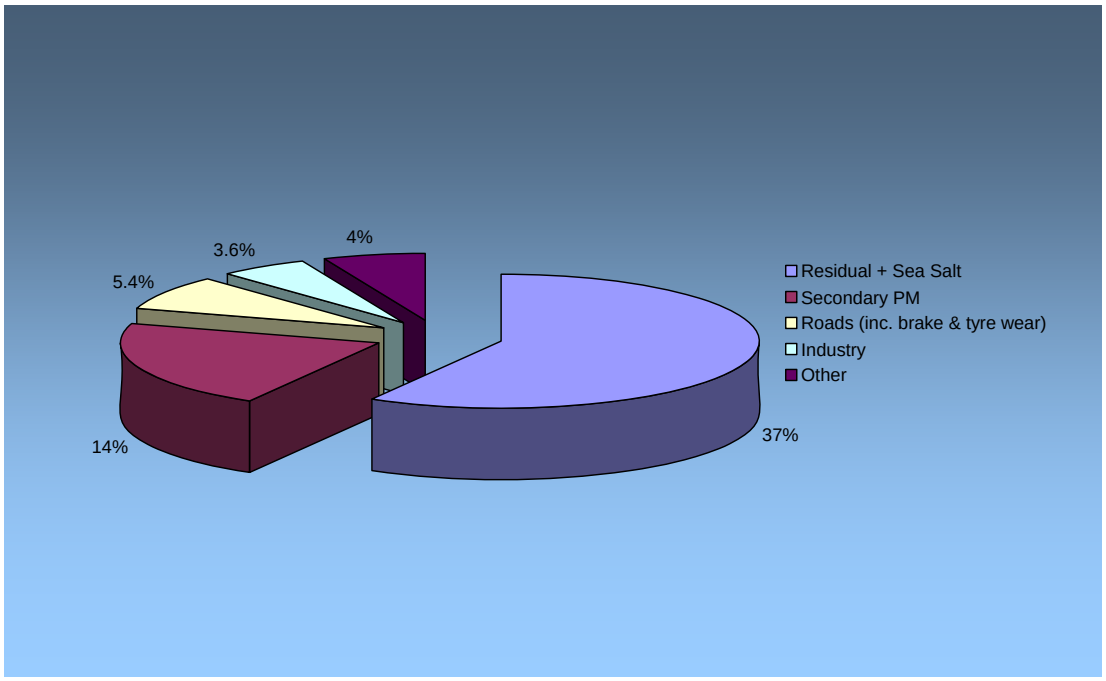
The graph below shows the relative components of total PM_{10} levels modelled across multiple receptors in the Byres Rd area.

Figure 4.7 Byres Rd PM_{10} Source Apportionment 2009



The background component of the PM_{10} concentrations can be further broken down as in the following graph. All sources are expressed as a percentage of total PM_{10}.

Fig 4.8 Byres Rd Background PM_{10} 2009



The following two graphs show the same breakdown of the relative components of PM_{10} modelled in the Parkhead Cross area.

