Dumfries and Galloway Council

Annual Progress Report (APR)

2020 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

May 2020

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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_2 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 mostly a rural region, with two hundred miles of coast line; area 6,426 square kilometres; estimated 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_2 has not identified any new requirement to proceed to a detailed assessment with concentrations all below the objectives and NO_2 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_{10} at a worst-case junction in Dumfries showed that no Air Quality Management Areas were required to be designated for PM_{10} in Dumfries.

Due to a perceived increase in traffic levels following the re-location of the Stena Line port from Stranraer to Old House Point, Cairnryan PM_{10} (+ $PM_{2.5}$) reference method monitoring was carried out at Cairnryan from 22nd March 2018 – 08th October 2018 with results provided in 2019 Annual Progress Report.

Reference method monitoring showed that no Air Quality Management Areas were required to be designated for PM_{10} or $PM_{2.5}$ in Cairnryan.

Actions to improve air quality

In general, the air quality in Dumfries & Galloway is very good and as a result of this there are no designated Air Quality Management Areas (AQMAs) in Dumfries and Galloway. The focus of the air quality work undertaken by Dumfries and Galloway Council revolves and continues to revolve around NO_2 with transportation being the primary source of emissions.

Priorities and Challenges

Environmental Health have monitored at several passive diffusion tube sites that have shown sustained compliance over a number of years and as such are now examining the possibility of changing or expanding monitoring locations throughout Dumfries and Galloway to maximise available resources.

With respect to this the triplicate tube site at Buccleuch Street Bridge has been made a duplicate site and a duplicate site at Buccleuch Street West has been made a single tube site in order to facilitate measurement at the entrance to the Stena Port in Cairnryan and in order to respond to a complaint of poor air quality in Kirkcudbright.

Environmental Health recognises that good air quality and health are intrinsically linked. We are keen to increase public knowledge and perception of air quality in the region and are working to create a programme of work which will increase the profile of air quality issues such as vehicle anti-idling campaigns, clean air day promotion, alternative travel etc.

Environmental Health recognise that with the advance of technology there are mobile (non-reference) monitoring stations (that can operate independently from a mains

power source) that could be used to collect hourly data from road traffic sources. Environmental Health are currently seeking funding options to acquire this equipment.

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.

Table of Contents

List of Tables

List of Figures

1. Local Air Quality Management

This report provides an overview of air quality in Dumfries and Galloway during 2019. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) 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 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 (APR) is 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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m^3	Annual mean	31.12.2005
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 µg/m^3	Annual mean	31.12.2010
Particulate Matter ($PM_{2.5}$)	10 µg/m^3	Annual mean	31.12.2020
Sulphur dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
Benzene	3.25 µg/m^3	Running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon Monoxide	10.0 mg/m^3	Running 8-Hour mean	31.12.2003
Lead	0.25 µg/m^3	Annual Mean	31.12.2008

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.

2.2 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 https://www.gov.scot/Publications/2015/11/5671/17.

Progress by Dumfries and Galloway Council against relevant actions within this strategy is demonstrated below.

2.2.1 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

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 are available online at: http://egenda.dumgal.gov.uk/aksdumgal/images/att42349.pdf

2.3 National Low Emission Framework (NLEF) Stage 1 Screening Appraisal for Dumfries and Galloway Council.

The NLEF[1], which is now part of the review and assessment process for LAQM reporting in Scotland, contributes to the Cleaner Air for Scotland strategy by aiming to improve local air quality in areas where air quality objectives are exceeded, or likely to be exceeded, primarily due to emissions from transport.

The NLEF is directly linked to Air Quality Action Planning (AQAP) for local authorities with Air Quality Management Areas (AQMAs), and will help to identify actions to improve local air quality within AQMAs. The NLEF appraisal takes the form of a two-stage process, as summarised in Table 2.1:

Table 2.1 – NLEF Appraisal Process

Stage		Outcome	Actions Required
1	Screening	• decision on whether to proceed to stage two assessment	• screening process to identify actions that will benefit air quality within the AQMA • screening evidence should form part of the Annual Progress Report, with the decision agreed by Scottish Government and SEPA
2	Assessment	• decision to proceed with introduction of LEZ or identification of alternative transport-related measures required to improve air quality • Stage two assessment report agreed by Scottish Government and SEPA	• NMF approach to support assessment of sources of pollution and options • quantitative impact assessment (based on predicted change in pollutant concentrations) • consideration of consequential impacts (e.g. congestion, export of pollution)

Dumfries and Galloway Council currently does not have any AQMAs, and therefore a Stage 1 Screening Appraisal has not been undertaken.

[1] https://www.gov.scot/publications/national-low-emission-framework/pages/2/

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

Dumfries and Galloway Council has taken forward a number of measures during the reporting year of 2018 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

In the 2017-18 Programme for Government, the Scottish Government committed to commence work for the second Strategic Transport Projects Review (STPR) in the Dumfries and Galloway area. Responding to this commitment, in 2018, AECOM and Peter Brett Associates (PBA) were commissioned to carry out the first stage in the Scottish Transport Appraisal Guidance (STAG) process, researching the case for investment in transport interventions in the South West of Scotland through an Initial Appraisal: Case for Change study.

The key aim of the work is to consider the rationale for improvements to road, rail, public transport and active travel on key strategic corridors in the South West of Scotland, including those served by the A75, A76, A77, A701 and A709 as well as the railway corridors to Stranraer and Carlisle via Kilmarnock / Dumfries with a particular focus on access to the ports at Cairnryan. The report can be available at: https://www.transport.gov.scot/media/45046/initial-appraisal-case-for-change-south-west-scotland-transport-study.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 2019. 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/

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_2 at 14 sites during 2019. 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_2)

In 2019 there were no exceedances of air quality objectives for NO_2 recorded in Dumfries and Galloway

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past eleven years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B.

Figures A.1 – A.5 in Appendix A shows the ratified continuous monitored NO_2 hourly mean concentrations with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

No hourly means greater than 200µg/m^3 have been recorded in 2019 and historically have only been recorded a few times over the years at Dumfries and never at Eskdalemuir.

3.2.2 Particulate Matter (PM_{10})

Previous monitoring for PM_{10} at a worst-case junction in Dumfries showed that no air quality management areas were required to be designated for PM_{10} in Dumfries. No PM_{10} monitoring is currently carried out at Dumfries.

PM_{10} 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_{10} 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 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 was representative of relevant public exposure in respect of both the annual and the 24-hour mean. As readings from the Osiris PM_{10} monitor were taken over two APR reporting periods both the annualised means for PM_{10} and $PM_{2.5}$ for the 2016 and 2017 reporting years were in excess of prescribed limits in terms of annualised means and PM_{10} levels exceeded seven 24-hour means greater than 50µg/m^3.

As a result of the higher than expected levels of particulate matter at Cairnryan Dumfries and Galloway Council's Environmental Health installed an approved (reference-method equivalent) Fidas 200 EN-certified fine dust monitoring and ambient air measuring system PM_{10} (+ $PM_{2.5}$) monitor in order to carry out a detailed assessment of PM_{10} levels at Cairnryan. If, as a result of reference method equivalent monitoring levels were shown to exceed the objective(s) then Environmental Health would thereafter be able to designate the whole or part of the village of Cairnryan as an Air Quality Management Area.

