

## Annual Progress Report (APR)



## 2017 Air Quality Annual Progress Report (APR) for Dumfries and Galloway Council

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

June 2017

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## Executive 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. Within this report results of NO<sub>2</sub> monitoring within the Council's area are also presented and evaluated in relation to national objectives.

Under the Local Government in Scotland Act 2003 Dumfries and Galloway Council is responsible for the provision of a range of services, including: mandatory powers (e.g. providing school education for 5-16 year-olds, Roads Services and Social Work Services); permissive powers (e.g. economic development and recreation services); and regulatory powers (e.g. Planning, Environmental Health, Licensing).

Dumfries and Galloway is a mostly rural region, with two hundred miles of coast line; area 6,426 square kilometres; population 149,670 (2015, by 2037 the population of Dumfries & Galloway is projected to decline to 141,619). The main towns are Dumfries and Locharbriggs (38,900 residents), Stranraer (10,600), Annan (9,000), Lockerbie (4,300) Dalbeattie (4,200) and Castle Douglas (4,200). All other settlements have populations of less than 4,000. The entire region lies in the Solway Tweed river basin district.

Dumfries and Galloway's key economic sectors are: Volume Sectors - Agriculture; Creative Industries (cultural business); Food and drink; Health and social care; Tourism/leisure/hospitality. Value Sectors - Creative Industries (digital business); Energy—particularly renewables and their supply chain; forest and timber technologies.

The air quality in Dumfries & Galloway is generally very good and currently there are no designated Air Quality Management Areas (AQMAs). This is mainly due to the fact that there is a limited amount of heavy industry with the majority of pollution assessed to arise from road vehicles as in terms of accessibility 30% of the population are 'remote' i.e. living further than a 30-minute drive from a large town.

Recent monitoring for NO<sub>2</sub> has not identified any new requirement to proceed to a detailed assessment with concentrations all below the objectives and NO<sub>2</sub> levels in Dumfries and Galloway have essentially been static over the past number of years.

Previous air quality assessments in Dumfries and Galloway have concluded that concentrations of carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide and nitrogen dioxide are all unlikely to exceed the objective and, in accordance with technical guidance these pollutants are not currently monitored.

Details of monitoring undertaken by the Council can be found in Chapter 3 of this report.

Previous monitoring for PM<sub>10</sub> at a worst-case junction in Dumfries showed that no Air Quality Management Areas were required to be designated for PM<sub>10</sub> in Dumfries.

### **Actions to improve air quality**

Due to a perceived increase in traffic levels following the re-location of the Stena Line port from Stranraer to Old House Point, Cairnryan and, due to the fact that the majority of air quality pollutants arising in Dumfries and Galloway are created as a result of road traffic, PM<sub>10</sub> monitoring has subsequently been carried out at Cairnryan.

In 2016 an Osiris PM<sub>10</sub> monitor was deployed for a period of 10 months as a screening method and the annualised results do not meet the PM<sub>10</sub> objective indicating that it will be necessary to proceed to a detailed assessment for PM<sub>10</sub>. PM<sub>2.5</sub> levels from the Osiris monitor are also reported.

It is currently proposed to carry out a detailed assessment of PM<sub>10</sub> 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.

Part-funding has been provisionally been secured for an approved PM<sub>10</sub> (+ PM<sub>2.5</sub>) monitor at Cairnryan and it is anticipated that the equipment will be installed and become operational in 2017.

It is proposed to install a Fidas 200 EN-certified fine dust monitoring and ambient air measuring system for the measurement of PM<sub>2.5</sub> and PM<sub>10</sub>.

## Local Priorities and Challenges

Apart from a proposed detailed assessment of PM<sub>10</sub> levels in Cairnryan no significant air quality issues have been identified in the Council area. A detailed assessment was carried out in 2004 at Cairnryan to assess SO<sub>2</sub> levels from shipping, and in 2008/9 for PM<sub>10</sub> levels in Dumfries but no air quality management areas were required and there are currently no AQMAs in Dumfries and Galloway.

As a result of the PM<sub>10</sub>/PM<sub>2.5</sub> monitoring project in Cairnryan only being part-funded the monitoring period has been reduced from a previously proposed year's monitoring to a 6-month period. However monitoring over the 6-month period should be sufficient to identify trends and assess whether or not an AQMA will be required to be designated.

## 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>

Dumfries and Galloway Council's priorities, since October 2014, have been: Build the local economy; Provide the best start in life for all our children; Protect our most vulnerable people; Be an inclusive council; Provide an attractive location to do business; Support children to be healthy and active and; Keep our communities safe.

By safeguarding that air quality within Dumfries and Galloway remains within national objective levels and ensuring that via the planning process and its regulatory functions any air pollution potential which may give rise to a risk of an exceedance of an air quality objective is considered at consultation phase, the Environmental Health Service works toward meeting a number of Dumfries and Galloway Council's priorities by providing a safe, attractive place to live and do business.

Members of the public can also choose to support or object to planning applications that may have an impact on air quality. All applications are published on-line and are accessible on-line via <https://eaccess.dumgal.gov.uk/online-applications/> Grounds for commenting can relate to planning issues such as: local and national planning policy and guidance; traffic, access or parking; impact of the proposal on the built or natural environment, design/materials/scale of the proposal and its relationship to its surroundings; residential amenity, overshadowing, overlooking, etc.; effect on the setting of a Listed Building or the character and appearance of a Conservation Area.

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## 1. Local Air Quality Management

This report provides an overview of air quality in Dumfries and Galloway during 2016. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act 1995<sup>(i)</sup> and the relevant Policy and Technical Guidance<sup>(iv)</sup> documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Progress Report summarises the work being undertaken by Dumfries and Galloway Council to improve air quality and any progress that has been made.

**Table 1.1 – Summary of Air Quality Objectives in Scotland**

<b>Pollutant</b>	<b>Air Quality Objective</b>		<b>Date to be achieved by</b>
	<b>Concentration</b>	<b>Measured as</b>	
<b>Nitrogen dioxide (NO<sub>2</sub>)</b>	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m <sup>3</sup>	Annual mean	31.12.2005
<b>Particulate Matter (PM<sub>10</sub>)</b>	50 µg/m <sup>3</sup> , not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 µg/m <sup>3</sup>	Annual mean	31.12.2010
<b>Particulate Matter (PM<sub>2.5</sub>)</b>	10 µg/m <sup>3</sup>	Annual mean	31.12.2020
<b>Sulphur dioxide (SO<sub>2</sub>)</b>	350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
<b>Benzene</b>	3.25 µg/m <sup>3</sup>	Running annual mean	31.12.2010
<b>1,3 Butadiene</b>	2.25 µg/m <sup>3</sup>	Running annual mean	31.12.2003
<b>Carbon Monoxide</b>	10.0 mg/m <sup>3</sup>	Running 8-Hour mean	31.12.2003
<b>Lead</b>	0.25 µg/m <sup>3</sup>	Annual Mean	31.12.2008

(See ref (ii) page 37 for links to relevant legislation)

## 2. Actions to Improve Air Quality

### 2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12 months, setting out measures it intends to put in place in pursuit of the objectives.

Dumfries and Galloway Council currently does not have any AQMAs.

Following analysis of results obtained expected from the PM<sub>10</sub>/PM<sub>2.5</sub> monitoring project to be undertaken in Cairnryan in 2017/2018 it may be necessary to declare a new AQMA in the village of Cairnryan (or part thereof). Data from this monitoring exercise is expected to be available in the 2017 & 2018 LAQM Annual Progress Reports.

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

Dumfries and Galloway has taken forward a number of measures during the current reporting year of 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in the Public Sector Climate Change Duties 2015-2016 Report which is available online at: <http://egenda.dumgal.gov.uk/aksdumgal/images/att42349.pdf>

This Dumfries and Galloway Council document in addition to carbon reporting covers: alternatives to private vehicle use; corporate freight and delivery management; policy guidance and development control; promotion of low emission plants and promoting low emission transport; promoting travel alternatives; transport planning and infrastructure and includes initiatives such as vehicle fleet efficiency and driver training.

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 Council area. The Climate Change Strategy is available at <http://www.swestrans.org.uk/CHttpHandler.ashx?id=12123&p=0>

## 2.3 Cleaner Air for Scotland

Cleaner Air for Scotland – The Road to a Healthier Future (CAFS) is a national cross-government strategy that sets out how the Scottish Government and its partner organisations propose to reduce air pollution further to protect human health and fulfil Scotland's legal responsibilities as soon as possible. A series of actions across a range of policy areas are outlined, a summary of which is available at <http://www.gov.scot/Publications/2015/11/5671/17>. Progress by Dumfries and Galloway Council against relevant actions within this strategy is demonstrated below.

