



Annual Progress Report

2016 Air Quality Annual Progress Report for
Dumfries and Galloway Council

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

November 2016

Dumfries and Galloway Council

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Report Reference Number	dgc/laqm/dec/2016v1
Date	December 2016

Summary: Air Quality in our Area

Air Quality in Dumfries and Galloway

This report comprises Dumfries and Galloway Council's annual progress report on air quality within the Council's area. Any new or changed sources of potential air pollution which may give rise to a risk of an exceedance of an air quality objective have been considered. Results of NO₂ monitoring within the Council's area are also presented and evaluated in relation to the objectives.

Previous air quality assessments have concluded that concentrations of carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide and nitrogen dioxide are all unlikely to exceed the objectives.

Recent monitoring results for NO₂ have not identified any new requirement to proceed to a detailed assessment with concentrations all below the objectives. NO₂ levels have remained fairly static over the last three years and remain significantly below the relatively high levels experienced in 2010.

Previous monitoring for PM₁₀ at a worst-case junction in Dumfries showed that no air quality management areas were required to be designated for PM₁₀ in Dumfries. PM₁₀ monitoring was carried out at Cairnryan as a result of a perceived increase in traffic levels following the re-location of the Stena Line port from Stranraer to Old House Point, Cairnryan. An Osiris PM₁₀ monitor was deployed for a period of 10 months as a screening method and the annualised results do not meet the PM₁₀ objective indicating that it will be necessary to proceed to a detailed assessment for PM₁₀. PM_{2.5} levels from the Osiris monitor are also reported.

Actions to improve air quality

It is proposed to carry out a detailed assessment of PM₁₀ levels at Cairnryan using an approved (reference-method equivalent) monitor and if levels are shown to exceed the objective(s), thereafter to designate as an Air Quality Management Area the whole or part of the village of Cairnryan.

Local priorities and challenges

A detailed assessment was carried out in 2004 at Cairnryan to assess SO₂ levels from shipping, and in 2008/9 for PM₁₀ levels in Dumfries but no air quality management areas were required and there are currently no AQMAs in Dumfries and Galloway. Apart from a proposed detailed assessment of PM₁₀ levels in Cairnryan no significant air quality issues have been identified in the Council area.

How to get involved

Several previously published air quality reports including results of monitoring in our area are available at

<http://www.scottishairquality.co.uk/news/reports?view=laqm>

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1. Local air quality management

This report provides an overview of air quality in Dumfries and Galloway during 2015. The report fulfils the requirements of local air quality management (LAQM) as set out in Part IV of the Environment Act 1995⁽ⁱ⁾ and the relevant policy and technical guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedances are considered likely the local authority must designate as an air quality management area the part or parts of its area in which it appears likely that exceedances will occur and prepare an air quality action plan setting out the measures it intends to put in place in pursuit of the objectives. This annual progress report summarises the work being undertaken by Dumfries and Galloway Council to monitor and improve air quality in the Council-area and any progress that has been made.

Table 1.1 Summary of air quality objectives in Scotland

Pollutant	Air Quality Objective ⁽ⁱⁱ⁾		Date to be achieved by
	Concentration	Measured as	
Nitrogen dioxide (NO ₂)	200 µg/m ³ (or less) not to be exceeded more than 18 times a year	1-hour mean	31/12/2005
	40 µg/m ³ (or less)	Annual mean	31/12/2005
Particulate matter (PM ₁₀)	50 µg/m ³ (or less) not to be exceeded more than 7 times a year	24-hour mean	31/12/2010
	18 µg/m ³ (or less)	Annual mean	31/12/2010
Particulate matter (PM _{2.5})	10 µg/m ³ (or less)	Annual mean	31/12/2020
Sulphur dioxide (SO ₂)	350 µg/m ³ (or less) not to be exceeded more than 24 times a year	1-hour mean	31/12/2004
	125 µg/m ³ (or less) not to be exceeded more than 3 times a year	24-hour mean	31/12/2004
	266 µg/m ³ (or less) not to be exceeded more than 35 times a year	15-minute mean	31/12/2005
Benzene	3.25 µg/m ³ (or less)	Running annual mean	31/12/2010
1,3-butadiene	2.25 µg/m ³ (or less)	Running annual mean	31/12/2003
Carbon monoxide	10.0 mg/m ³ (or less)	Running 8-hour mean	31/12/2003
Lead	0.25 µg/m ³ (or less)	Annual mean	31/12/2008

(i) & (ii) See references on page 29 for legislation.

See the Air Quality Strategy for England, Scotland, Wales and Northern Ireland ⁽ⁱⁱⁱ⁾ for objectives applying in other parts of the UK.

2. Actions to improve air quality

2.1 Air quality management areas

Air quality management areas (AQMA) are designated when there is an exceedance or likely exceedance of an air quality objective. After designation, the authority must prepare an air quality action plan within twelve months, setting out measures it intends to put in place in pursuit of the objectives.

Dumfries and Galloway Council currently does not have (and never has had) any AQMA.

2.2 Progress and impact of measures to address air quality in Dumfries and Galloway

Many of the measures outlined in the South West of Scotland Transport Partnership (SWESTRANS) Climate Change Strategy together with previous SWESTRANS initiatives have had and will have direct implications for the improvement of air quality in our area. The Climate Change Strategy is available at

<http://www.swestrans.org.uk/CHttpHandler.ashx?id=12123&p=0>

3. Air quality monitoring data and comparison with air quality objectives

3.1 Summary of monitoring undertaken

3.1.1 Automatic monitoring sites

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

Dumfries and Galloway Council undertook automatic (continuous) monitoring at one site during 2015. Results of automatic monitoring undertaken at Eskdalemuir^{iv} by the British Geological Society / Met Office have also been included in this report. Table A.1 in Appendix A shows the details of the sites. National monitoring results for both sites are available at <http://www.scottishairquality.co.uk/>

Monitoring for PM₁₀ commenced in October in 2015 using an Osiris light-scattering monitor and details of this site have also been included in Table A.1. Monitoring is for screening purposes only as this device is not reference-method equivalent.

Further details on how the monitors are calibrated and how the data have been adjusted are included in Appendix C. Maps showing the location of the monitoring sites are provided in Appendix D.

3.1.2 Non-automatic monitoring sites

Dumfries and Galloway Council undertook non-automatic (passive) monitoring of NO₂ at 12 sites during 2015. Table A.2 in Appendix A shows the details of the sites. Further details on quality assurance/quality control (QA/QC) and bias adjustment are included in Appendix C. Maps showing the location of the monitoring sites are provided in Appendix D.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO₂)

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

For diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix B.

Figures A1 to A5 show trends in NO₂ levels over the past seven years or more. No exceedances of the objectives for NO₂ have been recorded and the trend for the last 3 years has been fairly static and significantly below the relatively high level recorded at Buccleuch Street Dumfries in 2010.

Table A.4 in Appendix 4 compares the ratified continuous NO₂ hourly mean concentrations for the past seven years with the air quality objective of 200µg/m³ not to be exceeded more than eighteen times per year. Hourly means greater than 200µg/m³ have only been recorded a few times over the years at Dumfries and not at all at Eskdalemuir.

3.2.2 Particulate Matter (PM₁₀)

Previous monitoring for PM₁₀ at a worst-case junction in Dumfries showed that no air quality management areas were required to be designated for PM₁₀ in Dumfries. No PM₁₀ monitoring is currently carried out at Dumfries.

PM₁₀ monitoring was carried out at Cairnryan as a result of a perceived increase in traffic levels following the re-location of the Stena Line port from Stranraer to Old House Point, Cairnryan. An Osiris PM₁₀ monitor was deployed for a period of 10 months from 10th October 2015 to 11th August 2016 for screening purposes only as this type of monitor is not reference-method equivalent. The monitor was situated on the northmost façade of the recently re-built Village Hall in Cairnryan adjacent to an outdoor children's play area with swings and other play equipment. As such the location is representative of relevant public exposure in respect of both the annual and the 24-hour mean.

