



# 2012 Air Quality Updating and Screening Assessment for Gateshead Council

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

Date: April 2012

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## Executive Summary

Gateshead Council's Updating and Screening Assessment 2012 has found that there are no new developments or changes in existing pollutant sources which may have a significant impact on pollutant concentrations in Gateshead.

All of the air quality objectives in the Governments National Air Quality Strategy 2007 are met for all of the relevant pollutants, namely benzene, 1-3 Butadiene, Carbon Monoxide, Lead, Sulphur Dioxide (SO<sub>2</sub>) and importantly PM<sub>10</sub> (Particulate Matter less than 10 Microns) and Nitrogen Dioxide (NO<sub>2</sub>) including within the town centre Air Quality Management Area (AQMA). This report shows that air quality has improved within the AQMA.

Gateshead Council is not proposing to carry out any further detailed assessments. It is though working in partnership with Newcastle City Council, Newcastle University and Capita Symons on a feasibility study to make further improvements to air quality and in particular NO<sub>2</sub> through the introduction of a Low Emission Zone or Strategy.

In May 2011 Gateshead Council undertook a Detailed Assessment of NO<sub>2</sub> within the Portobello AQMA. A report was subsequently submitted to DEFRA with a view to revoking the AQMA. The content of the report was agreed by DEFRA in December 2011. Work to revoke the AQMA by order is nearing completion.

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# 1 Introduction

## 1.1 Description of Local Authority Area

Gateshead is a unitary authority with a population of just under 200,000 in the heart of North East England, bordering the cities of Newcastle and Sunderland and the unitary authorities of South Tyneside, Northumberland and Durham. Covering 142 square kilometres and stretching 21 kilometres along the south bank of the River Tyne it is the largest of the Tyneside Districts, with a mix of large urban and rural areas.

A substantial road and rail network covers the region which includes the A1(M) at Portobello, Birtley and the A1, which passes Metrocentre, one of the largest out of town retail and leisure complexes in Europe. A comprehensive network of bus services and regional and national rail systems operate within the Gateshead area, as well as a Metro light rail network. There are rail and road bridge crossings over the River Tyne, the roads suffering high traffic flows and congestion.

There are a total of 92 industrial processes registered under the Environmental Permitting Regulations 2010, 20 Part A1's, 4 Part A2's, and 68 Part B's. Gateshead town centre is currently undergoing substantial redevelopment. This has included wholesale demolition of the infamous 'Get Carter' car park and Trinity Square retail area. The works are phased over a number of years but on completion the site will include a hotel, retail units, a large supermarket and student accommodation.

This redevelopment takes place centrally within an Air Quality Management Area (AQMA). The AQMA was declared in April 2005 and included much of the town centre, for exceedences of the nitrogen dioxide mean annual average air quality objective notably from road traffic. It was amended to include a southward extension along the A167 road in April 2008.

A further AQMA was also declared in the south east of the borough along Penshaw View and Portobello Terrace, a C category road which runs parallel to the A1(M) in the Portobello area of Birtley, although the Council is in the process of revoking this due to significant improvements in air quality in the area.

## 1.2 Purpose of Report

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

Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment (USA) is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

### 1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in England are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre  $\mu\text{g}/\text{m}^3$  (milligrammes per cubic metre,  $\text{mg}/\text{m}^3$  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 England**

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 $\text{mg}/\text{m}^3$	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM <sub>10</sub> ) (gravimetric)	50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

## 1.4 Summary of Previous Review and Assessments

**Table 1.2 Summary of previous reviews & assessments**

Date	R&A Round	Stage/Report	Outcome/Comment
April 1999	1	R&A Stage 1 Tyne & Wear	Proceeded to Stage 3 for all pollutants except 1-3 butadiene
November 2000	1	R&A Stage 3 Gateshead	No exceedences of any of 6 pollutants investigated, therefore no AQMA's
May 2003	2	Updating & Screening Assessment	Exceedences of annual mean objective for NO <sub>2</sub> at 2 busy road junctions predicted by DMRB modelling. Proceeded to DA for NO <sub>2</sub> . Further investigations required for benzene - reported in 2005 Progress Report
January 2005	2	Detailed Assessment of NO <sub>2</sub>	AQMA required due to slight exceedence of NO <sub>2</sub> annual mean objective at Trinity Court in town centre (junction of A167 & A184)
April 2005	2	Air Quality Management Order	AQMA declared for whole of Gateshead town centre
April 2005	2	Annual Progress Report	Benzene & PM <sub>10</sub> assessed - AQO's found to be achieved at all relevant locations. Ref made to DA for NO <sub>2</sub> . No further NO <sub>2</sub> hotspots identified
March 2006	2	Further Detailed Assessment	AQMA declared for NO <sub>2</sub> found to still be justified, with no need to amend AQO exceedence areas
April 2006	3	Updating & Screening Assessment	AQO's found to be achieved for all pollutants, except for annual mean NO <sub>2</sub> - 3 exceedences found at locations outside of existing AQMA - one south of AQMA on A167, and 2 in Birtley.
April 2007	3	Detailed Assessment of NO <sub>2</sub> for Town Centre AQMA & Portobello	AQMA as declared found still be justified. AQMA's also found to be required at A167 Durham/Dryden Road junction, south of AQMA, and at Portobello, Birtley
January 2008	2	Air Quality Action Plan	For Town Centre AQMA
April 2008	3	Air Quality Management Orders	Variation Order to extend existing Town Centre AQMA southwards along A167 to include Durham/Dryden Road junction. AQMA declared for Portobello Tce, Birtley.
April 2008	3	Annual Progress Report	AQO's found to be achieved for all pollutants, except for annual mean NO <sub>2</sub> - Ref made to DA, Further DA and AQAP
April 2009	3	Further Detailed Assessment of NO <sub>2</sub>	Extension to Town Centre AQMA, and declaration of Portobello AQMA confirmed.
April 2009	4	Updating & Screening Assessment	A few exceedences of annual mean NO <sub>2</sub> AQO found within Town Centre AQMA only. None at Portobello, but AQMA not revoked. No exceedences of any of the other AQO's, therefore DA not required for any pollutant.
April 2010	4	Annual Progress Report & AQMA Action Plan Update	A few exceedences of annual mean NO <sub>2</sub> AQO found within Town Centre AQMA only. No exceedences of any of the other AQO's, therefore DA not required for any pollutant.
April 2011	4	Annual Progress Report	All Air Quality Objectives met Including NO <sub>2</sub> in town centre AQMA. 3rd consecutive year of NO <sub>2</sub> reduction in Portobello AQMA.
		Detailed Assessment of	For Portobello, with a view to revocation of



## Gateshead Council

May 2011 (resubmitted October 2011)	4	NO2	AQMA, due to no exceedences of NO2 AQO for 2 years, & downward trend in NO2 concentrations over 3 years. Document revised and resubmitted in October 2011 to demonstrate minimum data capture rate of 75%.
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## 2 New Monitoring Data

### 2.1 Summary of Monitoring Undertaken

#### 2.1.1 Automatic Monitoring Sites

For the first three months of 2011, Gateshead Council measured nitrogen dioxide concentrations using real-time chemiluminescent monitors at four roadside sites. Three of these were within the Town Centre AQMA (at Trinity Court, Lychgate, and Bottle Bank) and one on the A1 South slip road at Dunston. Their locations are shown on the maps in Appendix A Figs 1.1 & 1.3. All of the sites are roadside and situated closer to the road traffic pollution source than the nearest relevant receptors which are residential properties.

