



2011 Air Quality Progress Report for *Aberdeen City Council*

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

June 2011

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Executive Summary

This Progress Report has been undertaken to fulfil Aberdeen City Council's duty to annually review and assess air quality. The Report provides the latest monitoring results and discusses the implications for air quality management in Aberdeen. In writing the Report, the Council has regard to the Government's published guidance LAQM.TG(09).

In 2010 the annual mean nitrogen dioxide level (NO₂) continued to exceed the national air quality objective across the City Centre Air Quality Management Area. Pockets of exceedances were also recorded within the Wellington Road and Anderson Drive/Haudagain Roundabout Air Quality Management Areas (AQMA's). Levels at monitoring locations were generally similar to previous years.

Outwith the City Centre AQMA, the diffusion tube at 86 Victoria Road, Torry marginally exceeded the annual objective. Similarly the diffusion tube at 40 Auchmill Road, outwith the Anderson Drive/Haudagain AQMA, also exceeded the objective. Concentrations at both of these sites have intermittently been close to, or slightly above the objective in previous years. The Dispersion modelling of City Centre NO₂ and particulates (PM₁₀) 2010 report also predicted exceedances on the northern section of Victoria Road, Auchmill Road, outside new student accommodation on West North Street and on Bridge Street. Both of the latter sites are also just outwith the City Centre AQMA.

Monitoring at the Union Street continuous monitoring station indicated likely exceedances of the 1-hour objective. The objective was marginally exceeded in 2008. The objective was met at all other continuous monitoring sites, although diffusion tube monitoring and modelling indicated potential exceedances at other City Centre locations. Currently only Market Street is designated an AQMA due to predicted exceedances of the objective.

As a result of the monitoring and modelling results it is recommended that:

- The City Centre AQMA for NO₂ is slightly extended to include Victoria Road to the junction with Sinclair Road, Bridge Street and West North Street to the junction with Littlejohn Street
- The City Centre AQMA is amended to include the risk of exceedance of the 1-hour NO₂ objective
- The Anderson Drive/Haudagain roundabout AQMA is extended to include Auchmill Road to the junction with Howes Road

The 2005 PM₁₀ objective was met at all continuous monitoring stations. The 2010 annual mean objective was exceeded at the Wellington Road and Market Street continuous monitoring sites. Concentrations at King Street and Union Street reach the objective value of 18µg m⁻³. The objective was met at Errol Place and Anderson Drive.

All sites met the 2010 24-hour objective with the exception of Market Street. There were 6 exceedances of the objective at this location over a 9 month monitoring period indicating there is a likelihood of exceedances of the objective. Monitoring data indicates the boundaries of the AQMA for PM₁₀ are representative, although due to limited monitoring data available, it is more difficult to precisely identify locations of predicted exceedance.

There were no new or proposed developments with the potential to significantly impact on air quality considered in 2010. Supplementary Guidance on Air Quality to accompany the Council's new draft Local Development Plan will assist controlling emissions from new developments in future years.

A new draft Air Quality Action Plan covering all three AQMAs was developed in 2010. Following a public consultation process in October/November 2010, the new Action Plan was adopted in March 2011. Implementation of these actions, including a feasibility study of a City Centre Low Emission Zone, is ongoing.

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1 Introduction

1.1 Description of Local Authority Area

Aberdeen is situated on the east coast of Scotland by the North Sea and has a population of 220,000. The city acts as a focus for employment, service and leisure activities both for residents of Aberdeen and the surrounding area.

There is little heavy industry within the city and much of the economy is based around services to the oil industry. Road traffic is the main source of atmospheric pollution. Aberdeen's road transportation system is constrained by the River Dee to the south of the city and the River Don to the north therefore there are limited routes to either arrive at or pass around the city. Construction of a Western Peripheral Route around the city was due to commence during 2010, however an appeal against the development was lodged in the Court of Session in May 2010. Progression of the project has been delayed until the appeal outcome is determined. The A90 and A96 trunk roads, A93 North Deeside Road, A956 Ellon Road and A956 Wellington Road are the most significant routes to converge or pass through the city centre. Much of the commuter traffic entering the city comes from the neighbouring Aberdeenshire.

Aberdeen Harbour is located in the city centre and is a thriving environment acting as the UK's main base for supply vessels to offshore installations. There are also regular ferries to Shetland and Orkney Islands. Aberdeen Airport (Dyce) is located around 7km to the northwest of the city.

1.2 Purpose of Progress Report

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Scotland are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre, $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in Scotland.

Pollutant	Concentration	Measured as	Date to be achieved by
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	3.25 $\mu\text{g}/\text{m}^3$	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 mg/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 (PM₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	18 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2010
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

The outcomes of the first, second, third and fourth rounds of the review and assessment process for NO₂ and PM₁₀ are described in sections 1.4.1-1.4.4. All rounds of the process concluded levels of carbon monoxide, benzene, 1,3-butadiene, sulphur dioxide and lead in Aberdeen are unlikely to exceed the national air quality objectives.

1.4.1 First Round of Review and Assessment

The first round of the review and assessment process predicted exceedances of the annual mean objective for NO₂ in parts of the city centre. An Air Quality Management Area (AQMA) was declared in June 2001 centring around Market Street and Union Street. Following subsequent detailed assessments in 2001 and 2002 the AQMA was slightly amended in March 2003 to include adjoining areas.

1.4.2 Second Round of Review and Assessment

The second round of review and assessment confirmed levels of NO₂ continued to exceed the annual mean objective in the city centre, including streets adjacent to the AQMA. Exceedances of the 1-hour objective were also predicted on Market Street. Additionally, exceedances of the new annual mean objective for PM₁₀ to be achieved by 2010, were also predicted in the city centre. Following a Detailed Assessment, the AQMA was amended in January 2005 to include all areas of current or predicted exceedances of both the NO₂ and 2010 PM₁₀ annual mean objectives in the city centre and the 1-hour NO₂ objective on Market Street.

The Detailed Assessment also predicted annual mean levels close to the NO₂ objective and potential exceedances of the objective at several locations outwith the city centre, particularly around Haudagain roundabout on Great Northern Road/Anderson Drive (A96). Further monitoring was recommended prior to the consideration of an AQMA in this area. A feasibility study into a Western Peripheral Route (AWPR) around Aberdeen that would remove a significant amount of traffic from the Haudagain roundabout/Anderson Drive corridor was carried out in 2006.

Emissions from Aberdeen Harbour were considered in the Detailed Assessment. It was concluded that emission contributed to elevated levels of NO₂ and PM₁₀ in the Market Street and Guild Street areas, but do not cause exceedances of the objectives.

An Air Quality Action Plan was also published in July 2006 detailing measures to improve the air quality in the AQMA. These included

- Pedestrianisation of Union Street and associated road infrastructure improvements
- Additional controlled parking
- Additional Park and Ride facilities

- Green Transport Plans
- Improved Public Transport
- Increase Awareness of Air Quality Issues
- Construction of a Western Peripheral Route around the city (AWPR)

1.4.3 Third Round of Review and Assessment

A further Updating and Screening Assessment and Progress Reports were completed in 2006, 2007 and 2008 respectively. NO₂ levels across the city and PM₁₀ levels on Union Street were found to be similar to previous years. In 2007 elevated levels of PM₁₀ were recorded on Market St due to roadworks and the development of Union Square adjacent to the continuous monitoring station. Potential exceedances of the annual mean objective for both PM₁₀ and NO₂ were again predicted on the Anderson Drive/Haudagain roundabout corridor even with the construction of the AWPR and on parts of Wellington Road.

A Detailed Assessment was completed in March 2008 and concluded that the annual mean NO₂ objective and the annual mean 2010 PM₁₀ objective were likely to be exceeded in 2010 at the Haudagain roundabout (A96/A90), locations along the A90 Anderson Drive and Wellington Road (Queen Elizabeth II Bridge to Balnagask Road) without the AWPR. With the AWPR exceedances were still predicted on Wellington Road although levels slightly below the objectives were predicted on the Haudagain roundabout/Anderson Drive corridor.

Wellington Road (Queen Elizabeth II Bridge to Balnagask Road) was designated an AQMA in November 2008 as a result of the Detailed Assessment and annual mean NO₂ and PM₁₀ levels recorded in the 2008 Progress Report. The Haudagain roundabout/Anderson Drive corridor was also declared an AQMA for both pollutants as NO₂ monitoring in the vicinity of the roundabout has frequently recorded measurements in excess of the objective and the AWPR will not be completed until 2012 at the earliest.

The Detailed Assessment also considered NO₂ and PM₁₀ levels on King Street. Although potential exceedances of both objectives were identified, there was a lack of monitoring data in the area to confirm the likelihood of exceedances. Accordingly further monitoring was recommended prior to any decision being made on the requirement for an AQMA on King Street.

1.4.4 Fourth Round of Review and Assessment

The 2009 Updating and Screening Assessment and 2010 Progress Report completed in July 2009 and July 2010 respectively confirmed measured NO₂ levels were again similar to previous years with the exception of Market Street. The Market Street monitoring station was relocated in 2008 and the lower levels recorded at the new site are attributable to the more open nature of the site and reduced congestion. Both reports confirmed continued widespread exceedances of the NO₂ annual mean

objective within the City Centre AQMA and pockets of exceedances within the Wellington Road and Anderson Drive/Haudagain roundabout AQMAs.

A City Centre modelling study completed in March 2010 indicated potential exceedances of the annual mean NO₂ objective just outwith the AQMAs, however additional monitoring confirmed NO₂ levels well below the objective with the exception of Auchmill Road. The 1-hour objective was met at all sites in 2009, although the objective was exceeded for the first time at Union Street in 2008.

PM₁₀ levels were lower in 2009 compared to previous years. It is believed that the replacement of TEOMs with FDMS and the use of the VCM for the first time contributed to the lower values. The 2010 annual mean was exceeded only at Market Street and Wellington Road, although the objective was reached at Union Street. There were no exceedances of the 24-hour objective.

Modelling of the City Centre reported in March 2010 predicted widespread exceedances of the annual mean PM₁₀ objective outwith the AQMAs, however the modelling was based on pre 2010 data. More recent data suggests the modelling over predicted measured concentrations.

The 2010 Progress Report also reported progress in the development of a new Air Quality Action Plan to cover the 3 AQMAs.

1.4.4 Summary Table of Review and Assessment Reports and Outcomes

Table 1.2 summarises the outcome of previous air quality reports

Table 1.2 Air Quality Reports and Outcomes

Report	Outcomes
Stages 1, 2, 3 and 4 Reports 2000-2003	City centre AQMA declared in June 2001 due to predicted exceedances of annual mean NO ₂ objective. Area of AQMA extended in March 2003
Updating and Screening Assessment August 2003	Detailed Assessment of NO ₂ and PM ₁₀ recommended in city centre and assessment of Aberdeen Harbour
Detailed Assessment August 2004	Extension of city centre AQMA for NO ₂ and inclusion of predicted exceedances of 1-hour objective on Market Street. City Centre AQMA declared for PM ₁₀ due to predicted exceedances of the 2010 annual mean objective. Concluded emissions from Aberdeen Harbour do not cause exceedances of objectives, but contribute to elevated levels of NO ₂ and PM ₁₀ on Market Street and Guild Street areas
Progress Report 2005	Update of monitoring results and new developments
Updating and Screening Assessment July 2006	Update of monitoring results and new developments
Air Quality Action Plan	Detailed measures to improve air quality in the AQMA

July 2006	
Progress Report June 2007	Detailed Assessment of NO ₂ and PM ₁₀ recommended on Wellington Road, Anderson Dr/Haudigan roundabout/Auchmill Rd corridor and King Street
Detailed Assessment March 2008	AQMAs declared November 2008 on Anderson Drive/Haudagain roundabout and Wellington Rd (Queen Elizabeth II Bridge – Balnagask Rd) due predicted exceedances of NO ₂ and 2010 PM ₁₀ annual mean objectives
Progress Report May 2008	Update of monitoring results and new developments and progress on implementation of the Air Quality Action Plan
Updating and Screening Assessment July 2009	Update of monitoring results. Recommended additional NO ₂ diffusion tubes at potential areas of exceedances. Modelling of City Centre PM ₁₀ and NO ₂ recommended to support proposed new Action Plan
City Centre modelling study March 2010	City Centre modelling predicted widespread exceedances of annual mean PM ₁₀ objective and minor potential areas of exceedances of the NO ₂ annual mean objective outwith the AQMA
Progress Report July 2010	Update of monitoring results and progress in the development of a new Air Quality Action Plan covering the 3 AQMAs

Maps of the 3 AQMAs are shown in Figures A1-A3 in Appendix A.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Site

There are 6 continuous monitoring sites in Aberdeen. Details of pollutants monitored, equipment types and site locations are described in Table 2.1. Figure A4 in Appendix A shows the site locations.

The Market St site required to be removed in October 2008 due to the construction of the adjacent Union Square retail park. A new site at the junction of Market Street/Poynernook Road commenced collecting data in July 2009. However, as the equipment had been in storage for a number of months, various operational problems occurred during the initial months of operation both for the NO_x analyser and the TEOM, cumulating in the replacement of the TEOM with a BAM in March 2010 and a replacement NO_x analyser in April 2010.