The annualised mean for 2015 was 25 µg/m³ and there were forty-five 24-hour means greater than 50 µg/m³. Table A.5 in Appendix A compares the ratified and annualised monitored PM₁₀ annual mean concentration and the PM₁₀ daily mean concentrations with the air quality objective 18µg/m³ (or less) for the annual mean and 50µg/m³ (or less) not to be exceeded more than seven times per year for the 24-hour mean. Table C2 in Appendix C shows details of the annualisation of the period mean to the annual mean. Figure A.6 shows a graph of the recorded 24-hour means over the monitoring period.

3.2.3 Particulate Matter (PM_{2.5})

An Osiris PM₁₀ monitor was deployed for a period of 10 months from 10th October 2015 to 11th August 2016 for screening purposes only as this type of monitor is not reference-method equivalent. The monitor was situated on the northmost façade of the recently re-built Village Hall in Cairnryan adjacent to an outdoor children's play area with swings and other play equipment. The annualised mean for 2015 was 10.2 µg/m³ which is marginally in excess of the annual mean objective of 10 µg/m³. Table A.6 in Appendix A compares the ratified and annualised monitored PM_{2.5} annual mean concentration with the air quality objective of 10µg/m³. Table C3 in Appendix C shows details of the annualisation of the period mean to the annual mean. Figure A.6 shows a graph of the recorded 24-hour means over the monitoring period.

3.2.4 Sulphur Dioxide (SO₂)

A detailed assessment of the influence of shipping on SO₂ levels in Cairnryan was carried out in 2004 when it was found that the SO₂ levels met the objectives and an AQMA was not required.

Currently Dumfries and Galloway Council does no LAQM monitoring for SO₂ within the Council-area.

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

Monitoring for carbon monoxide and 1,3 butadiene have been carried out previously in Dumfries, where the levels were found to meet the relevant objectives.

Currently Dumfries and Galloway Council does no LAQM monitoring for carbon monoxide, lead and 1,3 butadiene within the Council-area.

4. New local developments

No new relevant local developments have been identified since completion of last year's report.

4.1 Road traffic sources

No road traffic sources relevant with respect to air quality in Dumfries and Galloway have been newly identified.

4.2 Other transport sources

No other transport sources relevant with respect to air quality in Dumfries and Galloway have been newly identified.

4.3 Industrial sources

No industrial sources relevant with respect to air quality in Dumfries and Galloway have been newly identified.

4.4 Commercial and domestic sources

No industrial sources relevant with respect to air quality in Dumfries and Galloway have been newly identified.

4.5 New developments with fugitive or uncontrolled sources

No developments with fugitive or uncontrolled sources relevant with respect to air quality in Dumfries and Galloway have been newly identified.

5. Planning applications

Planning consent subject to conditions has been granted for a new all-through school (comprising nursery, primary and secondary schools) at a large open site between Lochside Road and Alloway Road, Lochside Dumfries in a smoke control area. It is proposed to use a biomass boiler for heating and the proposed installation will be assessed when full details are available.

6. Conclusions and proposed actions

6.1 Conclusions from new monitoring data

NO₂ concentrations have been fairly stable for the past 3 years and are significantly lower than the relatively high levels recorded in 2010. Annualised PM₁₀ levels recorded at Cairnryan using a screening method exceed both the annual mean and 24-hour objective. The annualised mean for PM_{2.5} using the same method also marginally exceeded the 2020 PM_{2.5} annual mean objective.

6.2 Conclusions relating to new developments

No new relevant local developments have been identified since completion of last year's report.

6.3 Proposed actions

In addition to NO₂ monitoring continuing, it is intended, subject to funding being available, to carry out PM₁₀ monitoring at Cairnryan using a reference-method-equivalent monitor to establish accurately whether the PM₁₀ objectives are being exceeded.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site Name	Site Type	Grid Ref (easting northing)	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Inlet Height (m)
Buccleuch Street Dumfries	Roadside	297025 576259	NO ₂	No	Chemi-luminescent	<1	4.3	2.2
Eskdalemuir	Rural	323551 603022	NO ₂	No	Chemi-luminescent	N/A	225	4.0
Village Hall Cairnryan	Other	207184 567601	PM ₁₀	No	Nephel-ometer	2	32.3	4.0

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

(2) N/A if not applicable

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

Site Name	Site Type	Grid Ref (easting northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m)	Tube collocated with continuous analyser
M74 Slip Road. Lockerbie	Other	313345 581416	NO ₂	No	32	1.9	no
Buccleuch St. (E) Dumfries	Roadside	297025 576259	NO ₂	No	<1	4.3	yes
Buccleuch St. (W) Dumfries	Kerbside	296949 576218	NO ₂	No	<1	1.0	no
Buccleuch St. (S) Dumfries	Kerbside	296978 576219	NO ₂	No	<1	0.6	no
Buccleuch St. Bridge Dumfries	Roadside	296868 576182	NO ₂	No	<1	5.0	no
St. Michael St. Dumfries	Roadside	297457 575692	NO ₂	No	<1	3.1	no
Argyll Drive Dumfries	Background	299378 578847	NO ₂	No	1	1.7	no
Charlotte St. Stranraer	Roadside	206085 560859	NO ₂	No	<1	4.0	no
A77 Cairnryan	Roadside	207216 567422	NO ₂	No	19	2.0	no
Nithbank Dumfries ⁽³⁾	Roadside	297712 575254	NO ₂	No	0	1.7	no
Castle Break Ecclefechan ⁽³⁾	Roadside	319272 575029	NO ₂	No	1	1.5	no
Gretna Loaning Gretna ⁽³⁾	Roadside	332110 568264	NO ₂	No	1	1.4	no

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

(2) N/A if not applicable

(3) new sites from 01/01/14

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Table A3 - Annual Mean NO₂ Monitoring Results

Site Name	Site Type	Monitoring Type	Valid Data Capture 2015 (%) ⁽¹⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽²⁾						
				2009	2010	2011	2012	2013	2014	2015
Buccleuch Street Dumfries	Roadside	Automatic	97.8	35.0	39.9	31.5	33.1	30.2	30.5	30.1
Eskdalemuir	Rural	Automatic	98.1	4.3	3.0	3.2	3.0	2.5	2.3	2.2
M74 Slip Road. Lockerbie	Other	Diffusion Tube	100	28.2	37.0	30.6	31.6	28.1	27.4	27.8
Buccleuch St. (E) Dumfries	Roadside	Diffusion Tube (Triplicate)	100	34.2	39.8	31.5	33.2	30.3	30.4	30.2
Buccleuch St. (W) Dumfries	Kerbside	Diffusion Tubes (Duplicate)	95.8	31.3	35.2	30.0	31.4	27.8	28.6	29.1
Buccleuch St. (S) Dumfries	Kerbside	Diffusion Tube	100	32.5	36.1	34.1	31.9	30.3	30.9	28.4
Buccleuch St. Bridge Dumfries	Roadside	Diffusion Tubes (Triplicate)	97.2	32.3	34.0	28.2	28.8	26.6	26.8	25.1
St. Michael St. Dumfries	Roadside	Diffusion Tube	100	24.9	28.5	23.8	26.7	22.4	20.8	20.9
Argyll Drive Dumfries	Urban Background	Diffusion Tube	100	11.0	12.1	10.7	12.1	8.7	9.2	9.4
Charlotte St. Stranraer	Roadside	Diffusion Tube	91.7	18.7	21.8	17.7	18.1	17.9	17.6	17.0
A77 Cairnryan	Roadside	Diffusion Tube	100	19.2	21.6	19.6	21.5	20.9	21.5	19.3
Nithbank Dumfries ⁽³⁾	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	24.5	23.0
Castle Break Ecclefechan ⁽³⁾	Roadside	Diffusion Tube	91.7	N/A	N/A	N/A	N/A	N/A	14.4	14.5
Gretna Loaning Gretna ⁽³⁾	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	17.9	19.1
Port Rodie Car Park, Stranraer ⁽⁴⁾	Kerbside	Diffusion Tube	N/A	17.5	18.2	16.6	12.4	10.4	N/A	N/A
Nith Place, Dumfries ⁽⁴⁾	Kerbside	Diffusion Tube	N/A	30.8	35.0	26.8	30.0	27.5	N/A	N/A
Loreburn St. Dumfries ⁽⁴⁾	Kerbside	Diffusion Tube	N/A	26.0	30.8	24.5	30.1	26.4	N/A	N/A

(1) data capture for the full calendar year.