The Fidas 200 EN-certified fine dust monitoring and ambient air measuring system Equipment was installed and become operational in 2018 from the 22nd March 2018 – 08th October 2018

As a result of the 2018 monitoring no further PM_{10} monitoring has carried out by Dumfries and Galloway Council in 2019 as further monitoring is not warranted

3.2.3 Particulate Matter ($PM_{2.5}$)

An Osiris PM_{10} 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 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 was representative of relevant public exposure in respect of both the annual and the 24-hour mean.

The annualised mean for 2015 was 10·2µg/m^3 which was in excess of the annual mean objective of 10µg/m^3 but using 2016 valid data capture and the same data set after ratification this result is now reduced to 8·45µg/m^3.

As a result of the higher than expected levels of particulate matter at Cairnryan Dumfries and Galloway Council's Environmental Health installed an approved (reference-method equivalent) Fidas 200 EN-certified fine dust monitoring and ambient air measuring system PM_{10} (+ $PM_{2.5}$) monitor in order to carry out a detailed assessment of $PM_{2.5}$ levels at Cairnryan. If, as a result of reference method equivalent monitoring levels were shown to exceed the objective(s) then Environmental Health would thereafter be able to designate the whole or part of the village of Cairnryan as an Air Quality Management Area.

The Fidas 200 EN-certified fine dust monitoring and ambient air measuring system Equipment was installed and become operational in 2018 from the 22nd March 2018 – 08th October 2018

As a result of the 2018 monitoring no further $PM_{2.5}$ monitoring has carried out by Dumfries and Galloway Council in 2019 as further monitoring is not warranted

3.2.4 Sulphur Dioxide (SO_2)

A detailed assessment of the influence of shipping on SO_2 levels in Cairnryan was carried out in 2004 when it was found that the SO_2 levels met the objectives and an AQMA was not required.

Currently Dumfries and Galloway Council does no LAQM monitoring for SO_2 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

Despite a number of large developments proposed within Dumfries and Galloway 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 2019 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 2019 LAQM APR reporting year.

4.2 Industrial Sources

No industrial sources relevant with respect to air quality in Dumfries and Galloway have been identified in the 2019 LAQM APR reporting year.

4.3 Commercial and Domestic Sources

No relevant industrial sources with respect to air quality in Dumfries and Galloway have been identified in the 2019 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.

4.4 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 in the 2019 LAQM APR reporting year

5. Planning Applications

No planning applications with significant effects with respect to air quality in Dumfries and Galloway have been newly identified in the 2019 LAQM APR reporting year.

6. Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

There were no exceedances of the NO_2 air quality objectives identified within Dumfries and Galloway Council. It can be seen that in general NO_2 concentrations have been fairly stable for the past eight years and are significantly lower than the relatively high levels recorded in 2010.

Results at several of the diffusion tube sites for the 2019 LAQM APR reporting year were seen to be slightly higher than previous year but were within a reasonable tolerance. This apparent increase is thought to be due to higher than average tube concentrations at sites during January 2019 which has increased the overall yearly average for those sites. This trend will be re-assessed during 2020 and will be discussed in the 2021 APR

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

Environmental Health have monitored at several passive diffusion tube sites that have shown sustained compliance over a number of years and as such are now examining the possibility of changing or expanding monitoring locations throughout Dumfries and Galloway to maximise resources currently available.

With respect to this (and as previously discussed in the 2019 APR) a triplicate tube site at Buccleuch Street Bridge has been modified to a duplicate site and a duplicate site at Buccleuch Street West has been made a single tube site in order to facilitate measurement at the entrance to the Stena Port in Cairnryan and in order to respond to a complaint of poor air quality in Kirkcudbright.

Environmental Health recognises that good air quality and health are intrinsically linked. We are keen to increase public knowledge and perception of air quality in the region and are working to create a programme of work which will increase the profile of air quality issues such as vehicle anti-idling campaigns, clean air day promotion, alternative travel etc.

Environmental Health also recognise that with the advance of technology there are mobile (non-reference) monitoring stations (that can operate independently from a mains power source) that could be used to collect hourly air quality data.

Environmental Health are currently seeking funding options to acquire this equipment.

Details of any newly proposed locations for non-automatic NO_2 monitoring locations will be included in the 2020 APR (if relevant).

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) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
Buccleuch Street Dumfries	Roadside	297025	576259	NO_2	N	Chemiluminescent	<1	4·3	2·2
Eskdalemuir	Rural	323551	603022	NO_2	N	Chemiluminescent	N/A	225	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) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a 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 (P&O)	Roadside	207216	567422	NO_2	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) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a continuous analyser?
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
A77 Cairnryan (Stena)	Roadside	206109	569375	NO2	No	5	5	No
Kirkcudbright	Roadside	268574	551126	NO_2	No	<1	2.0	No

Table A.3 – Annual Mean NO_2 Monitoring Results

Site Name	Site Type	Monitoring Type	Valid Data Capture 2019 (%) [1]	NO_2 Annual Mean Concentration (µg/m^3) [2]										
				2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Buccleuch Street Dumfries	Roadside	Automatic	99.26	35·0	39·9	31·5	33·1	30·2	30·5	30·1	30·9	30.2	29.5	31.1
Eskdalemuir	Rural	Automatic	96.67	4·3	3·0	3·2	3·0	2·5	2·3	2·2	2·0	2	1.9	1.8
M74 Slip Road. Lockerbie	Other	Diffusion Tube	100	28·2	37·0	30·6	31·6	28·1	27·4	27·8	27·8	27.2	23.1	24.4
Buccleuch St. (E) Dumfries	Roadside	Diffusion Tube (Triplicate)	100	34·2	39·8	31·5	33·2	30·3	30·4	30·2	30·7	30.6	29.9	30.5
Buccleuch St. (W) Dumfries	Kerbside	Diffusion Tubes (Duplicate)	79.1 *	31·3	35·2	30·0	31·4	27·8	28·6	29·1	28·5	28.7	27	28.2
Buccleuch St. (S) (Sheriff) Dumfries	Kerbside	Diffusion Tube	100	32·5	36·1	34·1	31·9	30·3	30·9	28·4	29·3	30.9	30.2	29.6
Buccleuch St. Bridge Dumfries	Roadside	Diffusion Tubes (Triplicate)	94.4 **	32·3	34·0	28·2	28·8	26·6	26·8	25·1	25·0	25.2	25.3	25.9
St. Michael St. Dumfries	Roadside	Diffusion Tube	100	24·9	28·5	23·8	26·7	22·4	20·8	20·9	23·7	21.2	20.3	21
Argyll Drive Dumfries	Urban Background	Diffusion Tube	100	11·0	12·1	10·7	12·1	8·7	9·2	9·4	9·0	9.5	8.4	9.4
Charlotte St. Stranraer	Roadside	Diffusion Tube	100	18·7	21·8	17·7	18·1	17·9	17·6	17·0	16·3	15.5	19.5	18.5
A77 Cairnryan P&O	Roadside	Diffusion Tube	100	19·2	21·6	19·6	21·5	20·9	21·5	19·3	19·8	17.9	17.4	17.9
Nithbank Dumfries [3]	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	24·5	23·0	27·4	22.8	19.8	20.8
Castle Break Ecclefechan [3]	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	14·4	14·5	15·9	13.1	13.2	13.1
Gretna Loaning Gretna [3]	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	17·9	19·1	16·2	17.5	14.3	14
Kirkcudbright	Kerbside	Diffusion	16.67 ***	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	16.1
A77 Cairnryan Stena	Kerbside	Diffusion Tube	41.6 ****	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.4
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	N/A	N/A	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	N/A	N/A	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	N/A	N/A	N/A	N/A

Notes: Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(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) 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.