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Errol Place	Background	X394397	Y807392	PM ₁₀ , PM _{2.5} , O ₃ , NO ₂ (NO, NO _x)	FDMS FDMS Chemiluminescence	N	N/A	N/A	N
Union Street	Roadside	X393656	Y805967	PM ₁₀ , NO ₂ (NO, NO _x)	TEOM Chemiluminescence	Y	Y(2m)	2m	Y
Market Street	Roadside	X394560	Y805677	PM ₁₀ , NO ₂ (NO, NO _x)	BAM Chemiluminescence	Y	Y(0m)	2m	N
Anderson Drive	Roadside	X392506	Y804186	PM ₁₀ , NO ₂ (NO, NO _x)	TEOM Chemiluminescence	Y	Y(10m)	6m	N
Wellington Road	Roadside	X394395	Y804779	PM ₁₀ , NO ₂ (NO, NO _x)	TEOM Chemiluminescence	Y	Y(5m)	4m	Y
King Street	Roadside	X394333	Y808770	PM ₁₀ , NO ₂ (NO, NO _x)	BAM Chemiluminescence	N	Y(10m)	3m	N

2.1.2 Non-Automatic Monitoring Sites

Levels of nitrogen dioxide are also monitored across the city via diffusion tubes attached to lamppost and downpipes. Figure A4 in Appendix C shows the site locations. The diffusion tubes provide an indication of longer-term average NO₂ concentrations and highlight areas of high NO₂ concentrations. Tubes are co-located in triplicate at all the continuous monitoring sites to enable the bias adjustment of the city wide survey. Duplicate tubes are also co-located at several city centre sites. Table 2.2 provides details of diffusion tube monitoring sites.

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Bucksburn Primary Sch, Inverurie Road	Roadside	X389744	Y809575	NO ₂	Y	Y (façade)	8m	N
885 Gt Northern Rd	Roadside	X391167	Y809161	NO ₂	Y	Y (11m)	3m	Y
549 Anderson Dr ^N	Roadside	X391394	Y808949	NO ₂	Y	Y (17m)	3m	Y
38 Ellon Rd	Roadside	X394652	Y809714	NO ₂	N	Y(7m)	3m	Y
520 King St	Roadside	X394236	Y808066	NO ₂	N	Y(9m)	0.1m	N
86 Victoria Rd, Torry	Roadside	X394764	Y805197	NO ₂	N	Y(façade)	3m	Y
Wellington Rd//Kerloch Pl	Roadside	X394411	Y804407	NO ₂	Y	Y(façade)	3m	Y
107 Anderson Dr	Roadside	X392337	Y804340	NO ₂	Y	Y(14m)	3m	Y
31 Market St	Roadside	X394258	Y806157	NO ₂	Y	Y(façade)	3m	Y
184/192 Market St	Roadside	X394530	Y805708	NO ₂	Y	Y(façade)	3m	Y
105 King St	Roadside	X394406	Y806637	NO ₂	Y	Y(façade)	3m	Y
40 Union St	Roadside	X394284	Y806284	NO ₂	Y	Y(façade)	3m	Y
Music Hall, Union St	Roadside	X393777	Y806030	NO ₂	Y	Y(façade)	6m	Y
Dyce Prim, Gordon Ter	Urban background	X389046	Y812794	NO ₂	N	Y(N/A)	N/A	N

Northfield swimming pool	Urban background	X390801	Y808132	NO ₂	N	Y(N/A)	N/A	N
Guild St/Market St	Roadside	X394336	Y806097	NO ₂	Y	Y(facade)	5m	Y
43/45 Union St	Roadside	X394284	Y806284	NO ₂	Y	Y(façade)	3m	Y
14 Holburn St	Roadside	X393305	Y805734	NO ₂	Y	Y(façade)	3m	Y
468 Union St	Roadside	X393386	Y805826	NO ₂	Y	Y(façade)	3m	Y
212 King St	Roadside	X394400	Y806842	NO ₂	N	Y(façade)	4m	N
26 King St	Roadside	X394449	Y806453	NO ₂	Y	Y(façade)	4m	Y
104 King St	Roadside	X394425	Y806634	NO ₂	Y	Y(façade)	4m	Y
785 Gt Northern Rd	Roadside	X391458	Y809102	NO ₂	N	Y(façade)	3m	Y
40 Auchmill Rd	Roadside	X389913	Y809603	NO ₂	N	Y(facade)	3m	Y
21 Holburn St	Roadside	X393323	Y805728	NO ₂	Y	Y(façade)	3m	Y
147 Holburn St	Roadside	X393323	Y805728	NO ₂	N	Y(façade)	3m	N
80 Holburn St	Roadside	X393233	Y805565	NO ₂	Y	Y(façade)	3m	Y
61 Holburn St	Roadside	X393275	Y805624	NO ₂	Y	Y(5m)	3m	Y
469 Union St	Roadside	X393400	Y805811	NO ₂	Y	Y(façade)	3m	Y
209 Union St	Roadside	X393795	Y806009	NO ₂	Y	Y(façade)	5m	Y
249 Union St	Roadside	X393170	Y805120	NO ₂	Y	Y(façade)	5m	Y
Willowbank Rd/Albury Rd	Roadside	X393642	Y805503	NO ₂	N	Y(5m)	3m	N
East North St	Roadside	X394505	Y806529	NO ₂	Y	Y(façade)	4m	Y
404 King Street	Roadside	X394317	Y807527	NO ₂	N	Y(façade)	9m	N

Riverside House, Riverside Drive	Roadside	X39425	Y804873	NO ₂	N	Y(façade)	6m	N
115 Menzies Rd/Wellington Rd	Roadside	X394403	Y804799	NO ₂	Y	Y(12m)	1m	Y
137 Wellington Road	Roadside	X394697	Y803735	NO ₂	N	Y(17m)	14m	N
Wellington Road / 4 Nigg Kirk Road	Roadside	X394719	Y803329	NO ₂	N	Y(7m)	3m	N
819 Gt Northern Rd	Roadside	X391293	Y809136	NO ₂	Y	Y(façade)	3m	Y
852 Fullerton Ct (facade)	Facade	X391353	Y809158	NO ₂	Y	Y(façade)	7m	Y
852 Fullerton Ct (roadside)	Roadside	X391352	Y809151	NO ₂	Y	Y(7m)	0.1m	Y
248 George St	Roadside	X393868	Y806741	NO ₂	N	Y(façade)	2m	N
25 Rosemount Pl	Roadside	X393424	Y806685	NO ₂	N	Y(3m)	3m	N
214 Rosemount Pl	Roadside	X392897	Y806352	NO ₂	N	Y(façade)	3m	N
111 S Anderson Dr	Facade	X392311	Y804349	NO ₂	Y	Y(façade)	13m	N

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

The Union Street and Market Street continuous monitoring sites are on busy city centre roads and are representative of population exposure for NO₂. Union Street is the city's main shopping street with shops on the ground floor properties and commercial premises and flats on the 1st, 2nd and 3rd floors. Almost all of the city's bus routes pass along at least part of Union Street and the inside lane of both sides of the road is a bus lane. Market Street is adjacent to Aberdeen Harbour and has a high proportion of HGV's travelling between the north-east of Scotland, the Harbour and locations to the south of Aberdeen. The street is used by pedestrians travelling to the city centre from residential properties to the south of the river Dee, visiting the new Union Square retail park and people working around the Harbour area. There are a small number of 1st, 2nd and 3rd floor flats. Emissions from Aberdeen Harbour also contribute to the pollution on Market Street.

The Anderson Drive site is 4m from the kerb and is not representative of population exposure as residential properties are set back 10-20m from the kerb. Similarly the site at Wellington Road is around 3-4m closer to the kerb than residential properties in the area. The nearest properties are 10m from the King Street site, however the location is typical of flatted properties close to the kerb at other locations on King Street. Errol Place is representative of typical residential properties close to the city centre but not adjacent to a major road.

Diffusion tubes on Market Street, Union Street and the majority of those on Holburn Street and King Street within the city centre are at building façade and are representative of population exposure. Some of the tubes outwith the city centre are at roadside locations with the façade of the nearest relevant property 5-20m back from the roadside. Procedures within LAQM.TG(09) have been used to estimate the concentration at the nearest receptor where appropriate.

Automatic Monitoring Data

Tables 2.3a shows the annual mean objective for NO₂ obtained from the continuous monitoring stations in 2008, 2009 and 2010. No data for the Errol Place site was available between 02/08/2010 and 11/11/2010. As data capture was less than 75%, the seasonally adjusted value has been calculated from the measured annual mean concentration of 22ugm⁻³ using the Edinburgh St Leonards and Glasgow City Chambers urban background sites. Both sites are over 50km from Aberdeen, however there are no other urban background site close to Aberdeen. For comparative purposes, the Aberdeen roadside sites were also used to annualise the Errol Place data and provided a similar value (21.6 ugm⁻³ compared to 21.0 ugm⁻³ for Edinburgh St Leonards/Glasgow City Centre). Appendix B shows the calculation for the short to long term adjustment (annualisation) of continuous monitoring data.

The annual mean concentrations at Errol Place, King St and Anderson Drive, which is within an AQMA, were well below the objective. The Anderson Drive AQMA was declared due to predicted exceedances of the annual mean objective at locations elsewhere along the Anderson Drive/Haudagain roundabout corridor.

Concentrations at Union Street, Market Street and Wellington Road, which are all within AQMAs, continue to exceed the annual mean objective. At Union Street the value is slightly higher than recent years, however the value at Wellington Road is significantly greater than 2009, the first full year of data. The concentration at the new Market Street site was considerably less than at the previous site probably due to the more open nature of the site and less standing traffic at this site.

Trends in annual mean NO₂ concentrations at the continuous monitoring stations are shown in Figure 2.1. Market St 2010 data has been excluded as 2010 was the first full year of data of new data. There has been no noticeable decrease in concentrations at the Errol Place urban background site or Anderson Drive, despite improvements in vehicle emissions while at Union Street there has been slight increase in concentrations. This trend is similar to other cities elsewhere in the UK and may be due to an increase in the proportion of NO₂ directly emitted to the atmosphere rather than via the oxidation of NO to NO₂.

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

Site ID	Location	Within AQMA?	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2010 ^b %	Annual mean concentrations (µg/m ³)		
					2008	2009	2010 ^c
A1	Errol Place	N	99	71.6	25	26	21
A2	Union Street	Y		78.9	54	56^c	59
A3	Market Street	Y		78.0	73^d	38 ^c	44
A4	Anderson Drive	Y		89.2	25	24	27
A5	Wellington Road	Y		95.4	40^c	43	52
A6	King Street	N		99.4	N/A	32	29

^adata capture for the Errol Place monitoring periods as monitoring was only carried out for part of the year (no data August, September, October 2010)

^bdata capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)

^c Errol Place 2010, Union Street 2009, Market Street 2009 data and Wellington Road 2008 data have been seasonally adjusted to provide "annualised" data procedures within TG(09).

^d The Market Street site ceased operation in October 2008 due to the development of the adjacent land and was relocated in 2009. Data capture for 2008 and 2009 were 77% and 36% respectively.

Figure 2.1 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Automatic Monitoring Sites.

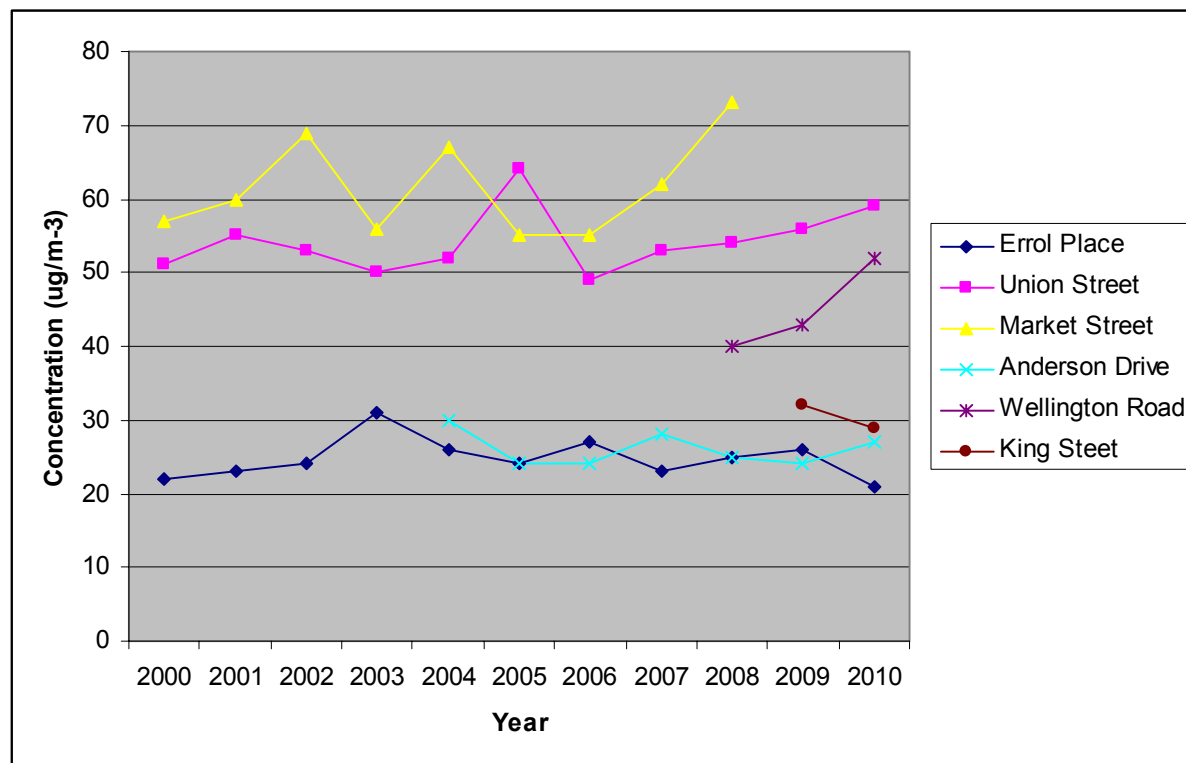


Table 2.3b shows the number of exceedances of the 1-hour objective at the automatic monitoring sites. In 2010 all sites were well below the objective value of 18 permitted exceedances per year with the exception of Union Street. There were 17 exceedances at Union Street in 2010, however data capture was only 79%. The 99.8% percentile suggests exceedance of the objective is likely. Results from 10 years of monitoring showed levels well below the objective with the exception of 2008. Consequently 2008 data was considered atypical. However, the 2008 and 2010 results together now indicate a risk of exceedance of the 1-hour objective on Union Street.

Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period %	Data Capture for full calendar year 2010 %	Number of Exceedences of hourly mean (200 µg/m³)		
					2008	2009	2010
A1	Errol Place	N	99	71.6	0	0	0 (101)
A2	Union Street	Y		78.9	21	10(190)	17 (202)
A3	*1Market Street	Y		78.0	94*(244)	2*(175)	0 (157)
A4	Anderson Drive	Y		89.2	2	0	0 (111)
A5	Wellington Road	Y		95.4	0(153)	0	1
A6	King Street	N		99.4	N/A	0	0

Where data capture is less than 90% the 99.8th percentile of hourly means is presented in brackets.

* The Market Street site ceased operation in October 2008 due to the development of the adjacent land and was relocated in 2009. Data capture for 2008 and 2009 were 77% and 36%.

Diffusion Tube Monitoring Data

Table 2.4 shows the results of the diffusion tube monitoring. Tubes have been bias adjusted using the methodology described in LAQM.TG(09). Prior to 2009 there was a clear difference in the bias factor for the Errol Place continuous monitoring background site compared to roadside sites. Accordingly, the 2009 Progress Report reported 2 bias factors (A and B) where A corrected background diffusion tubes using the Errol Place factor and roadside site using the mean of the roadside bias factors. Factor B corrected the diffusion tube data using the bias factor from the most relevant continuous monitoring site.

Bias factors in 2010 again varied across the monitoring sites. Accordingly, the bias factor from the most relevant continuous monitoring site was used to adjust diffusion tube data. Where there is no nearby continuous monitoring station data was adjusted using the mean of the continuous monitoring sites. The Errol Place and Market Street sites were excluded from calculations as less than 9 months co-located data was available. The following summarises the bias factors used for the various monitoring sites

Diffusion Tube Sites	Bias Factor Applied	Value
City Centre AQMA	Union St CM	1.0
King Street (outwith city centre AQMA)	King St CM	0.82
Wellington Road	Wellington Rd CM	0.89
Anderson Drive	Anderson Dr CM	0.87
Sites with no relevant CM	Mean of CMs	0.90

The National Diffusion Tube Bias Adjustment Factor Spreadsheet (NDTBAFS) was also considered to adjust diffusion tube concentrations. As documented in Appendix C, only 1 study (Aberdeen) is represented for 2010 listing a factor of 0.82. Table 2.4 also shows adjusted diffusion tube results using the (NTBFAFS) Factor. Factor A is calculated from the most relevant continuous monitoring sites and Factor B from the NDTBAFS.

Information and tables showing 4-weekly, uncorrected diffusion tube data bias adjustment factor calculations and calculations to correct roadside sites to façade where appropriate are shown in Table A5 in Appendix C.

Measured concentrations at all sites are similar to previous years. As with the continuous monitoring data, the nationally predicted downward trend in concentrations due to vehicle improvements has not been experienced at sites across Aberdeen.

All diffusion tubes within the City Centre AQMA continued to exceed the annual mean objective with the exception of 212 King Street. Levels greater $60\mu\text{gm}^{-3}$ were also recorded at a number of sites using the Union Street bias factor indicating a risk of exceedance of the 1-hour objective, although only the site at 184/192 Market Street exceeded the objective applying the NDTBAFS factor. Façade corrected tubes at 819 Great Northern Road and Fullerton Road façade, within the Anderson Drive/Haudagain roundabout AQMA also exceeded the objective. These readings

agree with the 2008 Detailed Assessment which predicted pockets of exceedances along the corridor. Similarly, tubes at Wellington Road/Kerloch Place and 115 Menzies Road/Wellington Rd within the Wellington Road AQMA exceeded the objective.

Outwith the City Centre AQMA, the concentration at 86 Victoria Road exceeded the objective using the Union Street correction factor, although the concentration was well below the objective applying the NDTBAFS factor. Concentrations at this location have been close to the objective in previous years and it may be appropriate to extend the AQMA to include the northern section of Victoria Road. The concentration at 46 Auchmill Road, just outwith the Anderson Drive/Haudigan roundabout AQMA also exceeded the objective. Again values close to and slightly above the objective have been recorded in previous years at this site and it may be appropriate to extend this AQMA. Concentrations at all other sites were below the objective.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Relevant public exposure? Y/N	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2010 ^b %	Annual mean concentrations adjusted for bias ($\mu\text{g}/\text{m}^3$). Corrected to façade conc in brackets where relevant			
						2008 ^c	2009 ^c	2010 ^c	
								Bias Factor A	Bias Factor B
1	Buckburn Primary Sch, Inverurie Road	Y	Y	100	100	37	33	37	34
2	885 Gt Northern Rd	Y	Y	100	100	53(40)	54(41)	52(39)	47(36)
3	549 North Anderson Dr	Y	Y	100	100	37(27)	36(27)	42(30)	39(28)
4	38 Ellon Rd	N	Y	100	92	44(38)	44(38)	36(31)	36(31)
5	520 King St	N	N	100	92	45(25)	45(30)	40(31)	40(31)
6	86 Victoria Rd, Torry	N	Y	100	92	39	34	41	34
7	Wellington Rd/Kerloch Pl	Y	Y	100	92	47	43	45	41
8	107 Anderson Dr	Y	Y	100	92	64(44)	59(42)	60(42)	57(40)
9	31 Market St	Y	Y	100	100	58	55	63	52
10	184/192 Market St	Y	Y	100	92	75	64	76	62
11	105 King St	Y	Y	100	100	70	67	66	54
12	40 Union St	Y	Y	100	92	62	53	62	50
13	Music Hall, Union St	Y	Y	100	100	52	45	57	47
14	Dyce Prim, Gordon Ter	N	Y	100	100	12	11	13	12
15	Northfield swimming pool	N	Y	100	100	15	13	18	14
16	Guild St/Market St	Y	Y	100	100	63	53	63	51
17	43/45 Union St	Y	Y	100	100	60	54	61	50
18	14 Holburn St	Y	Y	100	100	59	53	67	55
19	468 Union St	Y	Y	100		64	55	68	56
20	212 King St	N	Y	100	92	38	36	38	31
21	26 King St	Y	Y	100	77	46	44	46	38
22	104 King St	Y	Y	100	100	52	47	52	43
23	785 Gt Northern Rd	N	Y	100	100	42(34)	39(32)	45(36)	41(33)
24	40 Auchmill Rd	N	Y	100	100	47	39	44	40
25	21 Holburn St	Y	Y	100	100	56	49	55	45
26	147 Holburn St	N	Y	100	92	38	35	38	32

27	80 Holburn St	Y	Y	100	100	36	38	38	32
28	61 Holburn St	Y	Y	100	100	47(43)	41(38)	48(44)	40(37)
29	469 Union St	Y	Y	100	85	71	65	65	54
30	209 Union St	Y	Y	100	100	61	57	62	51
31	249 Union St	Y	Y	100	92	39	36	41	33
32	Willowbank Rd/Albury Rd	N	Y	100	85	24	22(21)	28(27)	22
33	East North St	Y	Y	100	92	54	53	53	44
34	404 King Street	N	Y	100	92	41	40^c(40)	33	30
35	Riverside House, Riverside Drive	N	Y	100	92	31	28	30	27
36	115 Menzies Rd/Wellington Rd	Y	Y	100	92	68(47)	60(44)	59(42)	54(40)
37	137 Wellington Road	N	Y	100	92	36(34)	33(32)	33(32)	31(30)
38	Wellington Road / 4 Nigg Kirk Road	N	Y	100	92	34(30)	32(31)	33(33)	30(29)
39	819 Gt Northern Rd	Y	Y	100	92	N/A	54	55	50
40	852 Fullerton Ct (facade)	Y	Y	100	100	N/A	36	40	36
41	852 Fullerton Ct (roadside)	Y	Y	100	100	N/A	49(29)	48(28)	44(26)
42	248 George St	N	Y	100	92	N/A	34 ^c	38.3	31
43	25 Rosemount Pl	N	Y	100	85	N/A	30(30)	32(32)	27
44	214 Rosemount Pl	N	Y	100	92	N/A	26 ^c	30	24
45	111 South Anderson Drive	Y	Y	100	92	N/A	N/A	32	32

^amonitoring in 2010 at all sites was for the full calendar

^bdata capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)

^c2008 and 2009 data for sites 34, 42, 43 and 44 have been "annualised" as in Box 3.2 of TG(09) as monitoring was not carried out for the full year.

2.2.2 PM₁₀

The Union Street and Market Street continuous monitoring locations are representative of population exposure for PM₁₀ due to the proximity of flats in the area. Anderson Drive and Wellington Road are both closer to the kerb than the façade of the nearest residential properties and are not representative of population exposure. The nearest properties are 10m from the King Street site, however the location is typical of flatted properties close to the kerb at other locations on King Street. Errol Place is representative of typical residential properties close to the city centre but not adjacent to a major road.

Tables 2.5a and 2.5b show the annual mean and number of exceedances of the 24 hour objective for PM₁₀ obtained from the continuous monitoring sites in 2008, 2009 and 2010. TEOM and BAM data has been corrected to gravitational equivalent using the processes described in Appendix B. All data was ratified and corrected to gravitational equivalent by AEA Technology. Prior to 2009 the annual mean concentration for TEOM monitoring sites in Scotland required to be reported with a 1.3 and a 1.14 correction factor to gravitational equivalent. Table 2.5a therefore reports 2008 data with both correction factors.

Data for Market Street was only available for the period August-December 2009 and April-December 2010 and therefore has been annualised using the process within TG(09). Similarly data for Wellington Road was only available for July-December 2008 and has been annualised. Appendix B shows the calculation for the short to long term adjustment of data.

The 2004 annual mean and 24-hour objectives were met at all sites. The annual mean objective to be met by 2010 was exceeded at Wellington Road and King St while at Union Street and King Street concentrations reached the objective value. Concentrations at Errol Place and Anderson Drive were well below the objective. The 6 exceedances of the 24-hour objective over a 9 month monitoring period and 98th percentile of hourly means at Market Street indicate potential exceedances of the 24-hour objective at this site. The 24-hour objective, to be met by 2010, was met at all other sites. Monitoring data suggests that the boundaries of the AQMAs are currently representative for PM₁₀.

It is difficult to directly compare 2009 and 2010 values with previous years due to the different methodologies applied to correct data and replacement of the Errol Place and Market Street TEOMs with FDMS and BAM equipment. Additionally, the Market station is at a new location. With the exception of Market St, concentrations in Table 2.5a are broadly similar to previous years using the 1.14 correction factor to gravitational equivalent. Exceptionally high levels were recorded at Market St in 2007 and 2008 due to the neighbouring construction works. The limited 2009 and 2010 data at the new Market Street site indicates that levels at this location are significantly lower, possibly due to more open nature of the site and less standing traffic.

It is also difficult to assess trends in annual mean PM₁₀ concentrations due to the aforementioned methodologies applied to correct data and site equipment changes.

Concentrations over the period 2001-2010 are shown in Figure 2.2 using the 1.14 factor to correct pre 2009 data and processes described in Appendix B to correct 2009 and 2010 data.