### 2.3.1 Transport – Avoiding travel – T1

All local authorities should ensure that they have a corporate travel plan (perhaps within a carbon management plan) which is consistent with any local air quality action plan. Details of all measures completed, in progress or planned in Dumfries and Galloway are set out in the Public Sector Climate Change Duties 2015-2016 Report which is available online at: <http://egenda.dumgal.gov.uk/aksdumgal/images/att42349.pdf>

### 2.3.2 Climate Change – Effective co-ordination of climate change and air quality policies to deliver co-benefits – CC2

Scottish Government expects any Scottish local authority which has or is currently developing a Sustainable Energy Action Plan to ensure that air quality considerations are covered. Details of Dumfries and Galloway Council's Public Sector Climate Change Duties 2015-2016 Report is available online at: <http://egenda.dumgal.gov.uk/aksdumgal/images/att42349.pdf>

### **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 2016. Results of automatic monitoring undertaken at Eskdalemuir 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 PM<sub>10</sub> 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 was for screening purposes only as this device is not reference-method-equivalent.

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

##### **3.1.2 Non-Automatic Monitoring Sites**

Dumfries and Galloway Council undertook non- automatic (passive) monitoring of NO<sub>2</sub> at 12 sites during 2016. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

#### **3.2 Individual pollutants**

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

### 3.2.1 Nitrogen Dioxide (NO<sub>2</sub>)

In 2016 there were no exceedances of air quality objectives for NO<sub>2</sub> recorded in Dumfries and Galloway.

Table A.3 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past eight years with the air quality objective of 40µg/m<sup>3</sup>.

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

Figures A.1 to A.5 show trends in NO<sub>2</sub> levels over the past eight years or more. No exceedances of the objectives for NO<sub>2</sub> have been recorded and the trend for the last 4 years has been fairly static and significantly below the relatively high level recorded at Buccleuch Street Dumfries in 2010.

Table A.4 in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m<sup>3</sup>, not to be exceeded more than 18 times per year. No hourly means greater than 200µg/m<sup>3</sup> have been recorded in 2016 and historically have only been recorded a few times over the years at Dumfries and never at Eskdalemuir.

### 3.2.2 Particulate Matter (PM<sub>10</sub>)

Previous monitoring for PM<sub>10</sub> at a worst-case junction in Dumfries showed that no air quality management areas were required to be designated for PM<sub>10</sub> in Dumfries. No PM<sub>10</sub> monitoring is currently carried out at Dumfries.

PM<sub>10</sub> 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 PM<sub>10</sub> monitor was deployed for a period of 10 months from 10<sup>th</sup> October 2015 to 11<sup>th</sup> August 2016 for screening purposes only as this type of monitor is not reference-method-equivalent. The monitor was situated on the northernmost 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 2016 was 25.6 µg/m<sup>3</sup> and there were forty-five 24-hour means greater than 50 µg/m<sup>3</sup>.

Tables A.5 and A.6 in Appendix A compare the ratified and annualised monitored PM<sub>10</sub> annual mean concentration and the PM<sub>10</sub> daily mean concentrations with the air

quality objective  $18\mu\text{g}/\text{m}^3$  (or less) for the annual mean and  $50\mu\text{g}/\text{m}^3$  (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<sub>2.5</sub>)**

An Osiris PM<sub>10</sub> monitor was deployed for a period of 10 months from 10<sup>th</sup> October 2015 to 11<sup>th</sup> August 2016 for screening purposes only as this type of monitor is not reference-method-equivalent. The monitor was situated on the northernmost 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  $10.2\mu\text{g}/\text{m}^3$  which was in excess of the annual mean objective of  $10\mu\text{g}/\text{m}^3$  but using 2016 valid data capture and the same data set after ratification this result is now reduced to  $8.45\mu\text{g}/\text{m}^3$ . Table A.7 in Appendix A compares the ratified and annualised monitored PM<sub>2.5</sub> annual mean concentration with the air quality objective of  $10\mu\text{g}/\text{m}^3$ .

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 (SO<sub>2</sub>)**

A detailed assessment of the influence of shipping on SO<sub>2</sub> levels in Cairnryan was carried out in 2004 when it was found that the SO<sub>2</sub> levels met the objectives and an AQMA was not required.

Currently Dumfries and Galloway Council does no LAQM monitoring for SO<sub>2</sub> within 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 or 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 identified in the 2016 reporting year that may significantly change traffic flows.

### **4.2 Other transport sources**

No other transport sources relevant with respect to air quality in Dumfries and Galloway have been identified in the 2016 LAQM APR reporting year.

### **4.3 Industrial sources**

No industrial sources relevant with respect to air quality in Dumfries and Galloway have been identified in the 2016 LAQM APR reporting year.

### **4.4 Commercial and domestic sources**

No relevant industrial sources with respect to air quality in Dumfries and Galloway have been identified in the 2016 LAQM APR reporting year.

A number of Planning Consultations received in relation to installation of proposed biomass combustion systems have been assessed but these proposals are predominately in rural areas with diminutive cumulative impact.

### **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

At the time of writing this report (May / June 2017) a Planning Application has been lodged with Dumfries and Galloway Council with regard to the Erection of Extension to form Biomass Boiler House at PET Processors (UK) at Cargenbridge, Dumfries (17/0824/FUL). Whilst details are not included in the 2016 LAQM APR it is anticipated that details will be included within the 2017 APR report.

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. At the time of writing this report the development is still being constructed and biomass has not yet become operational.

## 6. Conclusions and proposed actions

### 6.1 Conclusions from new monitoring data

There were no exceedances of the NO<sub>2</sub> air quality objectives identified within Dumfries and Galloway Council. It can be seen that in general NO<sub>2</sub> concentrations have been fairly stable for the past 4 years and are significantly lower than the relatively high levels recorded in 2010.

Annualised PM<sub>10</sub> levels recorded at Cairnryan using a screening method exceed both the annual mean and 24-hour objectives.

The period of monitoring using the Osiris Monitor of 10/10/2015 – 11/08/2016 and results obtained therefrom was used in the annualisation of PM<sub>10</sub> and PM<sub>2.5</sub> results both in the 2015 and 2016 APR reports. The annualised mean for PM<sub>2.5</sub> in 2015 using the same method also marginally exceeded the 2020 PM<sub>2.5</sub> annual mean objective but did not exceed the annual mean objective using ratified data in the 2016 report.

Reference method monitoring in 2017 should clarify the situation and direct Dumfries and Galloway as to required action (if any).

### 6.2 Conclusions relating to New Local Developments

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

### 6.3 Proposed Actions

It is currently proposed to carry out a detailed assessment of PM<sub>10</sub> 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.

Part-funding has been provisionally been secured for an approved PM<sub>10</sub> / PM<sub>2.5</sub> monitor at Cairnryan and it anticipated that the equipment will be installed and become operational in 2017.

It is proposed to install a Fidas 200 EN-certified fine dust monitoring and ambient air measuring system for the measurement of PM<sub>2.5</sub> and PM<sub>10</sub>

## Appendix A: Monitoring Results

**Table A.1 – Details of Automatic Monitoring Sites**

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Inlet Height (m)
Buckleuch Street Dumfries	Roadside	297025	576259	NO <sub>2</sub>	N	Chemiluminescent	<1	4.3	2.2
Eskdalemuir	Rural	323551	603022	NO <sub>2</sub>	N	Chemiluminescent	N/A	225	4.0
Village Hall Cairnryan	Other	207184	567601	PM <sub>10</sub>	N	Nephelometer	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	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to relevant exposure (m) ( <sup>1</sup> )	Distance to kerb of nearest road (m) ( <sup>2</sup> )	Tube collocated with a continuous analyser?
M74 Slip Road. Lockerbie	Other	313345	581416	NO <sub>2</sub>	No	32	1·9	No
Buckleuch St. (E)Dumfries	Roadside	297025	576259	NO <sub>2</sub>	No	<1	4·3	Yes
Buckleuch St. (W)Dumfries	Kerbside	296949	576218	NO <sub>2</sub>	No	<1	1·0	No
Buckleuch St. (S)Dumfries	Kerbside	296978	576219	NO <sub>2</sub>	No	<1	0·6	No
Buckleuch St. Bridge Dumfries	Roadside	296868	576182	NO <sub>2</sub>	No	<1	5·0	No
St. Michael St. Dumfries	Roadside	297457	575692	NO <sub>2</sub>	No	<1	3·1	No
Argyll Drive Dumfries	Background	299378	578847	NO <sub>2</sub>	No	1	1·7	No
Charlotte St. Stranraer	Roadside	206085	560859	NO <sub>2</sub>	No	<1	4·0	No
A77 Cairnryan	Roadside	207216	567422	NO <sub>2</sub>	No	19	2·0	No

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to relevant exposure (m) ( <sup>1</sup> )	Distance to kerb of nearest road (m) ( <sup>2</sup> )	Tube collocated with a continuous analyser?
Nithbank Dumfries <sup>(3)</sup>	Roadside	297712	575254	NO <sub>2</sub>	No	0	1.7	No
Castle Break Ecclefechan <sup>(3)</sup>	Roadside	319272	575029	NO <sub>2</sub>	No	1	1.5	No
Gretna Loaning Gretna <sup>(3)</sup>	Roadside	332110	568264	NO <sub>2</sub>	No	1	1.4	No

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

(2) N/A if not applicable.