As a result of the need to make significant savings across the Council's budget for the financial year 2011/12, monitoring of NO<sub>2</sub> at Trinity Court ceased in March 2011. The rationale for discontinuing monitoring at this site was that it is in close proximity to Lychgate Court where annual mean concentrations tended to be higher representing the worst case scenario of the two sites. This decision was further justified by the Council's decision to commence the demolition of a number of maisonette style properties at Trinity Court in January 2012 thus removing receptors. Monitoring continued at the remaining sites.

PM<sub>10</sub> concentrations were also measured between January and May 2011 using a TEOM sampler at Lychgate Court and between January and March 2011 at the A1 Dunston site. The PM<sub>10</sub> monitors were located in self contained mobile units together with the NO<sub>2</sub> monitors. PM<sub>10</sub> concentrations are consistently and significantly below the Air Quality Objective in Gateshead year on year. As a result of the emerging body evidence around the health impact of PM<sub>2.5</sub>, a decision was also made to cease the monitoring of PM<sub>10</sub> and move to the monitoring of PM<sub>2.5</sub>.

QA/QC procedures for automatic monitoring are outlined in Appendix B.

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road	Does this location represent worst-case exposure?	Summary
Trinity Ct	Roadside	X 425781 Y 563055	NO2	Chemiluminescent	Y	Y (8m)	10m	Y	Monitoring ceased 01.04.2011
Lychgate Ct	Roadside	X 425912 Y 563108	NO2 PM2.5	Chemiluminescent TEOM	Y	Y (6m)	7m	Y	PM10 monitoring ceased 30.05.2011 PM2.5 commenced 01.06.2011
Bottle Bank	Roadside	X 428265 Y 554970	NO2	Chemiluminescent	Y	Y (8m)	2.5m	Y	Remains unchanged
A1 Dunston	Roadside	X 422510 Y 561928	NO2 PM2.5	Chemiluminescent TEOM	N	N (16M)	9m	Y	PM10 monitoring ceased 31.03.2011 PM2.5 commenced 01.04.2011

### 2.1.2 Non-Automatic Monitoring Sites

Monthly average nitrogen dioxide concentrations are measured at a large number of sites across Gateshead using passive diffusion tubes. The current monitoring sites are detailed in Table 2.2.

Non-Automatic monitoring sites within the two AQMA's and the A1 Dunston site are shown in Appendix A Figs 1.1, 1.2 & 1.3. Most of the sites are located roadside, and represent residential exposure, most of the tubes being located on the property façade of the nearest relevant receptors, or are sets of triplicate tubes used at co-location sites with automatic monitors.

In the Progress Report 2011 it was reported that a number of diffusion tubes were discontinued in 2010. However two of these tubes have returned to service in 2011. They are G43 (Regent Court) and G60 Lychgate Court. Site G46 has changed name and is now reported as Mulgrave Villas rather than Team Vale Villas. Sites G3, G16 & G87 have not been reported in previous reports despite monitoring taking place. These have now been added.

All of the sites with the exception of three produced 12 months worth of data (100% data capture). Two sites produced 11 months of data and the remaining site produced 10 months of data. This exceeds the 75% data capture requirement and negates the requirement to calculate annualised data (TG 09 section 3 Box 3.1).

Table 2.2 Details of Non- Automatic Monitoring Sites

Site ID	Site Name	Site Type	OS Grid Ref	In AQMA ?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case Location ?
G2	Priory Court	Roadside	425737 563251	Y	Yes 0 metres	10 metres	Y
G3	Melbourne Court	Roadside	425333 563303	Y	Yes 19 metres	28 metres	Y
G59	Peareth Ct	Roadside	425770 563135	Y	Yes 0 metres	10 metres	Y
G42	Trinity Ct	Roadside	425781 563055	Y	Yes 0 metres	7 metres	Y
G55	Trinity Ct AQ Unit	Roadside	425753 563061	Y	Yes 8 metres	10 metres	Y
G37	Lychgate Ct AQ Unit*	Roadside	425883 563103	Y	Yes 6 metres	8.5 metres	Y
G60	Lychgate Court	Roadside	425912 563108	Y	Yes 0 metres	13 metres	Y
G43	Regent Court	Roadside	425553 562965	Y	Yes 0 metres	9 metres	N
G45	Brisbane Court	Roadside	425306 563093	Y	Yes 0 metres	15 metres	N
G61	Monk Ct	Urban background	425855 562994	Y	Yes 0 metres	20 metres	N
G47	Dryden Rd	Roadside	425760 561641	Y	Yes 0 metres	6 metres	Y
G83	Durham Rd Gateshead 2	Roadside	425788 561966	Y	Yes 0 metres	7 metres	N
G71	Durham Rd Low Fell	Roadside	425759 561612	Y	Yes 0 metres	5 metres	N
G53	Hill St Bottle Bank	Roadside	425447 563528	Y	Yes 1.5 metres	3.5 metres	Y
G63	Bottle Bank AQ Unit*	Roadside	425425 563555	Y	Yes 8 metres	3 metres	Y
G46	Mulgrave Villas	Urban background	425297 562886	N	Yes 0 metres	12 metres	N
G52	Bensham / Coatsworth Road	Roadside	425034 562736	N	Yes 0 metres	6 metres	N
G12	Coach Road	Urban background	423765 560510	N	Yes 0 metres	8.5 metres	N
G31	Westway, Dunston	Urban background	423086 561543	N	Yes 0 metres	20 metres	N
G35	A1 Dunston AQ Unit*	Roadside	422513 561925	N	No 16 metres	4 metres	Y
G4	North Dene Birtley	Urban background	427187 557230	N	Yes 0 metres	8.5 metres	N
G10	Portobello Terrace	Roadside	428254 554988	Y	Yes 0 metres	1.5 metres	Y
G16	Portobello Terrace	Roadside	428254 554988	Y	Yes 0 metres	1.5 metres	Y
G74	Penshaw View Portobello	Roadside	428259 555077	Y	Yes 0 metres	1.5 metres	N
G87	A1 Houses	Urban background	422518 561933	N	Yes 0 metres	11 metres	Y

\* Triplicate tube location with automatic monitor

## **2.2 Comparison of Monitoring Results with AQ Objectives**

Monitoring results are shown in Figures 2.3 to 2.8. Any exceedences of the air quality objectives, and borderline cases, are highlighted in bold.

### **2.2.1 Nitrogen Dioxide**

Monitoring results are shown in figures 2.3 to 2.6. Exceedences of the air quality objectives, and borderline cases, are highlighted in bold.

#### **Automatic Monitoring Data**

The results from the 12 months from January to December 2011 of automatic monitoring data for nitrogen dioxide are given in tables 2.3 and 2.4.

The results show that there were no exceedences of either the annual mean or the hourly air quality objectives, with annual mean concentrations well below the  $40\mu\text{g}/\text{m}^3$  objective level and no exceedences of the  $200\mu\text{g}/\text{m}^3$  hourly mean concentration at any of the monitoring locations.