Table 2.5a Results of PM₁₀ Automatic Monitoring: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2010 ^b %	Annual mean concentrations (µg/m ³)			
					2008	2009	2010	
Correction Factor to Gravitational Equivalent					1.3	1.14		
A1	Errol Place	N		91.5	18	16	15	13
A2	Union Street	Y		97.3	22	19	18	18
A3	*Market St	Y		72.2	80 ^d	70 ^d	28 ^c	22 ^c
A4	Anderson Dr	Y		88.4	18	16	15	14
A5	Wellington Rd	Y		96.1	26	23 ^c	23	22
A6	King Street	N		97.9	N/A	N/A	17	18

^bdata capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)

^c Market Street 2009 data, Wellington Road 2008 and Market St 2010 data have been seasonally adjusted to provide "annualised" data using Errol Place background data and procedures within TG(09). There are no other urban background sites within 50 miles of Aberdeen.

^d The Market Street site ceased operation in October 2008 due construction works at a neighbouring development site. 2008 data collection was only 77%. The site was relocated in 2009.

Table 2.5b Results of PM₁₀ Automatic Monitoring: Comparison with 24-hour Mean Objective

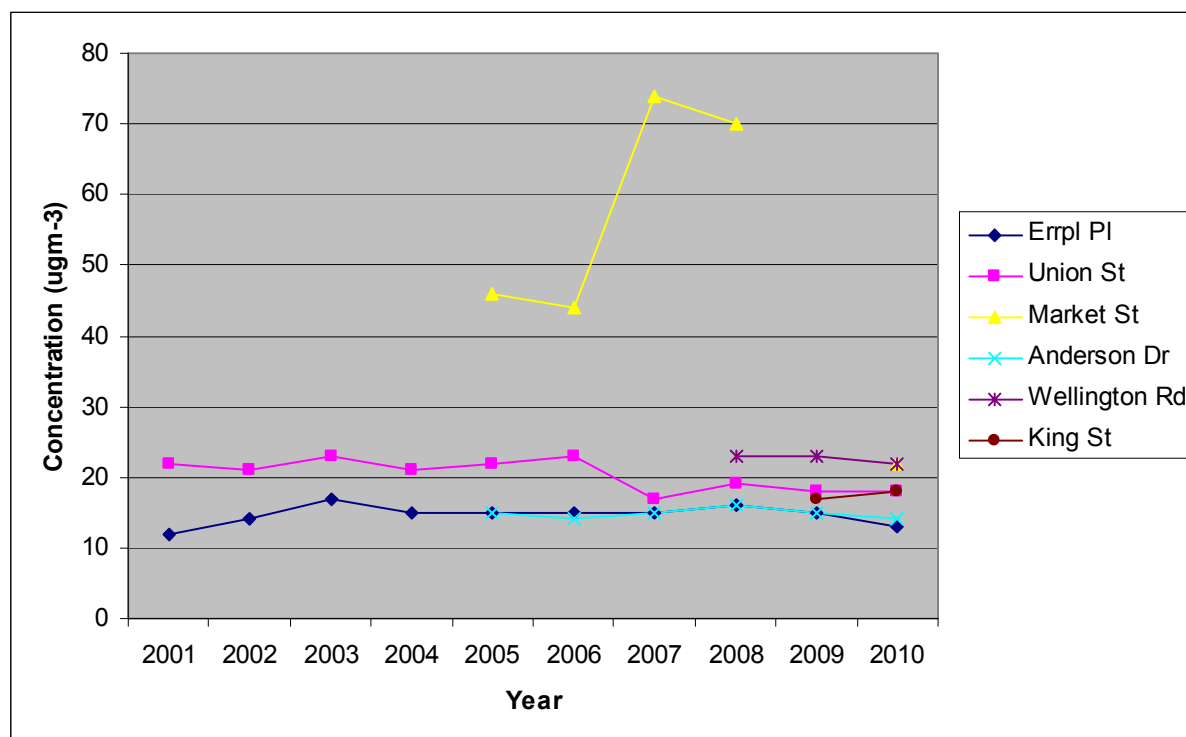
Site ID	Location	Within AQMA?	Data Capture for monitoring period ^a %	Data Capture 2010 ^b %	Number of Exceedences of daily mean objective (50 µg/m ³)		
					2008	2009	2010
A1	Errol Place	N		91.5	2	4	1
A2	Union Street	Y		97.3	1 (39)	1	0
A3	Market St	Y	95.8	72.2	148^c(170)	3 (86)	6 (53)
A4	Anderson Dr	Y		88.4	0	1	0 (32)
A5	Wellington Rd	Y		96.1	3 (46)	5	1
A6	King Street	N		97.9	N/A	2	4

Where data capture is less than 90% the 98th percentile of hourly means is presented in brackets.

^adata capture for Market St monitoring periods as monitoring was only carried out for part of the year

^bdata capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)

^c The Market Street site ceased operation in October 2008 due construction works at a neighbouring development site. 2008 data collection was only 77%. The site was relocated in 2009.

Figure 2.5 Trends in Annual Mean PM₁₀.

2.2.3 Sulphur Dioxide

No monitoring of sulphur dioxide was carried out in 2010 as previous assessments did not predict a likelihood of exceedances of the objective and there has been no significant change in local emissions.

2.2.4 Benzene

No monitoring of benzene was carried out in 2010 as previous assessments did not predict a likelihood of exceedances of the objective and there has been no significant change in local emissions.

2.2.5 Other pollutants monitored

Monitoring of PM_{2.5} at Errol Place commenced in February 2009 as part of the UK automatic urban network (AUN). The new objectives for PM_{2.5} have not been incorporated into the LAQM regime and authorities are not required to review and assess air quality against the objectives. Table 2.7 shows the annual mean concentration in 2009 and 2010. These results indicate the PM_{2.5} objective value of 12ugm⁻³, to be achieved by 2020, is likely to be met at urban background sites in Aberdeen. Measuring in future years will determine whether the target of a 15% reduction in concentrations at urban background sites, measured as a 3-year mean is being achieved.

Table 2.7 Results of Automatic Monitoring for PM2.5: Annual Mean Concentration

Year	Data Capture for Monitoring Period (%)	Annual Mean (ugm ⁻³)
2009	60.6	7
2010	80	7

Monitoring of ozone is also carried out at Errol Place as part of the AUN. Concentrations of ozone are outwith the control of local authorities and hence ozone is not part of the Local Air Quality Management process. Action to reduce concentrations is a responsibility of the UK government and devolved administrations.

The national objective for ozone is a running 8-hour mean of 100ugm⁻³ not to be exceeded more than 10 times a year. Table 2.7 shows the annual mean concentration and number of exceedances of the 8-hour running mean at Errol Place over the period 2005-2010. It can be seen that the annual mean was lower in 2009 and 2010 compared 2005-2008. Changes in ozone are reflective of meteorological

conditions and relatively poor summers in 2009 and 2010 may have influenced concentrations. The number of exceedances of the 8-hour objective has varied considerably.

Table 2.7 Results of Automatic Monitoring for Ozone: Annual Mean Concentration

Year	Data Capture for Monitoring Period (%)	Annual Mean ($\mu\text{g m}^{-3}$)	Number of Days exceedances of 8-hour objective
2005	99.0	50	26
2006	99.0	48	13
2007	98.5	48	2
2008	98.9	50	30
2009	94.4	42	1
2010	90.3	44	0

2.2.6 Summary of Compliance with AQS Objectives

Aberdeen City Council has measured concentrations of nitrogen dioxide (NO₂) above the annual mean at Victoria Road outside of the City Centre AQMA and likely exceedances of the 1-hour objective within the City Centre AQMA. Exceedance of the annual mean objective was also measured on Auchmill Road, outside the Anderson Drive/Haudigan roundabout AQMA. Modelling of the City Centre and a Detailed Assessment of the Anderson Drive/Haudigan roundabout corridor were reported in 2010 and 2008 respectively. No further Detailed Assessment is proposed and amendment of both AQMAs to account for these exceedances is recommended.

3 New Local Developments

3.1 Road Traffic Sources

The 2010 Progress Report included information on a new retail park and new bus depot on a former brownfield site adjacent to Market Street/Guild Street bus which opened in November 2009. There are no other significant changes to road traffic sources since the last Updating and Screening Assessment.

3.2 Other Transport Sources

There are no other transport sources that are new since the last Updating and Screening Assessment.

3.3 Industrial Sources

There are no new industrial installations, major fuel storage depots, petrol stations or poultry farms since the last Updating and Screening Assessment.

3.4 Commercial and Domestic Sources

Table 3.1 summarises planning applications that were considered during 2010 for proposed new biomass combustion plants. A summary of each development and the outcome of air quality assessments is also provided. There are no areas where the combined impact of several biomass combustion sources or where domestic solid fuel burning may be relevant.

There is little domestic fuel burning in Aberdeen as the City is provided with a natural gas supply. Approximately 5-10 complaints are received each year regarding odours from domestic fuel burning. Although, at a national level, there has been an increase in solid fuel burning in recent years, this authority has not experienced a significant increase in complaints.

Table 3.1 Biomass combustion plant considered during 2010

Name	Location	Grid reference	Capacity	Description
Marishcal College	Broad Street, Aberdeen	X394289 Y806514	Min Fire 72kW, Max Fire 240kW	Wood pellet process
Duthie Park	Polmuir Road, Aberdeen	X393700 Y804600	500kW	Woodchip process

Marischal College

Marishcal College is former University premises situated within the City Centre and adjacent to the AQMA. The building is being modernised for new Council premises accommodating 900 employees and will be occupied in 2011, replacing St Nicholas House located directly across the road. Biomass was not originally the preferred fuel, but included following a minor change to the original planning application. The biomass boiler will utilise existing flues within the building.

An air quality assessment of the impact of the biomass emissions was undertaken by BMH Cordah Ltd. Predicted minimum (worst case) and maximum fire increases in annual mean NO₂ and PM₁₀ concentrations at sensitive receptors shown in Table 3.2. The biomass plant will be supported by a natural gas supply and is designed to operate primarily at maximum fire.

Receptor	Annual Mean increase in NO ₂ concentration (ugm-3)		Annual Mean increase in PM ₁₀ concentration (ugm-3)	
	Min fire	Max fire	Min fire	Max fire
Worst case sensitive receptor	0.48	0.07	0.08	0.22
Worst case sensitive receptor within AQMA	0.10	0.13	0.02	0.06
Max ground level in study area	0.63	1.18	0.27	0.27

Using the Environmental Protection UK guidance Development Control: Planning for Air Quality (2010 Update), the worst case magnitude of change would just fall within the small descriptor for both NO₂ and PM₁₀ with a slight adverse PM₁₀ impact. Under normal operations, the predicted impact would be negligible.

St Nicholas House has an oiled fired boiler and therefore replacement with a biomass development will result in no overall air quality deterioration. The Council is developing a specific planning policy on biomass developments to ensure that biomass is not the preferred source of heat and power within or adjacent to AQMAs or other locations where PM₁₀ concentrations are close to the annual mean objective.

Duthie Park

Duthie Park is located in open area away from other industrial and commercial processes and major roads. Background PM₁₀ and NO₂ levels are low. The preferred supplier/installation contractor requires to be confirmed. Planning approval requires the submission of plant operation information and risk assessment from the supplier to demonstrate the specific design will have no significant air quality impact. The biomass plant will replace an existing oil fired system and therefore it is anticipated there will be no detrimental impact on local air quality in the area.

3.5 New Developments with Fugitive or Uncontrolled Sources

No potential sources of fugitive or uncontrolled particulate matter were identified that are new since the last Updating and Screening Assessment.

Aberdeen City Council has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area.

- Marischal College biomass combustion plant, Broad Street
- Duthie Park biomass combustion plant, Polmuir Road

Both of the biomass processes were the subject of an air quality assessment and will not require further assessment. The Union Square retail development will be taken into consideration in the next Updating and Screening Assessment, scheduled for 2012.

4 Local / Regional Air Quality Strategy

There is no local or region Air Quality Strategy covering the Aberdeen area, however there are various City and Regional initiatives ongoing that consider air quality issues. These include work carried out by NETRANS and NHS Grampian described in Section 7.

5 Planning Applications

Section 3.4 describes biomass plant considered in the planning process. Table 5.1 provides information on other planning applications that have the potential to impact on air quality.

Table 5.1 Planning Applications with Potential Air Quality Impact

Location	Application Approved	Development Description	Air Quality Impact
3 rd Don Crossing, Tillydrone/Gordon's Mill Road	Under consideration. Will depend on financial resources	New road over River Don to reduce traffic congestion on existing crossing at King Street/Ellon	Some beneficial and detrimental impacts on existing City Centre AQMA. Air Quality Assessment described overall impact as neutral
Provision of 50m Swimming pool, Aberdeen Sports Village, King Street	Yes	Provision of new swimming pool with 180 car parking spaces and predicted 823 cars using facility per day	Air Quality Assessment predicted negligible significance in local area, however commented on the potential cumulative impact of similar small scale developments adjacent to City Centre AQMA.
Aberdeen Football Club, Loirston Loch	Yes	Construction of 21,000 seating football stadium with 1400 car and coach parking spaces	Air Quality Assessment predicted negligible significance in local area, however slight increase in NO ₂ /PM ₁₀ concentrations in Wellington Road AQMA.
Health Village, Fredrick Street	Yes	Construction of health centre, underground car park and multi-storey car park within/adjacent to City Centre AQMA	Air Quality Assessment predicted negligible air quality impact. Replacement of existing car parks and net decrease in overall parking provision
A96 Park and Ride	Yes	New Park and Ride to reduce traffic entering Aberdeen from north west	Air Quality Assessment predicted no NO _x impact and slight adverse PM ₁₀ impact. Site in area of good air quality and no risk of exceedance of objectives. Wider benefits to AQMAs if 'clean' buses used on route.