Figure 4.9 Parkhead Cross PM_{10} Source Apportionment 2009

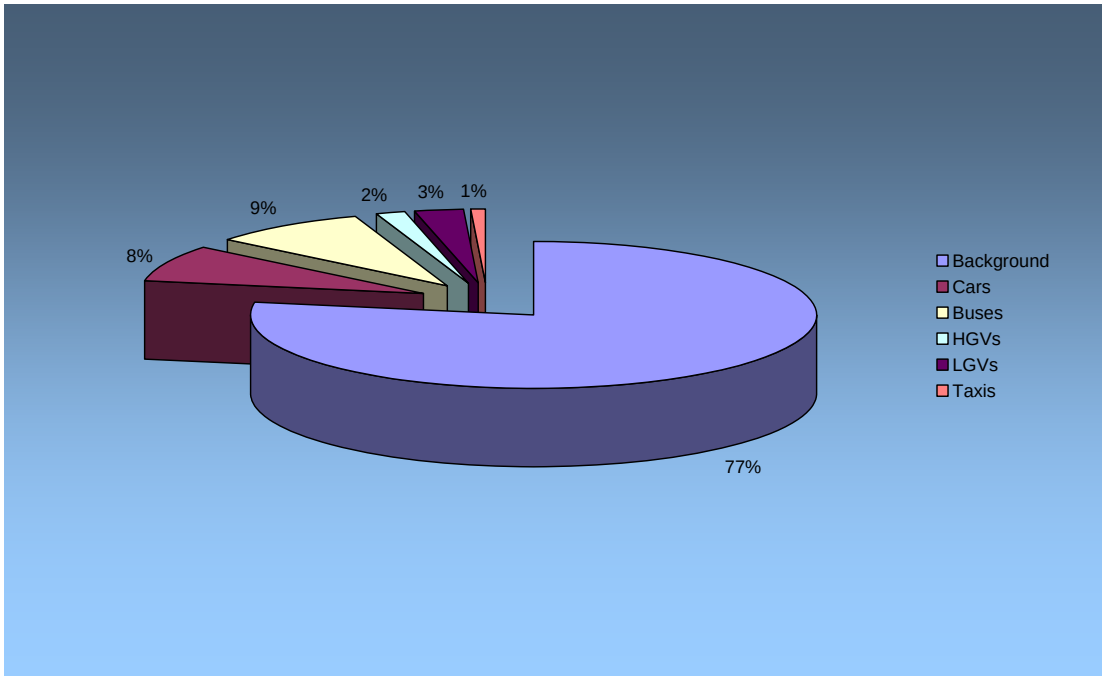
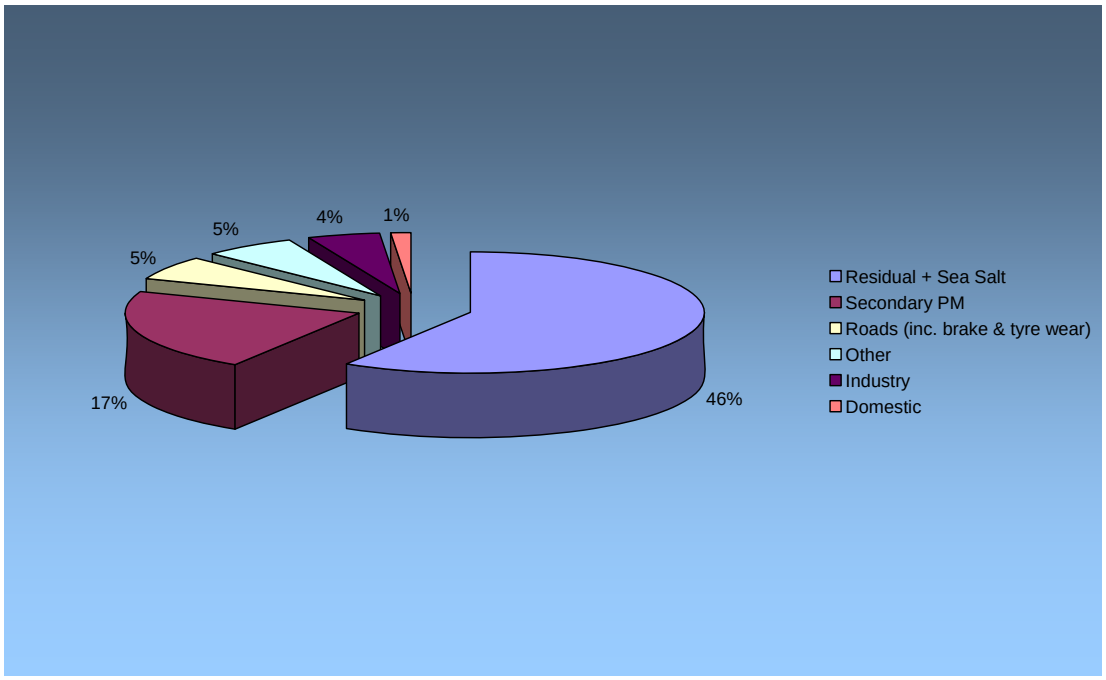


Fig 4.10 Parkhead Cross Background PM_{10} 2009



In both cases the background component dominates, albeit at different levels.