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

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring % <sup>a</sup>	Valid Data Capture 2011 % <sup>b</sup>	Annual Mean Concentration $\mu\text{g}/\text{m}^3$				
					2007* <sup>c</sup>	2008* <sup>c</sup>	2009* <sup>c</sup>	2010* <sup>c</sup>	2011 <sup>c</sup>
Trinity Court	Roadside	Y	99.4	99.4	29	31	31	39.5	Discontinued
Lychgate Ct	Roadside	Y	99.4	99.4	32	33	33	40.2	31.8
Bottle Bank	Roadside	Y	97.6	97.6	36	34	32	36.1	35.9
A1 Dunston	Roadside	N	99.0	99.0	34	34	38	38.4	36.8

Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring % <sup>a</sup>	Valid Data Capture 2011 % <sup>b</sup>	Number of Exceedences of Hourly Mean ( $200 \mu\text{g}/\text{m}^3$ )				
					2007* <sup>c</sup>	2008* <sup>c</sup>	2009* <sup>c</sup>	2010* <sup>c</sup>	2011 <sup>c</sup>
Trinity Court	Roadside	Y	99.4	99.4	0	0	0	0	0
Lychgate Ct	Roadside	Y	99.4	99.4	0	0	0	1	0
Bottle Bank	Roadside	Y	97.6	97.6	0	0	0	0	0
A1 Dunston	Roadside	N	99	99	0	0	0	0	0

## Diffusion Tube Monitoring Data

Diffusion tube monitoring results for the 12 month monitoring period from January to December 2011 are given in Tables 2.5 & 2.6.

The Council changed contractor from Harwell to Gradko for the analysis of diffusion tubes in March 2010. Data that was submitted in the 2011 Progress Report covered the 12 month period of Analysis by Gradko from April 2010 to March 2011. The data submitted should have been for the remaining nine months of 2010 where the minimum 75% data capture requirement was met. The three months worth of data provided by Harwell was disregarded. Where it was not met the data should have been annualised in accordance with Box 3.2 of LAQM.TG(09). The data in the submitted Progress Report was accepted by DEFRA. However, a further detailed Assessment that was submitted in relation to the Portobello AQMA was challenged on the validity of the same data as it was not an annual figure. The 2010 data has been updated but where the minimum 75% data capture requirement was not met the data has not been annualised.

The results for 2011 show that there were no exceedences of the annual mean air quality objectives with annual mean concentrations generally well below the  $40\mu\text{g}/\text{m}^3$  requirement.

The monthly  $\text{NO}_2$  Diffusion tube results for 2011 including the bias adjustment factor and calculation can be found in Appendix C.



Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2011

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.89)
								2011 ( $\mu\text{g}/\text{m}^3$ )
G2	Priory Court	Roadside	Y	Single	12	N/A	N	29.4
G3	Melbourne Court	Roadside	Y	Single	12	N/A	N	38.3
G59	Peareth Ct	Roadside	Y	Single	12	N/A	N	30.3
G42	Trinity Ct	Roadside	Y	Single	12	N/A	N	38.3
G55	Trinity Ct AQUnit	Roadside	Y	Single	12	N/A	N	27.1
G37,38,39	Lychgate Ct AQ Unit*	Roadside	Y	Triplicate	12	N/A	N	30.1
G60	Lychgate Crt	Roadside	Y	Single	12	N/A	N	26.5
G43	Regent Crt	Roadside	Y	Single	11	N/A	N	24.2
G45	Brisbane Crt	Roadside	Y	Single	12	N/A	N	21.6
G61	Monk Ct	Urban bkground	Y	Single	12	N/A	N	23.3
G47	Dryden Rd	Roadside	Y	Single	12	N/A	N	37.5
G83	Durham Rd Gateshead 2	Roadside	Y	Single	12	N/A	N	31.1
G71	Durham Rd Low Fell	Roadside	Y	Single	12	N/A	N	32.9
G53	Hill St Bottle Bank	Roadside	Y	Single	10	N/A	N	37.7
G63,65,66	Bottle Bank AQ Unit*	Roadside	Y	Triplicate	12	N/A	N	33.0

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.89)
								2011 ( $\mu\text{g}/\text{m}^3$ )
G46	Mulgrave Villas	Urban bkground	N	Single	12	N/A	N	26.8
G52	Bensham / Coatsworth Road	Roadside	N	Single	12	N/A	N	29.1
G12	Coach Road	Urban bkground	N	Single	12	N/A	N	24.6
G31	Westway, Dunston	Urban bkground	N	Single	12	N/A	N	25.6
G35,40,41	A1 Dunston AQ Unit*	Roadside	N	Triplicate	12	N/A	N	34.9
G4	North Dene Birtley	Urban bkground	N	Single	12	N/A	N	24.5
G10	Portobello Terrace	Roadside	Y	Co located	12	N/A	N	35.2
G16	Portobello Terrace	Roadside	Y	Co located	12	N/A	N	24.6
G74	Penshaw Vw Portobello	Roadside	Y	Single	11	N/A	N	32.4
G87	A1 Houses	Roadside	N	Single	12	N/A	N	30.3

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007* (Bias Adjustment Factor = 0.79)	2008* (Bias Adjustment Factor = 0.77)	2009* (Bias Adjustment Factor = 0.81)	2010* (Bias Adjustment Factor = 0.92)	2011 (Bias Adjustment Factor = 0.89)
G2	Priory Court	Y	32	31	31	29	29
G3	Melbourne Court	Y	<b>43.4</b>	<b>43.3</b>	<b>42.9</b>	37.3	38
G59	Peareth Ct	Y	38	29	31	29	30
G42	Trinity Ct	Y	37	39.7	<b>40</b>	38	38
G55	Trinity Ct AQ Unit	Y	34	31	29	29	27
G37,38,39	Lychgate Ct AQ Unit*	Y	35	33	32	31	30
G60	Lychgate Court	Y	32	28	30	Relocated as part of study	27
G43	Regent Court	Y	28	26	24	Relocated as part of study	24
G45	Brisbane Court	Y	27	25	27	Less than 75% data capture	22
G61	Monk Ct	Y	26	26	25	24	23
G47	Dryden Rd	Y	<b>40.3</b>	39.4	<b>41</b>	Less than 75% data capture	37
G83	Durham Rd Gateshead 2	Y	31	31	32	29	31
G71	Durham Rd Low Fell	Y	35	31	33	Less than 75% data capture	33
G53	Hill St Bottle Bank	Y	<b>41</b>	36	36	Less than 75% data capture	38

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007* (Bias Adjustment Factor = 0.79)	2008* (Bias Adjustment Factor = 0.77)	2009* (Bias Adjustment Factor = 0.81)	2010* (Bias Adjustment Factor = 0.92)	2011 (Bias Adjustment Factor = 0.89)
G63,65/66	Bottle Bank AQ Unit*	Y	38	36	34	32	33
G46	Team Vale Villas,	N	29	31	28	28	27
G52	Bensham / Coatsworth Road	N	30	27	28	Less than 75% data capture	29
G12	Coach Road	N	29	24	26	28	25
G31	Westway, Dunston	N	29	26	25	29	26
G35,40,41	A1 Dunston AQ Unit*	N	35	33	34	35	35
G4	North Dene Birtley	N	31	27	27	28	25
G10	Portobello Terrace	Y	43	38	36	37	35
G16	Portobello Terrace	Y	38.6	37.7	36.2	37.7	35
G74	Penshaw View Portobello	Y	34	33	32	32	32
G87	A1 Houses	N		29.2	32.7	Relocated as part of study	30

\*mean concentration of triplicate tube exposure

### 2.2.2 PM<sub>10</sub>

PM<sub>10</sub> concentrations were also measured between January and May 2011 at Lychgate Court and between January and March 2011 at the A1 Dunston site. The PM<sub>10</sub> monitors were located in self contained mobile units together with the NO<sub>2</sub> monitors. Both monitoring locations are roadside and are situated closer to the source, namely road traffic, on the A1 at Dunston, and the A184/A167 junction at Lychgate, than the nearest receptors, which are residential properties. PM<sub>10</sub> monitoring data from the preceding 4 years is provided and demonstrates that concentrations of PM<sub>10</sub> are consistently and significantly below the Air Quality Objectives in Gateshead.