6 Air Quality Planning Policies

The Aberdeen City and Shire Structure Plan was approved in August 2009 and sets out the council's development policies over the next 25 years. No specific reference is made to air quality as these are considered in the Local Plan and Transport Strategy. Partnership arrangements have been adopted with Aberdeenshire Council to account for major developments in Aberdeenshire that have the potential to impact significantly on traffic volumes in Aberdeen. This includes developer contributions to improve the transport network and, as a result, reduce the air quality impact.

Aberdeen's Proposed Local Development Plan (LPD) was approved by the Council in August 2010 following a public consultation process. The new LDP will replace the 2008 Local Plan and sets out the Council's proposals for development and how policy issues will be addressed up until 2023. Formal consultation with key agencies commenced in September 2010 and, following consideration of comments, the LPD and associated draft Environmental Report was submitted to Scottish Ministers in April 2011. It is anticipated the final plan will be adopted in 2012.

Specific Air Quality Supplementary Guidance was produced during 2010 to accompany the LPD. This Guidance states the Council's policy on air quality in the planning context and criteria specifying when an air quality assessment would be expected, including the assessment methodology and mitigation proposals.

Guidance on biomass installations and a biomass boiler information request form, both based on the Environmental Protection UK publications, have also been produced for developers.

7 Local Transport Plans and Strategies

Aberdeen's Local Transport Strategy (LTS) was approved in March 2008 and details policies and interventions the council will adopt to guide the planning and improvement of the local transport network over the period 2008-2012. The Air Quality Action Plan (AQAP) and LTS are intrinsically linked and many of the actions within the draft AQAP build on the LTS. Various remedial measures outlined throughout the LTS are designed to improve air quality at hot spots, primarily through travel planning issues that aim to encourage modal shift by improving the attractiveness of walking, cycling and public transport. Specific policies and actions cover issues such as car parking, land use and travel planning, traffic management and infrastructure measures. Environmental Objective ENV3 is to 'reduce air quality throughout the City' with a target to comply with the national air quality objectives by 2012.

Various other initiatives are ongoing to address transport issues. For example, the Council works closely with Nestrans (the Transport Partnership for Aberdeen City and Aberdeenshire). The purpose of Nestrans is to develop and deliver a long term regional transport strategy and take forward transport improvements that support and improve the economy, environment and quality of life across Aberdeen City and Shire. The Nestrans Regional Transportation Strategy (RTS), developed in consultation with partners including Aberdeen City Council, received Ministerial approval in July 2008. Specific objectives within the Strategy that relate to air quality and climate change are as follows:

- Reduce the proportion of journeys made by cars and especially single occupant cars
- Reduce the environmental impact of transport in line with national targets
- Reduce growth in vehicle kilometres travelled.

Nestrans also produced a Freight Action Plan and Bus Action Plan in 2009 for Aberdeen City and Shire. Both of these Plans and the RTS complement and build on the objectives within the LTS by setting out measures to provide more sustainable transport within the area.

Additionally, NHS Grampian is developing a Health and Transport Action Plan (HTAP). A working group, with representation from the Council's Pollution and Planning Services, meets monthly to progress the Plan. The development and implementation of measures that will improve air quality will be key objectives of the HTAP. Issues being considered include an improved public transport service, improved access to public transport and health care facilities, the development and promotion of travel plans by partner organisations and a reduction in emissions from vehicle fleets operated by partner organisations. For example, in 2010 both Aberdeen City and Aberdeenshire purchased 3 electric vehicles through a Low Carbon Vehicle Procurement Support Scheme. Through the work of the HTAP these vehicles will be used for a shared mail delivery run to/from facilities operated by partner organisations including Aberdeen City Council, Aberdeenshire Council, NHS Grampian, Grampian Police and the Scottish Ambulance Service. Similar cross sector agency projects are proposed through the HTAP.

8 Climate Change Strategies

Aberdeen City Council does not have a Climate Change Strategy, however a Carbon Management Plan was adopted in April 2010. The Plan covers the period 2010-2015 and aims to reduce CO₂ emissions from Council buildings, vehicles, street lighting and landfill by 23% by 2015 and 42% by 2020. In 2007 Aberdeen City Council, along with other Scottish local authorities, signed the Climate Change Declaration demonstrating ongoing commitment to combating the effects of climate change. Aberdeen's Climate Declaration Report 2009 considers actions to reduce emissions from specific council operations and the wider authority area.

No specific reference is made to air quality in either report, however the majority of proposed actions will have a positive impact on air quality. For example, the Carbon Management Plan considers the council's fleet, including the introduction of alternative weekly collections to reduce the number of journeys, business travel plans and a review of the council's car usage, car parking and travel plans. Emissions from premises are also considered with the replacement of inefficient oil fired burners in schools and the main council office and a general reduction in energy usage. There are a few proposals within the Plan that will have a potential negative air quality impact. For example, an increase in fleet vehicles using biodiesel from 2 to 20 and the provision of a biomass boiler within the new main council building as reported in section 3.4.

Officers in the council responsible for climate change are part of the air quality action plan working group to ensure that future climate change and air quality policies are complementary. Consideration is being given to the development of a specific strategy covering both air quality and climate change. Work has commenced in the development of an Alternative Energy Strategy for Council Owned Public Buildings that will have both climate change and air quality benefits.

9 Implementation of Action Plans

Table 9.1 Action Plan Progress

No.	Measure	Focus	Lead authority	Planning phase	Implementation phase	Progress to date	Progress in last 12 months	Estimated completion date	Comments
1	Raise Public Awareness	Improve knowledge of health impacts of poor air quality	ACC	6 months	ongoing	-Web based public information system with real time data -Air quality promoted at ECO and other events -Leaflet produced 2006 -Air quality/environmental information included in new city wide Variable Message System	-Seminar with over 50 delegates on good practice to reduce carbon and improve air quality -widespread consultation on proposed new draft Air Quality Action Plan	Ongoing	Emission reduction not quantifiable
2	Use of cleaner fuels in council fleet	Sets a good example and reduces emissions	ACC	6 months	ongoing	-Council policy to replace LGVs after 7yrs, HGVs after 9yrs -particulate traps in pre-Euro 4 vehicles -2 LGVs on LPG -Vehicle tracking system on refuse vehicles to reduce routing and improve efficiency -7 low emitting pool cars available for all Council staff	-Fortnightly waste collections introduced to encourage waste recycling has additional benefit of reduced vehicle routing -all pre EURO 4 fleet vehicles retrofitted with PM ₁₀ emission traps	Ongoing	Council financial position restricting fleet replacement

No.	Measure	Focus	Lead authority	Planning phase	Implementation phase	Progress to date	Progress in last 12 months	Estimated completion date	Comments
3	Roadside emission testing	-Improve public awareness -media publicity	ACC	6 months	Annual vehicle testing	-Testing carried out in 2006, 2007, 2008, 2010	2 days formal testing (day 3 cancelled due to weather). 1 Fixed Penalty Notice served	Ongoing	Testing proposed for 2011 depending on grant funding
4	Idling vehicles/request to switch off engine	Improve awareness of air quality issues	ACC	6 months	Ongoing	-Traffic wardens trained, however replaced with City Wardens in 2008	Sites for 'No Idling' signs identified and liaison with City Wardens on enforcement protocols	Ongoing	Signs to be installed early 2011 with increased awareness, leaflet distribution and commencement of enforcement through City Wardens
5	Support increase of use of public transport	Improve service, information systems and fleet quality	ACC/bus companies/Nestrans	6 months	Ongoing	-Quality Bus Partnership formed and NESTRANS' Bus Action Plan produced Dec 2009 -2007-09 approx £1m invested on upgrading bus corridors and other improvements -Real time information on bus shelters	-Quality Bus Action Plan refreshed in April 2010 with new targets and a Bus Punctuality Improvement Partnership agreement signed in April 2010 -First Bus Priority Corridor and bus lane on Buchan/King St identified, approved and designed. Second corridor identified on A96 and assessment ongoing. -Real time website with real time bus	Ongoing	

No.	Measure	Focus	Lead authority	Planning phase	Implementation phase	Progress to date	Progress in last 12 months	Estimated completion date	Comments
							information development and operational -City Bus Information Strategy approved and implementation to commence 2011		
6	Advisory signs for HGVs to avoid AQMA	Promote re-routing of HGVs from city centre	ACC	6 months	12 months	-signs not implemented -VMS car parking guidance system for city centre introduced 2007	-NESTRANS' Freight Action Plan produced Dec 2009 and Freight Forum established. -Freight route plans developed and will be widely circulated and available electronically		Re-routing of HGVs may result in increased HGVs on Anderson Dr AQMA
7	Development Control – Green Transport Plans	Regulate traffic generation	ACC	ongoing	ongoing	-Development of regional car-share database -Introduction of Sustainable Travel Grant Scheme -Annual Green Transport Week -Annual Bike Week -Green Transport Plans required for all developments -Updated Council Travel Plan -Local Transport Strategy adopted (2008-12)	-Car share database established and numbers growing -Sustainable Transport Grant Scheme operational -Getabout partnership formed to promote sustainable transport -City Centre Car Club spaces approved and appointment of Car Club provider being progressed -Internal resources provided to improve assessment of	Ongoing	Proposals to advertise and implement Car Club summer 2011

No.	Measure	Focus	Lead authority	Planning phase	Implementation phase	Progress to date	Progress in last 12 months	Estimated completion date	Comments
							Green Travel Plans and I-Trace programme purchased to monitor travel plans -Supplementary Guidance (SPG) on Transport and Accessibility in draft new Local Development Plan (LDP) -Guidance for developers on Travel Plans introduced		
8	Air quality assessment required for all new developments/road schemes	Reduce impact of new developments	ACC	Ongoing	Ongoing	-assessments required for major developments and mitigation sought	-Supplementary Planning Guidance (SPG) on air quality in draft LDP. Public consultation on draft LDP and SPG completed.	Ongoing	Draft LDP approved by Council April 2011 and sent to Scottish Government Reporter for Examination over summer 2011
9	Park and Ride	Reduce cars entering city centre	ACC, bus companies	2 years	2012	A90 south and A96 Park and Rides committed	-Planning permission for A90 P and R granted August 2010 and land acquisition being progressed -A90 south site being progressed and planning application proposed for spring 2011 -Study commenced into the relocation of	2012	Discussions ongoing with Scottish Government for consideration to include P and R construction within the AWPR contract. Completion dependent on progress of

No.	Measure	Focus	Lead authority	Planning phase	Implementation phase	Progress to date	Progress in last 12 months	Estimated completion date	Comments
							Bridge of Don P and R site		AWPR
10	Pedestrianisation of Union St and city centre road infrastructure	Improved environment for residents/shopping and improved/alternative routes for vehicles	ACC		2012	-Traffic management/road infrastructure improvements in city centre e.g. Market St, College St	No further progress at this time as measures to mitigate cross city traffic require implementation first. Capital funding to progress currently unavailable		Pedestrianisation dependent on completion of AWPR. Dispersion modelling indicated overall air quality improvement
11	Parking Policy	Manage parking by Controlled Parking Zones, charging levels and enforcement	ACC	Ongoing	2-5 years	-New zones Ferryhill and George St	-Council and Regional Car Parking Strategies developed -Feasibility study of emission based charging for car permits	Ongoing 2010 for Strategies	-Progress the potential introduction of emission based charging for car permits in 2011
12	Accord Card	Quicker boarding of buses as money not required	ACC	2-5 years	2-5 years	-Accord Card introduced	Integrated ticketing being considered as part of Bus Action Plan		
13	AWPR	Alternative route to avoid city centre and existing peripheral routes	ACC/Aberdeenshire Council/Scottish Govt	2 years	2-5 years	-Route finalised March 2006. Public enquiry December 2008 and Ministerial final approval 2009.	Legal challenged submitted to Court of Session in May 2010.	2012	Awaiting appeal outcome. If successful, a review of remaining stages of project required before issuing a definite timetable for construction
14	Cross-rail to/from city	Improve rail provision and	Nestrans	2-5 years	Over 7 years	-Laurencekirk station opened May 2009 –	Proposals developed for a new station at	Ongoing	Proposals for Kintore station

No.	Measure	Focus	Lead authority	Planning phase	Implementation phase	Progress to date	Progress in last 12 months	Estimated completion date	Comments
	and outwith city	public use of rail travel				greater public usage than predicted -NESTRANS developed a rail action plan -High growth in rail patronage at all north east stations	Kintore as part of Transport Scotland assessment of Aberdeen-Inverness line		ongoing
15	Low Emission Zone	Reduce emissions in City Centre	ACC/Aberdeen University	2-3 years	3-4 years	Funding secured for LEZ study	Study commenced 2010. Interim report indicated greatest benefit from bus LEZ on Union St and HGV LEZ in Market St	Ongoing	Detailed study delayed due to uncertainty in emission factors. Awaiting guidance from DEFRA

ACC - Aberdeen City Council

Nestrans - the Transport Partnership for Aberdeen City and Aberdeenshire

A new draft Air Quality Action Plan covering all three AQMAs was developed in 2010 to replace the outdated 2006 City Centre Action Plan. Consultation on the Plan ran from 7 October – 26 November 2010 and included the production of an information leaflet, survey monkey questionnaire, made available on-line, and poster which were widely circulated in community centres, libraries and other Council premises. Additionally, letters and emails were issued directly to relevant stakeholders and information circulated within partner organisations such as NESTRANS and NHS Grampian. The draft AQAP was also promoted at a Carbon Responsible Transport Strategy (Care-North) seminar jointly hosted by Aberdeen City Council and Aberdeen University in October 2010. Over 50 delegates attended with speakers from both the UK and partner European countries including Sweden, Denmark and Germany. Although the seminar was aimed at CO₂ reduction, measures to improve air quality were widely demonstrated by the speakers including LEZs, public transport improvements and urban design.