(3) new sites from 01/01/14

**Table A.3 – Annual Mean NO<sub>2</sub> Monitoring Results**

<b>Site Name</b>	<b>Site Type</b>	<b>Monitoring Type</b>	<b>Valid Data Capture 2016 (%)<sup>(1)</sup></b>	<b>NO<sub>2</sub> Annual Mean Concentration (µg/m<sup>3</sup>)<sup>(2)</sup></b>							
				<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
Buckleuch Street Dumfries	Roadside	Automatic	95·4	35·0	39·9	31·5	33·1	30·2	30·5	30·1	30·9
Eskdalemuir	Rural	Automatic	97·0	4·3	3·0	3·2	3·0	2·5	2·3	2·2	2·0
M74 Slip Road. Lockerbie	Other	Diffusion Tube	100	28·2	37·0	30·6	31·6	28·1	27·4	27·8	27·8
Buckleuch St. (E) Dumfries	Roadside	Diffusion Tube (Triplicate)	100	34·2	39·8	31·5	33·2	30·3	30·4	30·2	30·7
Buckleuch St. (W) Dumfries	Kerbside	Diffusion Tubes (Duplicate)	100	31·3	35·2	30·0	31·4	27·8	28·6	29·1	28·5
Buckleuch St. (S) Dumfries	Kerbside	Diffusion Tube	100	32·5	36·1	34·1	31·9	30·3	30·9	28·4	29·3
Buckleuch St. Bridge Dumfries	Roadside	Diffusion Tubes (Triplicate)	100	32·3	34·0	28·2	28·8	26·6	26·8	25·1	25·0
St. Michael St. Dumfries	Roadside	Diffusion Tube	91·7	24·9	28·5	23·8	26·7	22·4	20·8	20·9	23·7
Argyll Drive Dumfries	Urban Background	Diffusion Tube	100	11·0	12·1	10·7	12·1	8·7	9·2	9·4	9·0
Charlotte St. Stranraer	Roadside	Diffusion Tube	100	18·7	21·8	17·7	18·1	17·9	17·6	17·0	16·3
A77 Cairnryan	Roadside	Diffusion Tube	91·7	19·2	21·6	19·6	21·5	20·9	21·5	19·3	19·8
Nithbank Dumfries <sup>(3)</sup>	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	24·5	23·0	27·4
Castle Break Ecclefechan <sup>(3)</sup>	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	14·4	14·5	15·9
Gretna Loaning Gretna <sup>(3)</sup>	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	17·9	19·1	16·2
Port Rodie Car Park, Stranraer <sup>(4)</sup>	Kerbside	Diffusion Tube	N/A	17·5	18·2	16·6	12·4	10·4	N/A	N/A	N/A
Nith Place, Dumfries <sup>(4)</sup>	Kerbside	Diffusion Tube	N/A	30·8	35·0	26·8	30·0	27·5	N/A	N/A	N/A
Loreburn St. Dumfries <sup>(4)</sup>	Kerbside	Diffusion Tube	N/A	26·0	30·8	24·5	30·1	26·4	N/A	N/A	N/A

Notes: Exceedances (if any) of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup> (if any), indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

(1) 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%).

(2) means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

(4) sites discontinued from 01/01/14

**Table A.4 – 1-Hour Mean NO<sub>2</sub> Monitoring Results**

Site Name	Monitoring Type	Valid Data Capture 2016 (%) <sup>(1)</sup>	NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup>							
			2009	2010	2011	2012	2013	2014	2015	2016
Buckleuch Street, Dumfries	Automatic	95·4	0	3	2	0	1	1	1	0
Eskdalemuir	Automatic	97·0	0	0	0	0	0	0	0	0

Notes: Exceedances (if any) of the NO<sub>2</sub> 1-hour mean objective (200µg/m<sup>3</sup> not to be exceeded more than 18 times/year) are shown in **bold**.

(1) data capture for the full calendar year

**Table A.5 – Annual Mean PM<sub>10</sub> Monitoring Results**

<b>Site Name</b>	<b>Site Type</b>	<b>Valid Data Capture for Monitoring Period 10/10/2015 – 11/08/2016 (%)<sup>(1)</sup></b>	<b>Valid Data Capture 2016 (%)<sup>(2)</sup></b>	<b>PM<sub>10</sub> Annual Mean Concentration (µg/m<sup>3</sup>)<sup>(3)</sup></b>	
				<b>2015</b>	<b>2016</b>
Village Hall Cairnryan	Roadside	98.7	61	<b>25·2</b>	<b>25·6</b>

Notes: Exceedances of the PM<sub>10</sub> annual mean objective of 18µg/m<sup>3</sup> are shown in **bold**.

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

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

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

**Table A.6 – 24-Hour Mean PM<sub>10</sub> Monitoring Results**

<b>Site Name</b>	<b>Site Type</b>	<b>Valid Data Capture for Monitoring Period 10/10/2015 – 11/08/2016 (%)<sup>(1)</sup></b>	<b>Valid Data Capture 2016 (%)<sup>(2)</sup></b>	<b>PM<sub>10</sub> 24-Hour Means for measurement period &gt; 50µg/m<sup>3</sup><sup>(3)</sup></b>
				<b>2016</b>
Village Hall Cairnryan	Roadside	98.7	61	<b>45 (94)</b>

Notes: Exceedances of the PM<sub>10</sub> 24-hour mean objective (50µg/m<sup>3</sup> not to be exceeded more than 7 times/year) are shown in **bold**.

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

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

(3) If the period of valid data is less than 85%, the 90.4<sup>th</sup> percentile of 24-hour means is provided in brackets

**Table A.7 – Annual Mean PM<sub>2.5</sub> Monitoring Results**

<b>Site Name</b>	<b>Site Type</b>	<b>Valid Data Capture for Monitoring Period 10/10/2015 – 11/08/2016 (%)<sup>(1)</sup></b>	<b>Valid Data Capture 2016 (%)<sup>(2)</sup></b>	<b>PM<sub>2.5</sub> Annual Mean Concentration (µg/m<sup>3</sup>)<sup>(3)</sup></b>	
				<b>2015</b>	<b>2016</b>
Village Hall Cairnryan	Roadside	98.7	61	<b>10.2</b>	8.45

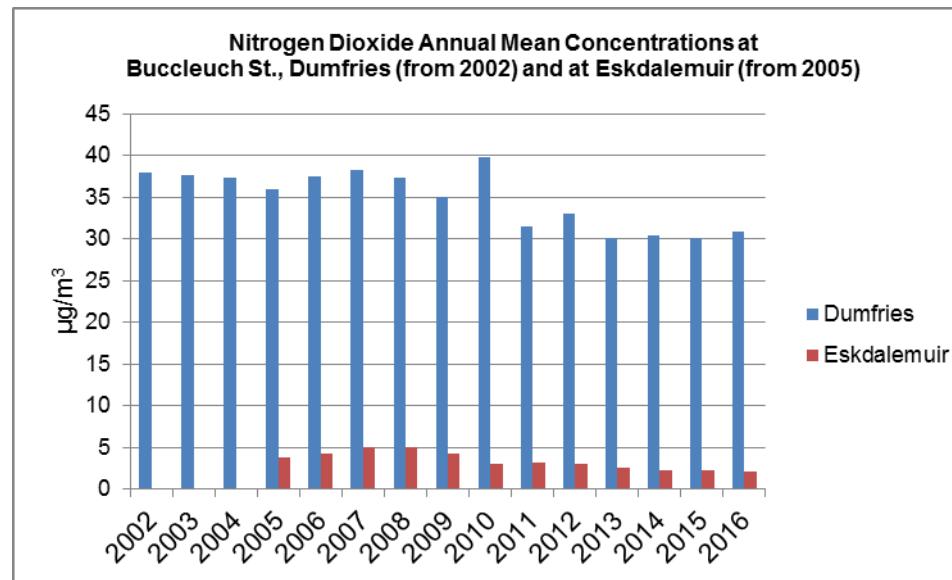
Notes: Exceedances of the PM<sub>10</sub> annual mean objective of 10µg/m<sup>3</sup> are shown in **bold**.