As a result of the emerging body evidence around the health impact of PM<sub>2.5</sub>, a decision was made by Gateshead Council to cease the monitoring of PM<sub>10</sub> and commence the monitoring of PM<sub>2.5</sub> at these sites.

Table 2.7 Results of Automatic Monitoring of PM<sub>10</sub>: Comparison with Annual Mean Objective

Site Name	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % <sup>a</sup>	Valid Data Capture 2011 % <sup>b</sup>	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration $\mu\text{g}/\text{m}^3$ ( $40\mu\text{g}/\text{m}^3$ )				
						2007* <sup>c</sup>	2008* <sup>c</sup>	2009* <sup>c</sup>	2010* <sup>c</sup>	2011 <sup>c</sup>
Lychgate	Roadside	Y	100	42	Y	25	23	20	21	26 Jan - May
A1 Dunston	Roadside	N	100	25	Y	22	22	21	21	25 Jan - Mar

Table 2.8 Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with 24-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % <sup>a</sup>	Valid Data Capture 2011 % <sup>b</sup>	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean ( $50 \mu\text{g}/\text{m}^3$ )				
						2007*	2008*	2009*	2010*	2011
Lychgate	Roadside	Y	100	42	Y	0	3	1	1	4 Jan - May
A1 Dunston	Roadside	N	100	25	Y	6	6	2	3	1 Jan - Mar

### **2.2.3 Sulphur Dioxide, Benzene and other pollutants**

Gateshead Council does not monitor these pollutants as there are no significant sources or likelihood of the relevant air quality objectives being exceeded in the Gateshead area.

### **2.2.4 Summary of Compliance with AQS Objectives**

Gateshead Council has examined the results from monitoring in the borough. Concentrations are all below the objectives including within the town centre AQMA, therefore there is no need to proceed to a Detailed Assessment.

### **3 Road Traffic Sources**

#### **3.1 Narrow Congested Streets with Residential Properties Close to the Kerb**

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

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

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

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

Gateshead Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

#### **3.4 Junctions**

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

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

Gateshead Council confirms that there are no new/proposed roads.



### **3.6 Roads with Significantly Changed Traffic Flows**

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

### **3.7 Bus and Coach Stations**

Gateshead Council confirms that there are no relevant bus stations in the Local Authority area.

## 4 Other Transport Sources

### 4.1 Airports

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

### 4.2 Railways (Diesel and Steam Trains)

#### 4.2.1 Stationary Trains

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

#### 4.2.2 Moving Trains

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

### 4.3 Ports (Shipping)

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

## **5 Industrial Sources**

### **5.1 Industrial Installations**

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

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

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

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

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

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

### **5.2 Major Fuel (Petrol) Storage Depots**

There are no major fuel (petrol) storage depots within the Local Authority area.

### 5.3 Petrol Stations

Gateshead Council identified one location with two petrol stations meeting the specified criteria, although the nearest relevant exposure is more than 10 metres from the fuel pumps. However, this site was examined for the 2003 USA due to the high petrol throughputs at both sites and the high traffic flows (80,000 AADT), as a result of which detailed monitoring for benzene was carried out at the site. The site is situated on the A1 at the Washington/Birtley Services, at which there are two large petrol filling stations with annual petrol throughputs of 3000 and 4000 cubic meters. Additionally there is a C category road adjacent to the nearest receptors (three blocks of terraced houses at Portobello within the former AQMA) which has an AADT of 6,500 vehicles. The C road runs parallel to the A1, between the A1 and the houses, whilst the northbound filling station lies between the A1 (northbound) and the C road. The nearest receptors are situated within 1.5 metres of the kerbside of the C road, and 30 metres of the petrol pumps.

A benzene monitoring survey, using Gradko diffusion tubes, was carried out at this site during 2003/04. The results, which showed that there were no exceedences of the 2010 benzene objectives at any of the monitoring locations, were reported in the annual Progress Report of 2005. The mean concentration for the 9 months monitoring period was  $2.08\mu\text{gms}/\text{m}^3$ , well below the 2010 objective of  $5\mu\text{gms}/\text{m}^3$  and the maximum mean concentration for any two week monitoring period was  $5.04\mu\text{gms}/\text{m}^3$ , marginally above the objective.

As there have been no significant changes to this situation, and no further petrol stations identified which meet the specified criteria, Gateshead Council does not intend to carry out any further assessment work for this pollutant.

### 5.4 Poultry Farms

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

## 6 Commercial and Domestic Sources

### 6.1 Biomass Combustion – Individual Installations

Gateshead Council currently operates 3 x 100KW wood pellet boilers in 2 locations. 2 further wood chip boilers of 500KW capacity are to be commissioned within 2 Council facilities within the next 12 months. Planning permission was granted for a private commercial/domestic site in November 2006 although it is not clear if this permission has been acted upon and equipment commissioned. One further commercial/domestic site retrospectively applied for planning permission and the application was subsequently refused but is being reviewed by the Planning Inspectorate. All of the appliances that have been installed or are proposed comply with the Smoke Control Areas (Exempted Fireplaces) England (No.2) Order 2011. None of the current or proposed sites are located in the current town centre AQMA. The impact of these biomass facilities on PM<sub>10</sub> and NO<sub>2</sub> have been assessed and considered in accordance with the procedure set out in Technical Guidance LAQM TG(09) Section D.1a of chapter 5. TG (09).

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

### 6.2 Biomass Combustion – Combined Impacts

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

### 6.3 Domestic Solid-Fuel Burning

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

## 7 Fugitive or Uncontrolled Sources

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

## **8 Conclusions and Proposed Actions**

### **8.1 Conclusions from New Monitoring Data**

Results from both automatic and diffusion tube monitoring for NO<sub>2</sub> during 2011 show that both the annual mean concentration and daily average air quality objectives were met at all sites. There are no proposals to consider revocation of the town centre AQMA as several years worth of data showing compliance with the air quality objectives is required and this is only the first.

The Detailed Assessment submitted to DEFRA in May 2011 (and revised and resubmitted in October 2011) supporting the revocation of the AQMA in Portobello, Birtley was accepted in December 2011. The monitoring detailed in this report was used to support the Detailed Assessment submission. It is proposed that the AQMA will be revoked in 2012 by order.

### **8.2 Conclusions from Assessment of Sources**

No new developments or changes in existing pollutant sources which have been assessed during earlier rounds of the review and assessment process, which may have an impact on pollutant concentrations, have been identified by this USA.

### **8.3 Proposed Actions**

The Updating and Screening Assessment has not identified a need to proceed to a detailed Assessment for any pollutant, or any need for additional monitoring, or changes to the existing monitoring programme.

Monitoring of both Nitrogen Dioxide and PM<sub>2.5</sub> will continue at the automatic sites. It is proposed that four of the diffusion tube sites will be discontinued. They are sites G42, G43, G55 & G16. An annual Progress report will be submitted to DEFRA in 2013.

In 2011, Gateshead Council in partnership with Newcastle City Council was awarded funding from DEFRA to examine the feasibility of introducing Low Emission Zones (LEZs) in the respective local authority areas particularly within the town centre AQMA's. This work is currently in progress.