(2) annual means for diffusion tubes have been corrected for bias (see Appendix C for details).

(3) new sites from 01/01/14.

(4) sites discontinued from 01/01/14.

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Table A4 – 1-hour Mean NO₂ Monitoring Results

Site Name	Site Type	Monitoring Type	Valid Data Capture 2015 (%) ⁽¹⁾	NO ₂ 1-hour Means > 200 µg/m ³						
				2009	2010	2011	2012	2013	2014	2015
Buccleuch Street Dumfries	Roadside	Automatic	97.8	0	3	2	0	1	1	1
Eskdalemuir	Rural	Automatic	98.1	0	0	0	0	0	0	0

(1) data capture for the full calendar year.

Table A.5 – Annual Mean PM₁₀ and 24-hour Mean Monitoring Results

Site Name	Site Type	Valid Data Capture for Monitoring Period 10/10/15 to 11/08/16 (%) ⁽¹⁾	Valid Data Capture 2015 (%) ⁽²⁾	PM ₁₀ Annual Mean Concentration (µg/m ³) ⁽³⁾	PM ₁₀ 24-hour Means For Period >50 µg/m ³ ⁽⁴⁾
Village Hall Cairnryan	Roadside	98.7%	23%	25	45 (94)

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

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

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

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

(3) The mean has been "annualised" as per Defra's Technical Guidance LAQM.TG(16)^v as valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(4) If the period of valid data is less than 85%, the 98.1st percentile of 24-hour means is provided in brackets.

Table A.6 – Annual Mean PM_{2.5} Monitoring Results

Site Name	Site Type	Valid Data Capture for Monitoring Period 10/10/15 to 11/08/16 (%) ⁽¹⁾	Valid Data Capture 2015 (%) ⁽²⁾	PM _{2.5} Annual Mean Concentration (µg/m ³) ⁽³⁾
Village Hall Cairnryan	Roadside	98.7%	23%	10.2

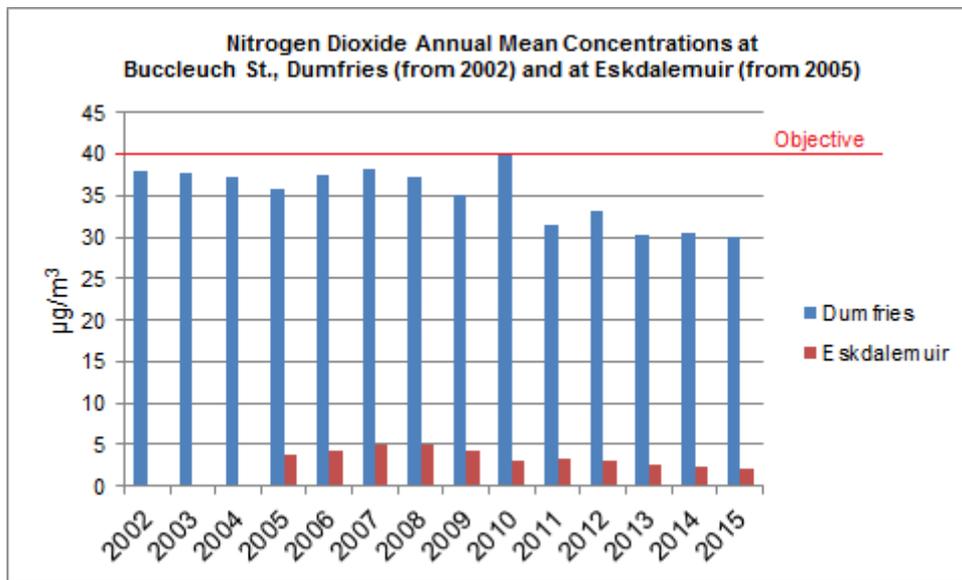
Notes: Exceedances of the PM₁₀ annual mean objective of 10µg/m³ are shown in **bold**.

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

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

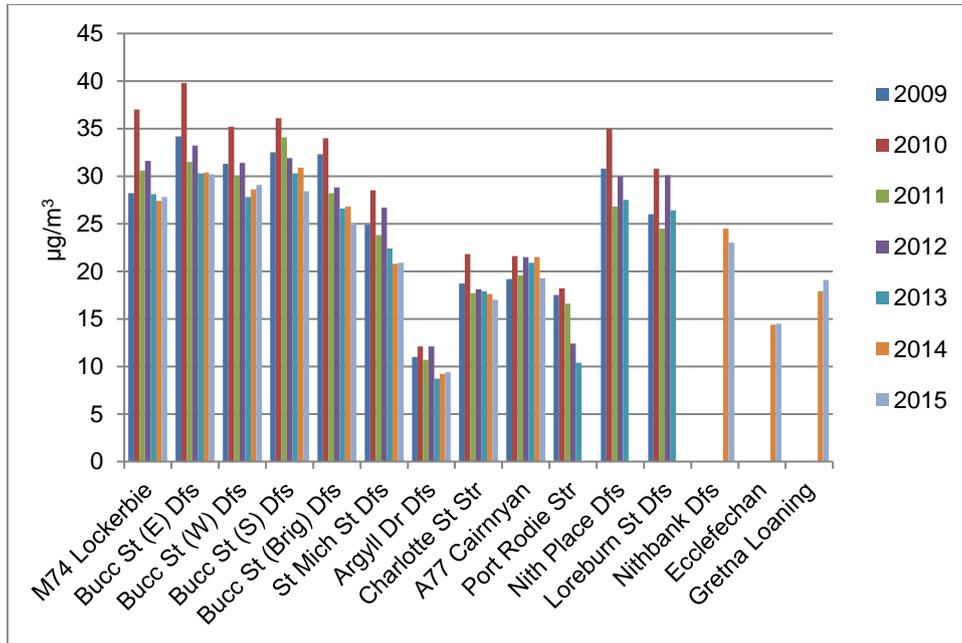
(3) the means has been "annualised" as per LAQM.TG(16) as valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 Trends in annual mean NO₂ concentrations at automatic monitoring sites at Dumfries and at Eskdalemuir.



The above chart shows that annual mean concentrations at the roadside site at Buccleuch Street, Dumfries have fallen significantly below the annual mean objective since 2010. The concentrations at Eskdalemuir remain well below the objective reflecting the site's rural background status.

Figure A.2 Trends in annual mean nitrogen dioxide concentrations measured at diffusion tube monitoring sites.



Most sites show a reduction in NO₂ annual average levels from 2010 to 2015.

Figure A.3 Graphs showing annual mean nitrogen dioxide diffusion tube concentrations over the last seven years at sites in Buccleuch Street, Dumfries.