* Previously Duplicate - Single from August 2019
** Previously Triplicate - Duplicate from November 2019
*** New Site from November 2019
**** New Site from August 2019

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site Name	Monitoring Type	Valid Data Capture 2019 (%) (1)	NO_2 1-Hour Means > 200µg/m^3										
			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Buccleuch Street, Dumfries	Automatic	99.3	0	3	2	0	1	1	1	0	1	0	0
Eskdalemuir	Automatic	96.7	0	0	0	0	0	0	0	0	0	0	0

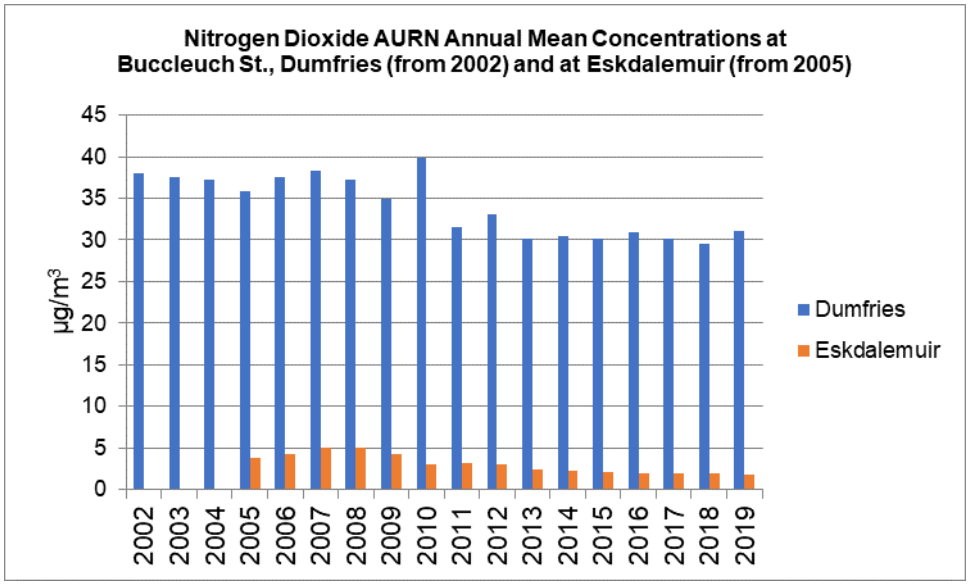
Notes: Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

(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%).

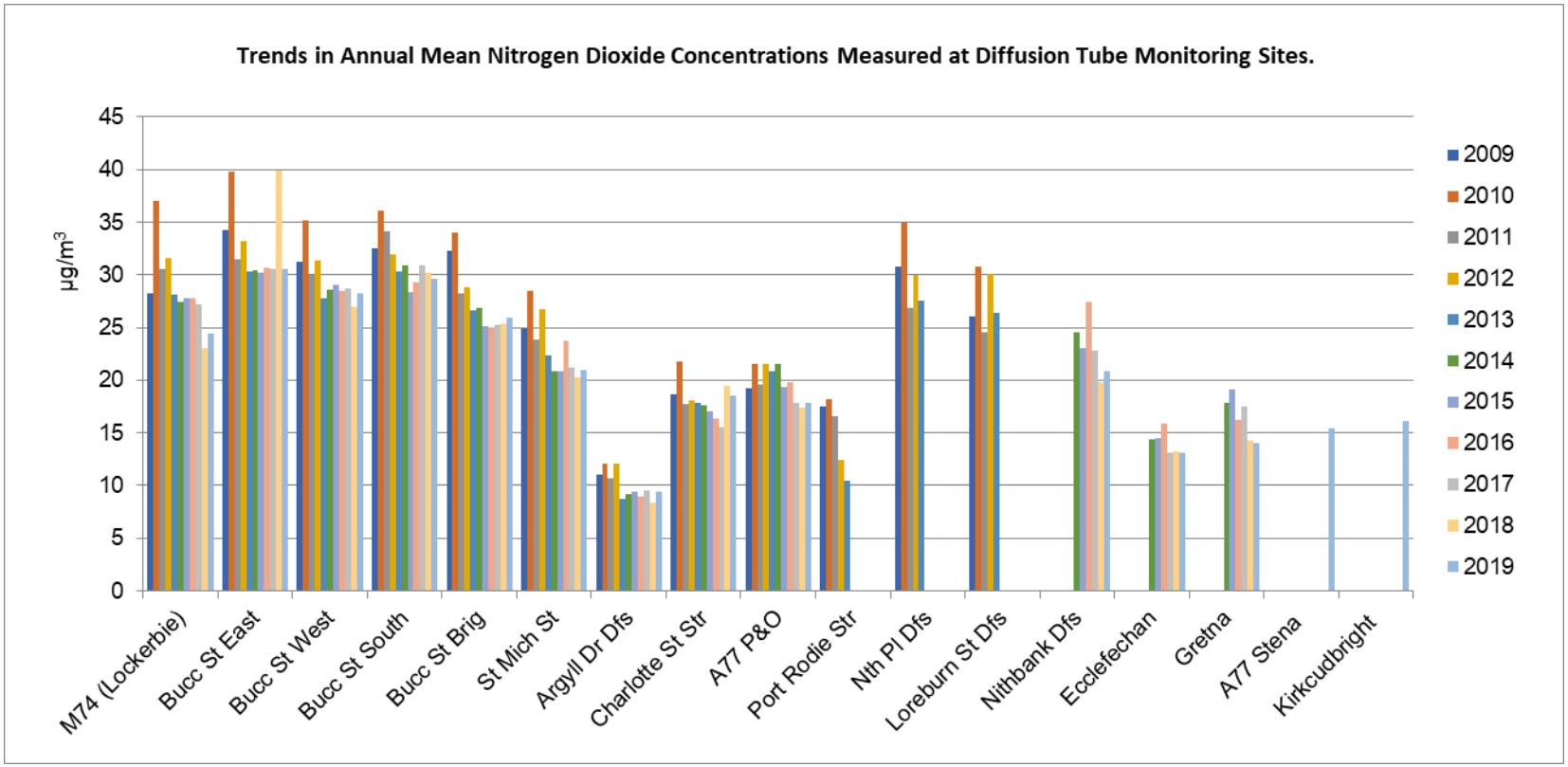
(3) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Figure A.1 Trends in Annual Mean NO_2 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_2 annual average levels from 2010 to 2019.

