Annual Progress Report (APR)

2023 Air Quality Annual Progress Report (APR) for

Dumfries and Galloway Council

In fulfilment of Part IV of the Environment Act 1995, as amended by the Environment Act 2021

Local Air Quality Management

August 2023

Dumfries and Galloway Council

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Executive Summary: Air Quality in Our Area

Air Quality in Dumfries and Galloway Council

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 148,290 (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

. Population data is based on the 2011 census data as 2022 Census data is not available until after 14th September 2023.

Dumfries and Galloway's key economic sectors are: - 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 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 community.

Recent monitoring in 2022 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 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.

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 because 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. Environmental Health are continuing to expand working relationships with colleagues in Sustainable Transport as well as Education colleagues in anticipation of a greater potential involvement throughout the year in Air Quality Initiatives such as Clean Air Day.

Local Priorities and Challenges

Environmental Health continue to monitor at 14 passive diffusion tube sites that have shown sustained compliance. Dumfries and Galloway Council in 2022 retained the locations of the existing diffusion tube monitoring sites as sites with higher potential NO_2 exposures were not identified to warrant removal.

In 2022 two new passive diffusion tube sites have been positioned in Stranraer in the vicinity of a potential development site that could likely increase HGV traffic in the area (S18 – Commerce Road and S19 – Loch Inch Place). Data from the newly installed passive diffusion tubes is intended to provide a data set of readings relating to NO_2 concentrations prior to any development of the site and is intended to assist in determination of potential effect on air quality if the facility were to be introduced to the area.

The previously triplicate tube site at Buccleuch Street Bridge remains a duplicate site and a previous duplicate site at Buccleuch Street West remains a single tube site in order to measure NO_2 levels at the entrance to the Stena Port in Cairnryan and in order to respond to a complaint of poor air quality in Kirkcudbright.

Dumfries and Galloway Council 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 continuing to work to increase the profile of air quality issues such as vehicle anti-idling campaigns, clean air day promotion and alternative travel. We have previously engaged with Dumfries and Galloway Council's Environment Champion and have participated in Clean Air Day Activities.

How to Get Involved

Members of the public can access several previously published air quality reports including results of monitoring in our area which are available at:

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

Dumfries and Galloway Council's priorities are Build the local economy; Provide the best start in life for all our children; Protect our most vulnerable people; Be an inclusive council; Urgently respond to climate change and transition to a carbon neutral region; and Delivering our priorities and commitments.

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 affect 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 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), 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) 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 Concentration	Air Quality Objective Measured as	Date to be Achieved by
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
Nitrogen dioxide (NO_2)	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
Particulate Matter (PM_{10})	18 µg/m^3	Annual mean	31.12.2010
Particulate Matter ($PM_{2.5}$)	10 µg/m^3	Annual mean	31.12.2021
Sulphur dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
Sulphur dioxide (SO_2)	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
Sulphur dioxide (SO_2)	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

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 publish and implement an Air Quality Action Plan (AQAP) within the shortest possible time and no later than 12 months of the date of AQMA Designation Order. The AQAP must set out measures the local authority intends to put in place in pursuit of the objectives within the shortest possible time Measures should be provided with milestones and a final date for completion. The action plan itself should have a timescale for completion and for revocation of the AQMA. Where measures to reduce air pollution may require a longer timescale an action plan shall be reviewed and republished within five years of initial publication and then five-yearly thereafter.

Dumfries and Galloway Council currently does not have any AQMAs.

2.2 Cleaner Air for Scotland 2

Cleaner Air for Scotland 2 – Towards a Better Place for Everyone (CAFS2) is Scotland's second air quality strategy. CAFS2 sets out how the Scottish Government and its partner organisations propose to further reduce air pollution to protect human health and fulfil Scotland's legal responsibilities over the period 2021 – 2026. CAFS2 was published in July 2021 and replaces Cleaner Air for Scotland – The Road to a Healthier Future (CAFS), which was published in 2015. CAFS2 aims to achieve the ambitious vision for Scotland "to have the best air quality in Europe". A series of actions across a range of policy areas are outlined, a summary of which is available on the Scottish Government's website.

Progress by Dumfries and Galloway Council against relevant actions for which local authorities are the lead delivery bodies within this strategy is demonstrated below.

2.2.1 Placemaking – Plans and Policies

Local authorities with support from the Scottish Government will assess how effectively air quality is embedded in plans, policies, City Deals and other initiatives, and more generally in cross departmental working, identifying and addressing evidence, skills, awareness and operational gaps.

Dumfries and Galloway Council has Placemaking in the Local Development Plan (LDP2). The Plan states that Development proposals should be compatible with the character and amenity of the area and should not conflict with nearby land uses. Air Quality issues as a result of LDP2 which may result from the development will be a material consideration in the assessment of proposals.

Placemaking policies in other areas such as building design, active travel and transport relate directly to sustainability and climate change mitigation within which improving air quality is implicit.

2.2.2 Transport – Low Emission Zones

Local authorities working with Transport Scotland and SEPA will look at opportunities to promote zero-carbon city centres within the existing LEZs structure.

Dumfries and Galloway Council has no Low Emission Zones established within the Local Authority area.

In general, the air quality in Dumfries & Galloway is very good and because 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.

As Dumfries and Galloway is predominantly rural Dumfries and Galloway Council does not have the association of high traffic density within urban conurbations which characterise poor air quality in urban areas. Dumfries and Galloway Council will be led by Regional and National strategies, including outcomes relating to avoiding unnecessary travel, promoting active travel and reducing transport emissions.

Details of measures completed, in progress or planned are contained in both the Dumfries and Galloway Council Carbon Management Plan 2 (CMP2) and the Dumfries and Galloway Council Active Travel Strategy which are accessible at:

Carbon Management Plan 2 (dumgal.gov.uk)
https://www.dumgal.gov.uk/article/16715/Active-Travel-Strategy

2.3 Implementation of Air Quality Action Plan(s) and/or measures to address air quality

Dumfries and Galloway Council currently does not have any AQMAs, and therefore does require an Air Quality action plan.

Dumfries and Galloway Council has taken forward a number of measures during the current reporting year of 2022 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in the Dumfries and Galloway Council Carbon Management Plan 2 (CMP2) which is accessible at:

Carbon Management Plan 2 (dumgal.gov.uk)

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 Southwest 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

The Scottish Government work for the Strategic Transport Projects Review (STPR) and the Strategic Transport Projects Review 2 will inform transport investment in Scotland for the next 20 years. STPR2 is a Scotland-wide review of the strategic transport network across all transport modes, including walking, wheeling, cycling, bus, rail and car, as well as reviewing wider island and rural connectivity.

STPR2 will help to deliver the vision, priorities and outcomes for transport set out in the National Transport Strategy (NTS2) and will align with other national plans such as the Infrastructure Investment Plan, National Planning Framework (NPF4) and the Climate Change Plan.

The key aim of previous work with SPTR was 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 2022. Table A.1 in Appendix A shows the details of the sites. National monitoring results 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.

Results of automatic monitoring undertaken at Eskdalemuir by the British Geological Society / Met Office have not been included in this report as it has been in previous years due to technical issues relating to the automatic (continuous) measurement of NO_2 at Eskdalemuir. Results for the 2022 APR reporting year are not available for this site.

3.1.2 Non-Automatic Monitoring Sites

Dumfries and Galloway Council undertook non- automatic (passive) monitoring of NO_2 at 16 sites during 2022. 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)

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

For diffusion tubes, the full 2022 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year. There were no exceedances of the 1-hourly mean air quality objective of 200µg/m^3 in 2022.

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 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 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 with an impact on air quality have been identified since the completion of last year's report.

4.1 Road Traffic Sources

No significant road traffic sources relevant with respect to air quality in Dumfries and Galloway have been identified in the 2022 reporting year that may significantly change traffic flows or affect target air quality objectives.

4.2 Other Transport Sources

No other transport sources relevant with respect to air quality in Dumfries and Galloway have been identified in the 2022 LAQM APR reporting year.

4.3 Industrial Sources

No industrial sources relevant with significant impact to air quality in Dumfries and Galloway have been identified in the 2022 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 2022 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 little cumulative impact.

4.5 New Developments with Fugitive or Uncontrolled Sources

No new developments with fugitive or uncontrolled sources relevant with respect to air quality in Dumfries and Galloway have been newly identified in the 2022 LAQM APR reporting year.

5 Planning Applications

No planning applications have been identified in the 2022 LAQM APR reporting year which would have significant effects with respect to air quality in Dumfries and Galloway.

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

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. NO_2 concentrations have been stable for the past ten years.

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

Monitoring during 2022 confirmed levels of atmospheric NO_2 continue to be well below the air quality objective. Therefore no actions to reduce NO_2 concentrations, are required to meet Air Quality Objectives.

Dumfries and Galloway Council 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 increase the profile of air quality issues such as vehicle anti-idling campaigns, clean air day promotion, alternative travel etc. We have previously engaged with elected members with respect to air quality initiatives such as clean air day and Environmental Health intends wishes to build on this in conjunction with Education, Sustainable Transport, Fleet Services with respect to work toward the Council Priorities.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Buccleuch Street Dumfries	Roadside	297025	576259	NO_2	No	Chemiluminescent	<1	4.3	2.2
CM2	Eskdalemuir	Rural	323551	603022	NO2	No	Chemiluminescent	N/A	225	4.0

Notes:

(1) 0m 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 ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
S1	M74 Slip Lockerbie	Other	313345	581416	NO_2	No	32.0	1.9	No	2.5
S2	A77 Stena Cairnryan	Kerbside	206109	569375	NO_2	No	5.0	5.0	No	2.4
S3	Buccleuch Street West	Kerbside	296949	576218	NO_2	No	0.0	1.0	No	2.5
S4	Gretna Loaning	Roadside	332110	568264	NO_2	No	1.0	1.4	No	2.6
S5	Nithbank	Kerbside	297712	575254	NO_2	No	0.0	1.7	No	2.6
S6	St Michael Street	Roadside	297457	575692	NO_2	No	0.0	3.1	No	2.5
S7	Argyl Drive	Urban Background	299378	578847	NO_2	No	1.0	1.7	No	2.3
S8	A77 Cairnryan (P&O)	Roadside	207216	567422	NO_2	No	19.0	2.0	No	2.6
S9	Castle Break, Ecclefechan	Roadside	319272	575029	NO_2	No	1.0	1.5	No	2.5
S10	Charlotte Street, Stranraer	Roadside	206085	560859	NO_2	No	0.0	4.0	No	3.7
S11 S12 S13	Buccleuch Street East Inlet	Kerbside	297025	576259	NO_2	No	0.0	4.3	Yes	1.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
S14	Sheriff Court Buccleuch Street	Kerbside	296978	576219	NO_2	No	0.0	0.6	No	2.4
S16	Kirkcudbright	Kerbside	268574	551126	NO_2	No	1.0	2.0	No	2.2
S15 S17	Buccleuch Street Bridge	Roadside	296868	576182	NO_2	No	0.0	5.0	No	2.4
S18	Commerce Road STR	Roadside	207087	559976	NO_2	No	1.0	1.0	No	2.4
S19	Loch Inch Place STR	Kerbside	207756	560789	NO_2	No	1.0	1.0	No	2.3

Notes:

(1) 0m 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.