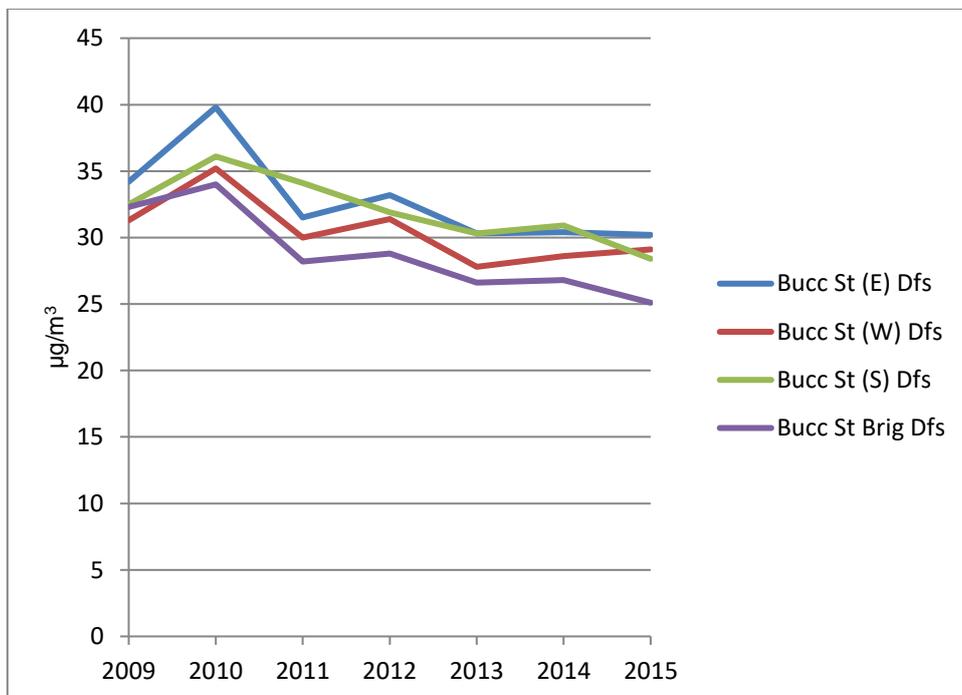


Figure A.4 Graphs showing annual mean nitrogen dioxide diffusion tube concentrations over the last seven years at sites other than Buccleuch Street, Dumfries.

(Excluding new and discontinued sites)

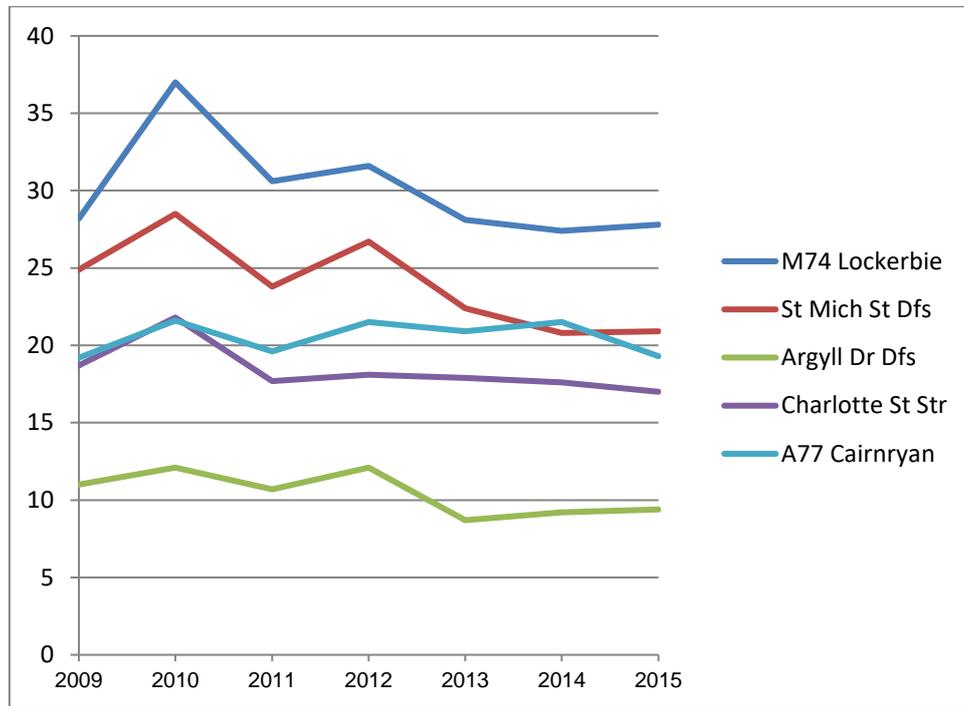


Figure A.5 Graphs showing annual mean nitrogen dioxide diffusion tube concentrations over the last seven years at all sites (excluding new sites).

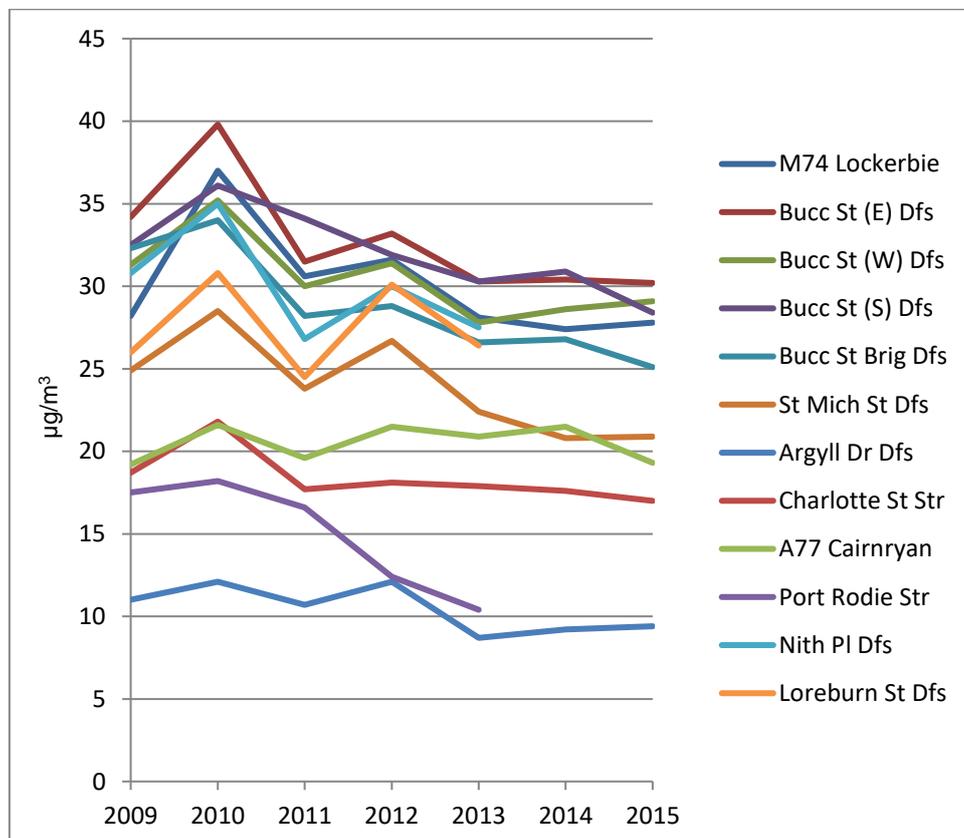
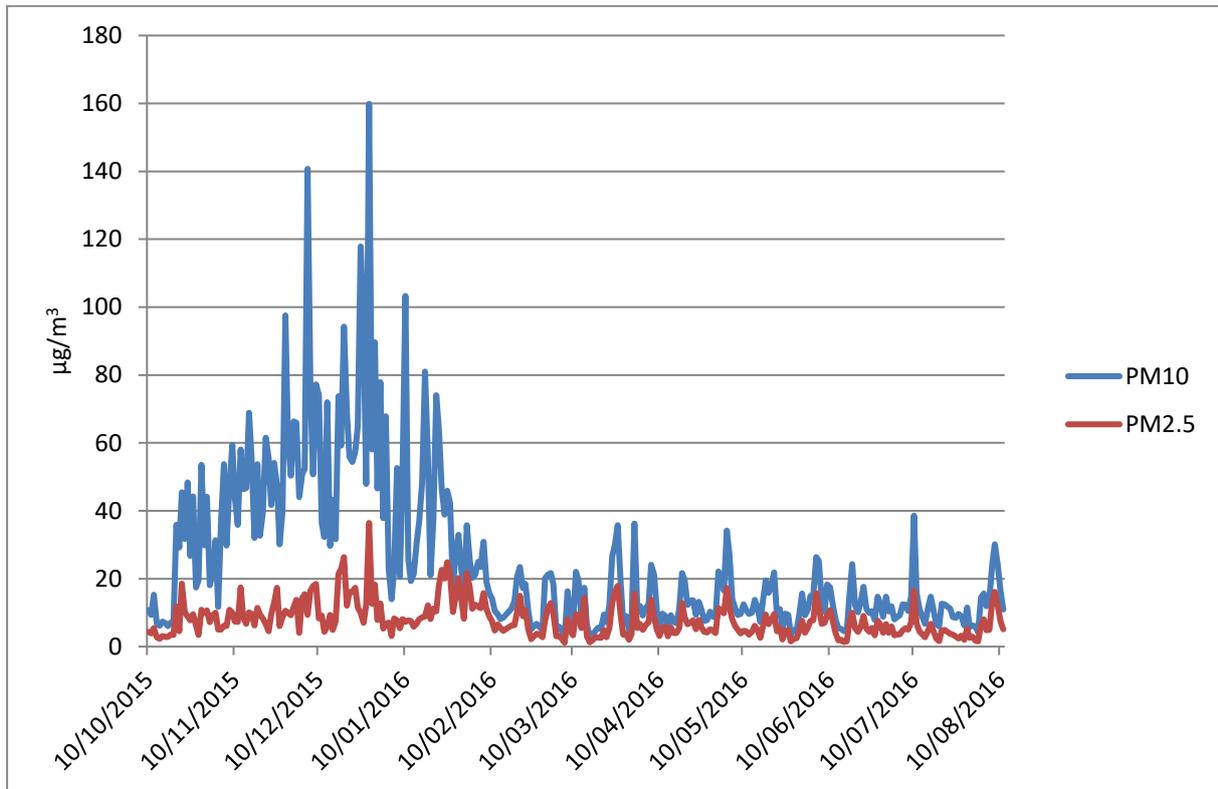