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

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

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

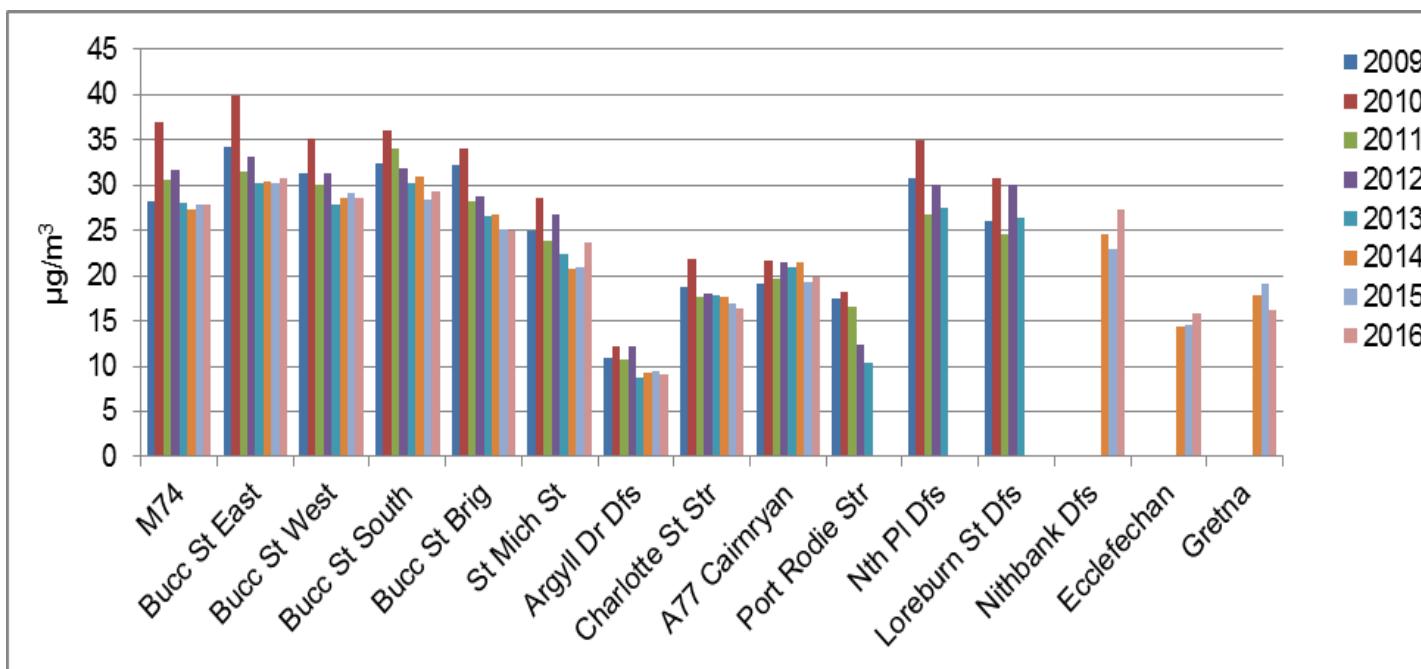
Figure A.1

**Trends in Annual Mean NO<sub>2</sub> 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 general reduction in NO<sub>2</sub> annual average levels from 2010 to 2016.

Figure A.3

**Graphs Showing Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations Over The Last Eight Years At Sites In Buccleuch Street, Dumfries.**

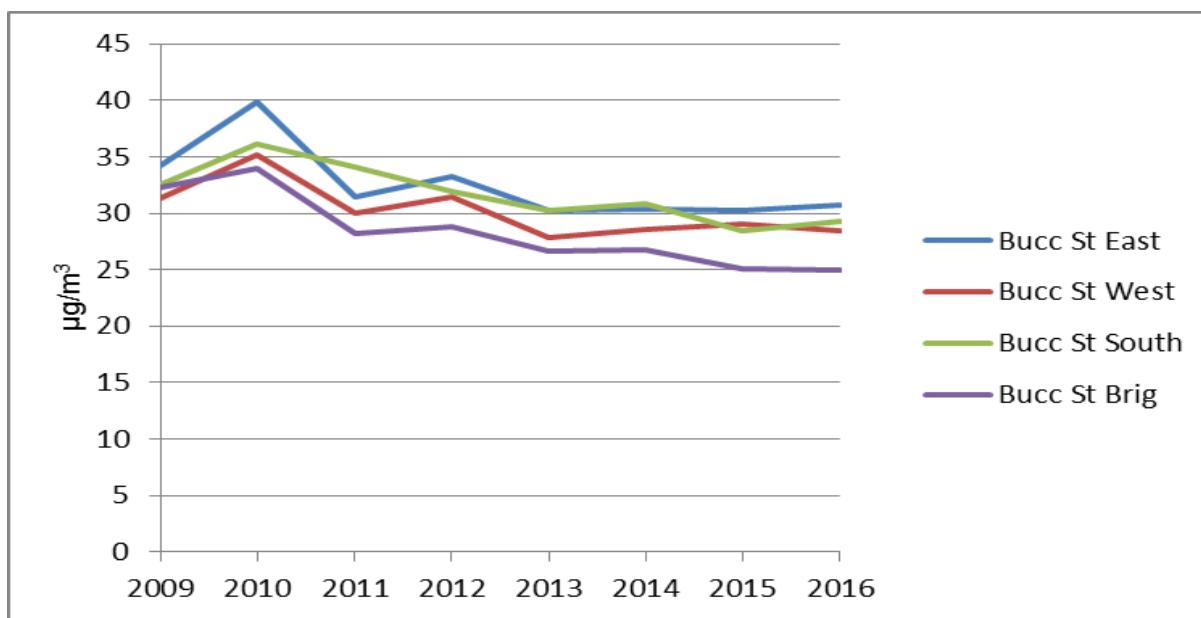


Figure A.4

**Graphs Showing Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations Over The Last Eight Years At Sites Other Than Buccleuch Street, Dumfries.**  
*(Excluding new and discontinued sites)*

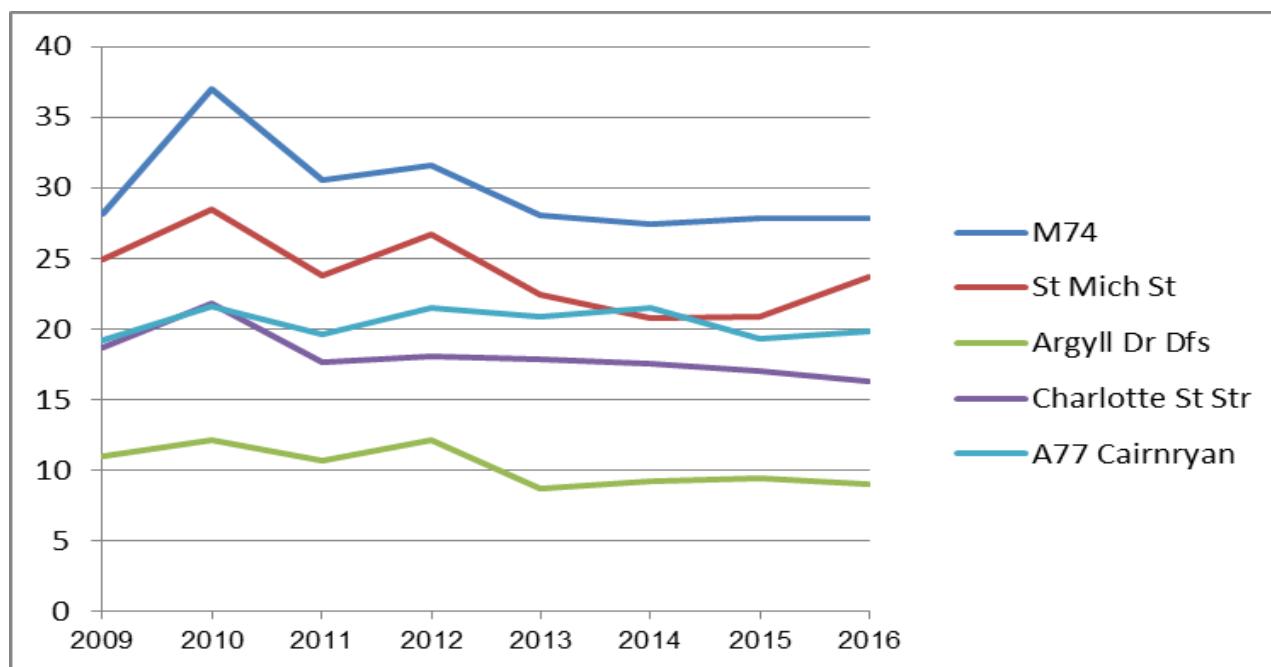


Figure A.5

**Graphs Showing Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations Over The Last Eight Years At All Sites**  
*(Excluding new sites).*