Table A.3 – Annual Mean NO_2 Monitoring Results ($\mu g/m^3$)

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2022 (%) [2]	2018	2019	2020	2021	2022
CM1	Roadside	Automatic	95.5	95.5	29.5	31.1	22.1	22.2	21.2
CM2	Urban Background	Automatic	0	0	1.9	1.8	1.65	1.6	-
S1	Kerbside	Diffusion Tube	100	100	23.1	24.7	17.9	17.7	16.7
S2	Kerbside	Diffusion Tube	100	100	-	15.6	16.0	15.6	15.1
S3	Kerbside	Diffusion Tube	89.8	89.8	27.0	28.5	23.0	20.9	21.5
S4	Roadside	Diffusion Tube	100	100	14.3	14.2	11.3	10.5	10.1
S5	Kerbside	Diffusion Tube	100	100	19.8	21.0	14.1	14.3	14.5
S6	Roadside	Diffusion Tube	100	100	20.3	21.3	15.3	15.6	16.4
S7	Urban Background	Diffusion Tube	92.9	92.9	8.4	9.5	7.6	6.5	6.8
S8	Roadside	Diffusion Tube	100	100	17.4	18.1	17.4	16.9	15.0
S9	Roadside	Diffusion Tube	92.9	92.9	13.2	13.2	9.5	10.6	9.8
S10	Roadside	Diffusion Tube	100	100	19.5	18.7	15.5	14.9	15.5
S11 S12 S13	Kerbside	Diffusion Tube (Triplicate)	100	100	29.9	30.8	22.4	19.7	20.7

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
S14	Kerbside	Diffusion Tube	100	100	30.2	29.9	21.4	20.8	23.9
S16	Kerbside	Diffusion Tube	100	100	-	16.3	12.9	14.7	12.1
S15 S17	Roadside	Diffusion Tube (Duplicate)	100	100	25.3	26.2	19.1	18.6	20.7
S18 (3)	Roadside	Diffusion Tube	67.3	67.3	-	-	-	-	7.9
S19 (3)	Kerbside	Diffusion Tube	67.3	67.3	-	-	-	-	5.5

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**.

Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG(22) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(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) Data Annualised as data capture for the year was less than 75%

Table A.4 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM1	Roadside	Automatic	95.5	95.5	0	0	3	1	0
CM2	Rural	Automatic	0	0	0	0	0	0	0

Notes:

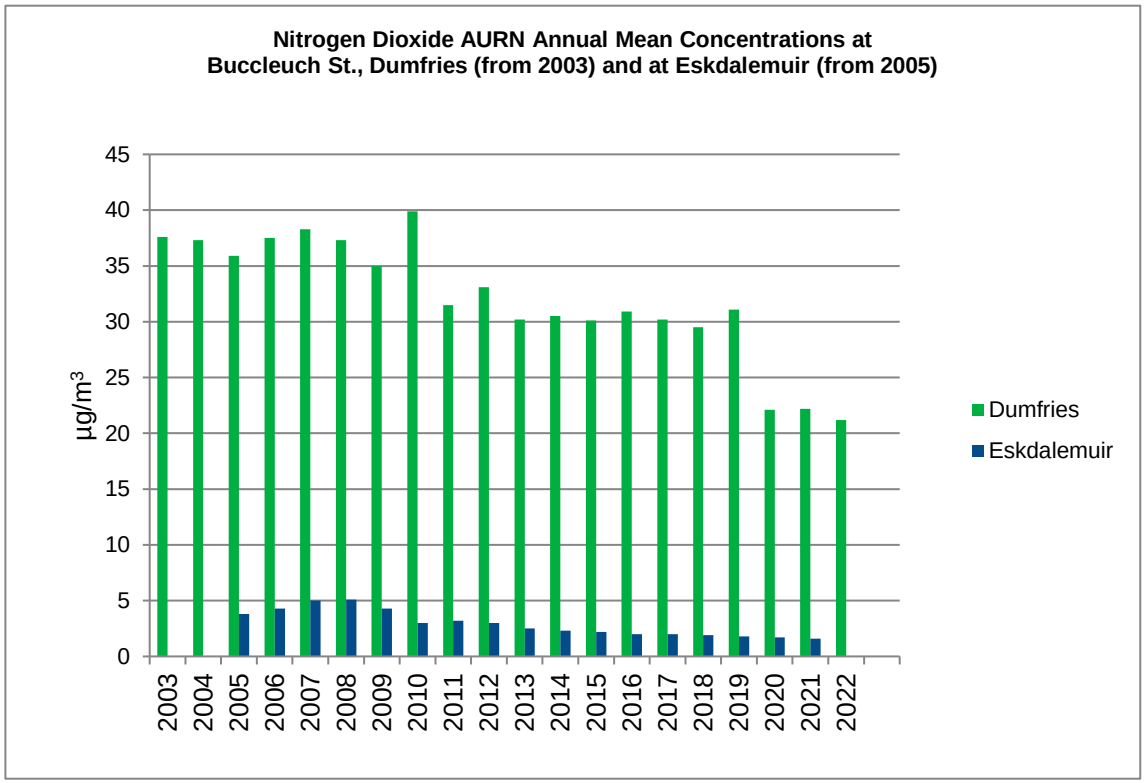
Exceedances of the NO_2 1-hour mean objective (200 µg/m^3 not to be exceeded more than 18 times/year) are shown in bold.

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

(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%).

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. When data was available NO_2 concentrations at Eskdalemuir remained 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.

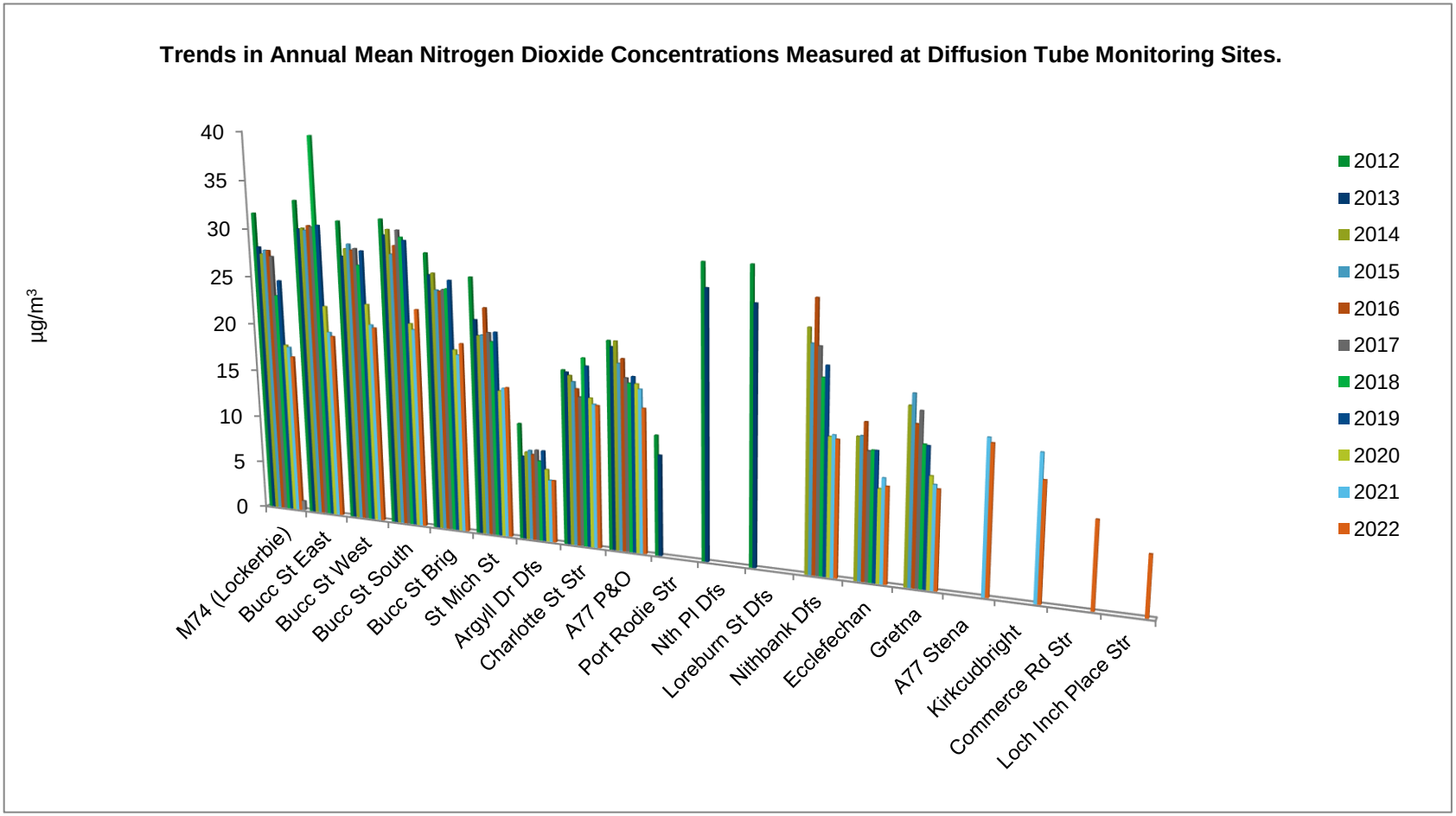


Figure A.3 **Graph Showing Historical Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations at Sites in Buccleuch Street, Dumfries.**