Figure A.6 Graphs showing PM₁₀ (and PM_{2.5}) daily mean concentrations over the monitoring period.



Data are produced on a 15-minute basis by the Osiris monitor. 24-hour averages with less than 75% data capture (ie less than 72 valid 15-minute averages out of 96) are not shown.

Dumfries and Galloway Council

Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 NO₂ - Monthly Diffusion Tube Results for 2015

Site	NO ₂ Mean Concentrations (µg/m ³)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
M74 Slip Road, Lockerbie	31.4	42.1	36.7	25.8	26.5	27.6	30.8	27.8	32.4	37.4	40.2	24.9	32.0	27.8
⁽²⁾ Buccleuch St (East) Dumfries	35.5	45.2	33.2	41.5	26.5	31.9	29.2	31.0	36.3	41.1	37.0	30.9	34.7	30.2
	36.7	30.6	40.8	35.8	32.0	30.4	31.2	29.3	37.8	41.5	35.2	33.7		
	41.1	40.6	41.0	36.7	29.7	31.0	29.6	28.8	38.7	33.7	35.4	28.7		
⁽³⁾ Buccleuch St (West) Dumfries	42.8	41.5	37.9	33.3	27.0	23.4	25.0	25.0	34.2	37.0	41.3	34.8	33.4	29.1
	34.0	42.1	37.4	35.1	28.0	25.6	28.7	(V)	34.8	35.9	36.5	35.3		
Buccleuch St (South) Dumfries	34.8	42.6	38.7	27.6	25.1	24.7	28.1	25.8	33.8	40.1	31.8	38.7	32.7	28.4
⁽⁴⁾ Buccleuch St Bridge, Dumfries	31.7	37.6	32.8	21.9	17.4	23.0	26.6	(V)	28.1	33.1	33.7	31.8	28.9	25.1
	29.1	37.1	33.3	22.6	22.7	20.3	23.4	25.8	27.1	34.8	32.1	33.3		
	27.6	41.1	33.0	26.6	20.5	21.2	25.9	26.3	27.6	35.1	33.5	35.6		
Nithbank Dumfries	29.2	31.5	37.0	27.5	20.4	17.0	22.8	21.8	26.3	33.0	25.5	24.4	26.4	23.0
St Michael St Dumfries	22.5	32.9	28.9	22.5	17.4	16.5	19.3	18.4	26.3	30.5	28.9	23.9	24.0	20.9
Argyll Drive Dumfries	17.2	18.1	13.1	9.1	5.2	5.1	7.3	5.9	8.9	13.4	14.4	12.1	10.8	9.4
Castle Break Ecclefechan	20.1	20.3	22.6	12.6	10.2	9.8	13.8	12.2	18.9	24.9	18.7	(V)	16.7	14.5
Gretna Loaning Gretna Green	29.6	29.7	27.1	21.4	16.7	16.2	19.2	17.5	19.3	20.5	27.4	19.4	22.0	19.1
Charlotte St Stranraer	19.9	23.2	26.0	16.8	17.4	14.0	18.1	15.4	21.1	(V)	22.9	19.4	19.5	17.0
A77 Cairnryan Stranraer	20.4	22.4	24.2	24.9	19.4	15.6	21.3	21.2	19.3	25.2	28.7	24.1	22.2	19.3

(1) See Appendix C for details on bias adjustment

(2) Triplicate tubes (co-located with automatic monitor)

(3) Duplicate tubes

(4) Triplicate tubes

(V) Tube(s) vandalised (or otherwise removed or sample tubes contaminated or result[s] rejected).

Appendix C Supporting Technical Information / Air Quality Monitoring

NO₂ continuous monitor

A continuous (chemiluminescent) NO₂ monitor (API M200A) is located at the Municipal Chambers, Buccleuch Street, Dumfries and forms part of the UK Automatic Urban and Rural Air Quality Monitoring Network (AURN).

QA/QC continuous monitor

Routine calibrations of the automatic monitor are carried out fortnightly by Council staff, with six-monthly audits carried out by Ricardo AEA. Ratification is carried out by the Quality Assurance and Control (QA/QC) Unit at Ricardo AEA. (The NO₂ continuous monitor at Eskdalemuir also forms part of the AURN and is subject to the same audit regime).

Triplicate diffusion tubes are co-located with the NO₂ continuous monitor and are used to derive a bias-adjustment factor.

Table C.1 Details of Co-location study at Buccleuch Street Dumfries 2015.

Date	Monthly average (continuous monitor) (µg/m ³)	Ratified/provisional data	Data capture %	Monthly average (diffusion tubes) (µg/m ³)	Ratio:- continuous/diffusion tube result
January	37.63	Ratified	87.59	37.77	1.00
February	33.84	Ratified	97.60	38.80	0.87
March	32.69	Ratified	95.38	38.33	0.85
April	32.59	Ratified	99.43	38.00	0.86
May	25.17	Ratified	99.69	29.40	0.86
June	25.91	Ratified	99.52	31.10	0.83
July	23.34	Ratified	94.64	30.00	0.78
August	25.65	Ratified	99.70	29.70	0.86
September	33.99	Ratified	99.41	37.60	0.90
October	34.66	Ratified	99.70	38.77	0.89
November	32.47	Ratified	99.64	35.87	0.91
December	25.24	Ratified	99.29	31.10	0.81
Average	30.26		97.63	34.70	

Bias-adjustment factor = continuous mean/diffusion tube mean = 30.26/34.70 = 0.87

Diffusion tube bias = (diffusion tube mean minus continuous mean) divided by continuous mean = (34.70 - 30.26)/30.26 = 0.146 i.e. tubes over-read by approximately 15%.