Figure A.3 **Graph Showing Historical Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations at Sites in Buccleuch Street, Dumfries.**

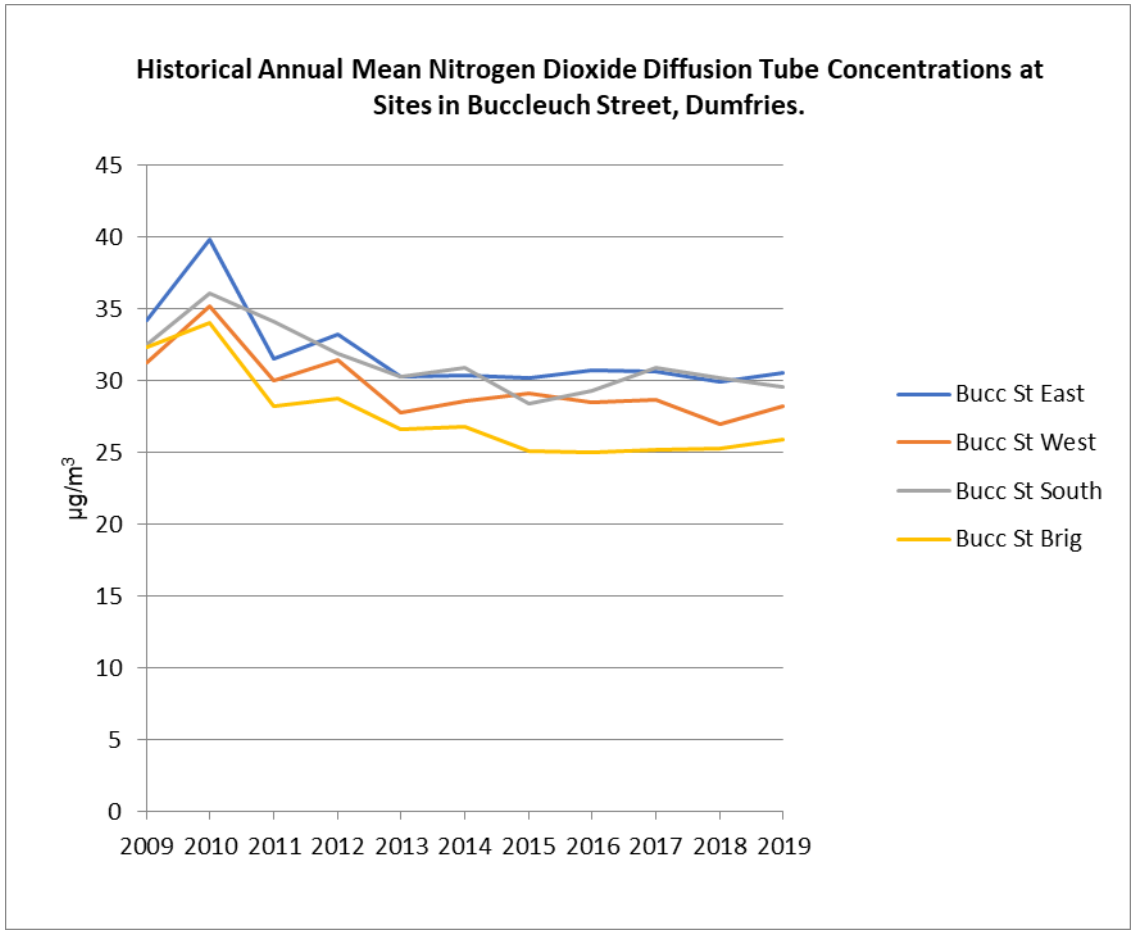


Figure A.4 **Graph Showing Historical Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations at Sites Other Than Buccleuch Street, Dumfries.**
(Excluding discontinued sites)

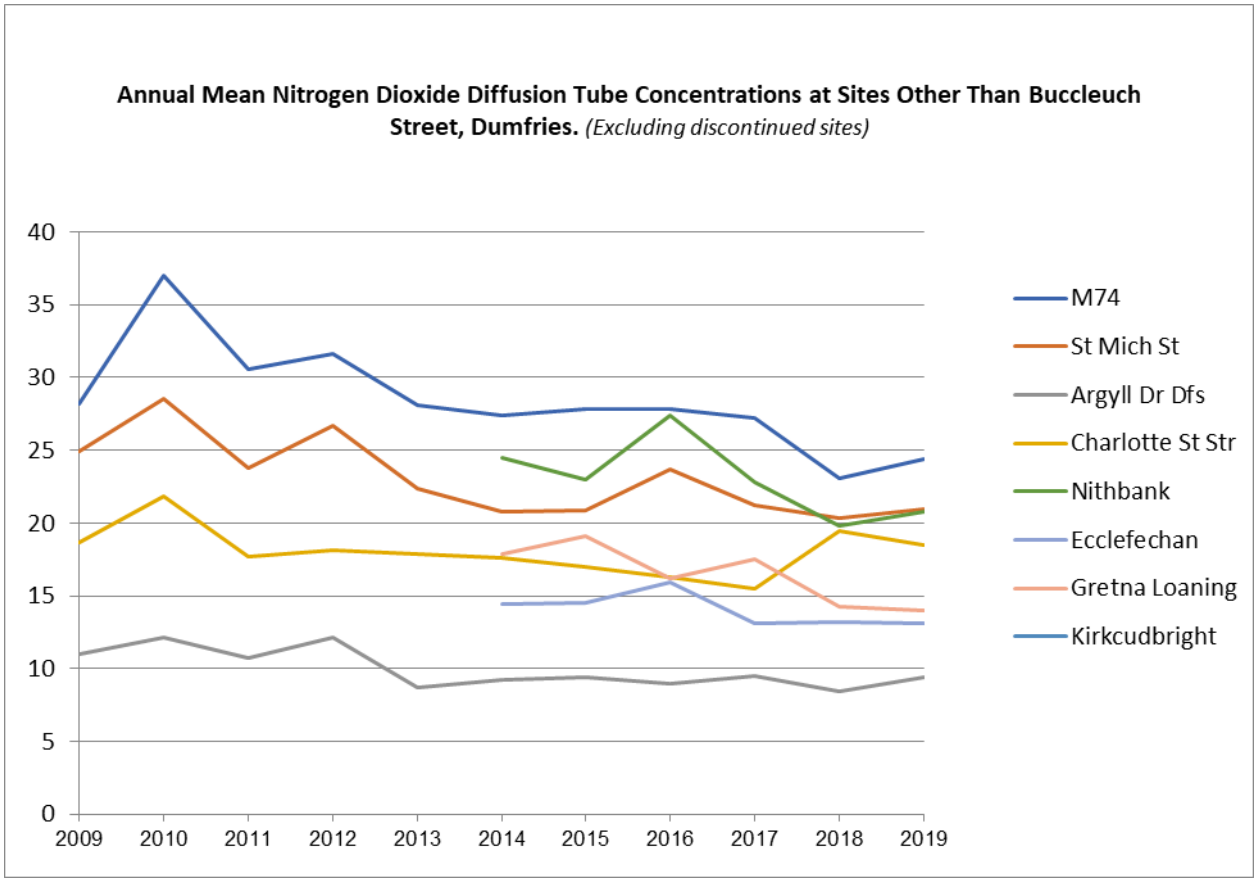
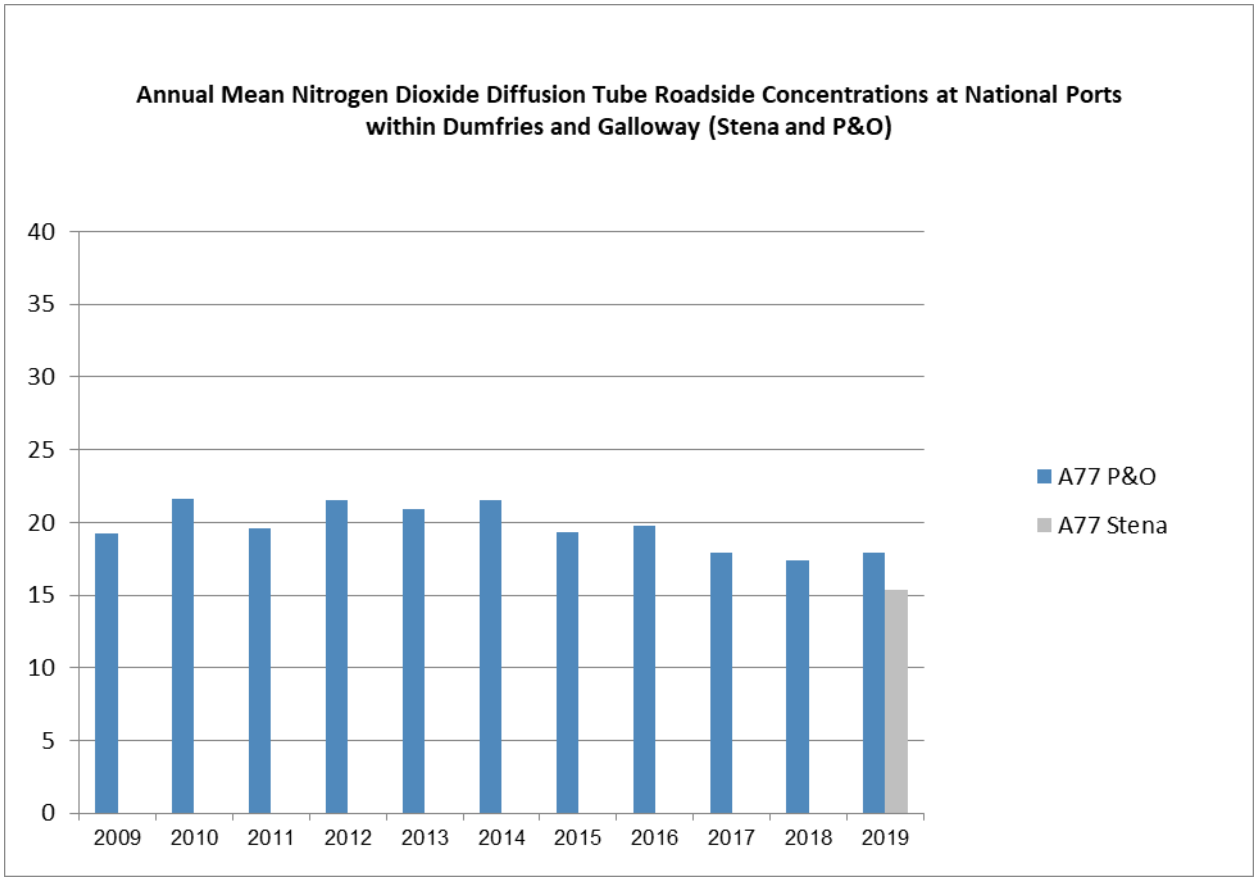