Over 200 surveymonkey questionnaire responses were received with additional written responses. A wide variety of opinions were received, predominantly supporting the measures within the draft Action Plan. Responses from statutory consultees, the Scottish Government and SEPA were also positive. In view of the positive feedback, only minor changes were made to the draft Plan. The final Air Quality Action Plan 2011 was approved by the Council in March 2011. Implementation of the Actions are ongoing, however a publicity exercise will be launched during 2011.

One of the measures in the draft Action Plan was a feasibility study into the development of a City Centre LEZ. The study commenced in 2010 and an interim report indicated greatest benefit from a bus LEZ on Union Street and a HGV LEZ on Market Street. Work commenced on a Detailed Assessment of these options, however completion has been delayed due to recent reports indicating current vehicle emission factors may not be representative. The study will be progressed in 2011 when national guidance is received.

10 Conclusions and Proposed Actions

10.1 Conclusions from New Monitoring Data

Data from continuous and diffusion tube monitoring confirmed the annual mean NO₂ objective continues to be exceeded at locations across the City Centre AQMA. Diffusion tube values just outwith the AQMA remain below the objective with the exception of a tube at 86 Victoria Road, Torry to the south of Market Street.

There were 17 exceedances of the 1-hour objective recorded at the Union Street continuous monitoring site both in 2010, however data capture was only 79% indicating likely exceedance of the objective. The objective was also exceeded in 2008, although concentrations were below the objective in 8 previous years of monitoring. The recent results indicate there is a potential for exceedance of the objective in future years. Diffusion tubes at a number of sites across the City Centre AQMA also recorded measurements in excess of 60ugm⁻³ indicating a risk of exceedance of the 1-hour objective. Exceedance of the objective was routinely recorded at the former Market Street continuous monitoring site, however levels were well below the objective at the new site in both 2009 and 2010. The more open nature of this site and less standing traffic are likely to account for the lower concentrations measured at this location.

Modelling of air quality in the City Centre was carried in 2009/10 using 2008 as the base year for traffic data. Concentrations in excess of the annual mean objective were mainly predicted within the AQMA, however concentrations over 40ugm⁻³ were predicted at the following locations of relevant population exposure just outwith the AQMA.

- King Street, to the north of the existing AQMA
- West North Street, new student accommodation (previously no relevant exposure at this location)
- Victoria Road, just to the south of the River Dee
- Bridge Street, just of Union Street

A diffusion tube on King Street, just to the north of the existing AQMA measured concentrations below the objective. Local knowledge, based on building location and traffic composition indicate potential exceedance at the new West North Street student accommodation. Similarly, it is recognised that a small section of Bridge Street, linking Guild Street to Union Street, should have been previously included in the City Centre AQMA.

The modelling also predicted concentrations in excess of 60ugm⁻³ in 2008 at Union Street, Market Street, Commerce Street, Virginia Street, and at the southern end of King Street. Although levels were predicted to fall below 60ugm⁻³ by 2012, the modelling and measured results indicate a risk of exceedance of the 1-hour objective across the AQMA.

Diffusion tube monitoring on Wellington Road and the Anderson Drive/Haudigan roundabout corridor continue to show pockets of exceedance of the annual mean NO₂ objective within the Wellington Road and Anderson Drive/Haudigan roundabout AQMAs. The bias adjusted diffusion tube on Auchmill Road, outwith the Anderson Drive AQMA, recorded exceedances of the annual mean objective in 2008 and 2010 suggesting the Anderson Drive/Haudigan roundabout AQMA should be extended to include this area. Diffusion tube measurements outwith the Wellington Road AQMA recorded levels below the annual mean objective indicating the boundary of this AQMA remains representative.

The 2004 annual mean and 24-hour objectives for PM₁₀ were met at all sites, although in previous years both objectives were exceeded at Market Street. Again, the location of the new monitoring station is likely to account for the lower readings in 2010.

Exceedance of the 2010 annual mean was recorded at Wellington Road and Market Street while the concentration at Union Street and King Street reached the objective value of 18µg m⁻³. The objective was met at the Errol Place, Anderson Drive and continuous monitoring stations. All sites met the 24-hour objective that required to be met by 2010 with the exception of Market St. There were 6 exceedances of the objective over a 9 month monitoring period at this site indicating there is a potential of exceedance of the objective in future years.

The 2009 Updating and Screening Assessment and dispersion modelling of the City Centre in 2010 indicated likely exceedances of the annual mean PM₁₀ objective across the wider City Centre area. Changes to the methodologies to correct data and the replacement of TEOMs with FDMS and BAM equipment at Errol Place and Market Street prevented the direct comparison of 2009 and 2010 with previous years, however recent data indicates the 1.14 correction factor is perhaps more appropriate for Aberdeen sites. Accordingly, the extent of potential exceedances is likely to be less than previously anticipated. Based on the 2010 monitoring data, the boundaries of the AQMAs for PM₁₀ appear representative.

10.2 Conclusions relating to New Local Developments

There are no new local developments that will require more detail in the next Updating and Screening Assessment.

10.3 Other Conclusions

A new draft Air Quality Action Plan covering all three AQMAs was developed in 2010 to replace the outdated 2006 City Centre Action plan. The draft Plan was approved in March 2011 and a publicity exercise will be launched during 2011.

The Council's Proposed Local Development Plan (LDP) was approved by the Council in August 2010 and, following a formal consultation process, submitted to Scottish Ministers for consideration in April 2011. Specific Air Quality Supplementary Guidance was produced to accompany the LPD. This Guidance states the Council's policy on air quality in the planning context and criteria specifying requirements for air quality assessments.

10.4 Proposed Actions

Diffusion Tube monitoring identified exceedance of the annual mean NO₂ objective on Victoria Road, just south of the City Centre AQMA. The 2010 City Centre modelling study also predicted concentrations above the objective on the northern section of Victoria Road, adjacent to new student accommodation on West North Street and on Bridge Street. **Based on these findings, it is proposed to slightly extend the boundaries of the AQMA to include these areas.**

Data from the Union Street continuous monitor measured exceedance, or likely exceedance, of the 1-hour objective both in 2008 and 2010. Diffusion tube monitoring also measured concentrations in excess of 60ugm⁻³ at various locations across the City Centre. Similarly the 2010 modelling study predicted concentrations in excess of 60ugm⁻³ on Market Street, Union Street, Virginia Street, Commerce Street and the southern section of King Street. **Based on these findings, it is proposed that the City Centre AQMA is also amended to include the likelihood of exceedance of the 1-hour objective.**

A diffusion tube on Auchmill Road, just outwith the Anderson Drive/Haudagain roundabout AQMA has repeatedly measured concentrations close to, or slightly above the annual mean objective. The Detailed Assessment carried out in 2008 prior to the declaration of the AQMA did not extend to the location of this diffusion tube, however traffic flows are similar to the locality of the AQMA at the Haudagain roundabout. Additionally flatted properties are located within 3-4m of the kerb in an area where standing traffic is common during peak periods. Little merit would be gained from a further Detailed Assessment in this area and, given the likelihood of further exceedance, **it is proposed to extend the existing AQMA to include the section of Auchmill Road between Haudagain roundabout and Howes Road.** Concentrations from the diffusion tube at Bucksburn Primary School, at the boundary of the proposed new AQMA and in a more open area where properties are set further back from the roadside, are below the objective.

11 References

- 1 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DETR July 2007.
- 2 Environment Act 1995.
- 3 The Air Quality (Scotland) Regulations 2000.
- 4 The Air Quality (Scotland)(Amendment) Regulations 2001.
- 5 Aberdeen City Council Updating and Screening Report August 2003.
- 6 Aberdeen City Council Detailed Assessment of Air Quality, August 2004.
- 7 Aberdeen City Council Air Quality Action Plan July 2006.
- 8 Aberdeen City Council Updating and Screening Assessment, July 2006
- 9 Aberdeen City Council Progress Report, June 2007
- 10 Aberdeen City Council Detailed Assessment, March 2008
- 11 Local Air Quality Management Technical Guidance LAQM, TG(09), DEFRA, February 2009
- 12 Local Air Quality Management Policy, (PG)(S)(09), DEFRA, February 2009
- 13 Aberdeen City Council Updating and Screening Assessment, July 2009
- 14 Aberdeen City Council Air Quality Modelling Study, March 2010
- 15 Aberdeen City Council Progress Report, July 2010
- 16 Aberdeen City Council Action Plan 2011