The local bias adjustment factor of 0.87 has been used in preference to the national bias-adjustment factor of 0.79 derived by amalgamation of 29 studies including Dumfries and Galloway's. The national bias adjustment spreadsheet (version 09/16) is available to download at

<http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

QA/QC for diffusion tubes

The diffusion tubes were prepared and analysed by Environmental Scientifics Group using 50% triethanolamine (TEA) in acetone. Environmental Scientifics Group demonstrated good performance for 2015 in the Workplace Analysis Scheme for Proficiency (WASP) (an independent analytical performance-testing scheme).

Table C.2 Annualisation of PM₁₀ monitoring data at Cairnryan.

Site	Site Type	Annual Mean 2015 (A _m) µg/m ³	Period Mean 10/10/15 to 11/08/16 (P _m) µg/m ³	Ratio A _m /P _m
Edinburgh St Leonards	Urban Background	10.48	10.49	0.999
Errol Place Aberdeen	Urban Background	11.71	11.70	1
Waulkmill Reservoir Glasgow	Rural	11.08	11.37	0.97
Average				0.99
Village Hall Cairnryan	Roadside	Estimated 2015 annual mean = 25.4 x 0.99 = 25.2 µgm ⁻³		

Data capture for comparison sites should ideally be at least 85% (as per LAQM TG16). Comparison sites for PM₁₀ and PM_{2.5} are slightly different due to availability of valid data.

Table C.3 Annualisation of PM_{2.5} monitoring data at Cairnryan.

Site	Site Type	Annual Mean 2015 (A _m) µg/m ³	Period Mean 10/10/15 to 11/08/16 (P _m) µg/m ³	Ratio A _m /P _m
Edinburgh St Leonards	Urban Background	6.37	6.12	1.04
Errol Place Aberdeen	Urban Background	8.01	5.13	1.56
Auchencorth Moss	Rural	2.95	2.35	1.26
Average				1.29
Village Hall Cairnryan	Roadside	Estimated 2015 annual mean = 7.9 x 1.29 = 10.2 µgm ⁻³		

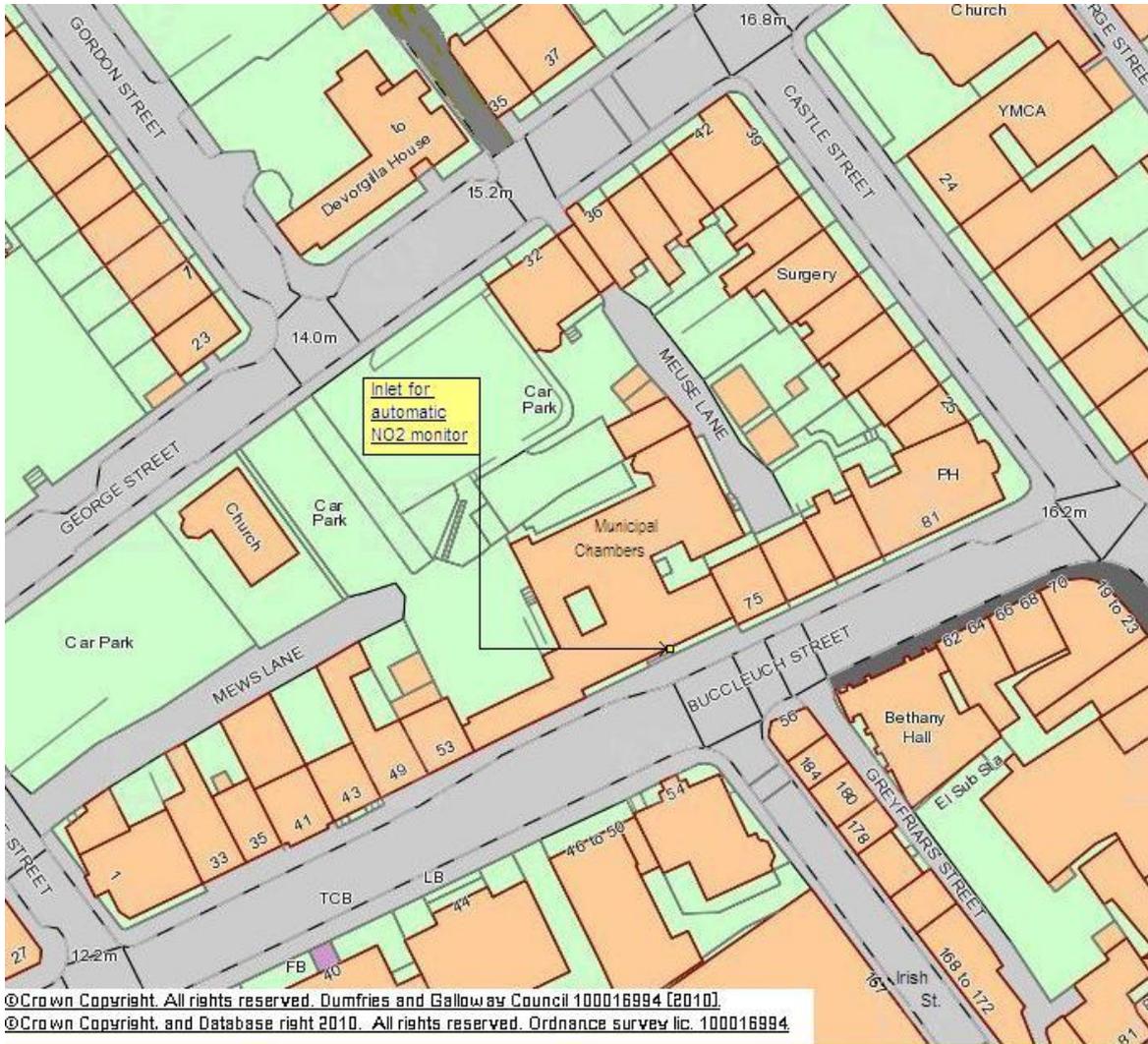
Data capture for comparison sites should ideally be at least 85% as per LAQM TG16). Comparison sites for PM₁₀ and PM_{2.5} are slightly different due to availability of valid data.

QA/QC Osiris monitor

The Osiris monitor serial number TNO2424 was fully serviced prior to being deployed. The service included being fitted with a refurbished laser photometer and replacement battery plus being upgraded to MCERTS. A new web-server was also provided enabling remote downloading of data over the internet. Alerts were also given on the web-site when filter changes were recommended enabling these to be carried out as appropriate.

Appendix D Maps showing the location of the monitoring sites.