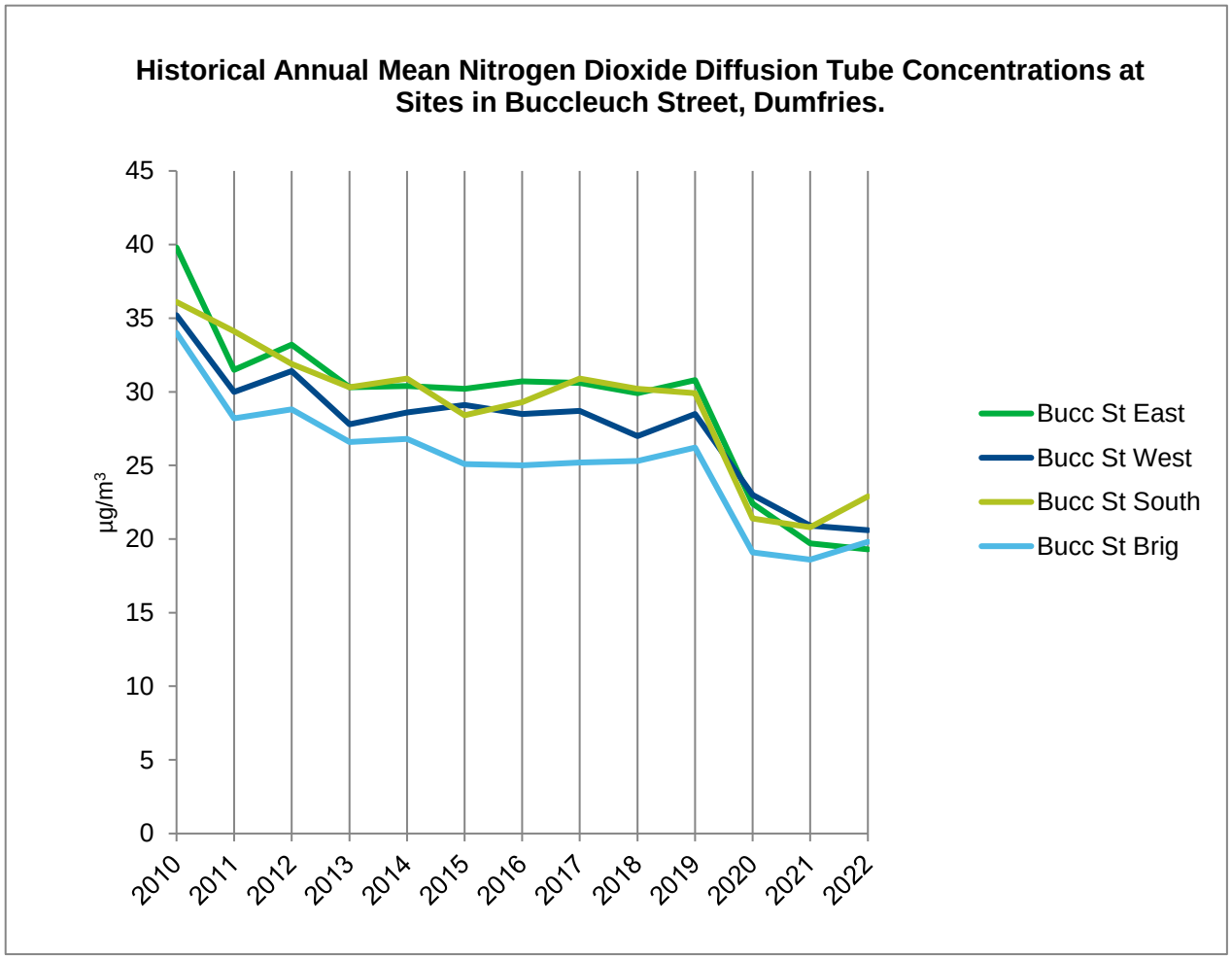


Figure A.4 **Graph Showing Historical Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations at Sites Other Than Buccleuch Street, Dumfries.** *(Excluding discontinued sites)*

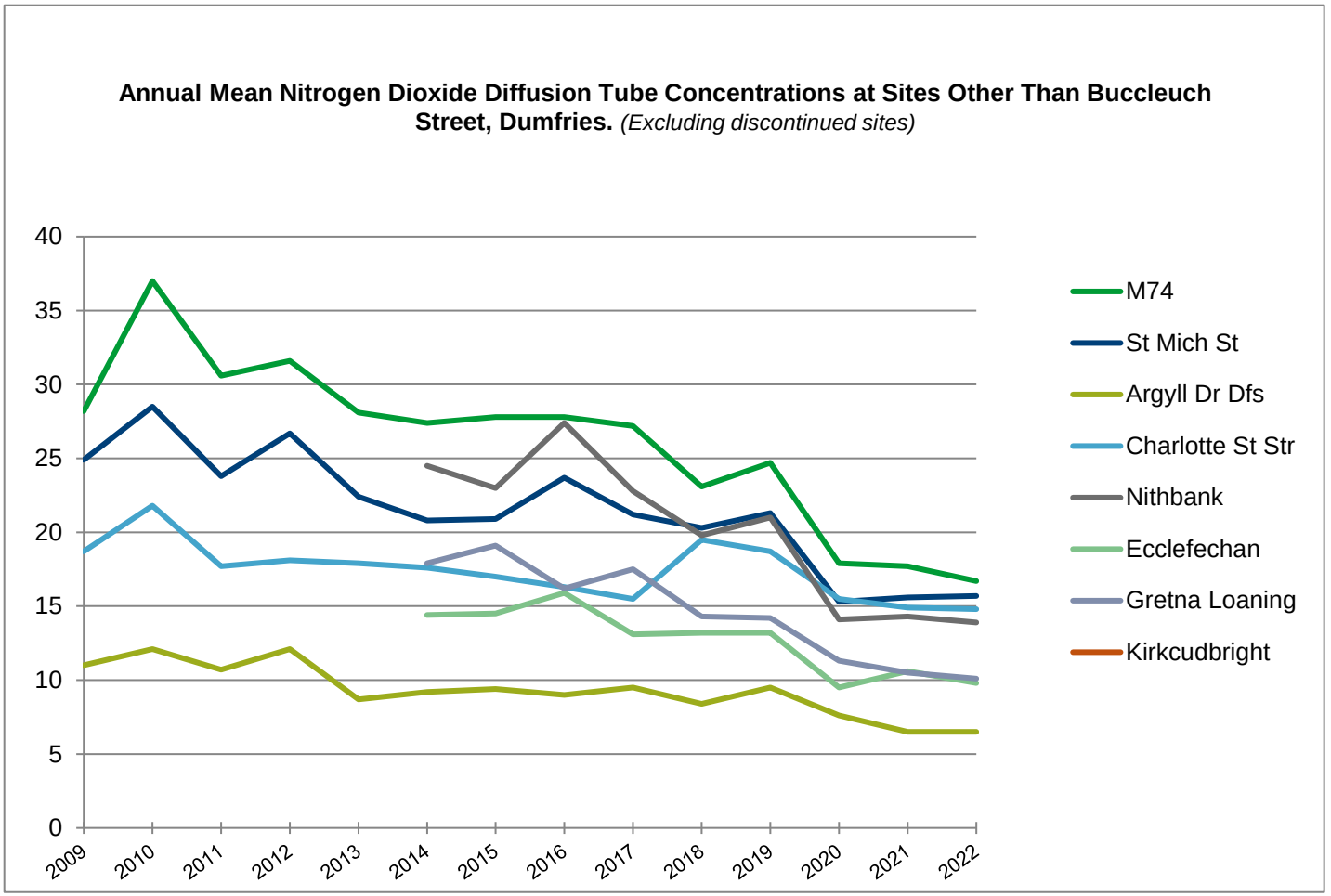
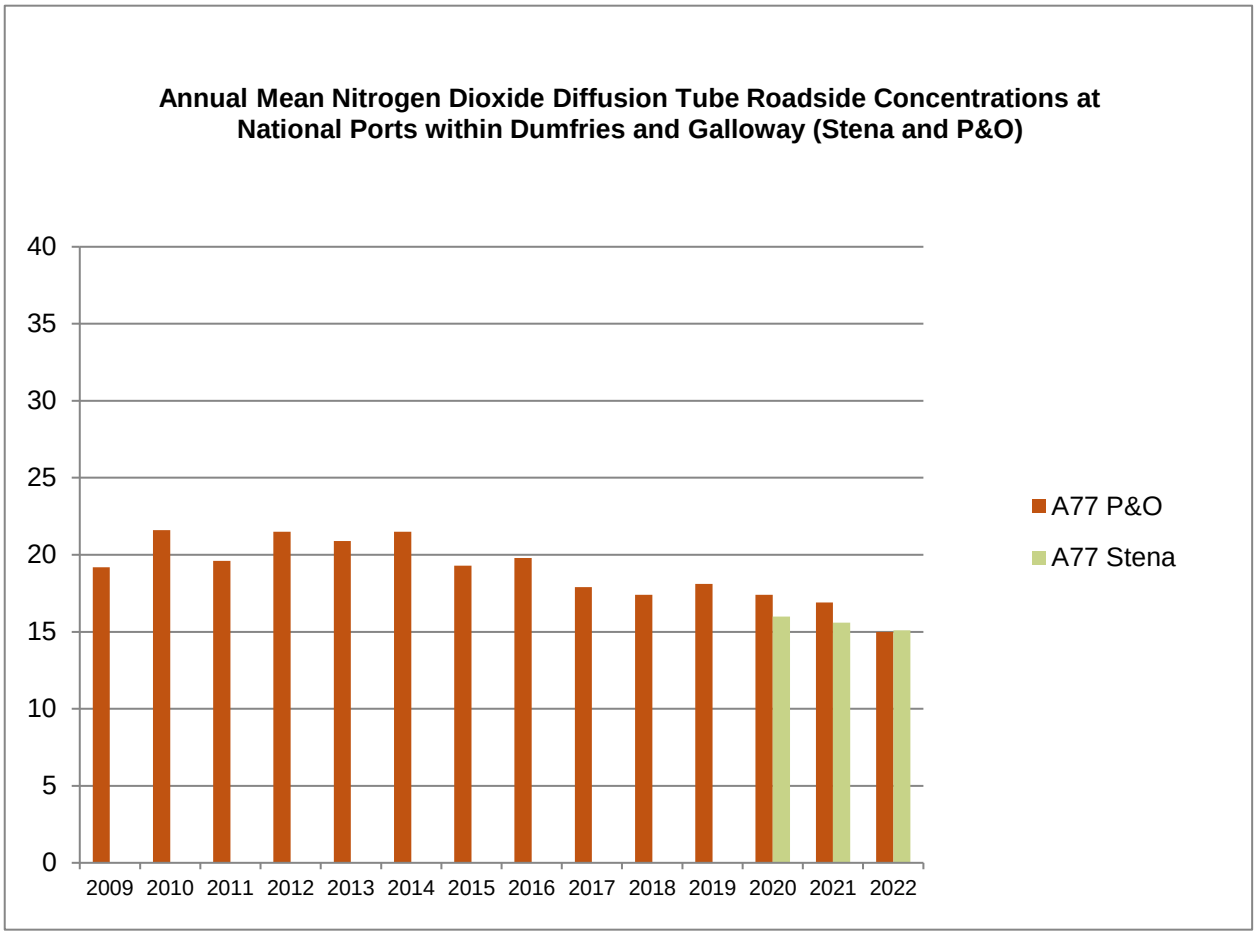


Figure A.5 **Graph Showing Annual Mean Nitrogen Dioxide Diffusion Tube Roadside Concentrations at National Ports within Dumfries and Galloway (P&O and Stena Line)**



Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO_2 2022 Monthly Diffusion Tube Results ($\mu g/m^3$)