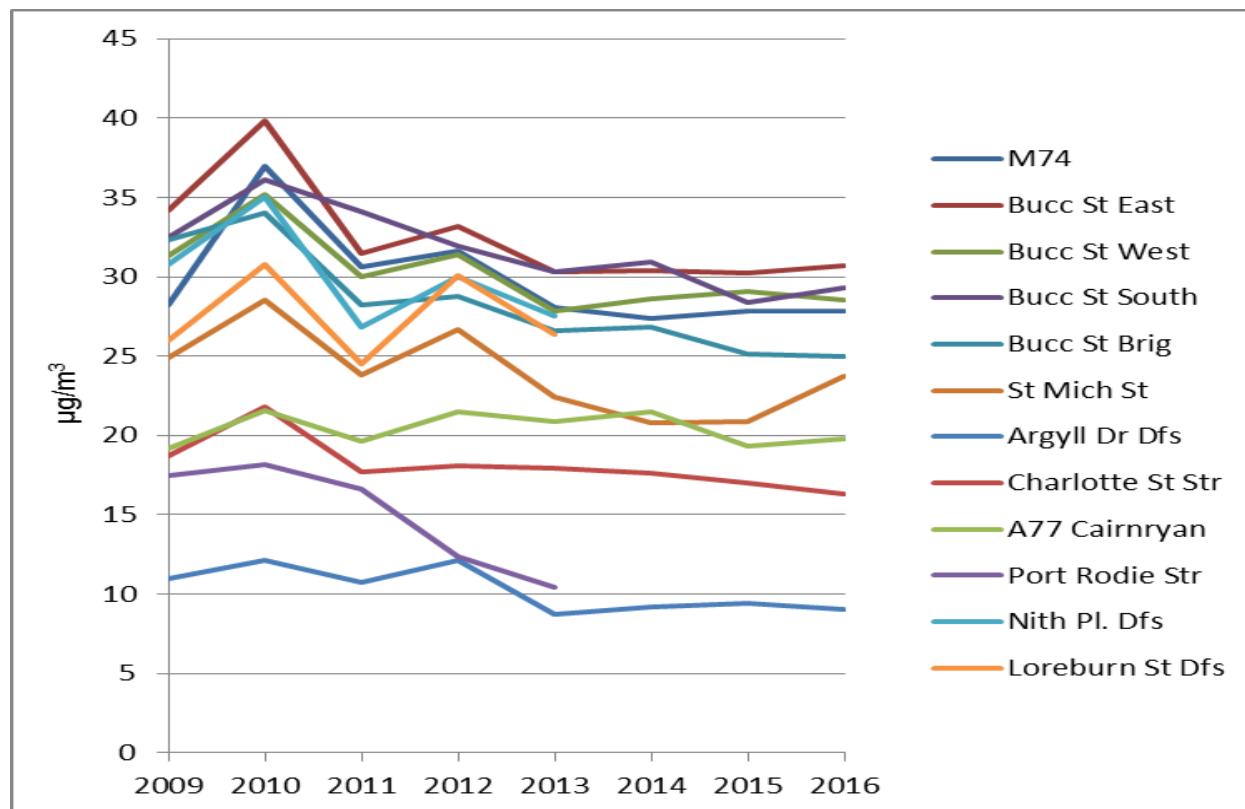
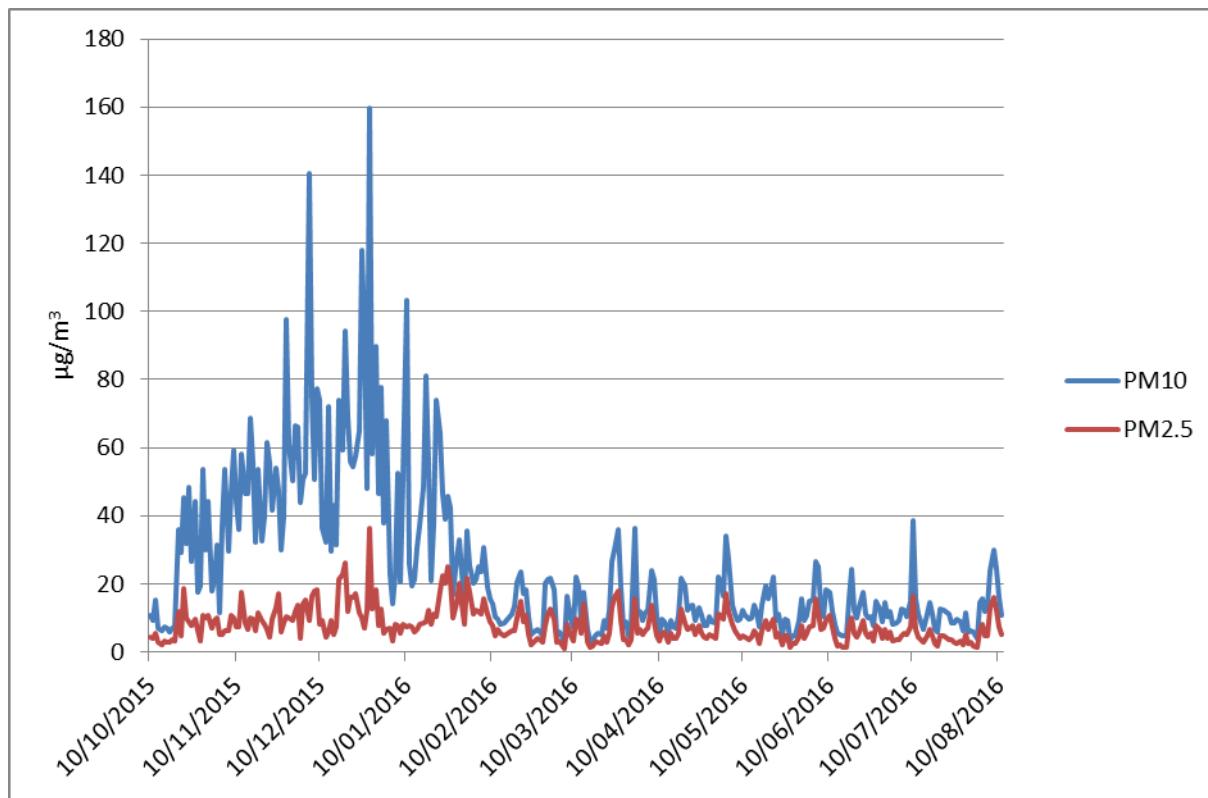


Figure A.6

Graphs Showing PM<sub>10</sub> (And PM<sub>2.5</sub>) 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.

## Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO<sub>2</sub> Monthly Diffusion Tube Results for 2016

Site Name	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )												Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted <sup>(1)</sup>
	28.4	45.4	23.2	31.3	25.8	30.3	29.3	31.5	28.3	29.3	48.0	36.5	32.3	27.8
M74 Slip Road, Lockerbie	44.6	34.1	38.0	41.7	25.2	32.5	24.5	30.2	27.9	36.7	39.4	38	-	-
<sup>(2)</sup> Buckleuch St (East) Dumfries	43.1	46.3	38.7	40.8	32.3	32.6	28.0	26.3	26.9	36.3	45.9	38	-	-
	41.8	48.0	40.7	40.8	28.0	31.2	26.8	31.2	28.4	37.4	45.6	38.6	35.7	30.7
<sup>(3)</sup> Buckleuch St (West) Dumfries	28.5	41.7	36.6	34.8	25.6	28.7	22.9	29.3	27.3	34.3	43.4	37.5	-	-
	43.0	44.4	35.2	33.8	25.7	28.1	27.5	24.9	27.9	33.9	42.3	36.8	33.1	28.5
Buckleuch St (South) Dumfries	36.9	41.7	36.6	35.4	29.4	28.4	27.3	29.1	24.9	36.7	41.3	41.4	34.1	29.3
<sup>(4)</sup> Buckleuch St Bridge, Dumfries	32.7	35.8	32.2	25.9	26.0	26.2	22.2	21.1	22.5	30	31.8	38.2	-	-
	34.5	38.5	29.2	28.0	22.4	25.3	21.9	26.2	26.0	29	32.4	35.1	-	-
	35.8	34.3	31.3	28.9	25.0	25.6	22.2	24.7	26.3	31	32.8	34.8	29.1	25.0
Nithbank Dumfries	39.3	39.6	34.2	39.2	29.5	28.0	16.1	25.8	22.3	37.2	41.5	30	31.9	27.4

Site Name	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
	Raw Data	Bias Adjusted <sup>(1)</sup>												
St Michael St Dumfries	34.7	33.9	28.9	27.8	21.8	21.4	15.4	20.6	v	30.3	37.0	31.4	27.6	23.7
Argyll Drive Dumfries	16.2	18.1	8.7	9.1	6.5	5.1	7.3	8.4	7.5	8.6	16.2	13.8	10.5	9.0
Castle Break Ecclefechan	19.2	23.0	18.8	21.1	14.6	14.3	9.0	14.7	12.1	22.5	26.9	26.3	18.5	15.9
Gretna Loaning Gretna Green	19.8	29.2	20.9	16	13.2	11.4	20	21.7	18.7	15	17.8	21.4	18.8	16.2
Charlotte St Stranraer	25.7	23.3	22.1	19.5	16.6	15.6	13.9	16.0	13.2	19.7	21.1	19.7	18.9	16.3
A77 Cairnryan Stranraer	21.0	24.6	21.0	v	21.2	23.3	23.2	23.7	23.2	19.3	25.2	27.6	23.0	19.8

(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 Data QA/QC

### NO<sub>2</sub> continuous monitor

A continuous (chemiluminescent) NO<sub>2</sub> 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 NO<sub>2</sub> continuous monitor at Eskdalemuir also forms part of the AURN and is subject to the same audit regime).