Figure A.5 **Graph Showing Annual Mean Nitrogen Dioxide Diffusion Tube Roadside Concentrations at National Ports within Dumfries and Galloway (P&O and Stena Line)**



Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 – NO_2 Monthly Diffusion Tube Results for 2019

Site Name	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	44.8	32.2	31.6	18.9	24.1	19.8	21	21.9	26.9	31.1	33.3	27.5	27.8	24.4
(2)Buccleuch St (East) Dumfries	52.8	32.9	36.0	34.3	33.9	29.0	26.4	26.7	33.9	37.2	44.9	33.1	34.7	30.5
	48.5	35.3	38.4	34.5	31.2	30.1	22.6	25.8	34	39.1	44.6	36.4		
	52.5	32.2	38.3	32.1	34.3	27.8	26.3	25.7	20.4	34.8	45.8	36		
(3)Buccleuch St (West) Dumfries	46.7	24.4	32.6	32.7	26.9	24.1	24.1	0	0	0	0	0	32.0	28.2
	45.9	32.5	35.3	30.2	30.3	26.6	25.9	28.5	29.0	37.1	40.5	34.8		
Buccleuch St (South)(Sheriff) Dumfries	46.4	33.4	33.5	41.9	26	23	24.1	26.3	30.3	37.7	41.6	38.9	33.6	29.6
(4)Buccleuch St Bridge, Dumfries	38.6	36.2	26	37.1	22.1	23.9	21.8	26	26.2	31.2	33.8	31.1	29.4	25.9
	38.8	33.8	26.9	39.9	24.8	23.6	20.8	25.1	27.4	30.6	0	0		
	38.2	33.3	26	48.7	22.7	21.2	22	25.9	27.1	31.1	31.8	26.1		
Nithbank Dumfries	39.3	21.1	21	27.5	22.8	18.7	15.8	13.9	23.1	17.9	40.9	21.6	23.6	20.8
St Michael St Dumfries	38.9	23.6	20.7	24.8	19.6	18.2	15.6	14.4	23.9	30.3	37.8	18.9	23.9	21.0

Site Name	NO_2 Mean Concentrations (µg/m^3) (Continued…)												Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (1)
Argyll Drive Dumfries	20.1	11.7	9.9	8.7	6.5	6	5.7	6.4	9.8	12	17.3	13.5	10.6	9.4
Castle Break Ecclefechan	25.1	16.9	11.2	17.5	11.6	8.8	9.7	8.8	14.4	18.6	22.2	13.7	14.9	13.1
Gretna Loaning Gretna Green	24.0	17.5	21.2	9.9	13.0	10.3	13.9	15.6	16.4	17.0	14.3	18.0	15.9	14.0
Charlotte St Stranraer	32.2	15.6	20.9	17.4	15	17.6	16.4	16.1	22.3	26.5	33.5	18.1	21.0	18.5
A77 Cairnryan Stranraer P&O	19.9	24.8	22.4	20.1	20.1	15.9	22.0	18.9	18.3	20.7	22.3	18.4	20.3	17.9
A77 Cairnryan Stena Port	0	0	0	0	0	0	0	19	19	14.5	19.1	15.9	17.5	15.4
Kirkcudbright	0	0	0	0	0	0	0	0	0	0	18.3	18.3	18.3	16.1

(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

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_2 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_2 continuous monitor and are used to derive a bias-adjustment factor.

Table C.1 Details of Co-Location Study at Buccleuch Street Dumfries 2019.

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	43.34	Ratified	99.55	40.10	1.08
February	27.27	Ratified	98.97	51.27	0.53
March	28.49	Ratified	99.26	33.47	0.85
April	28.53	Ratified	99.38	37.57	0.76
May	28.81	Ratified	99.77	33.63	0.86
June	23.45	Ratified	98.96	33.13	0.71
July	23.91	Ratified	98.15	28.97	0.83
August	21.85	Ratified	99.55	25.10	0.87
September	29.27	Ratified	99.07	26.07	1.12
October	34.92	Ratified	99.76	29.43	1.19
November	46.39	Ratified	99.4	37.03	1.25
December	35.41	Ratified	99.7	45.10	0.79
Average	30.97		99.29	35.07	

Bias-adjustment factor = continuous mean/diffusion tube mean = 30.97 / 35.07 = 0.88
Diffusion tube bias = (diffusion tube mean minus continuous mean) divided by continuous mean = (35.07 - 30.97) / 30.97 = 0·13 i.e. tubes over-read by approximately 13%.