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted (0.88) and Annualised (1)
S1	25.0	20.6	17.0	16.7	15.6	14.8	13.8	18.7	20.1	18.5	19.1	28.2	19.0	16.7
S2	21.0	16.9	20.1	19.3	18.3	15.3	18.9	17.8	18.9	11.7	15.1	12.7	17.2	15.1
S3	21.3	27.4	30.0	25.7	22.1	17.7	17.4	24.2	24.7	v	24.4	33.8	24.4	21.5
S4	18.1	13.2	13.1	9.9	9.8	11.8	7.3	9.0	10.3	12.7	8.1	13.9	11.4	10.1
S5	16.4	12.9	23.8	21.3	11.9	7.8	10.1	13.8	20.3	14.2	18.2	27.0	16.5	14.5
S6	17.5	18.5	26.2	19.2	14.2	10.9	12.5	18.2	20.0	14.0	22.0	30.2	18.6	16.4
S7	13.3	8.4	11.7	5.6	4.8	4.3	3.8	3.7	6.3	7.6	v	15.4	7.7	6.8
S8	23.7	15.3	18.2	13.3	17.5	17.1	15.9	16.9	14.6	17.6	15.6	18.5	17.0	15.0
S9	12.5	8.6	17.9	11.4	7.8	5.6	6.0	10.2	13.3	10.0	v	19.0	11.1	9.8
S10	19.6	14.0	25.6	19.7	15.2	14.4	13.8	16.1	17.8	13.8	16.0	24.8	17.6	15.5
S11	21.3	26.6	30.7	26.5	21.8	17.6	18.3	23.6	25.4	22.0	21.4	32.9	- (2)	- (2)

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted (0.88) and Annualised (1)
S12	29.2	25.2	27.0	26.4	21.7	16.7	17.5	22.9	24.4	23.2	24.9	29.5	- (2)	- (2)
S13	27.5	19.1	29.6	25.4	21.3	17.6	17.1	22.2	26.1	20.7	11.1	33.0	23.5	20.7
S14	30.4	27.1	32.0	28.8	24.0	20.5	18.2	25.5	24.5	28.5	32.7	33.7	27.2	23.9
S15	28.1	21.6	33.9	25.3	19.7	15.7	16.9	22.7	21.4	27.1	29.8	29.5	- (3)	- (3)
S16	18.7	12.6	17.9	14.0	12.7	13.8	11.7	12.2	10.7	11.6	13.2	16.0	13.8	12.1
S17	27.1	19.6	33.8	26.8	18.3	15.0	16.3	21.6	20.5	23.8	19.8	29.1	23.5 (3)	20.7 (3)
S18					4.9	8.3	7.2	9.8	9.2	7.3	8.6	10.7	8.3	7.9
S19					3.4	5.7	4.8	6.9	6.1	7.9	5.3	5.9	5.8	5.5

Notes:

(1) See Appendix C for details on bias adjustment and annualisation factor.

(2) Triplicate Site with S11, S12 and S13 - Annual data provided for S13 only.

(3) Duplicate Site with S15 and S17 - Annual data provided for S17 only.

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

New or Changed Sources Identified Within Dumfries and Galloway Council During 2022

Dumfries and Galloway Council has not identified any new sources relating to air quality within the reporting year of 2022

Additional Air Quality Works Undertaken by Dumfries and Galloway Council During 2022

Dumfries and Galloway Council has not completed any additional works within the reporting year of 2022. Dumfries and Galloway Council does not have any AQMAs within its area as there is no exceedance, nor is there likely to be exceedance in the future of air quality objectives.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes were prepared and analysed by SOCOTEC (Didcot) using 50% triethanolamine (TEA) in acetone. SOCOTEC has been a participant in the AIR PT proficiency scheme since its inception and was a participant in its predecessor WASP also since inception. Over the past two years SOCOTEC (formerly Environmental Scientifics Group, Didcot) has achieved 100% in the Air PT proficiency scheme.

Diffusion Tube Annualisation

Due to the commencement of diffusion tube sites S18 and S19 in April 2022 data capture for these sites in 2022 was therefore less than 75% and it was required to annualise monitoring data from relevant sites with reduced exposure.

All remaining diffusion tube monitoring locations within Dumfries and Galloway Council recorded data capture of above 75% therefore it was not required to further annualise any monitoring data.

Details of the calculation method undertaken are provided in Table C.2. Annualisation is required for any site with data capture less than 75% but greater than 25%.

Diffusion Tube Bias Adjustment Factors

Dumfries and Galloway Council have applied a local bias adjustment factor of 0.88 to the 2022 monitoring data. A summary of bias adjustment factors used by Dumfries and Galloway Council over the past five years is presented in Table C.1.

Triplicate diffusion tubes at Buccleuch Street (East) Dumfries are co-located with the AURN NO_2 continuous monitor and are used to derive a local bias-adjustment factor.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	Local	-	0.88
2021	Local	-	0.88
2020	Local	-	0.91
2019	Local	-	0.89
2018	Local	-	0.84

NO_2 Fall-off with Distance from the Road

No diffusion tube NO_2 monitoring locations within Dumfries and Galloway Council required distance correction during 2022.

QA/QC of Automatic Monitoring

Routine calibrations of the automatic monitor are carried out fortnightly by Council staff, with six-monthly audits carried out by Ricardo Energy and Environment. Ratification is carried out by the Quality Assurance and Control (QA/QC) Unit at Ricardo Energy and Environment. (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 local bias-adjustment factor.

Automatic Monitoring Annualisation

All automatic monitoring locations within Dumfries and Galloway Council recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

NO_2 Fall-off with Distance from the Road

No automatic NO_2 monitoring locations within Dumfries and Galloway Council required distance correction during 2022.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

				Sufficient (>85%) annual data capture	Sufficient (>85%) annual data capture	Sufficient (>85%) annual data capture	Sufficient (>85%) annual data capture			
Site Name ID	**Site Name**	**X OS Grid Ref (Easting)**	**Y OS Grid Ref (Northing)**	**Annualisation Factor Aberdeen Error Park UB**	**Annualisation Factor Glasgow Townhead UB**	**Annualisation Factor Peebles UB**	**Annualisation Factor Edinburgh St Leonards UB**	**Average Annualisation Factor**	**Raw Data Time Weighted Annual Mean (µg/m3)**	**Annualised Data Time Weighted Annual Mean (µg/m3)**
S18	Commerce Road Stranraer	207087	559976	1.1132	1.0671	1.0380	1.1122	1.0826	8.3	8.9
S19	Loch Inch Place Stranraer	207756	560789	1.1132	1.0671	1.0380	1.1122	1.0826	5.8	6.2

Table C.3 – Local Bias Adjustment Calculations

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	05/01/2022	02/02/2022	21.3	29.2	27.5	26	4.2	16	10.3	25.9	99.9	Good	Good
2	02/02/2022	02/03/2022	26.6	25.2	19.1	24	4.0	17	9.9	19.5	100	Good	Good
3	02/03/2022	01/04/2022	30.7	27.0	29.6	29	1.9	7	4.7	25.9	100	Good	Good
4	01/04/2022	04/05/2022	26.5	26.4	25.4	26	0.6	2	1.5	22.0	100	Good	Good
5	04/05/2022	08/06/2022	21.8	21.7	21.3	22	0.3	1	0.7	17.8	100	Good	Good
6	08/06/2022	07/07/2022	17.6	16.7	17.6	17	0.5	3	1.3	13.8	100	Good	Good
7	07/07/2022	03/08/2022	18.3	17.5	17.1	18	0.6	3	1.5	15.5	100	Good	Good
8	03/08/2022	31/08/2022	23.6	22.9	22.2	23	0.7	3	1.7	19.2	100	Good	Good
9	31/08/2022	28/09/2022	25.4	24.4	26.1	25	0.9	3	2.1	22.6	100	Good	Good
10	28/09/2022	04/11/2022	22.0	23.2	20.7	22	1.3	6	3.1	18.6	100	Good	Good
11	04/11/2022	30/11/2022	21.4	24.9		23	2.5	11	22.2	21.5	100	Good	Good
12	30/11/2022	04/01/2023	32.9	29.5	33.0	32	2.0	6	4.9	30.6	99.9	Good	Good
13													
											Overall survey -->	Good precision	Good Overall DC

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

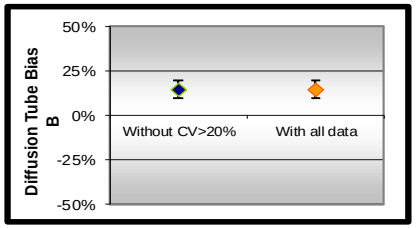
Site Name/ ID:	

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

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.88 (0.85 - 0.92)
Bias B	13% (8% - 18%)
Diffusion Tubes Mean:	24 μgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	21 μgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	21 (20 - 22) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.88 (0.85 - 0.92)
Bias B	13% (8% - 18%)
Diffusion Tubes Mean:	24 μgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	21 μgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	21 (20 - 22) μgm^{-3}

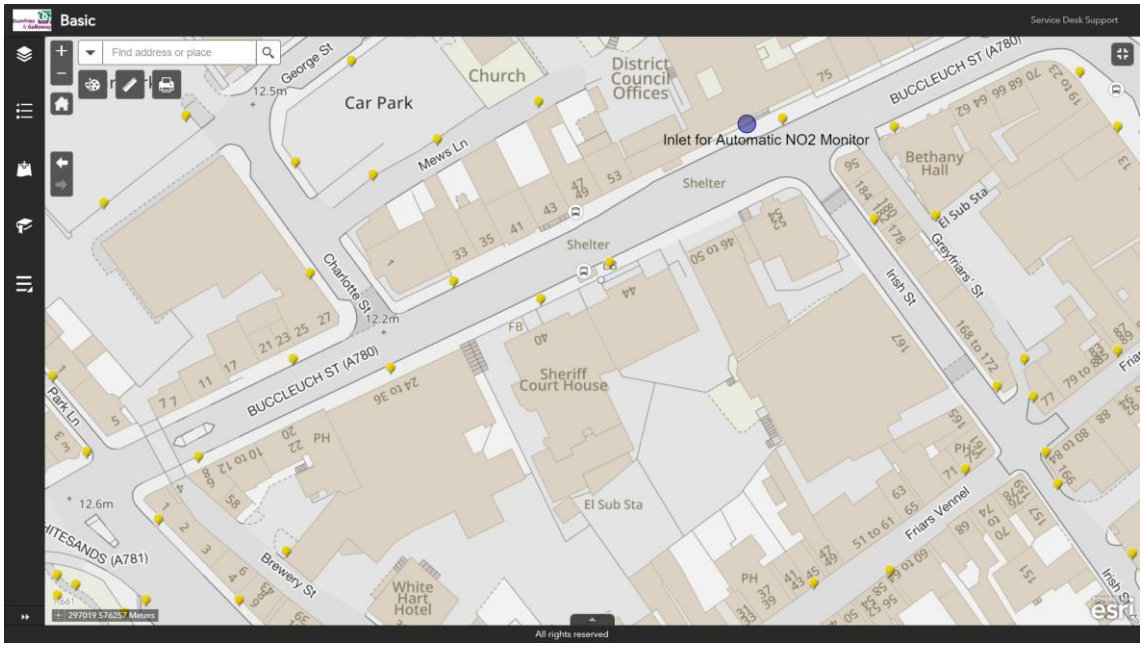


Jaume Targa, for AEA
Version 04 - February 2011

Notes: A local bias adjustment factor of 0·88 has been used in preference to the national bias-adjustment factor of 0·76 derived by amalgamation of 26 studies. The national bias adjustment spreadsheet (version 03/23) is available to download at: National Bias Adjustment Factors | LAQM (defra.gov.uk)

Appendix D: Maps Showing Monitoring Site Locations.