## 9 References

1. DEFRA, Local Air Quality Management Technical Guidance LAQM.TG(09)
2. DEFRA, Local Air Quality Management
3. DEFRA, R&A helpdesk: spreadsheet version 03/12 was used for the monitoring period January 2011 to December 2011.
4. Gateshead Council, Updating and Screening Assessment, 2009
5. Gateshead Council, Further Detailed Assessment of NO<sub>2</sub>, 2009
6. Gateshead Council, Annual Progress Report, 2011
7. Gateshead Council, Detailed Assessment of Nitrogen Dioxide – Portobello, 2011
8. AEA Energy & Environment, Technical Guidance: Screening assessment for biomass boilers, 2008

# Appendices

Appendix A : Maps showing NO<sub>2</sub>/PM<sub>10</sub> Monitoring Locations

Figure 1.1 Map of Gateshead Town Centre

Figure 1.2 Map of Portobello AQMA and monitoring locations

Figure 1.3 Map of A1 Dunston monitoring station

Appendix B: QA/QC Data

Appendix C: Monthly NO<sub>2</sub> Diffusion Tube Results 2011

Appendix D: Checking Precision and Accuracy of Triplicate Tubes – Lychgate Court, Bottle Bank, A1  
Dunston

## Appendix A: QA:QC Data

### Factor from Local Co-location Studies

As TG (09) suggests in Box 3.3 details of the Local bias adjustment factor have been provided. The data is derived from the AEA DifTPAB v04 spreadsheet and excludes all periods with a Coefficient of Variation (CV) larger than 20%. The combined bias adjustment factor from Gateshead's 3 co-location studies for 2011 is 1.04. The NO<sub>2</sub> annual mean concentrations and the correction factor for each site are shown in Table 2.9 below. Details of the Bias calculation are included in Appendix D.

**Table 2.9: Local Bias Adjustment Factor**

Site Name	Site Type	Diffusion Tube Mean (µg/m <sup>3</sup> )	Diffusion Tube Data Capture	Adjusted Automatic Monitor Mean (µg/m <sup>3</sup> )	Mean CV Precision	Adjusted Tubes Mean (µg/m <sup>3</sup> )	Automatic Data Capture %	Bias Adjustment Factor A
Lychgate Court	Roadside	33	100	33	7 Good	33	98	1.02
Bottle Bank	Roadside	38	100	39	7 Good	40	99	1.03
A1 Dunston	Roadside	39	100	42	6 Good	42	99	1.07

### Diffusion Tube Bias Adjustment Factors

All of the data presented in this report have been adjusted to account for diffusion tube bias, using the correction factor on the R&A website helpdesk for the relevant years. For this Updating and Screening Assessment a factor of 0.89 from the R&A helpdesk: spreadsheet version 03/12 was used for the monitoring period January 2011 to December 2011. Details of the corrected figures are provided in Appendix C.

### Discussion of Choice of Factor to Use

Gateshead Council has used the national bias correction figure since 2009. Consideration of Box 3.3 in TG(09) does not suggest any applicable circumstances that would benefit from the use of the local bias correction factor to provide more representative data.

## **PM Monitoring Adjustment**

PM10 concentrations are measured using TEOM samplers. The default factor has been applied to all data to estimate gravimetric concentrations.

## **QA/QC of automatic monitoring**

The automatic monitors are operated by a suitably trained officer and are serviced twice per year in accordance with manufacturer's instructions. Services and repairs are carried out by Cassella Measurement. Calibrations and filter changes are carried out at two-week intervals, and Lychgate Court, and the A1 Dunston monitors also have an automatic daily calibration feature. Ratification of the monitoring data is carried out by Casella Eti, and the ratified data is made available on the Tyne & Wear air quality website: [www.dataview247.com](http://www.dataview247.com)

As PM<sub>10</sub> concentrations are measured using TEOM samplers, the King's College Volatile Correction Model (VCM) portal method to correct the data has been applied by Casella Eti to estimate gravimetric concentrations. There is no such guidance relating to the correction of PM<sub>2.5</sub> in the latest guidance notes, TG09.

## **QA/QC of diffusion tube monitoring**

The diffusion tubes are exposed for a month at a time in accordance with the DEFRA Local Authority Air Quality support programme calendar of suggested exposure periods, before being returned to Gradko International Ltd laboratory, which participates in the Workplace Analysis Scheme for Proficiency (WASP) QA/QC procedure, for analysis using the 20% TEA in water method.

The precision and accuracy of the triplicate NO<sub>2</sub> diffusion tubes co-located with the automatic monitors was checked using the AEA DifTPAB v04 (1) spreadsheet. The results are presented in Appendix C.