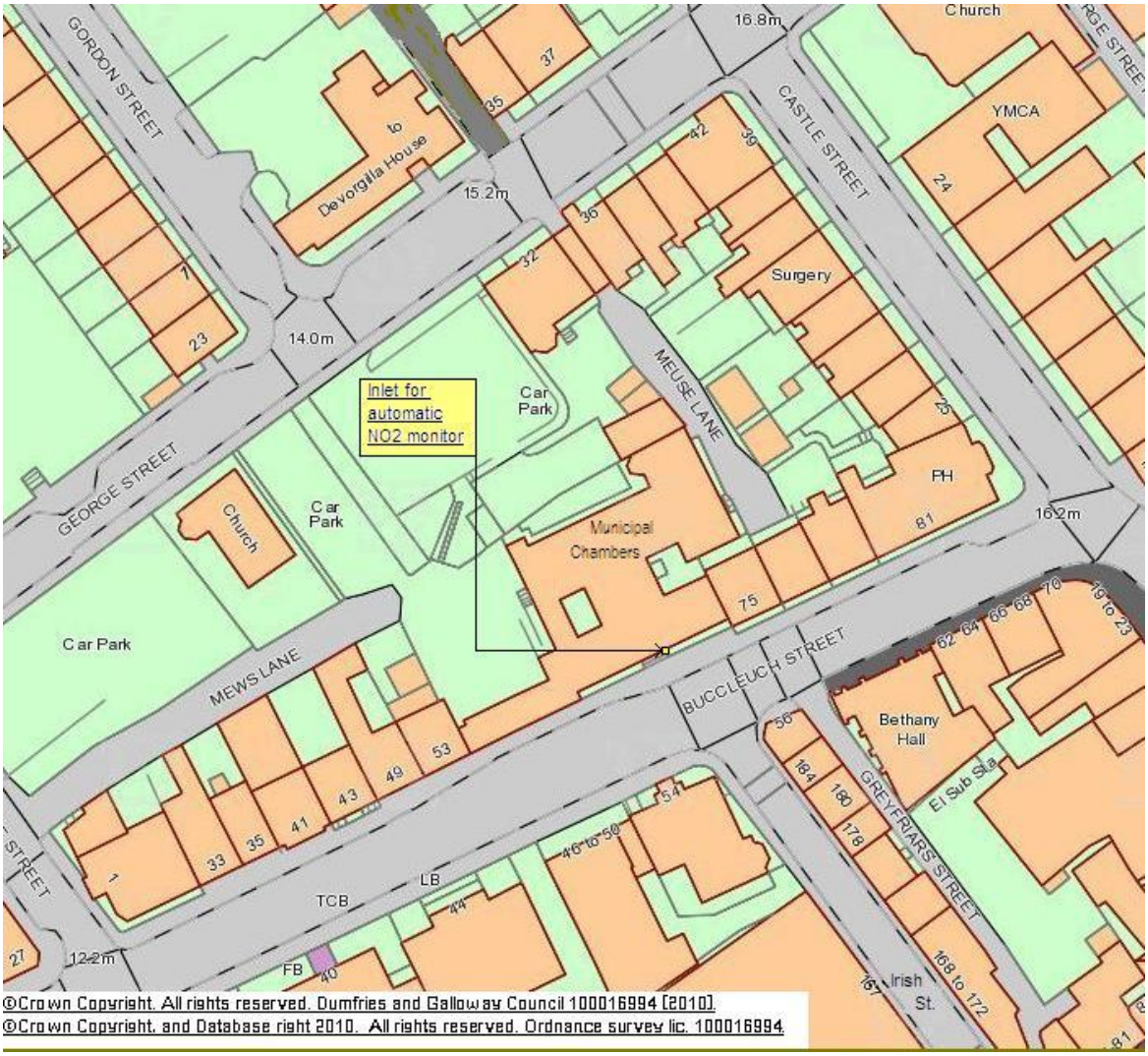
The local bias adjustment factor of 0·88 has been used in preference to the national bias-adjustment factor of 0·75 derived by amalgamation of 24 studies including Dumfries and Galloway's. The national bias adjustment spreadsheet (version 03/20) is available to download at
http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

QA/QC for diffusion tubes

The diffusion tubes were prepared and analysed by Socotec (Didcot) using 50% triethanolamine (TEA) in acetone. Socotec demonstrated satisfactory performance for 2018 in the Workplace Analysis Scheme for Proficiency (WASP) (an independent analytical performance-testing scheme).

Appendix D Maps showing the location of the monitoring sites.

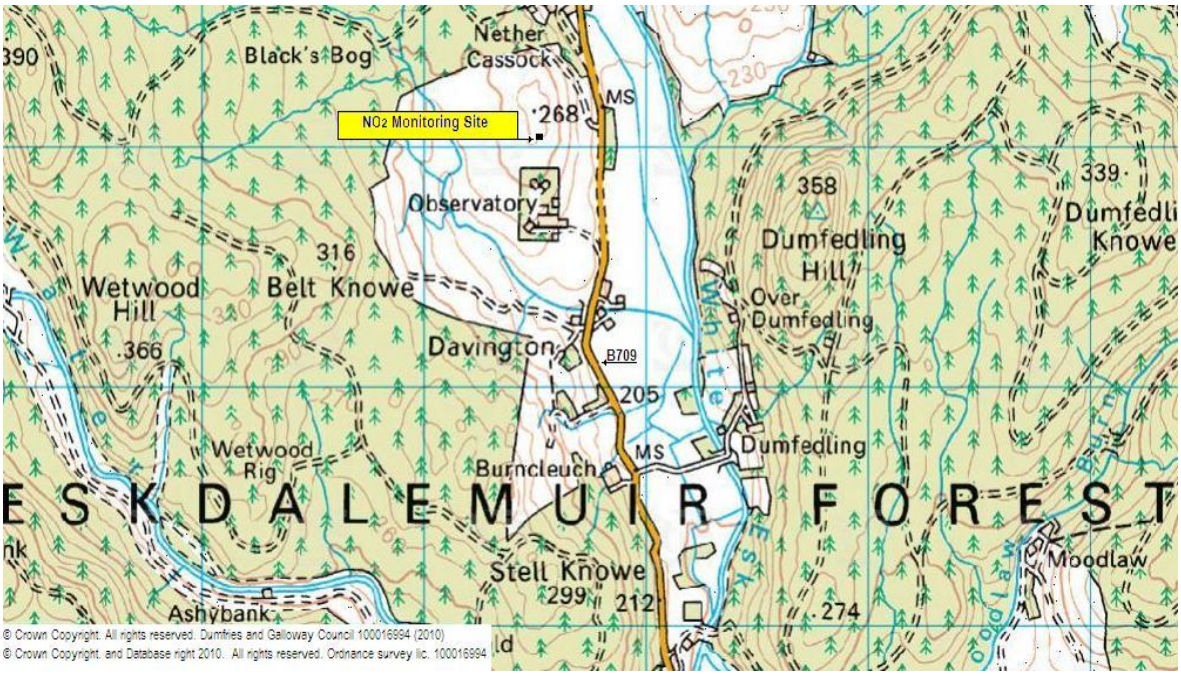
Figure D.1 Map of NO_2 automatic monitoring site at Buccleuch St., Dumfries.