5.0 Conclusions

5.1 Conclusions from New Monitoring Data

The Citywide AQMA and the extensions to the existing AQMAs which came into effect in 2012 were based on the results of the 2010 Detailed Assessment. This report predicted the possibility of ongoing exceedences of the annual and daily mean objectives for PM_{10} at various locations around the city and the possibility of exceedences of the annual mean objective for NO_2 adjacent to two of the existing AQMAs. However, the report acknowledged the limitations in the modelling which informed these conclusions and recommended that additional monitoring be conducted to verify the findings before proceeding to declaration or amendments of AQMAs.

Monitoring results for 2010 confirmed widespread exceedences and subsequently, the new AQMA and the amended AQMAs came into effect in March 2012.

Ongoing monitoring has shown a reduction in pollutant levels and, for the years 2011 and 2012, the objective levels are now largely being met at the locations which were declared in the 2012 orders.

5.1.1 Citywide PM_{10}

Monitoring data showed that, in 2011, only the Byres Rd monitoring station recorded an annual mean value for PM_{10} which exceeded the Scottish objective. However this location only achieved a data capture rate of 42% for this period and therefore the result is not suitable for direct comparison with the annual mean objective.

In 2012, only the Glasgow Kerbside monitoring station recorded an annual mean value for PM_{10} which exceeded the Scottish objective. However, this location is within the pre-existing City Centre AQMA for this pollutant and is not directly relevant to the Citywide AQMA to which this Further Assessment relates.

In 2011 only the Abercromby St monitoring station recorded an exceedence of the daily mean objective for PM_{10}. However, there was no exceedence observed at this location in 2012. The Nithsdale Rd monitoring station was the only station to record an exceedence of this objective in 2012 but the majority of the days which exceeded the 50 µg/m^3 objective occurred during a period in which there was extensive building work taking place immediately adjacent to the station. It is therefore considered that this exceedence is not representative of the normal conditions experienced at this location.

Given the widespread compliance with the objectives observed in the monitoring data, it is not necessary to calculate the percentage reduction, or the anticipated compliance date which is a normal part of a Further Assessment.

5.1.2 AQMA Amendments for NO_2

Since the exceedences of the annual mean objective for NO_2 observed at monitoring sites within the AQMA extensions in 2010, both locations have observed recorded levels within the objective in 2011 and 2012. As with the conclusions of the PM_{10} monitoring, it is therefore not necessary to calculate the percentage reduction, or the anticipated compliance date which is a normal part of a Further Assessment.

Automatic analysers show that the hourly mean objective for NO_2 was met in 2012. However, annual mean results above 60 µg/m^3 at a number of diffusion tubes within the City Centre AQMA indicate that there is still a possibility of an exceedence of the hourly mean objective.

5.2 Conclusions of the Further Assessment

The results from monitoring data show that the pollutant levels within the AQMAs subject to the March 2012 declaration are now within the relevant objective levels. Therefore Glasgow City Council believe that it would be inappropriate at this stage to proceed to the preparation of an Air Quality Action Plan in respect of the recent declarations. The purpose of an action plan is to propose methods designed to bring pollutant levels to within the objectives. In this case it is not clear that these measures are currently necessary.

Glasgow City Council propose to continue monitoring to clarify whether the downward trend in pollutant levels continues and whether the objectives continue to be met within the areas covered by the 2012 declaration.

Glasgow City Council proposes to review the situation again once monitoring data for 2013 is available. The availability of a further year of monitoring data will aid in the decision as to whether an action plan should be prepared or if the AQMAs should be revoked or amended.

6.0 References

- The Scottish Executive (2002). Air Quality (Scotland) Amended Regulations

- Department of the Environment, Food and Rural Affairs (2000). Part IV The Environment Act 1995, Local Air Quality Management, Technical Guidance, LAQM.TG(09);

- Glasgow City Council (2010). Local Air Quality Management, Detailed Assessment;

- Glasgow City Council (2012). Local Air Quality Management, Updating and Screening Assessment;