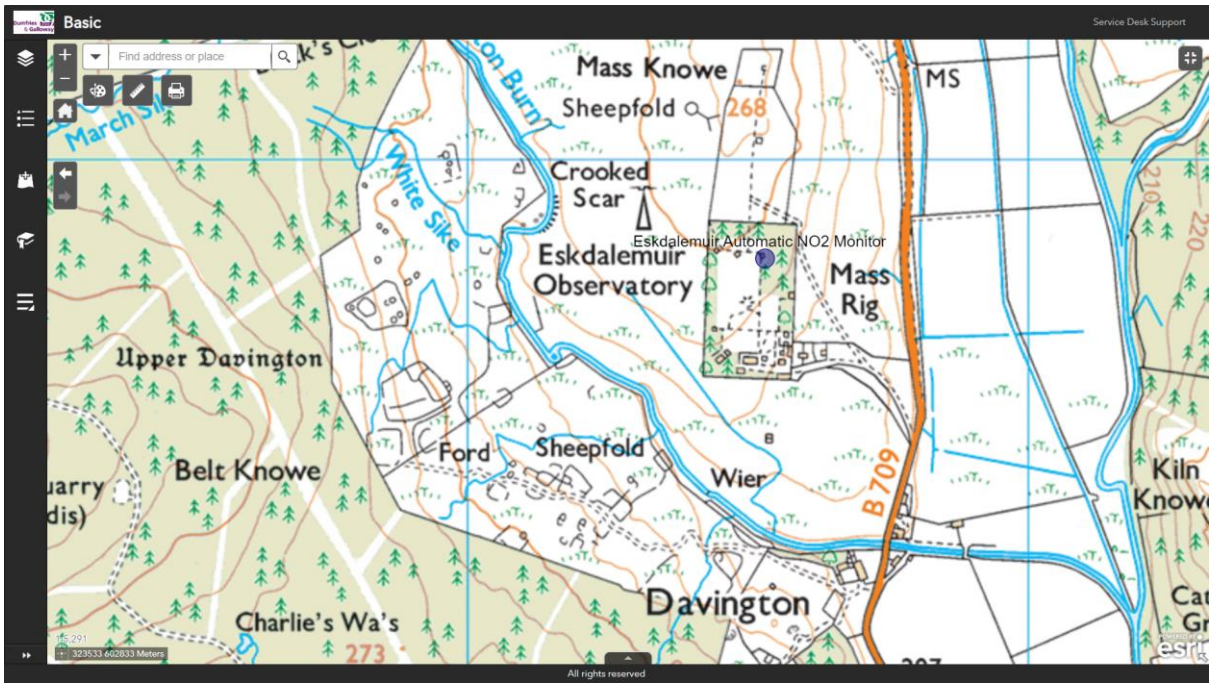
Figure D.1 Map of NO_2 automatic monitoring site at Buccleuch Street, Dumfries (AURN)



The air intake for the continuous monitor (AURN) is situated to the rear of a sign at the entrance to Municipal Chambers. The air intake tube goes through a window to the API monitor which is located in the Basement of Municipal Chambers.

Figure D.2 Map showing previous location of AURN NO_2 monitoring site Eskdalemuir

Figure D.2(2) Map showing previous location of AURN NO_2 monitoring site Eskdalemuir



During 2022 data from the Eskdalemuir AURN has not been recorded due to what is understood to be technical issue between other equipment operating at the Observatory and the AURN.

Figure D.3 Map of diffusion tube site at M74 Lockerbie (S1)

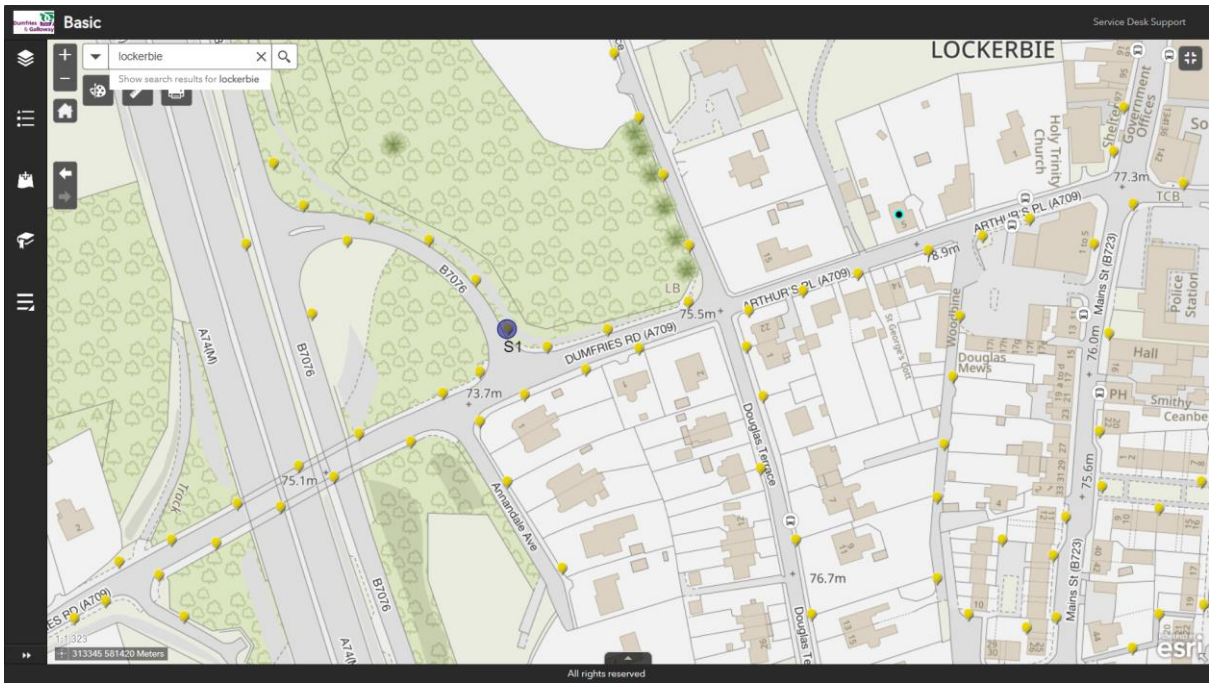


Figure D.4 Map of diffusion tube site at A77 Stena Line Port, Cairnryan (S2)

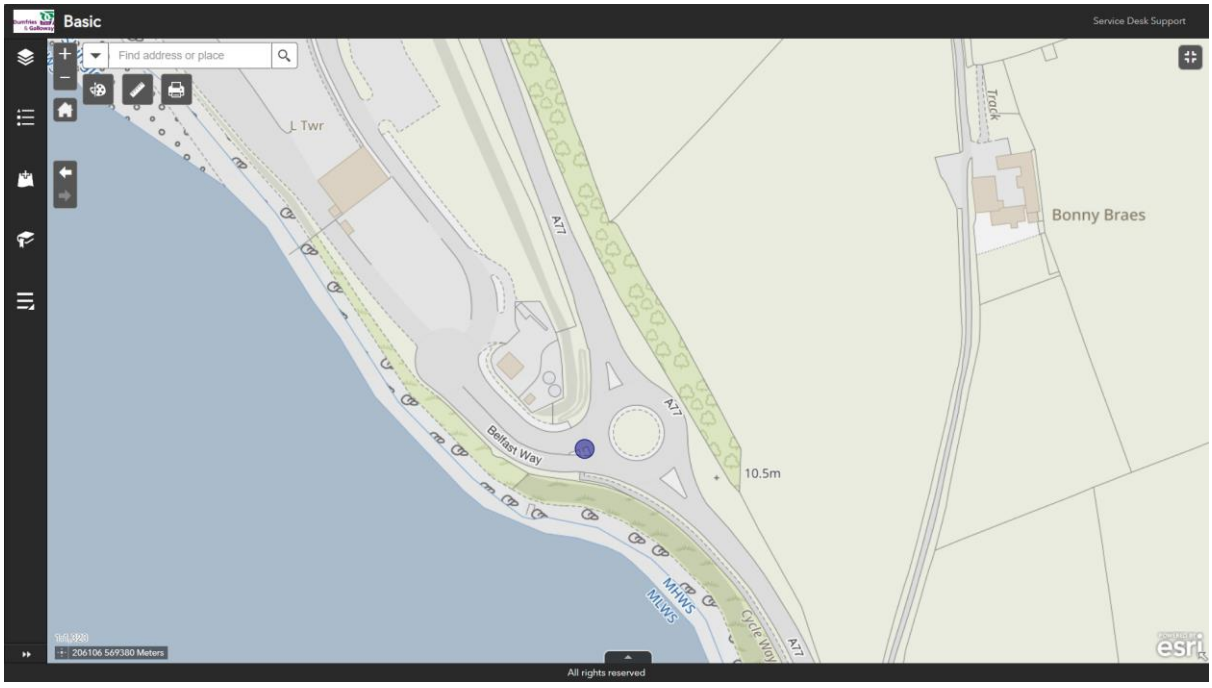


Figure D.5 Map of diffusion tube site at Buccleuch Street West (S3)