Appendices

Appendix A

Figure A1 Map of City Centre AQMA

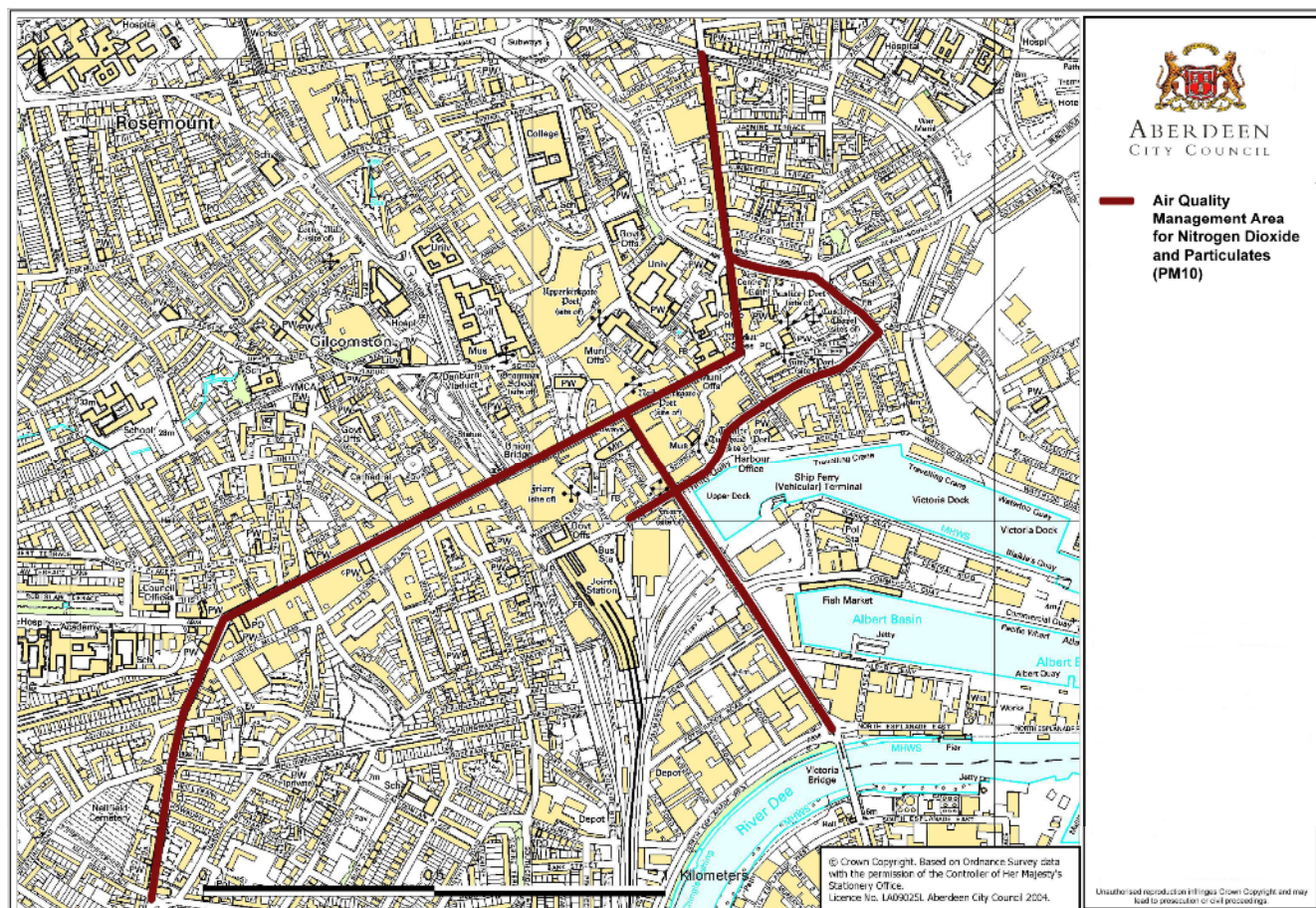


Figure A2 Map of Anderson Drive AQMA

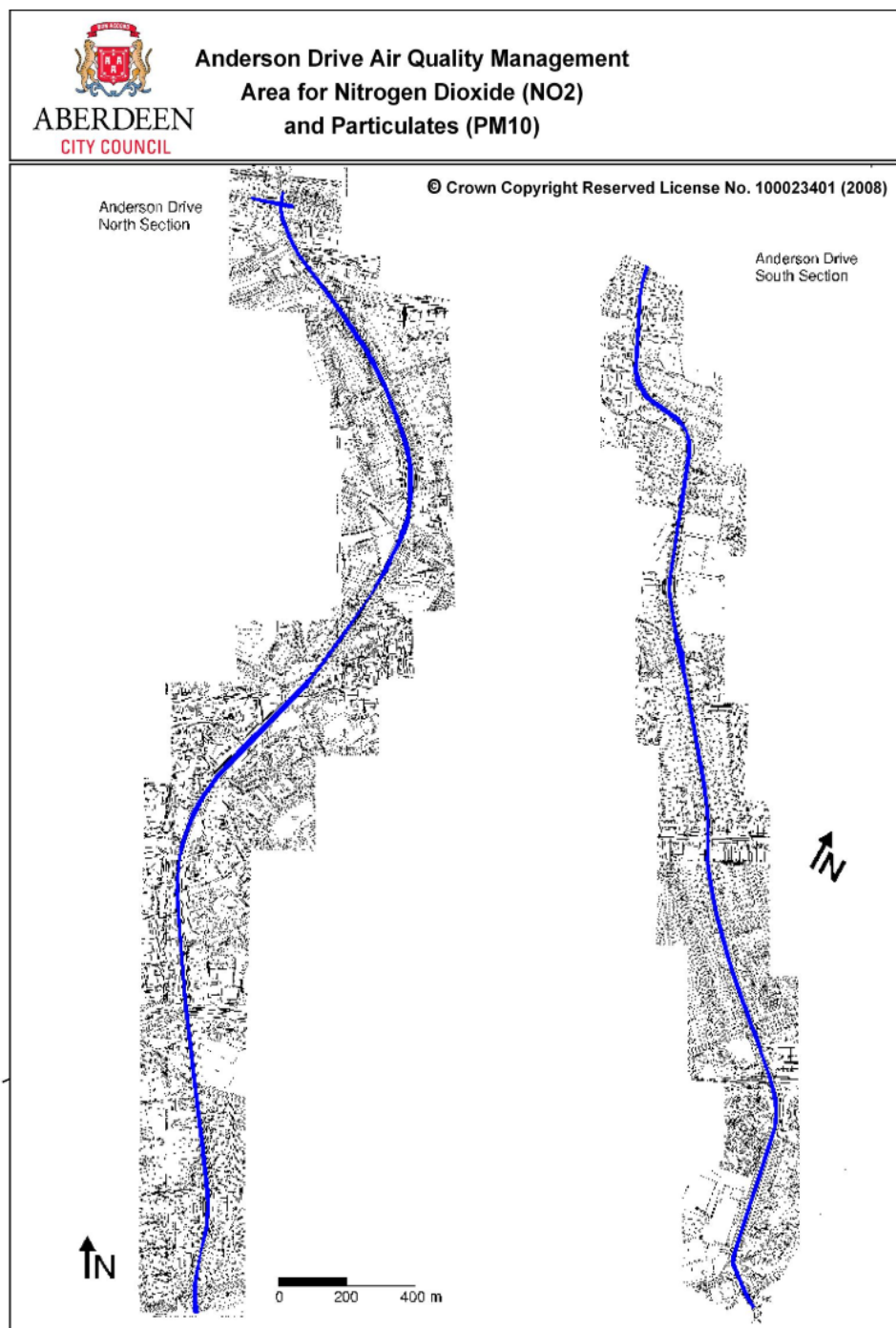
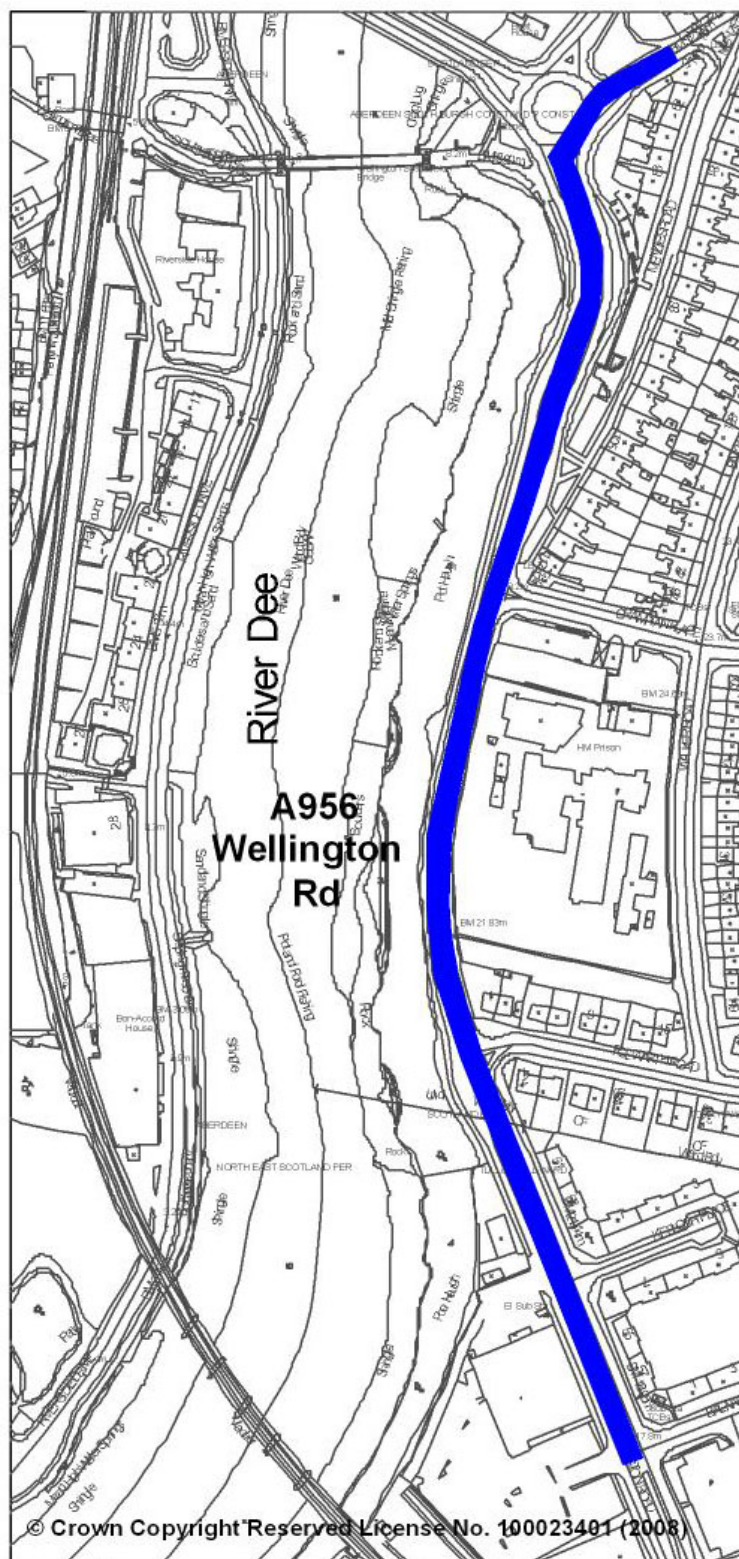


Figure A3 Map of Wellington Road AQMA



ABERDEEN
CITY COUNCIL

**Wellington Road
Air Quality Management
Area for Nitrogen Dioxide (NO₂)
and Particulates (PM₁₀)**

Figure A4 Continuous Monitoring and Diffusion Tube Locations

Appendix B: QA:QC Data

Diffusion Tube Bias Adjustment Factors

Diffusion tube monitoring is carried in accordance with the procedures contained in the guidance 'Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance for Laboratories and Users' and LAQM.TG(09). All tubes, other than those co-located at the continuous analysers are attached to lampposts/downpipes at a height of 2m above ground level and exposed for 4 weeks. Co-located tubes are located in triplicate close to the analyser air intake. All exposure times are recorded. Three unexposed travel blanks are submitted to the laboratory with each batch of exposed tubes.

The tubes are provided by Gradko International and analysed by Aberdeen City Council's Public Analyst. The preparation technique is 20% tri-ethanolamine in water.

Factor from Local Co-location Studies

Spreadsheets downloaded from the internet were used to calculate bias adjustment factors and the precision and accuracy of the co-located tubes. Table A1 summarises the bias adjustment factors. Only data with good precision and accuracy has been used. Errol Place and Market St data is included for reporting purposes only, the bias factor has not been applied to correct diffusion tube data. Errol Place is an urban background site while the others sites are roadside.

Table A1 Bias Factor Calculations

Type	DT Value	CM Value	Bias Factor	CM Data Capture	No Monitoring Periods
Errol Place	28	21	0.76	71.6	7
Union Street	56	56	1.0	78.9	9
Market Street	55	42	0.77	78.0	8
Anderson Dr	29	25	0.87	89.2	9
King Street	36	29	0.82	99.4	12
Wellington Road	57	51	0.89	95.4	11

Discussion of Choice of Factor to Use

The web based spreadsheet of national bias adjustment factors (NBAFS) was reviewed however there was only one study for 2010 (Aberdeen). Although the laboratory undertakes the analysis of diffusion tubes from neighbouring authorities, Aberdeen City Council is the only authority with continuous monitoring stations that can be used to calculate bias adjustment factors. Accordingly, a locally derived bias factor based on the co-located tubes at the continuous monitoring stations was used to adjust diffusion tube measurements at the other locations across the city. Diffusion tubes were adjusted using the bias factor from the nearest relevant continuous monitoring site. Where there is no relevant continuous monitor, the mean of the bias factors was applied. This process was considered appropriate due to the

lack of other co-located studies using the laboratory for tube analysis, the remote location of Aberdeen from other conurbations and the good QA/QC performance of the laboratory. Data for Aberdeen will be included in the national factors in future years.

As the NBAFS is available for 2010, it was considered appropriate to additionally report data adjusted with the NBAFS factor thereby providing a more comprehensive understanding of the impact of different factors. Bias adjusted diffusion tube data is shown in Table 2.4 where Factor A is the locally derived factor and Factor B the NBAFS factor.

PM₁₀ Monitoring Adjustment

All 2009 and 2010 TEOM data from Union Street, Anderson Drive and Wellington Road was corrected to gravitational equivalent by AEA using the Volatile Correction Model (VCM). Data from the BAMs at King Street and Market Street were also corrected by AEA using a gravitational factor of 0.83333 for Gravitational Equivalent.

Short-term to Long-term Data adjustment

Data capture at Errol Place was less than 75% (71.6%) and has been seasonally adjusted. There are no urban background site with 50km of Aberdeen, however the Review and Assessment Helpdesk advised it was appropriate to calculate a seasonally adjusted value using the mean ratio from the Edinburgh St Leonards and Glasgow City Chambers urban background sites. For comparative purposes, the Aberdeen roadside sites were also used to annualise the Errol Place data and provided a similar value (21.6 $\mu\text{g m}^{-3}$ compared to 21.0 $\mu\text{g m}^{-3}$ for Edinburgh St Leonards/Glasgow City Chambers). Table A2 shows the calculations to annualise the data. Union Street and Market Street data for 2009 and Wellington Road 2008 were similarly annualised.

Table A2 Short to Long-term Adjustment of Continuous Monitoring NO₂ Data

Site	Site Type	2010 Mean (Am) ^b	Annual (ugm ⁻³)	Period Mean (ugm ⁻³) (Pm) ^a	Ratio (Am/Pm)
Edinburgh St Leonard's 2010 CM	Urban background	31		32.4	0.957
Glasgow City Centre 2010 CM	Urban background	49		52.2	0.939
Errol Place 2010 CM	Urban background	21.0		22.2	n/a
Errol Place 2009 CM	Urban background	25.6		24.0 (for Union Street data)	1.07
Union St CM	Roadside	55.5 ^b		52	n/a
Errol PI 2009 CM	Urban background	25.6		27.0 (for Market St data)	0.95
Market St CM	Roadside	38.0 ^b		40	n/a
Errol Place	Urban	25.4		27.5 (for	0.92

2008 CM	background		Wellington Rd data)	
Wellington Road 2008 CM	Roadside	36.7 ^b	39.8	n/a

^aPeriod mean for Errol Place 2010, Union St January–September 2009; Market Street August–October 2009; Wellington Road July–December 2008

^bPeriod mean adjusted using the ratio (Am/Pm) for Errol Place CM

2010 PM₁₀ data for Market Street was only available for the period April–December. Data has therefore been annualised using the Errol Place background site. Similarly Market St 2009 and Wellington Road 2008 data has been annualised. Table A3 shows the calculations to annualise the data.