The air intake for the AURN monitor is situated to the rear of a sign at the entrance to Municipal Chambers. 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_2 automatic monitoring site at Eskdalemuir



Since December 2004 a continuous NO_2 monitor has been located at the Observatory[iii] 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, & Buccleuch St. East, Dumfries.

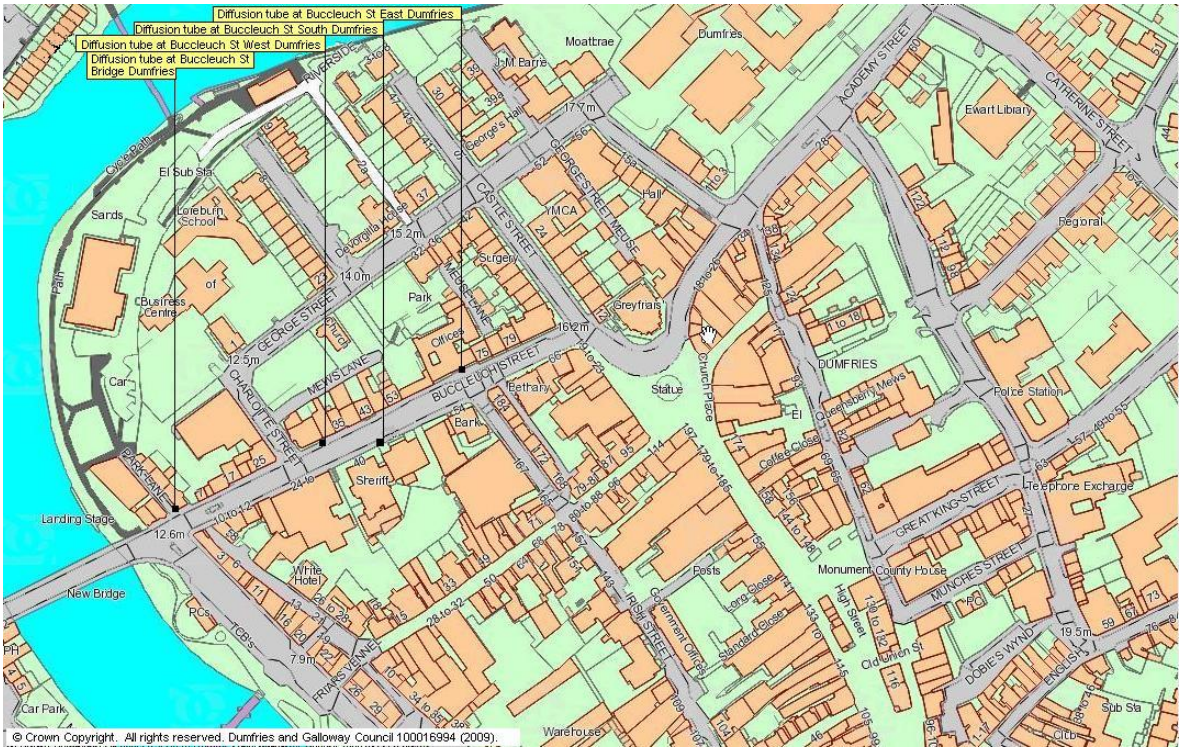
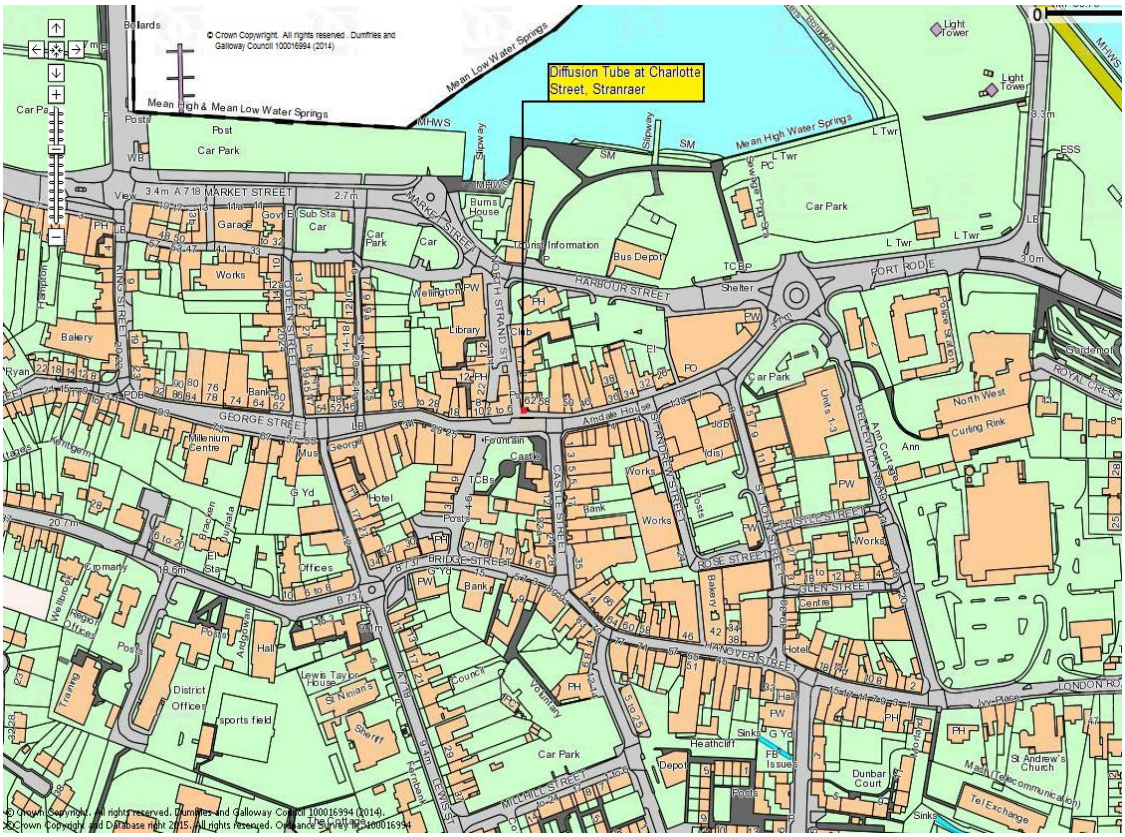


Figure D.5 Map of diffusion tube site at St Michael Street Dumfries

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 (P&O).