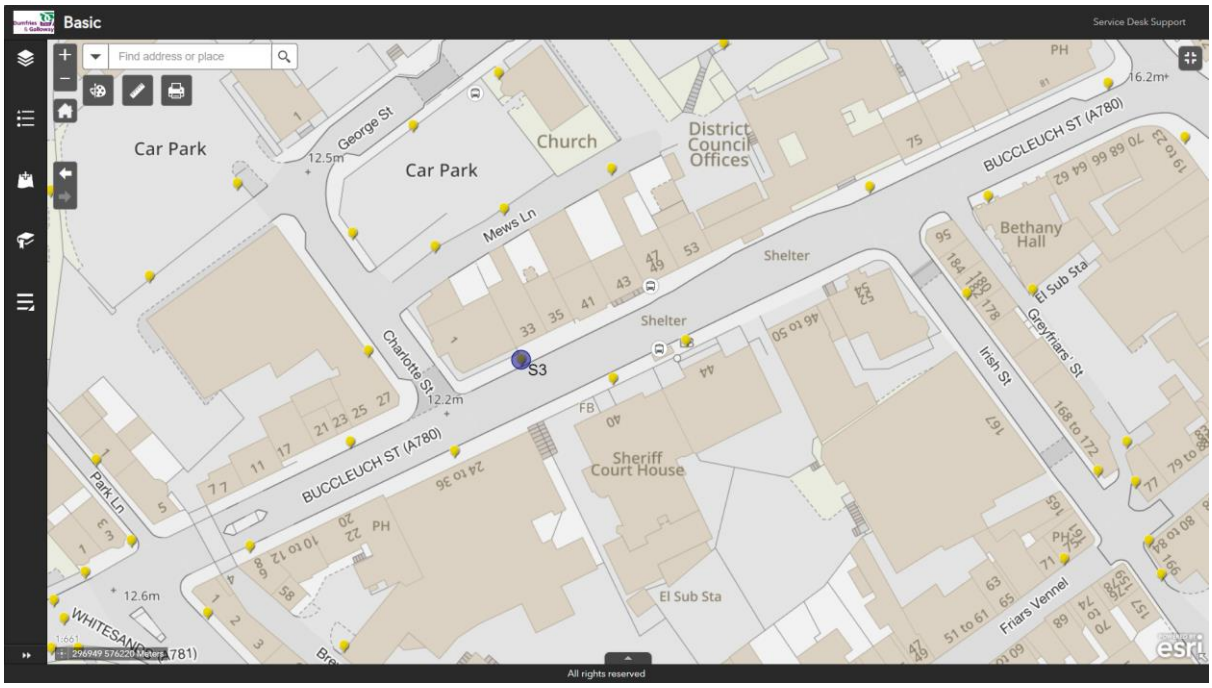


Figure D.6 Map of diffusion tube site at Gretna Loaning (S4)

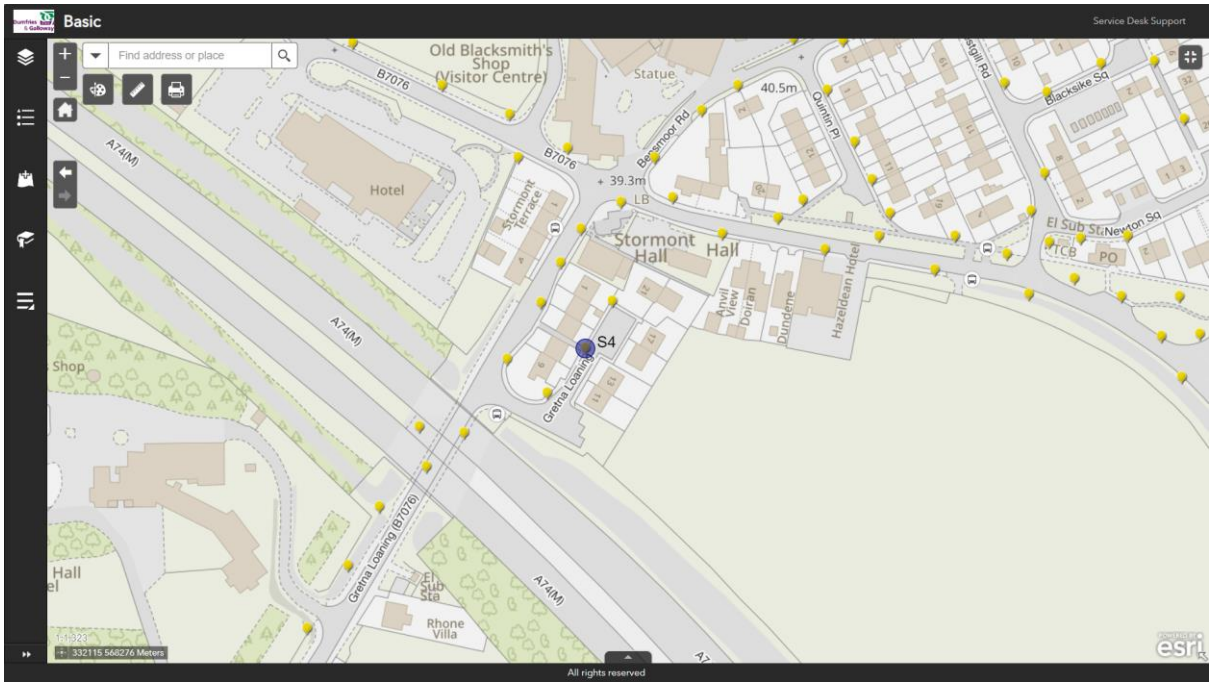


Figure D.7 Map of diffusion tube site at Nithbank, Dumfries (S5)

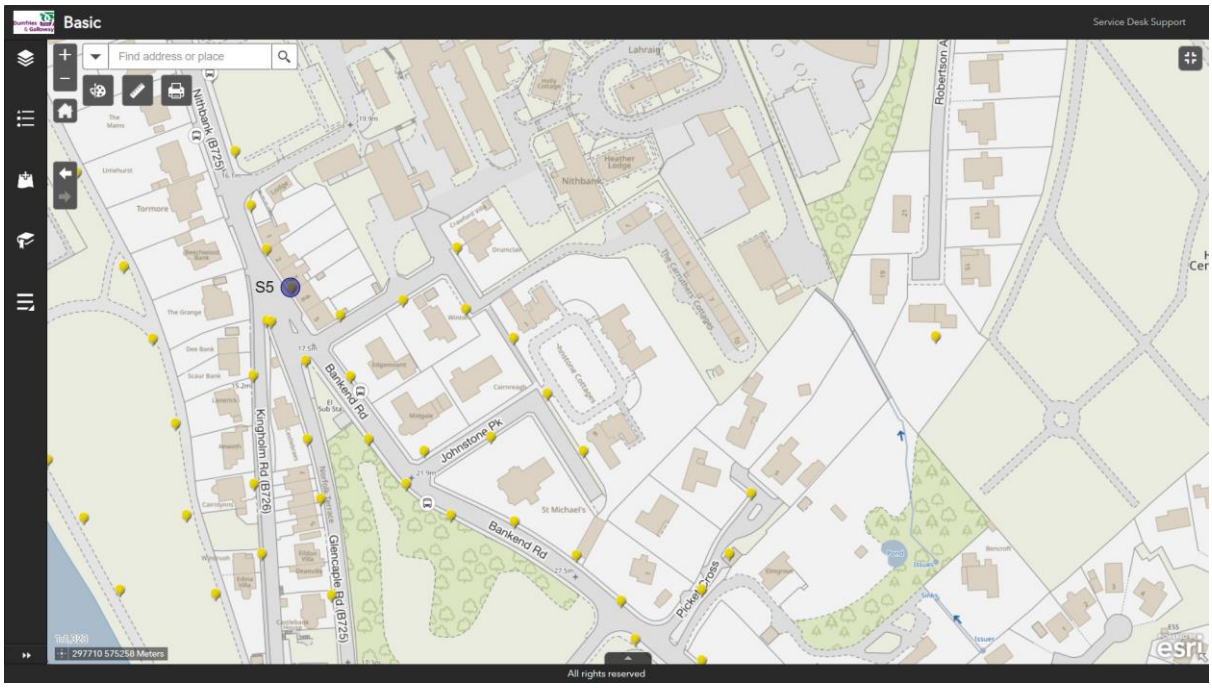


Figure D.8 Map of diffusion tube site at St Michael Street, Dumfries (S6)

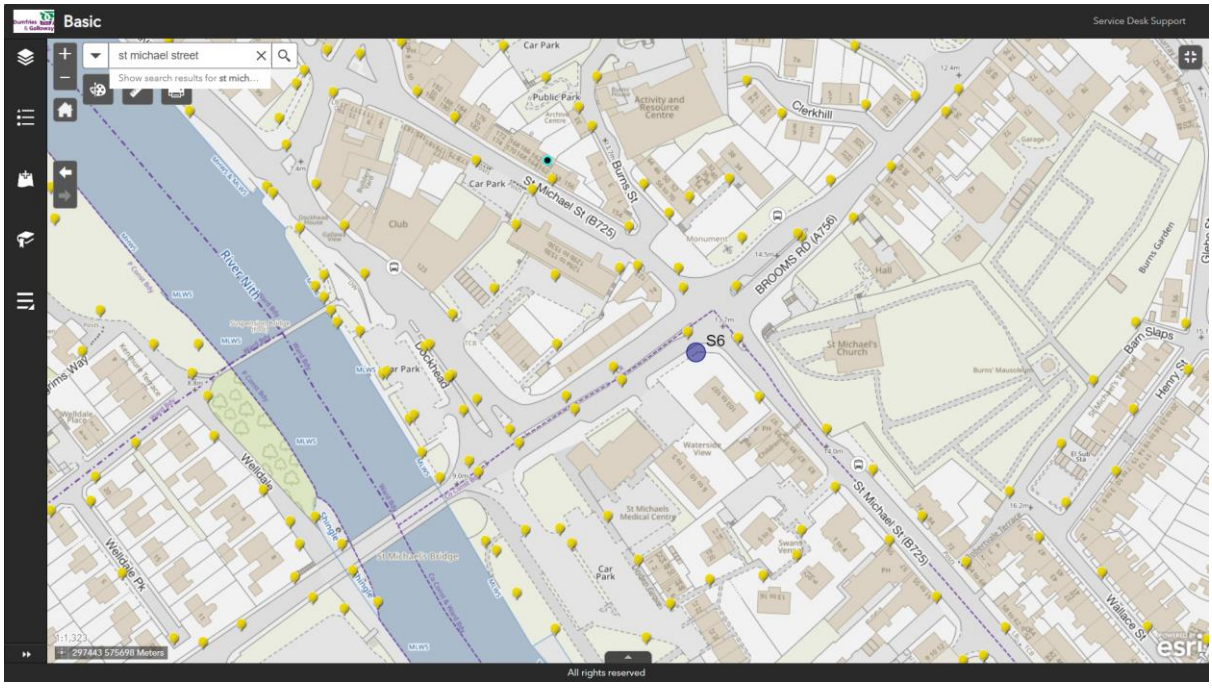


Figure D.9 Map of diffusion tube site at Argyll Drive, Dumfries (S7)