## Appendix B: Maps showing NO<sub>2</sub>/PM<sub>10</sub> Monitoring Locations

Figure 1.1 Map of Town Centre AQMA Boundaries and Monitoring Locations

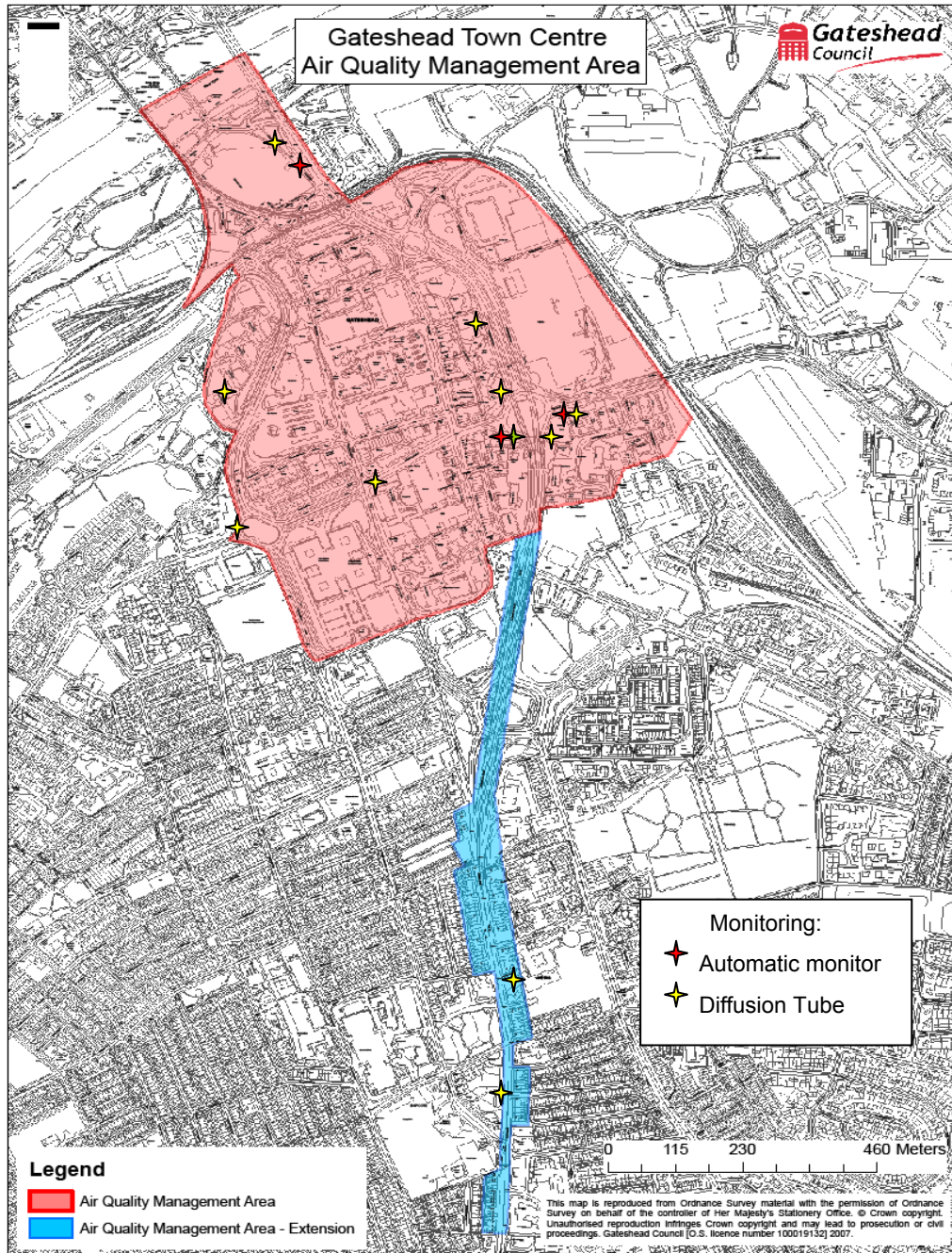


Figure 1.2 Map of Portobello AQMA Boundaries and Monitoring Locations

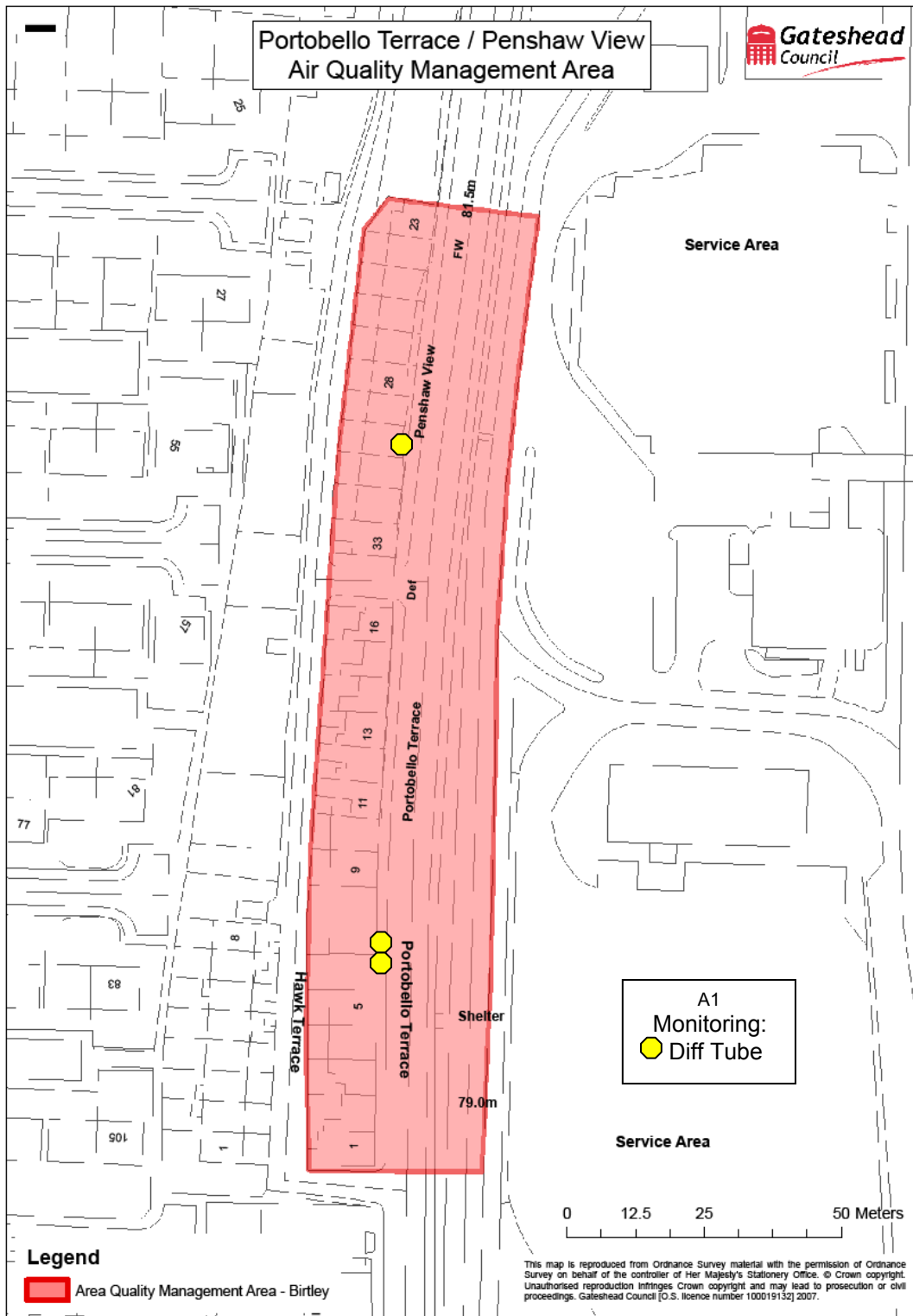
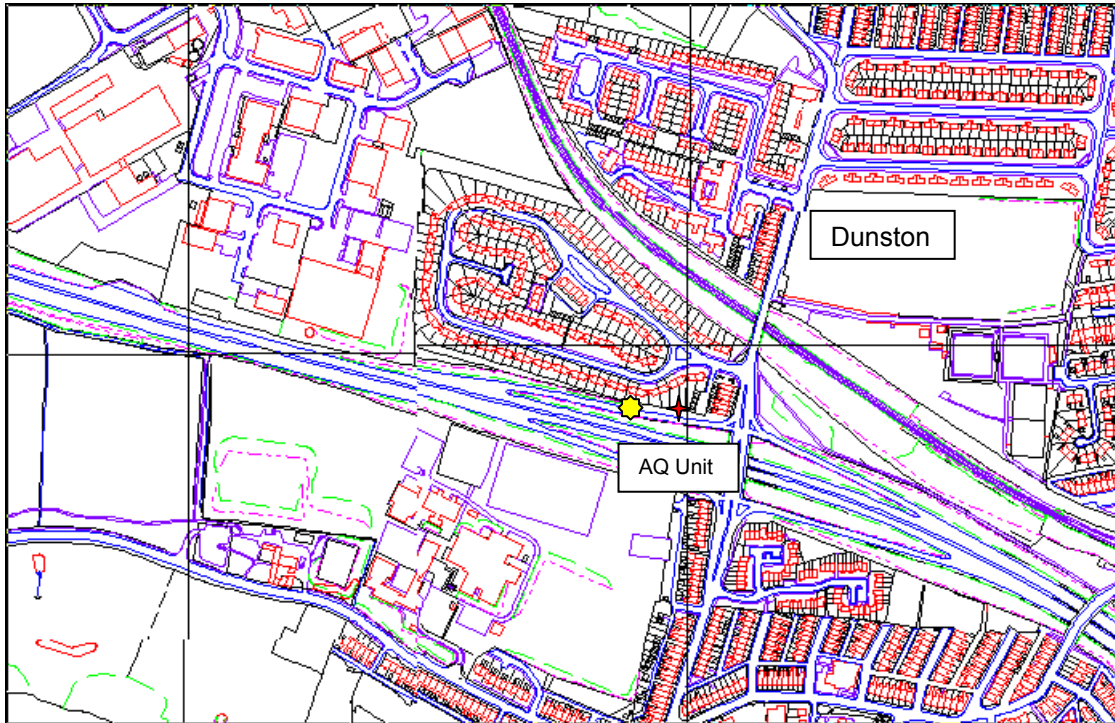