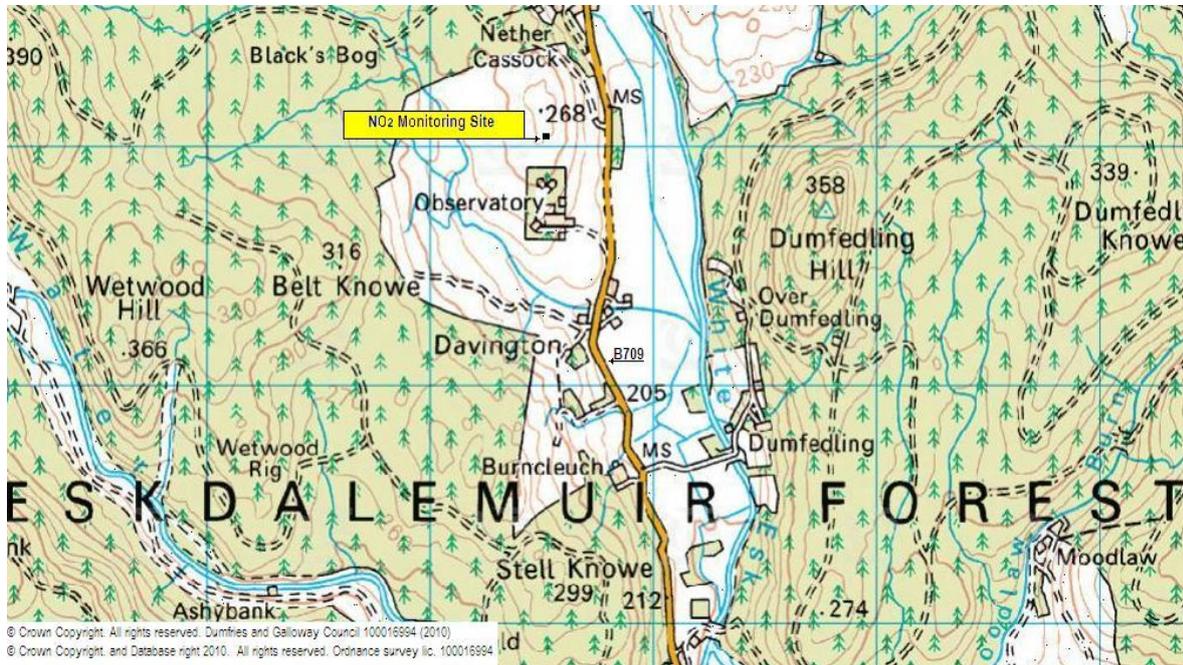
Figure D.1 Map of NO₂ automatic monitoring site at Buccleuch St., Dumfries.



The air intake for the monitor is situated at a height of approximately 2.2 metres in the supporting framework of one of two decorative lamps on either side of the Municipal Chambers entrance. The air-intake tube goes through a window to the monitor which is located in the basement of the building.

Appendix D Maps showing the location of the monitoring sites (continued).

Figure D.2 Map of NO₂ automatic monitoring site at Eskdalemuir



Since December 2004 a continuous NO₂ monitor has been located at the Observatory at Eskdalemuir as part of the AURN. The Observatory^(iv) is currently managed by the British Geological Society and the Met Office

Figure D.3 Map of diffusion tube site at M74 Lockerbie.



Appendix D Maps showing the location of the monitoring sites (continued).

Figure D.4 Map of diffusion tube sites at (from left to right) Buccleuch St. Bridge, Buccleuch St. West, Buccleuch St. South, & Buccleuch St. East, Dumfries.

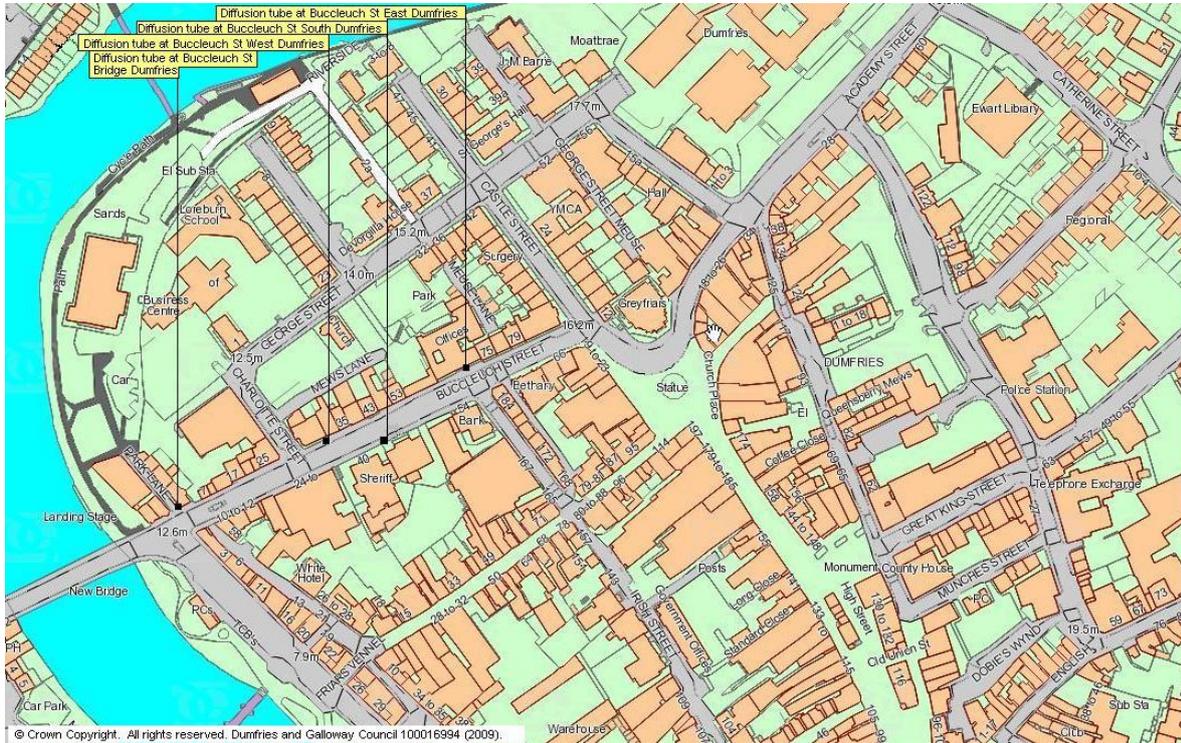


Figure D.5 Map of diffusion tube site at St Michael Street Dumfries

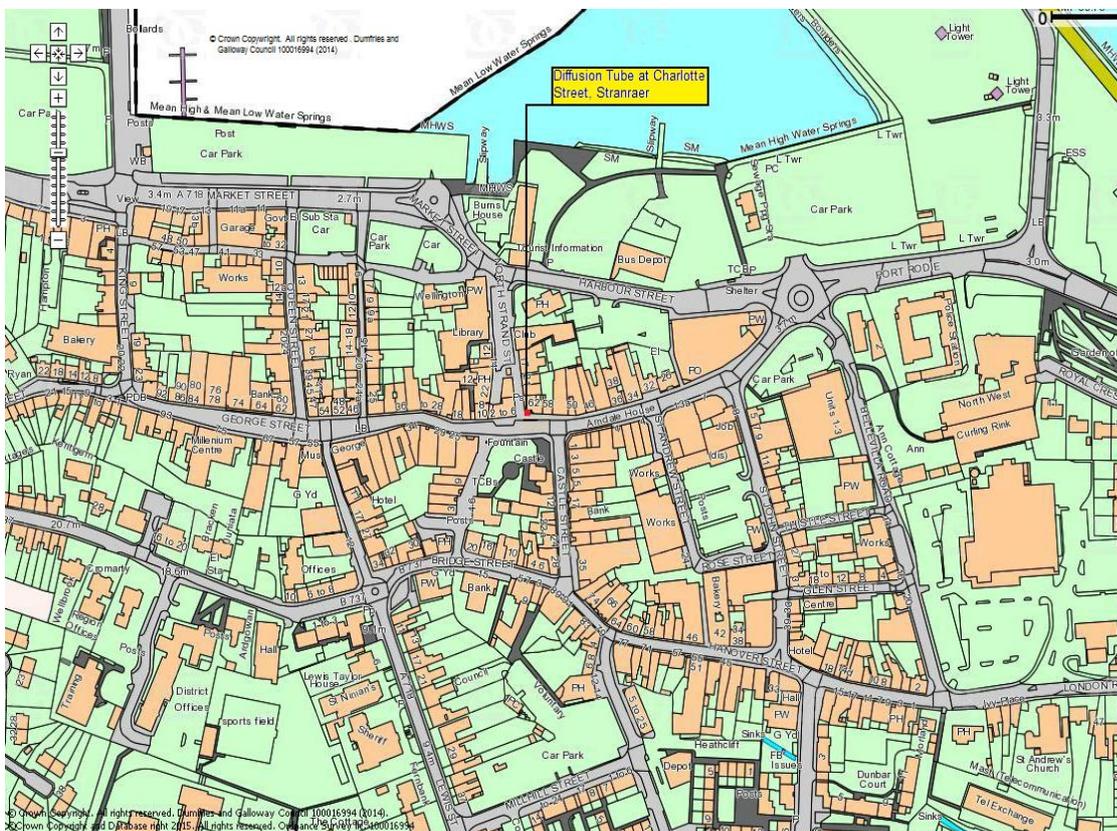


Appendix D Maps showing the location of the monitoring sites (continued).