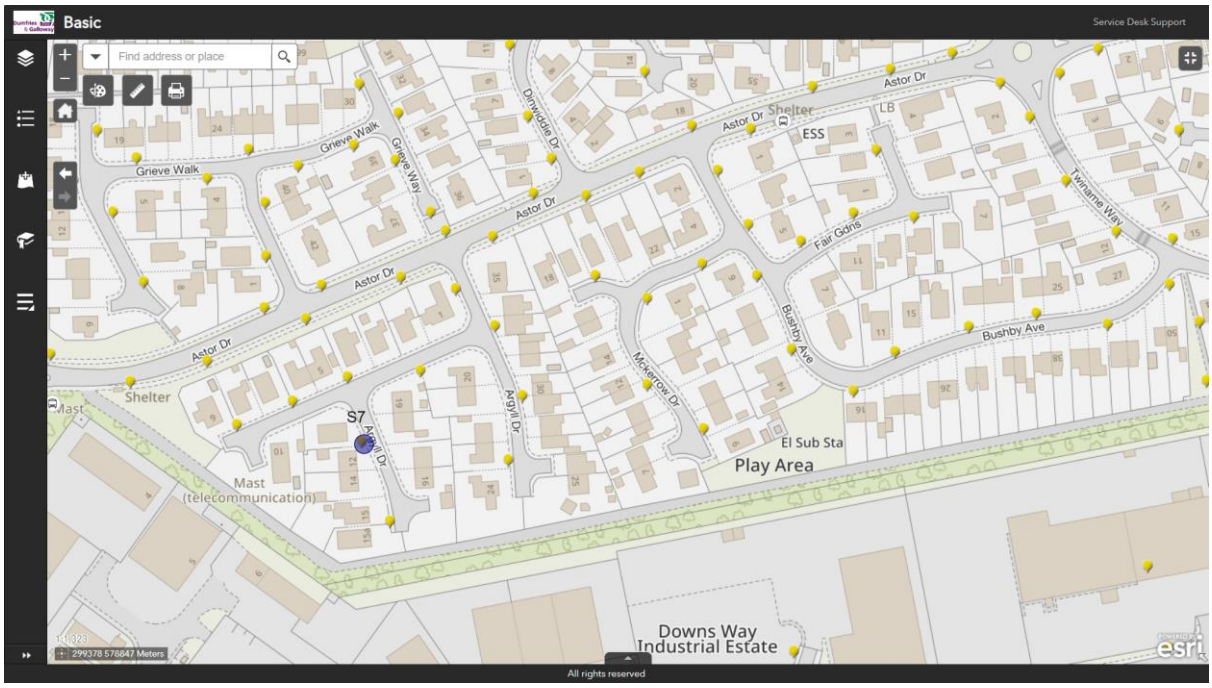


Figure D.10 Map of diffusion tube site at A77 P&O Port, Cairnryan (S8)

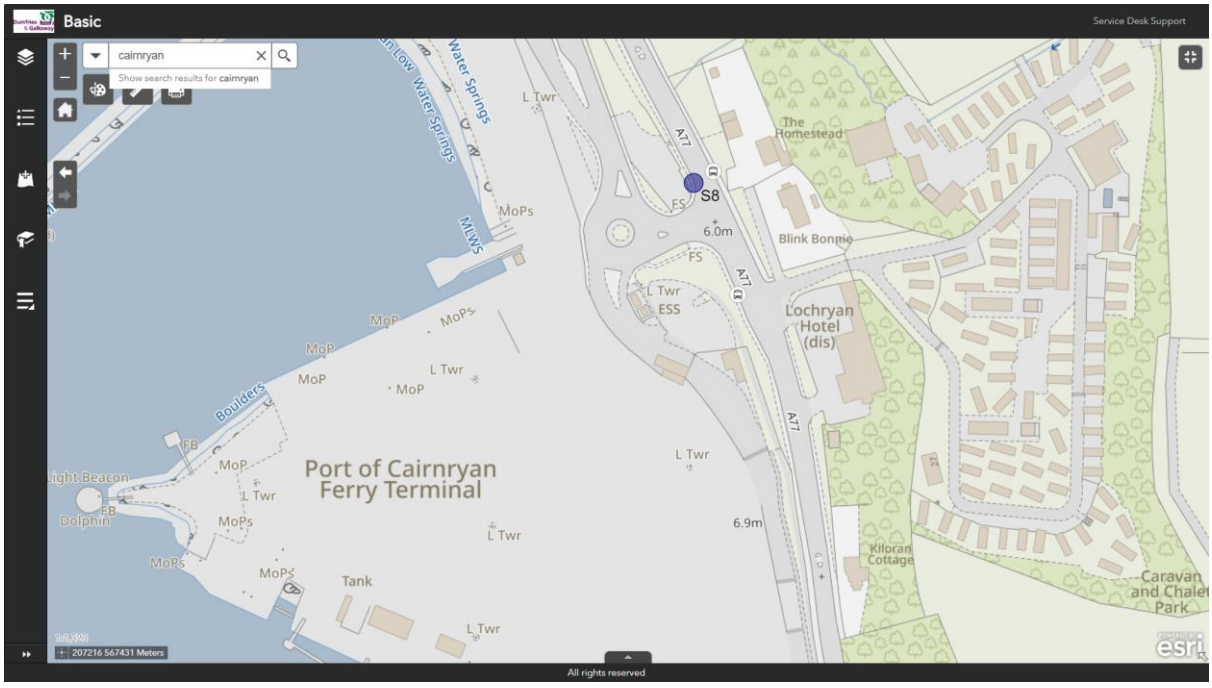


Figure D.11 Map of diffusion tube site at Castle Break, Ecclefechan (S9)

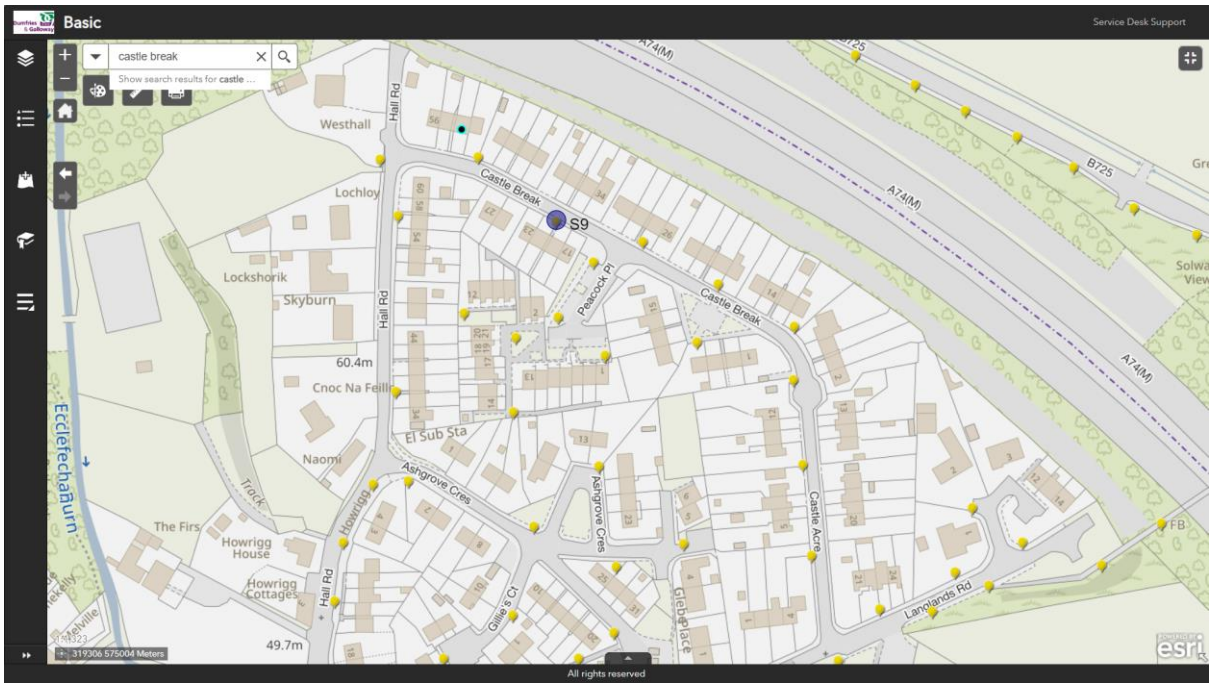


Figure D.12 Map of diffusion tube site at Charlotte Street, Stranraer (S10)

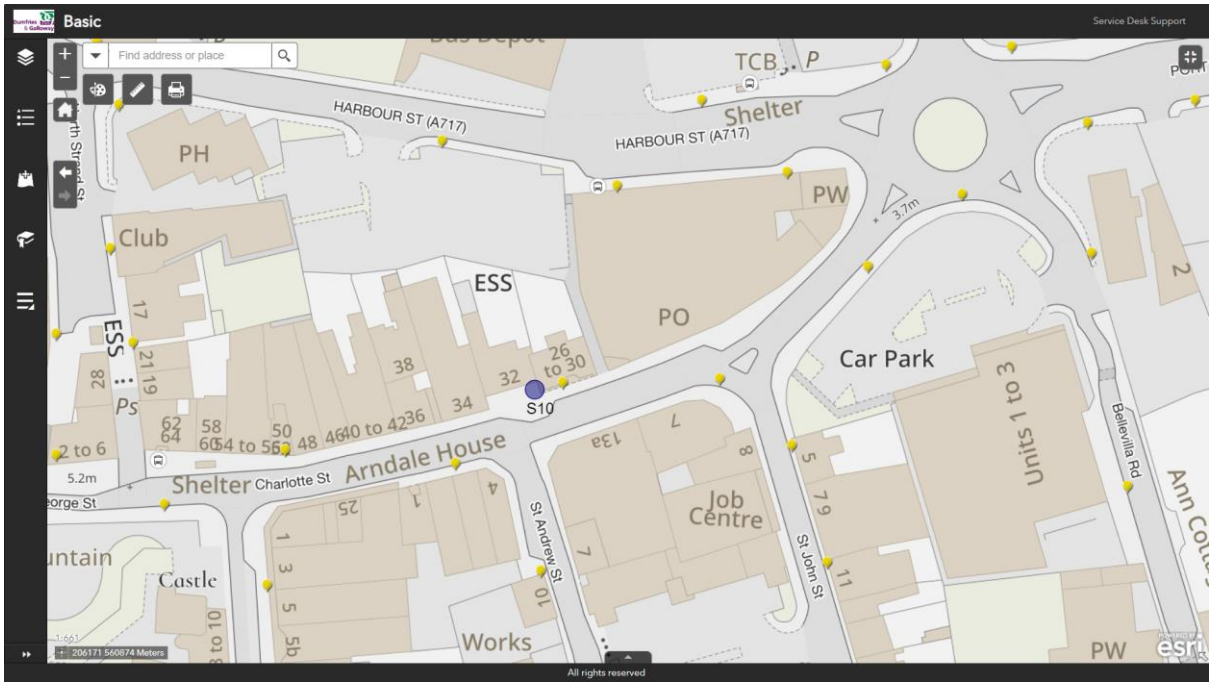


Figure D.13 Map of triplicate diffusion tube site at Buccleuch Street East Inlet (Co-Located AURN) (S11, S12, S13)