Triplicate diffusion tubes at Buccleuch Street (East) Dumfries are co-located with the NO<sub>2</sub> continuous monitor and are used to derive a bias-adjustment factor.

**Table C.1 Details of co-location study at Buccleuch Street Dumfries 2016.**

Date	Monthly average (continuous monitor) (µg/m <sup>3</sup> )	Ratified/provisional data	Data capture %	Monthly average (diffusion tubes) (µg/m <sup>3</sup> )	Ratio:-continuous/diffusion tube result
January	34.42	Ratified	98.81	43.2	0.80
February	38.26	Ratified	99.25	42.8	0.89
March	33.75	Ratified	98.96	39.1	0.86
April	34.08	Ratified	98.81	41.1	0.83
May	26.67	Ratified	99.43	28.5	0.94
June	30.53	Ratified	81.07	32.1	0.95
July	24.77	Ratified	97.01	26.4	0.94
August	22.94	Ratified	99.4	29.2	0.78
September	23.30	Ratified	99.52	27.7	0.84
October	31.07	Ratified	99.41	36.8	0.84
November	42.22	Ratified	92.35	43.6	0.97
December	28.89	Ratified	96.34	38.2	0.76
Average	30.9		96.37	35.7	0.86

*Bias-adjustment factor = continuous mean/diffusion tube mean = 30.9 / 35.7 = 0.86*

*Diffusion tube bias = (diffusion tube mean minus continuous mean) divided by continuous mean = (35.7 - 30.9)/30.9= 0.16 i.e. tubes over-read by approximately 16%.*

The local bias adjustment factor of 0.86 has been used in preference to the national bias-adjustment factor of 0.77 derived by amalgamation of 30 studies including Dumfries and Galloway's. The national bias adjustment spreadsheet (version 03/17) 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 Sciences Group using 50% triethanolamine (TEA) in acetone. Environmental Sciences Group demonstrated satisfactory performance for 2016 in the Workplace Analysis Scheme for Proficiency (WASP) (an independent analytical performance-testing scheme).

**Table C.2** Annualisation of PM<sub>10</sub> monitoring data at Cairnryan.

Site	Site Type	Annual Mean 2016 (A <sub>m</sub> ) µg/m <sup>3</sup>	Period Mean 10/10/15 to 11/08/16 (P <sub>m</sub> ) µg/m <sup>3</sup>	Ratio A <sub>m</sub> /P <sub>m</sub>
Edinburgh St Leonards	Urban Background	10.7	10.5	1.02
Errol Place Aberdeen	Urban Background	11.8	11.7	1.01
Waulkmillglen Reservoir Glasgow	Rural	9.4	9.5	0.99
		Average		1.01
Village Hall Cairnryan	Roadside	Estimated 2015 annual mean = 25.4 x 1.01 = 25.6 µgm <sup>-3</sup>		

Data capture for comparison sites should ideally be at least 85% as per LAQM TG16). Comparison sites for PM<sub>10</sub> and PM<sub>2.5</sub> are slightly different due to availability of valid data.

**Table C.3** Annualisation of PM<sub>2.5</sub> monitoring data at Cairnryan.

Site	Site Type	Annual Mean 2016 (A <sub>m</sub> ) µg/m <sup>3</sup>	Period Mean 10/10/15 to 11/08/16 (P <sub>m</sub> ) µg/m <sup>3</sup>	Ratio A <sub>m</sub> /P <sub>m</sub>
Edinburgh St Leonards	Urban Background	6.4	6.13	1.04
Errol Place Aberdeen	Urban Background	5.4	5.2	1.04
Auchencorth Moss	Rural	2.6	2.3	1.13
Average				1.07
Village Hall Cairnryan	Roadside	Estimated 2015 annual mean = 7.9 x 1.07 = 8.45µgm <sup>-3</sup>		

Data capture for comparison sites should ideally be at least 85% as per LAQM TG16). Comparison sites for PM<sub>10</sub> and PM<sub>2.5</sub> are slightly different due to availability of valid data.