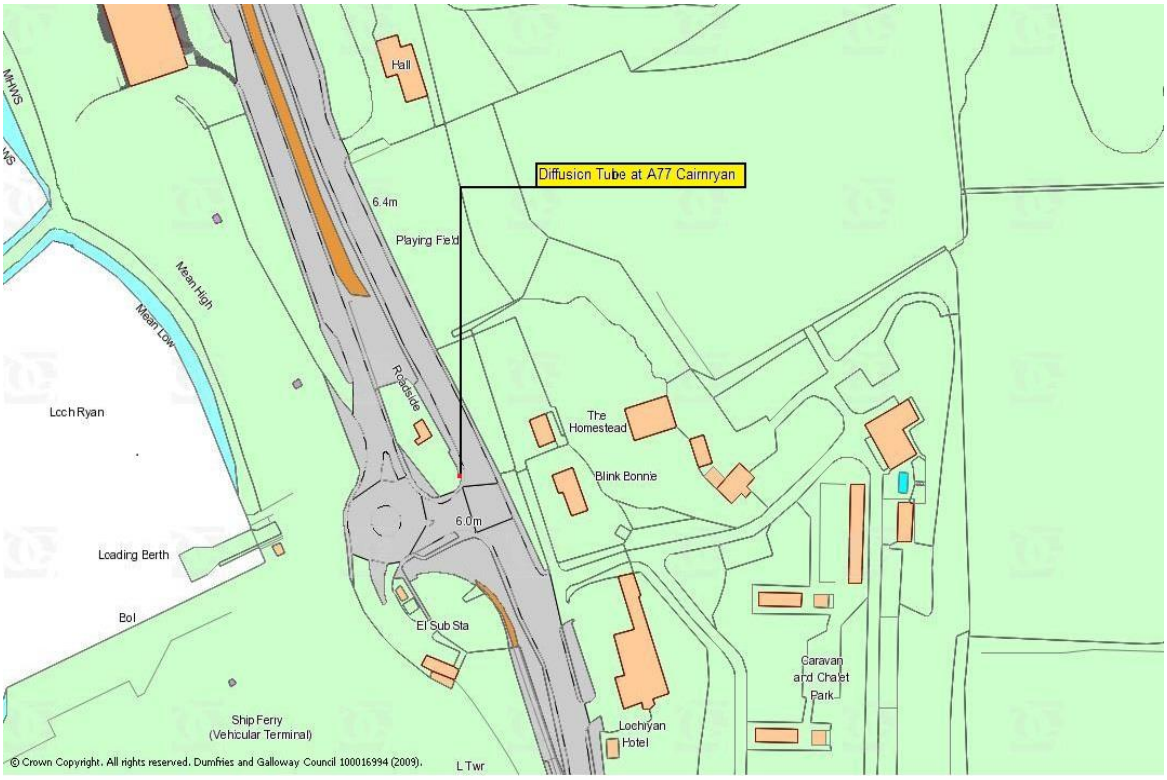
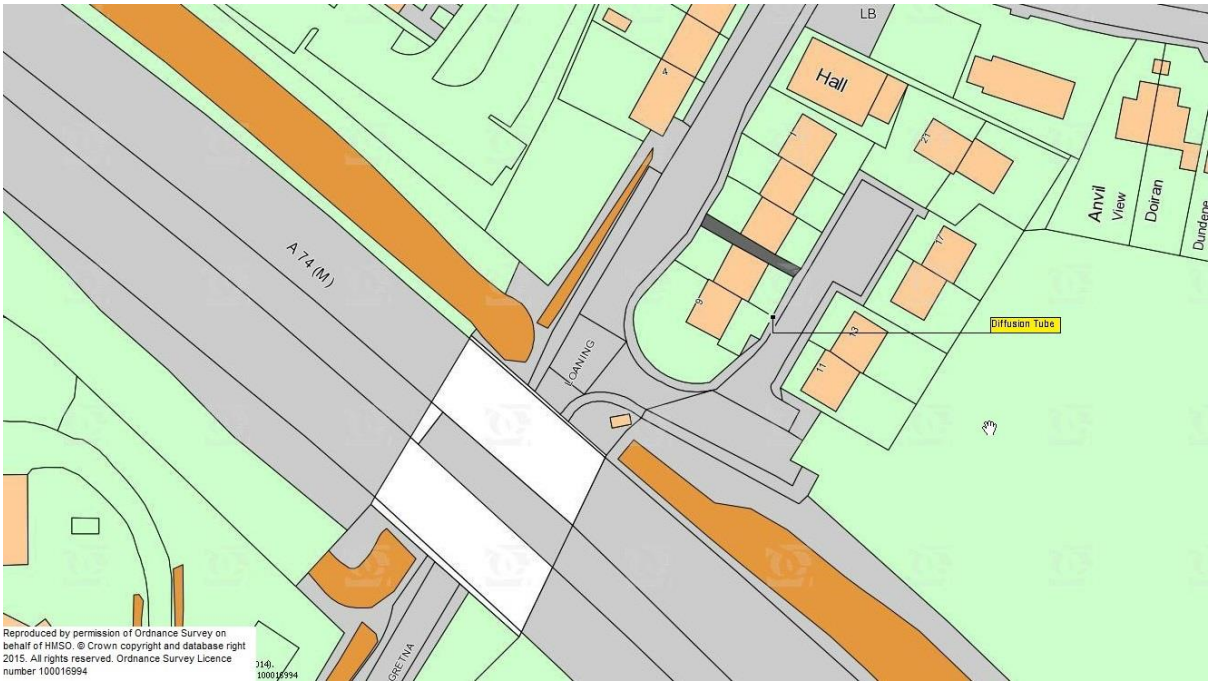


Figure D.9 Map of diffusion tube site at Nithbank, Dumfries.

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 diffusion tube site at A77 Cairnryan Stena Line Port, Stranraer

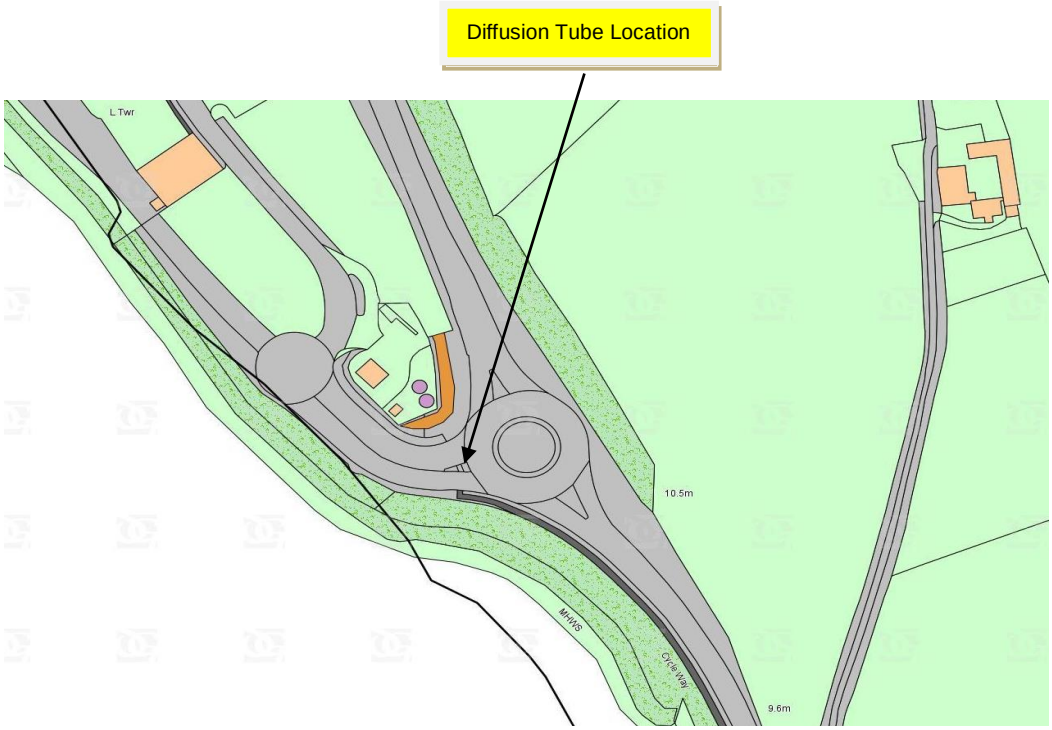


Figure D.13 Map of diffusion tube site at Kirkcudbright

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
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
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

References