Table A3 Short to Long-term Adjustment of Continuous Monitoring PM₁₀ data

Site	Site Type	2010 Annual Mean (Am) ^b (ugm ⁻³)	Period Mean (ugm ⁻³) (Pm) ^a	Ratio (Am/Pm)
Errol Place CM 2010	Urban background	13.5	12.14	1.12
Market St CM 2010	Roadside	22.3	20.0	n/a
Errol Place CM 2009	Urban background	15.3	13.3 (for Market St CM)	1.15
Market St CM 2009	Roadside	27.6 ^b	24	n/a
Errol Place CM 2009	Urban background	18.1	18.2 (for Wellington Rd CM)	1.0
Wellington Rd CM 2009	Roadside	26.5 ^b	26.5	n/a

^aPeriod mean for Market Street April–December 2010 and August–October 2009 and Wellington Road July–December 2008

^bPeriod mean adjusted using the ratio (Am/Pm) for Errol Place CM

QA/QC of automatic monitoring

All equipment is subject to the QA/QC procedure recommended with LAQM.TG(09). Equipment is serviced by the equipment supplier at 6 monthly intervals. The contract includes call outs to site for repairs and the routine replacement of consumables.

The Errol Place and Union Street sites are part of the UK's Automatic Urban Network. All sites are part of the Scottish Government data reporting process and subject to independent audit by AEA Technology plc at 6 monthly intervals. Data validation and ratification is also performed by AEA Technology plc.

The analysers perform daily automatic calibrations which are used to assess the routine performance of the analysers and any long term response drift. Manual calibrations are performed by trained Council officers every two weeks using a calibration mixture traceable to national standards. These calibrations act as a check on the operation of the analysers and enable determination of the instrument response factors used to calculate the concentration of NO₂.

Data is checked daily (Monday-Friday). Should a problem be identified either by Council officers or by AEA Technology the site is visited immediately and, if necessary, a further manual calibration is performed. Data considered suspect is deleted. Records are kept of instrument breakdowns, services and audits and any local activities or weather that may influence readings.

QA/QC of diffusion tube monitoring

Aberdeen City Council's Public Analyst is UKAS accredited for the analysis of diffusion tubes and also participates in the WASP scheme and the monthly intercomparison exercise managed by AEA. UKAS carried out an annual assessment of the laboratory in March 2011 to ensure laboratory guidance is being implemented. No problems were identified. The WASP Annual Performance Criteria for NO₂ Diffusion Tubes covering 2010 classified the laboratory as 'Good'.

Appendix C: Diffusion Tube Data and Calculations

Table A4 Measured 4-weekly diffusion tube data

Site	Ref	Monitoring Period													Mean (ugm-3)	SD
		1	2	3	4	5	6	7	8	9	10	11	12	13		
Bucksburn Primary School	1	44	45	51	36	36	40	32	33	39	39	42	40	57	41	7
885 Gt Northern Rd at Haudigan	2	49	60	64	39	52	67	53	54	60	64	63	59	66	58	8
549 North Anderson Drive	3	46	54	54	37	49	46	40	34	50	46	53	45	58	47	7
38 Ellon Road	4	33	56	43	48	36	44	35	31	44	45	53		53	43	8
Linkfield Centre, 520 King Street	5	42	53	59	44	46	49	44	39	49	45	60		56	48	7
86 Victoria Road, Torry	6	46	50	54	40	41	25	33	32	41	37	51		53	42	9
Wellington Rd/ Kerloch Place	7	46	69	41	46	52	50	43	41	49	49	52		62	50	8
107 South Anderson Drive	8	72	90	77	66	62	64	53	51	68	60	83		81	69	12
31 Market St	9	70	66	69	63	55	60	59	52	61	61	62	63	77	63	7
184/192 Market St	10	72	85	91	81	73	69	57	57	76	69	90		88	76	12
105 King St	11	63	77	60	68	61	54	53		63	69	78	70	80	66	9
40 Union St	12	68	65		63	62	58	56	49	59	61	65	57	76	62	7
Music Hall, Union St	13	64	57	61	97	55	45	43	37	47	43	56	61	80	57	16
Dyce Primary School	14	20	18	18	13	10	13	9	9	8	13	16	17	23	14	5
Northfield Swimming Pool	15	19	29	21	17	13	16	12	12	12	18	18	21	20	18	5
Guild St/ Market St roundabout	16	80	76	69	59	60	52	60	49	57	51	58	66	76	63	10
43/45 Union St	17	62	66	49	63	55	60	65	54	60	62	70	61	63	61	5
14 Holburn	18	74	49	80	64	68	63	54	49	66	55	67	74	102	67	14
468 Union St	19	73	72	76	62	64	54	48	50	62	58	65	95	102	68	16
212 King St	20	38	44	42	41	35	37	32	31	32	39	41		44	38	5
26 King Street	21	45	47	42	45			45	41	47		52	47	50	46	3
104 King St	22	51	57	52	45	53	53	53	45	49	55	59	52	52	52	4
785 Gt Northern Road at Shell garage	23	66	51	59	55	39	44	30	31	46	48	46	59	77	50	13
40 Auchmill Road	24	55	52	55	49	46	46	35	34	45	44	46	59	73	49	10
21 Holburn	25	63	55	67	48	55	53	49	48	58	45	60	55	61	55	7
147 Holburn Street	26	52	44	46	29	35	36	30	35	35	36	41		42	38	7
82 Holburn St (Malt Mill)	27	54	45	44	34	37	32	31	28	32	30	41	43	48	38	8
61 Holburn Street	28	53	58	52	42	47	45	40	38	48	41	52	55	56	48	7
469 Union Street	29	70	65	58			62	55	62	62	61	71	76	76	65	7

209 Union St	30	55	66	59	70	63	58	57	56	58	54	65	71	73	62	6
249 Holburn Street	31	49	48	46	36	36	38	32	34	37	38	44		48	41	6
Willowbank Road./Albury Rd	32	38	36	35		25	23	17	20	20	18	30		41	28	9
East North Street	33	51	58	55	51	53	52	46	49	41	51	63		68	53	7
404 King Street	34	37	47	46	36	33	32	28	29	30	36	45		43	37	7
Riverside House, Riverside Dr.	35	37	41	44	28	37	29	23	27	29	27	35		36	33	6
115 Wellington Road	36	66	79	67	52	71	70	62	56	64	60	74		75	66	8
137 Wellington Road	37	45	43	41	37	36	34	32	29	34	32	38		48	37	6
Wellington Rd / 4 Nigg Kirk Rd	38	36	46	53	31	31	36	35	29	36	32	36		38	37	7
819 Gt Northern Rd	39	62	61	65		58	58	57	57	55	57	65	71	72	62	6
852 Fullerton Court	40	53	47	47	36	34	42	29	46	34	38	42	64	60	44	10
852 Fullerton Court Roadside	41	68	56	60	49	43	50	41	34	50	55	56	50	78	53	11
248 George St	42	40	49	40	31	37	36	31	32	34	39	46		45	38	6
25 Rosemount Place	43	35	36	36	28	26		27	28	27	35	37		41	32	5
214 Rosemount Pl	44	38	37	38	24	25	28	21	22	23	26	38		36	30	7
111 South Anderson Drive		46	55	44	39	41	34	30	28	35	32	44		42	39	8

Table A5 Annual Mean Biased adjusted diffusion tube data and correction to façade

Map Ref	Site	Measured Conc (ugm-3)	Bias Factor A Conc (ugm-3)	Façade Conc (ugm-3)	Bias Factor A site used (ugm-3)	Bias Factor B Conc (ugm-3)	Façade Conc (ugm-3)
1	Bucksburn Primary Sch, Inverurie Rd	41	37	37	Mean	34	34
2	885 Gt Northern Road	58	52	39	Mean	47	36
3	549 North Anderson Dr	47	42	30	Mean	39	28
4	38 Ellon Road	43	36	31	KS	36	31
5	Linksfeld Centre, 520 King St	48	40	31	KS	40	31
6	86 Victoria Road Torry	42	41	41	US	34	34
7	Wellington Rd/ Kerloch Pl	50	45	45	WR	41	41
8	107 Anderson Drive	69	60	42	AD	57	40
9	31 Market St	63	63	63	US	52	52
10	184/192 Market St	76	76	76	US	62	62
11	105 King Street	66	66	66	US	54	54
12	40 Union St	62	62	62	US	50	50
13	Music Hall Union St	57	57	57	US	47	47
14	Dyce Primary, Gordon Terr	14	13	13	Mean	12	12
15	Northfield swimming pool, Keppleshill Cres	18	18	18	Mean	14	14
16	Guild St/ Market Street	63	63	63	US	51	51
17	43/45 Union St	61	61	61	US	50	50
18	14 Holburn St	67	67	67	US	55	55
19	468 Union St	68	68	68	US	56	56
20	212 King Street	38	38	38	US	31	31
21	26 King Street	46	46	46	US	38	38
22	104 King St (Gala Bingo)	52	52	52	US	43	43
23	785 Gt Northern Road	50	45	36	Mean	41	33
24	40 Auchmill Road	49	44	44	Mean	40	40
25	21 Holburn St	55	55	55	US	45	45
26	147 Holburn Street	38	38	38	US	32	32
27	82 Holburn St	38	38	38	US	32	32
28	61 Holburn Street	48	48	44	US	40	37
29	469 Union Street	65	65	65	US	54	54
30	209 Union St	62	62	62	US	51	51
31	249 Holburn Street	41	41	41	US	33	33
32	Willowbank Rd/Albury Rd	28	28	27	US	22	22
33	East North Street	53	53	53	US	44	44
34*	404 King Street	37	33	33	KS	30	30
35	Riverside House,	33	30	30	WR	27	27

	Riverside Dr.						
36	115 Wellington Road	66	59	42		54	40
37	137 Wellington Road	37	33	32	WR	31	30
38	Wellington Rd / 4 Nigg Kirk Rd	37	33	33	WR	30	29
39	819 Great Northern Road	62	55	55	Mean	50	50
40	852 Fullerton Court	44	40	40	Mean	36	36
41	852 Fullerton Court Roadside	53	48	28	Mean	44	26
42	248 George Street	38	38	38	US	31	31
43	25 Rosemount Place	32	32	32	US	27	27
44	214 Rosemount Place	30	30	30	US	24	24
45	111 South Anderson Drive	39	32	32	AD	32	32

Bias Factor A: Data corrected using most relevant continuous monitoring station.
The mean

factor has been used where there is no representative continuous monitoring site

Bias Factor B: Data corrected using National Diffusion Bias Adjustment Spreadsheet

Table A6 Diffusion Tube concentrations showing calculations to façade (Factor A)

Site Ref	Site	Bias Factor A Conc Cy (μgm^{-3})	Background Conc (μgm^{-3})	Dist to kerb Dy (m)	Dist façade Dz (m)	Calculated Façade Conc (μgm^{-3})
2	885 Gt Northern Rd	51.9	13.5	3	11	39
3	549 North Anderson Dr	42.4	15.3	3	17	30
4	Ellon Rd	35.6	14.9	3	7	31
5	Linksfild Crossing	40	25.5	0.1	9	31
8	107 South Anderson Dr	60	14.9	3	14	42
23	785 Gt Northern Rd	45.1	13.5	3	9	36
28	61 Holburn St	48.2	20.8	3	5	45
32	Willowbank Rd	27.6	20.8	3	5	27
36	115 Menzies Rd	59	19.8	1	8	43
37	137 Wellington Rd	33.3	23	10	13	32
38	Wellington/Nigg Kirk Rd	32.6	23	3	7	31
41	Fullerton Court roadside	47.8	13.4	0.1	7	28
43	25 Rosemount Place	32.4	20.7	3	3	32
		51	21	4	9	44

Table A7 Diffusion Tube concentrations showing calculations to façade (Factor B)

Site Ref	Site	Bias Factor B Conc Cy	Background Conc	Dist to kerb Dy (m)	Dist façade	Calculated Façade
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		(ugm ⁻³)	(ugm ⁻³)		Dz (m)	Conc (ugm ⁻³)
2	885 Gt Northern Rd	47.31	13.5	3	11	36
3	549 North Anderson Dr	38.61	15.3	3	17	28
4	Ellon Rd	35.6	14.9	3	7	31
5	Linksfeld Crossing	40.04	25.5	0.1	9	31
8	107 South Anderson Dr	56.51	14.9	3	14	40
23	785 Gt Northern Rd	41.07	13.5	3	9	33
28	61 Holburn St	39.55	20.8	3	5	37
32	Willowbank Rd	22.59	20.8	3	5	22
36	115 Menzies Rd	54.39	19.8	1	8	40
37	137 Wellington Rd	30.68	23	10	13	30
38	Wellington/Nigg Kirk Rd	30	23	3	7	29
41	Fullerton Court roadside	43.53	13.4	0.1	7	26
43	25 Rosemount Place	26.54	20.7	3	3	26

Dy - distance to kerb at which concentrations were measured

Dz – distance to kerb at which concentrations are to be predicted