Figure 1.3 Map of A1 Dunston Monitoring Location



- ★ Automatic monitoring station (with triplicate tubes)
- Diffusion Tube monitoring Site

Appendix C: Monthly NO<sub>2</sub> Diffusion Tube Results 2011

2011	NO2	ug/m3														
Tube No.		jan	feb	march	april	may	june	july	aug	sept	oct	nov	dec	average	bias 0.89	data capt
2	priory crt	33.56	38.19	37.67	36.41	28.44	28.99	30.95	29.6	28.2	38.4	45.9	20.2	33.0425	29.40783	100
3	melb crt	45.17	45.01	52.37	51.6	37.95	36.65	33.82	38.1	47	51.1	43.9	33.9	43.0475	38.31228	100
4	north dene	41.16	30.99	30.59	29.2	20.15	23.47	29.75	24.59	18	24.2	31.1	27.8	27.58333	24.54917	100
10	portobello tce	44.24	41.85	32.42	51.41	33.21	36.22	39.87	35.4	39.1	41.1	46.3	33.9	39.585	35.23065	100
12	coach rd	28.63	32.76	33.88	30.09	21.57	24.7	33.18	23.3	20.89	28.4	34.3	19.4	27.59167	24.55658	100
16	portobello tce	40.44	41.62	35.16	49.92	34.25	37.89	39.13	37.3	34.9	43.4	47.8	32	39.48417	35.14091	100
31	west way	35.4	27.9	34.16	33.83	21.98	26.12	31.82	25.3	21.2	28.5	33.1	26.1	28.78417	25.61791	100
35	A1 Dunston	37.94	50.53	50.78	46.48	32.08	30.82	27.95	33.9	40.9	42.8	43.6	25.9	38.64	34.3896	100
37	lychgate hog	46.29	31.49	41	36.38	26.94	29.89	34.04	31.7	29.6	35.8	33.1	26.7	33.5775	29.88398	100
38	lychgate hog	38.9	40.96	39.38	35.42	27.53	29.3	30.5	32	23.8	32.8	32.4	37.8	33.39917	29.72526	100
39	lychgate hog	44.59	41.19	39.64	36.87	25.72	31.41	32.49	32	28.9	29.6	37.1	33.2	34.3925	30.60933	100
40	A1 Dunston	40.07	52.13	45.1	44.31	35	32.1	31.46	33.6	40.3	42.7	49.9	35.1	40.1475	35.73128	100
41	A1 Dunston	45.52	48.08	49.33	46.2	27.23	33.32	30.28	33.8	39.5	47.4	29.57	35.9	38.84417	34.57131	100
42	trinity crt	45.41	46.56	46.65	50.74	38.34	42.6	43.72	39.3	37.3	40	44.9	40.4	42.99333	38.26407	100
43	regent crt	26.41	30.85	23.39	30		23.24	26.28	25.8	24.5	28.6	34.3	26.3	27.24273	24.24603	91.6
45	brisbane	37.9	20.54	24.55	21.33	17.38	24.39	26.32	25.3	18.6	30	30.4	14.1	24.23417	21.56841	100
46	team vale villas	34.86	35.82	35.1	21.33	24.13	26	30.92	27.1	28.9	34.9	42	20	30.08833	26.77862	100
47	dryden rd	47.06	34.6	41.47	43.26	34.32	45.08	38.91	45.4	44	44.4	48.1	38.7	42.10833	37.47642	100
52	bensham rd	33.92	36.83	41.53	37.43	27.57	30	29.18	27.9	27.3	32.7	39.7	27.8	32.655	29.06295	100
53	curzon 1	41.18	46.5	43.42	47.81		38.26	40.5		42.4	46.3	46.4	30.5	42.327	37.67103	83.3
55	romon trinity	39.65	14.21	35.22	33.97	27.08	29.7	33.73	28.1	23.7	28.3	50.5	20.6	30.39667	27.05303	100
59	peareth crt	41.98	38.23	38.06	36.53	26.42	25.35	30.65	30.2	29	36.3	38.8	37.4	34.07667	30.32823	100
60	lychgate crt2	35.74	36.5	30.8	32.2	24.5	26.3	28.2	26.2	24.8	29.8	30.3	32	29.77833	26.50272	100
61	monk crt	30.99	31.9	29.78	27.13	21.21	21.54	23.92	22.8	21.9	31.7	36.6	14.8	26.18917	23.30836	100
63	bottle bank	39.37	39.77	38.52	24.54	34.37	33	37.5	33	33	44.9	30.7	32	35.05583	31.19969	100
65	bottle bank	41.3	45.56	41.32	43.5	29.54	32.63	34.51	34.7	27.89	41.1	49.5	25.6	37.2625	33.16363	100
66	bottle bank	48.03	53.94	40.31	44.99	32.49	32.62	36.69	34.5	32.9	42.4	41.55	28.2	39.05167	34.75598	100




## Appendix D: AEA DifTPAB v04 spreadsheet Checking Precision and Accuracy of Triplicate Tubes – Lychgate Court, Bottle Bank, A1 Dunston

### Checking Precision and Accuracy of Triplicate Tubes

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{gm}^{-3}$	Tube 2 $\mu\text{gm}^{-3}$	Tube 3 $\mu\text{gm}^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/01/2011	31/01/2011	46.3	38.9	44.6	43	3.9	9	9.6
2	01/02/2011	28/02/2011	31.5	41.0	41.2	38	5.5	15	13.7
3	01/03/2011	31/03/2011	41.0	39.4	39.6	40	0.9	2	2.2
4	01/04/2011	30/04/2011	36.4	35.4	36.9	36	0.7	2	1.8
5	01/05/2011	31/05/2011	26.9	27.5	25.7	27	0.9	3	2.3
6	01/06/2011	30/06/2011	29.9	29.3	31.4	30	1.1	4	2.7
7	01/07/2011	31/07/2011	34.0	30.5	32.5	32	1.8	5	4.4
8	01/08/2011	31/08/2011	31.7	32.0	32.0	32	0.2	1	0.4
9	01/09/2011	30/09/2011	29.6	23.8	28.9	27	3.2	12	7.9
10	01/10/2011	31/10/2011	35.8	32.8	29.6	33	3.1	9	7.7
11	01/11/2011	30/11/2011	33.1	32.4	37.1	34	2.5	7	6.3
12	01/12/2011	31/12/2011	26.7	37.8	33.2	33	5.6	17	13.9
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements



From the AEA group

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
41.65	99.2	Good	Good
39.17	43.8	Good	or Data Capture
40.45	72.6	Good	or Data Capture
39.15	84.4	Good	Good
36	99.6	Good	Good
34	100	Good	Good
33	100	Good	Good
26	98.8	Good	Good
31	100	Good	Good
31	99.6	Good	Good
31.6	100	Good	Good
31.87	99.2	Good	Good

Overall survey -->	
Good precision	Good Overall DC

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Lychgate Court
----------------	----------------