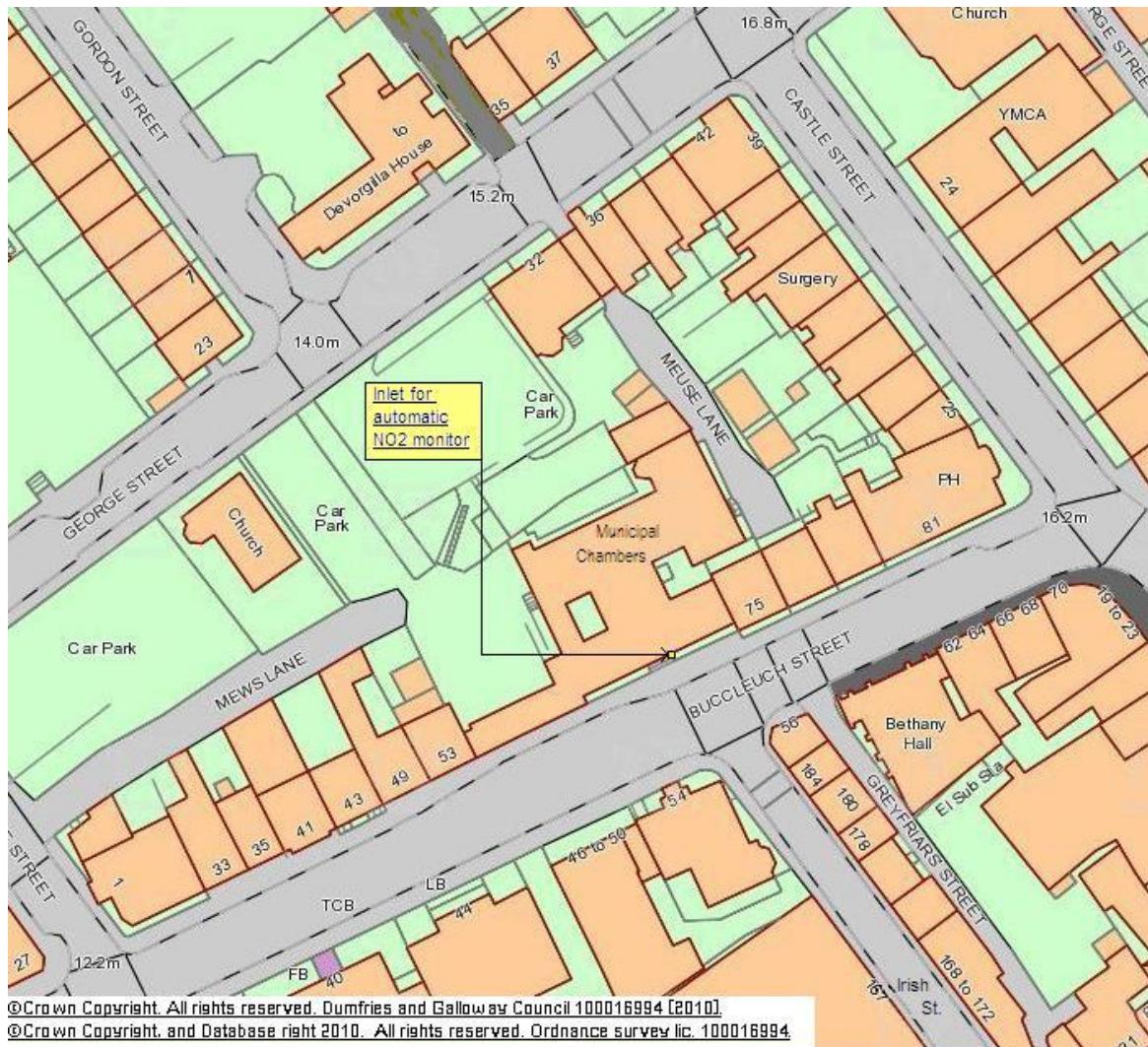
### QA/QC Osiris monitor

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

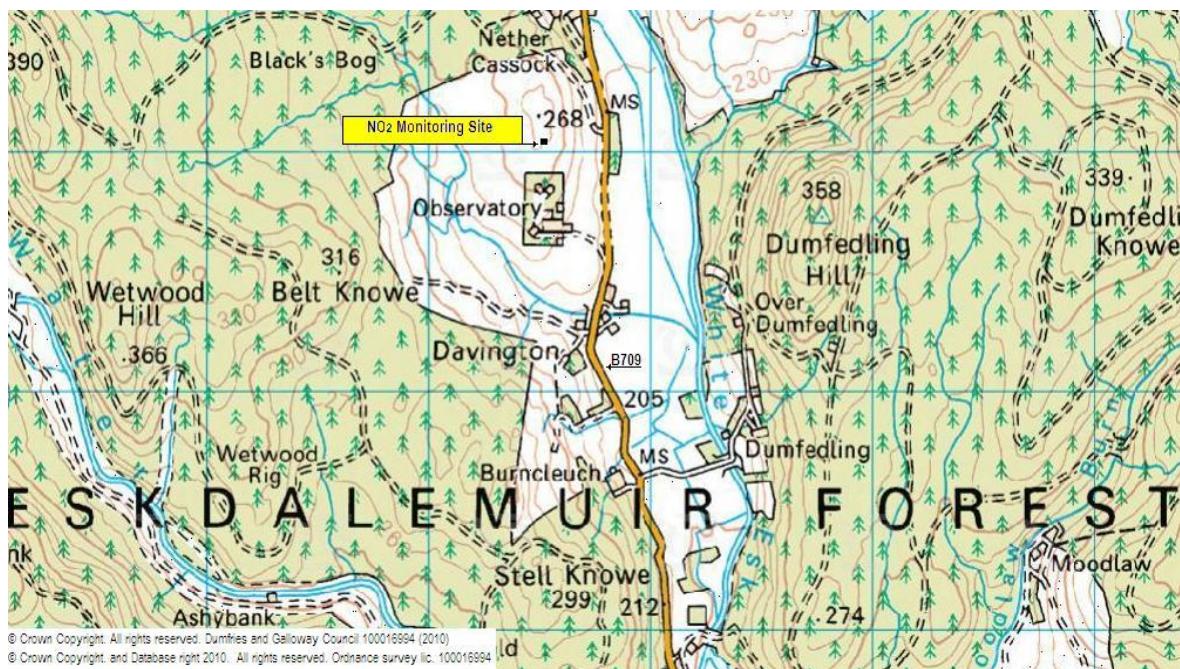
## Map of NO<sub>2</sub> automatic monitoring site at Buccleuch St., Dumfries.



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 NO<sub>2</sub> automatic monitoring site at Eskdalemuir

Since December 2004 a continuous NO<sub>2</sub> monitor has been located at the Observatory<sup>(iii)</sup> at Eskdalemuir as part of the AURN. The Observatory 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, &amp; Buccleuch St. East, Dumfries.

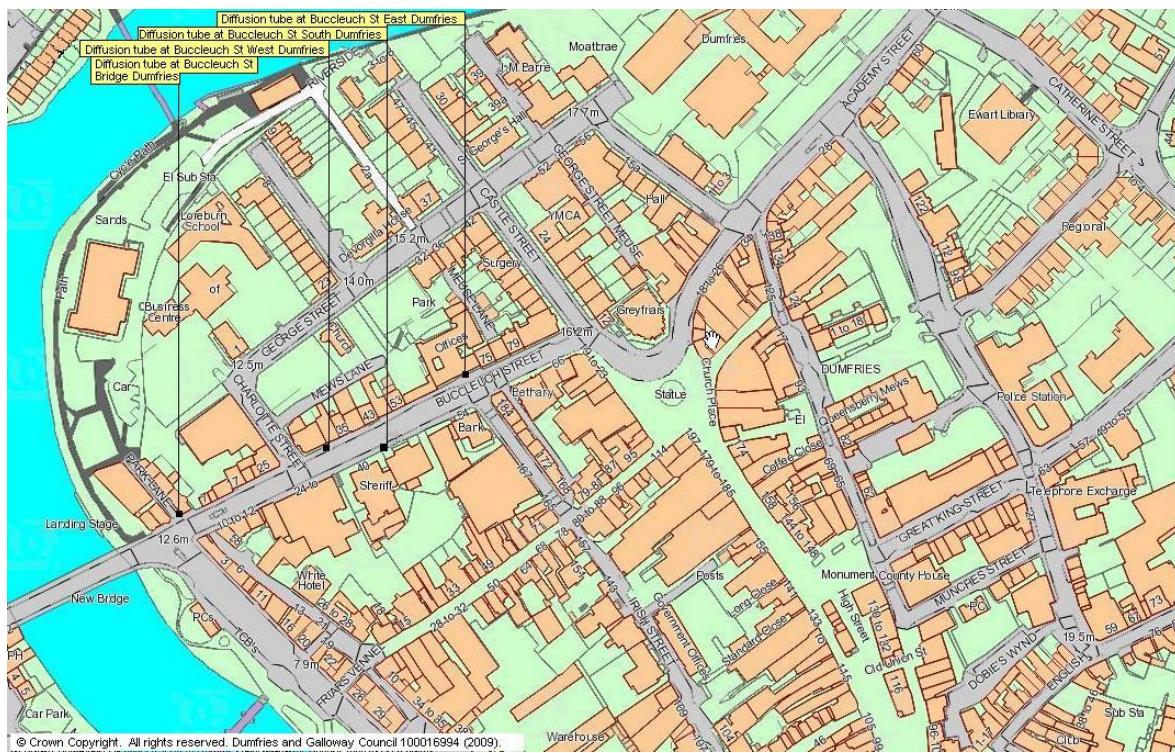


Figure D.5

Map of diffusion tube site at St Michael Street Dumfries



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

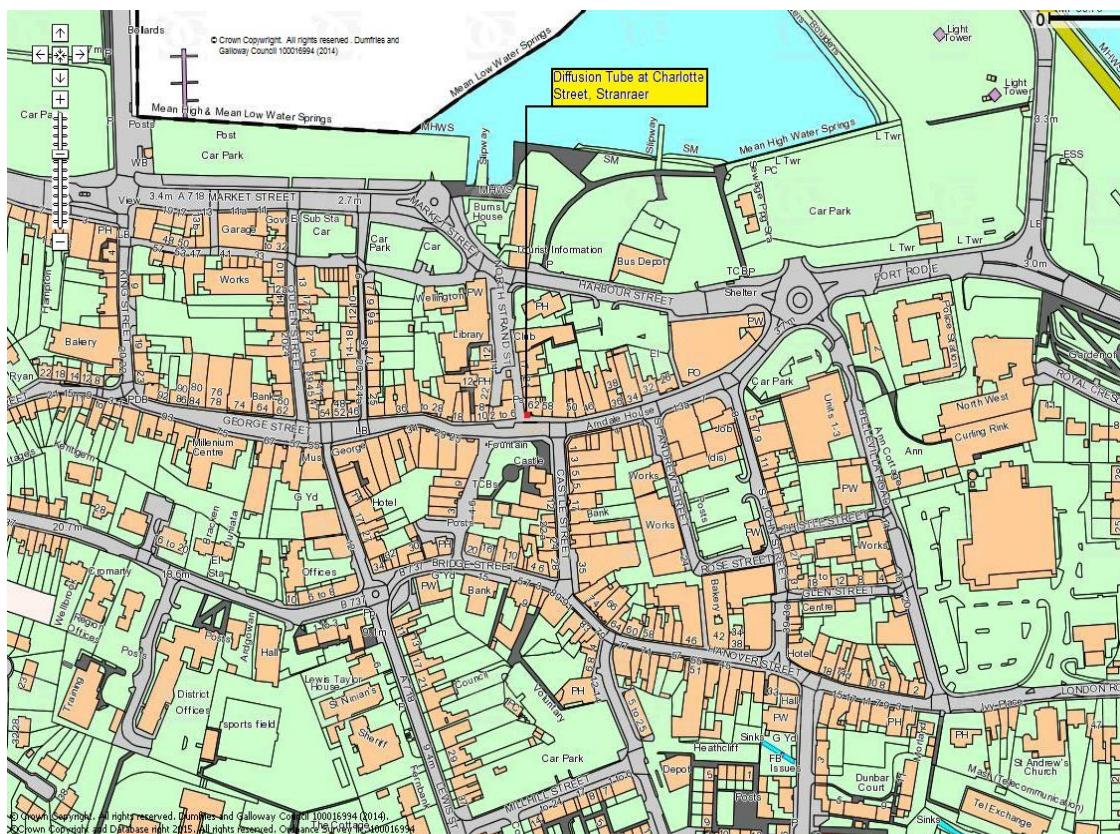
Figure D.6

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.