Figure D.6 Map of diffusion tube site at Argyll Drive, Heathhall Dumfries.



Figure D.7 Map of diffusion tube site at Charlotte St., Stranraer.



Appendix D Maps showing the location of the monitoring sites (continued).

Figure D.8 Map of diffusion tube site at A77 Cairnryan.

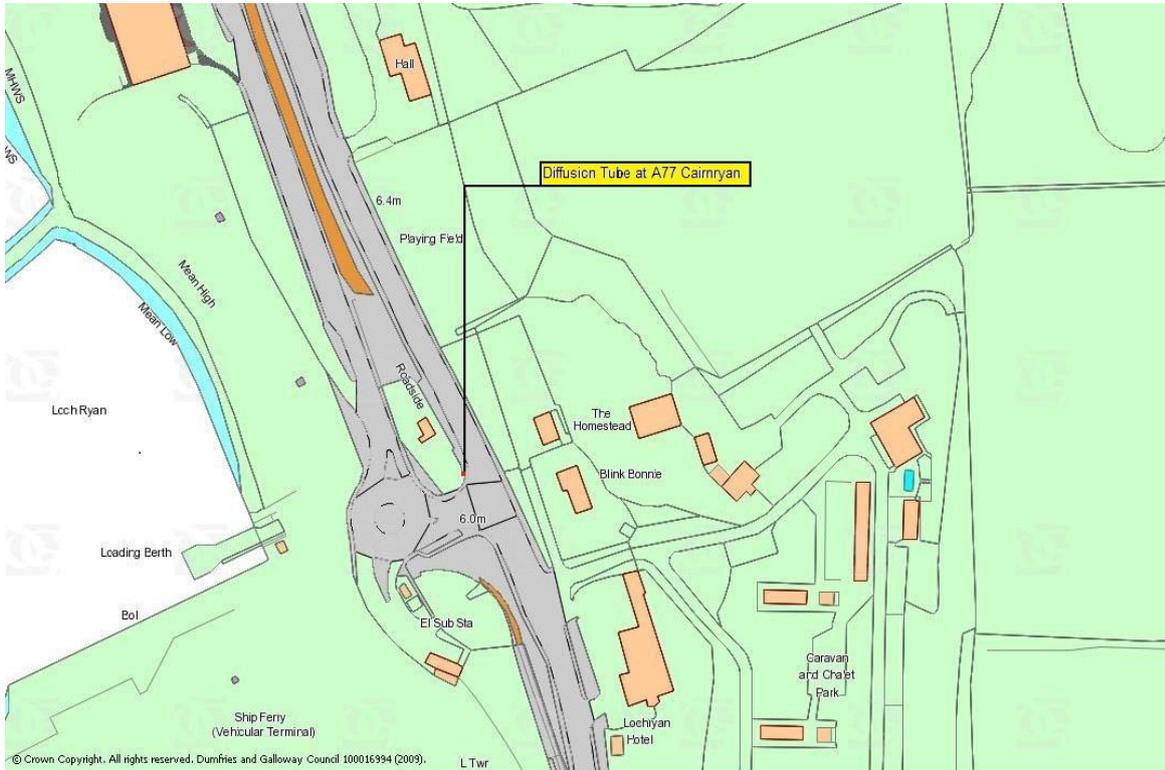


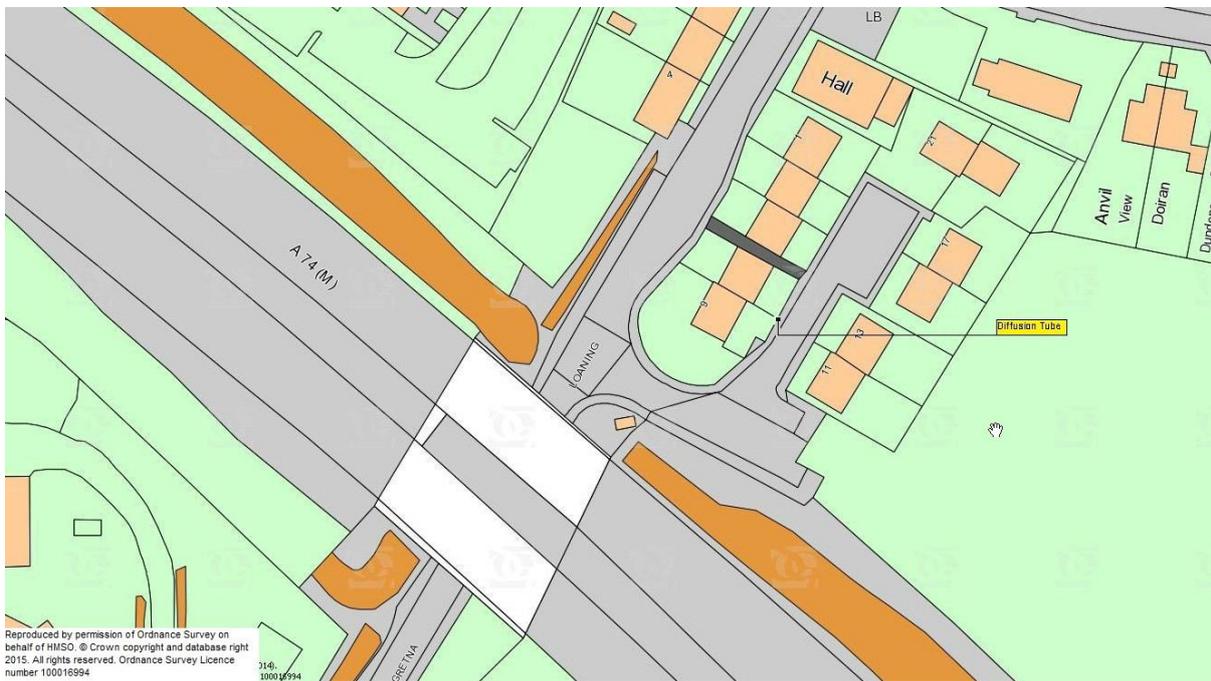
Figure D.9 Map of diffusion tube site at Nithbank, Dumfries.



Appendix D Maps showing the location of the monitoring sites (continued).
Figure D.10 Map of diffusion tube site at Castle Break, Ecclefechan.



Figure D.11 Map of diffusion tube site at Gretna Loaning, Gretna,



Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values.
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives.
APR	Air Quality Annual Progress Report
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
Defra	Department for Environment, Food and Rural Affairs
LAQM	Local Air Quality Management
MCERTS	Monitoring Certification Scheme.
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide
SWESTRANS	South West of Scotland Transport Partnership
WASP	Workplace Analysis Scheme for Proficiency (an independent analytical performance-testing scheme)

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