<b>Accuracy (with 95% confidence interval)</b>	
without periods with CV larger than 20%	
Bias calculated using 10 periods of data	
Bias factor A	1.02 (0.93 - 1.13)
Bias B	-2% (-11% - 7%)
Diffusion Tubes Mean:	33 $\mu\text{gm}^{-3}$
Mean CV (Precision):	7
Automatic Mean:	33 $\mu\text{gm}^{-3}$
Data Capture for periods used:	98%
Adjusted Tubes Mean:	33 (30 - 37) $\mu\text{gm}^{-3}$

<b>Accuracy (with 95% confidence interval)</b>	
WITH ALL DATA	
Bias calculated using 10 periods of data	
Bias factor A	1.02 (0.93 - 1.13)
Bias B	-2% (-11% - 7%)
Diffusion Tubes Mean:	33 $\mu\text{gm}^{-3}$
Mean CV (Precision):	7
Automatic Mean:	33 $\mu\text{gm}^{-3}$
Data Capture for periods used:	98%
Adjusted Tubes Mean:	33 (30 - 37) $\mu\text{gm}^{-3}$



Jaume Targa, for AEA  
Version 04 - February 2011

### Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{g m}^{-3}$	Tube 2 $\mu\text{g m}^{-3}$	Tube 3 $\mu\text{g m}^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/01/2011	31/01/2011	39.4	41.3	48.0	43	4.5	11	11.3
2	01/02/2011	28/02/2011	39.8	45.6	53.9	46	7.1	15	17.7
3	01/03/2011	31/03/2011	38.5	41.3	40.3	40	1.4	4	3.5
4	01/04/2011	30/04/2011	24.5	43.5	45.0	38	11.4	30	28.3
5	01/05/2011	31/05/2011	34.4	29.5	32.5	32	2.4	8	6.0
6	01/06/2011	30/06/2011	33.0	32.6	32.6	33	0.2	1	0.5
7	01/07/2011	31/07/2011	37.5	34.5	36.7	36	1.5	4	3.8
8	01/08/2011	31/08/2011	33.0	34.7	34.5	34	0.9	3	2.3
9	01/09/2011	30/09/2011	33.0	27.9	32.9	31	2.9	9	7.3
10	01/10/2011	31/10/2011	44.9	41.1	42.4	43	1.9	5	4.8
11	01/11/2011	30/11/2011	30.7	49.5	41.6	41	9.4	23	23.4
12	01/12/2011	31/12/2011	30.7	49.5	41.6	41	9.4	23	23.4
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
43.69	97.7	Good	Good
45.55	99.7	Good	Good
45.52	99.6	Good	Good
42.57	99.6	Poor Precision	Good
40	99.9	Good	Good
38	97.1	Good	Good
37	99.6	Good	Good
36	99.7	Good	Good
35	99.7	Good	Good
36	99.6	Good	Good
36.47	99	Poor Precision	Good
35.94	99	Poor Precision	Good

Overall survey ->

Poor precision Overall DC

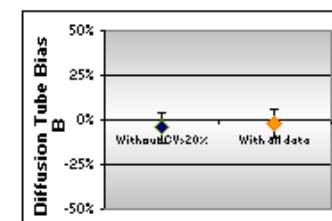
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Bottle Bank

Precision 9 out of 12 periods have a CV smaller than 20%


<b>Accuracy (with 95% confidence interval)</b>	
without periods with CV larger than 20%	
Bias calculated using 9 periods of data	
Bias factor A	1.05 (0.96 - 1.16)
Bias B	-5% (-13% - 4%)
Diffusion Tubes Mean:	38 $\mu\text{g m}^{-3}$
Mean CV (Precision):	7
Automatic Mean:	39 $\mu\text{g m}^{-3}$
Data Capture for periods used:	99%
Adjusted Tubes Mean:	40 (36 - 44) $\mu\text{g m}^{-3}$

<b>Accuracy (with 95% confidence interval)</b>	
WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	1.03 (0.95 - 1.12)
Bias B	-3% (-11% - 5%)
Diffusion Tubes Mean:	38 $\mu\text{g m}^{-3}$
Mean CV (Precision):	11 <b>caution</b>
Automatic Mean:	39 $\mu\text{g m}^{-3}$
Data Capture for periods used:	99%
Adjusted Tubes Mean:	39 (36 - 43) $\mu\text{g m}^{-3}$



Jaume Targa, for AEA  
Version 04 - February 2011

## Checking Precision and Accuracy of Triplicate Tubes


**AEA Energy & Environment**  
 From the AEA group

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{g m}^{-3}$	Tube 2 $\mu\text{g m}^{-3}$	Tube 3 $\mu\text{g m}^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/01/2011	31/01/2011	37.9	40.1	45.5	41	3.9	9	9.7
2	01/02/2011	28/02/2011	50.5	52.1	48.1	50	2.0	4	5.1
3	01/03/2011	31/03/2011	50.8	45.1	49.3	48	3.0	6	7.3
4	01/04/2011	30/04/2011	46.5	44.3	46.2	46	1.2	3	2.9
5	01/05/2011	31/05/2011	32.1	35.0	27.2	31	3.9	12	9.7
6	01/06/2011	30/06/2011	30.8	32.1	33.3	32	1.3	4	3.1
7	01/07/2011	31/07/2011	28.0	31.5	30.3	30	1.8	6	4.4
8	01/08/2011	31/08/2011	33.9	33.6	33.8	34	0.2	0	0.4
9	01/09/2011	30/09/2011	40.9	40.3	39.5	40	0.7	2	1.7
10	01/10/2011	31/10/2011	42.8	42.7	47.4	44	2.7	6	6.7
11	01/11/2011	30/11/2011	43.6	49.9	29.6	41	10.4	25	25.9
12	01/12/2011	31/12/2011	25.9	35.1	35.9	32	5.6	17	13.8
13									

Period Mean	Data Capture (% DC)
46.89	98.9
49.85	97.8
49.59	99.7
46.02	99.9
43	99.9
40	100
37	99.9
36	99.9
36	89.2
36	99.7
37.09	100
36.89	99.5

Tubes Precision Check	Automatic Monitor Data
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Poor Precision	Good
Good	Good

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

**Site Name/ ID:** A1 Dunston

Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 11 periods of data	
Bias factor A	1.07 (0.97 - 1.19)
Bias B	-6% (-16% - 3%)
Diffusion Tubes Mean:	39 $\mu\text{g m}^{-3}$
Mean CV (Precision):	6
Automatic Mean:	42 $\mu\text{g m}^{-3}$
Data Capture for periods used:	99%
Adjusted Tubes Mean:	42 (38 - 46) $\mu\text{g m}^{-3}$

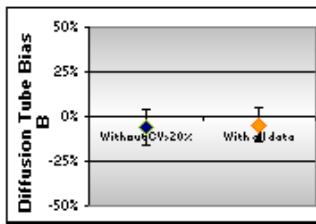
**Precision** 11 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	1.05 (0.96 - 1.17)
Bias B	-5% (-14% - 4%)
Diffusion Tubes Mean:	39 $\mu\text{g m}^{-3}$
Mean CV (Precision):	8
Automatic Mean:	41 $\mu\text{g m}^{-3}$
Data Capture for periods used:	99%
Adjusted Tubes Mean:	41 (38 - 46) $\mu\text{g m}^{-3}$

Overall survey ->

Good precision	Good Overall DC
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(Check average CV & DC from Accuracy calculations)



The chart shows Diffusion Tube Bias on the y-axis (ranging from -50% to 50%) for two data series. The 'Without CV>20%' series has a bias of approximately -10%, while the 'With all data' series has a bias of approximately -5%.

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