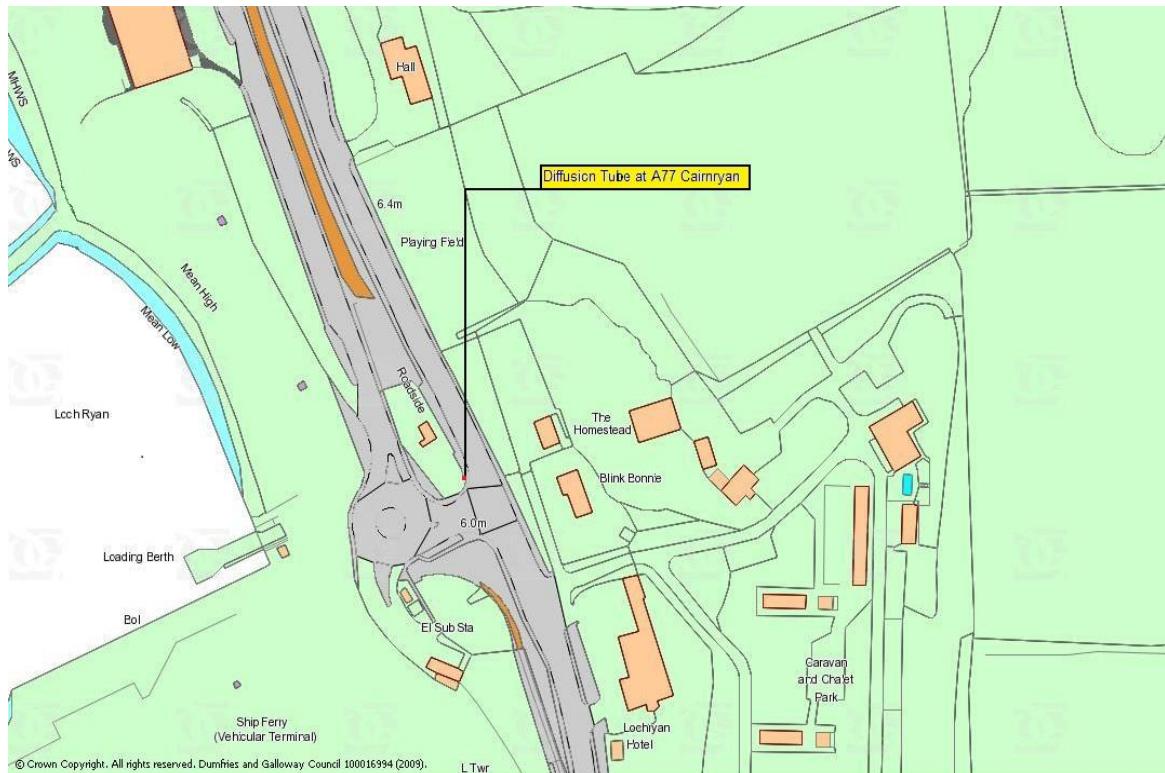


Figure D.9 Map of diffusion tube site at Nithbank, Dumfries.



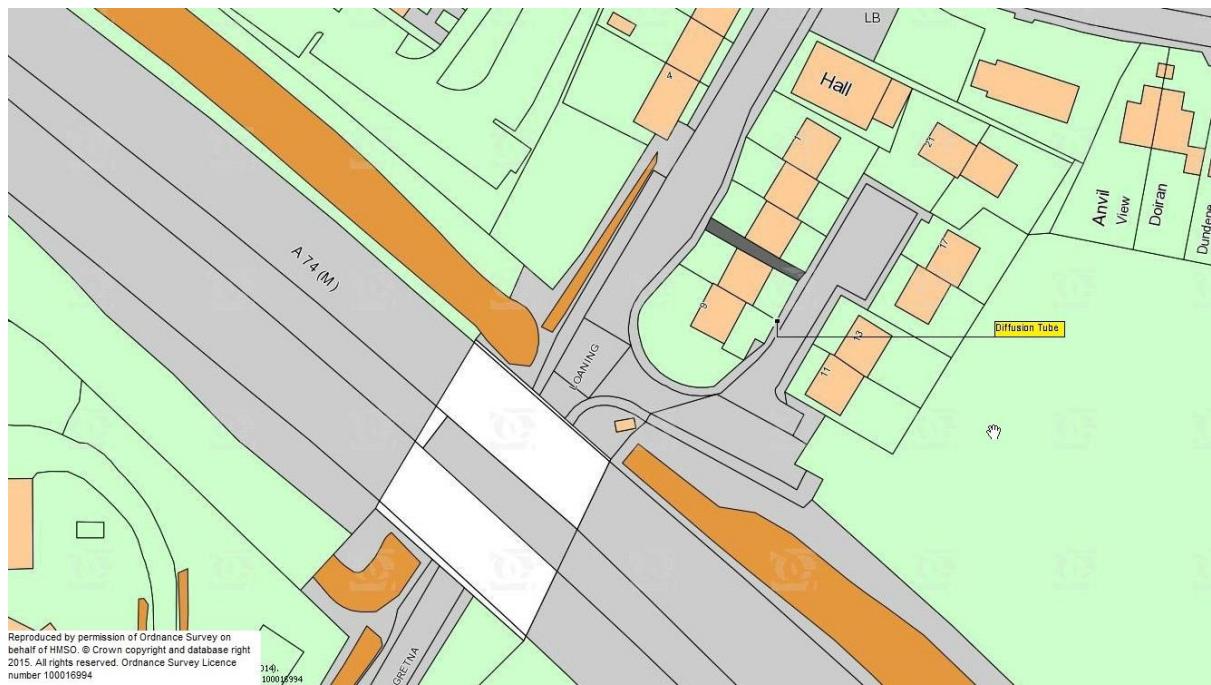
**Appendix D Maps showing the location of the monitoring sites (continued).**

Figure D.10

Map of diffusion tube site at Castle Break, Ecclefechan.

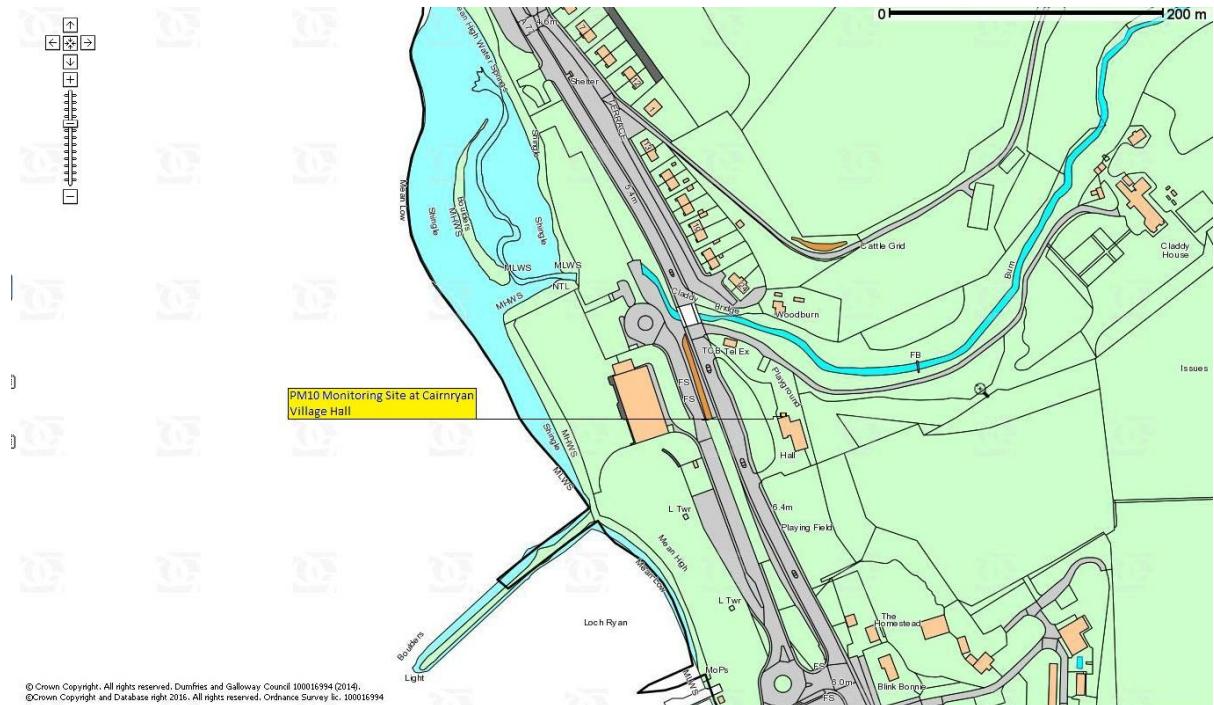


Figure D.11 Map of diffusion tube site at Gretna Loaning, Gretna,



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

Figure D.12 Map of PM<sub>10</sub> monitoring site at Cairnryan.



## Glossary of Terms

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

## References

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