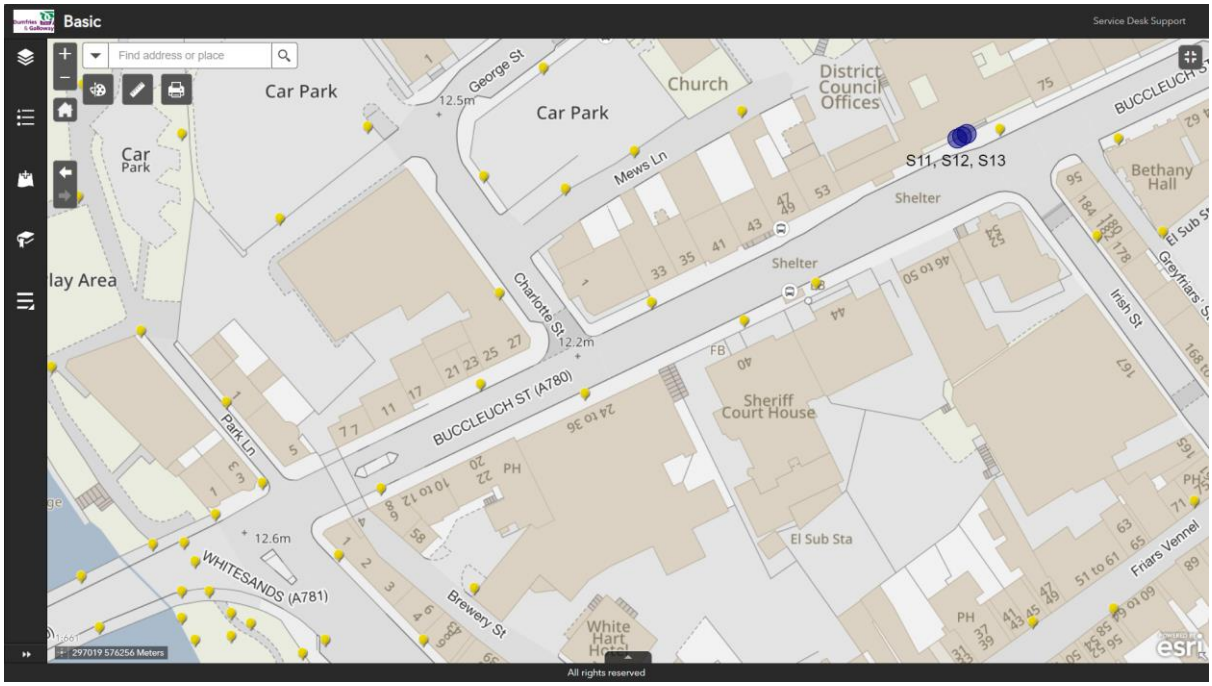


Figure D.14 Map of diffusion tube site at Buccleuch Street South Sheriff Court, Dumfries (S14)

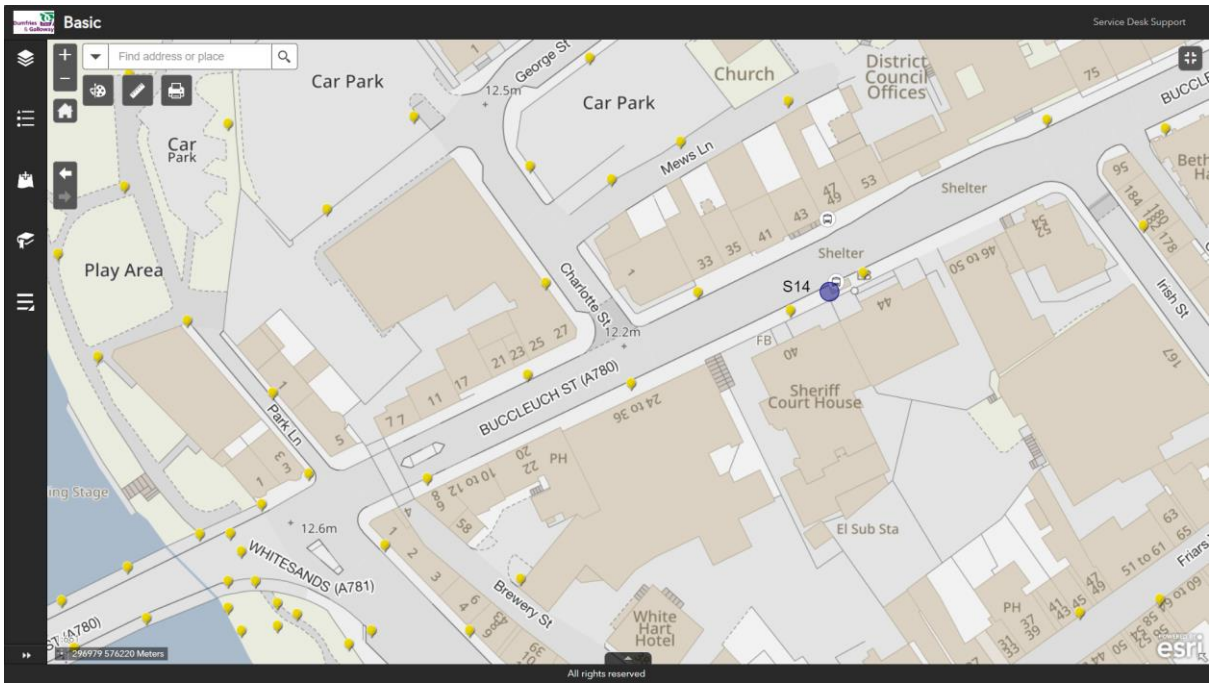


Figure D.15 Map of diffusion tube site at Buccleuch Street Bridge, Dumfries (Duplicate) (S15, S17)

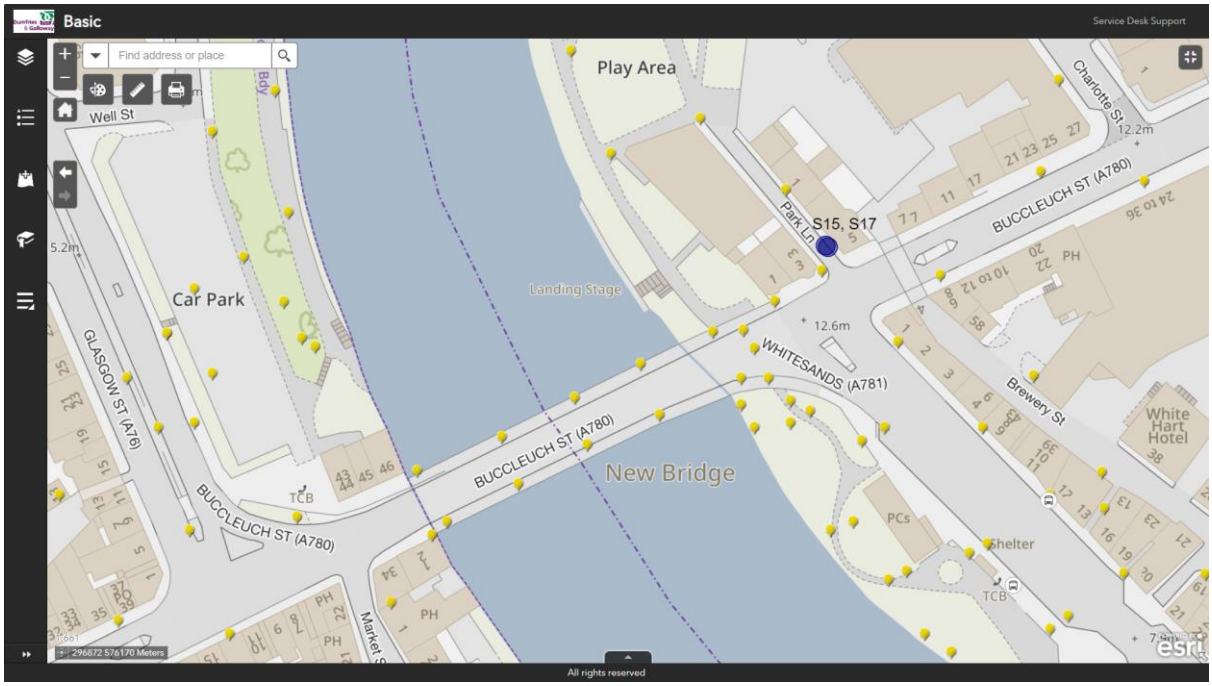


Figure D.16 Map of all diffusion tube sites located on Buccleuch Street, Dumfries

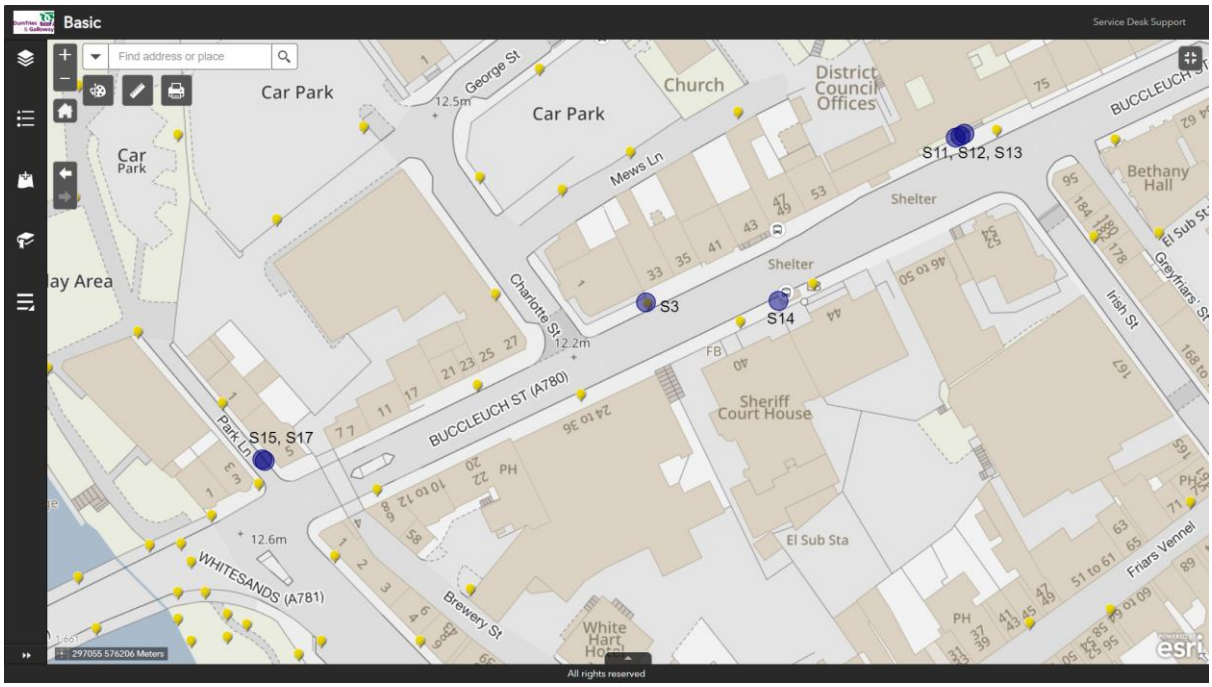


Figure D.17 Map of diffusion tube site at Kirkcudbright (S16)

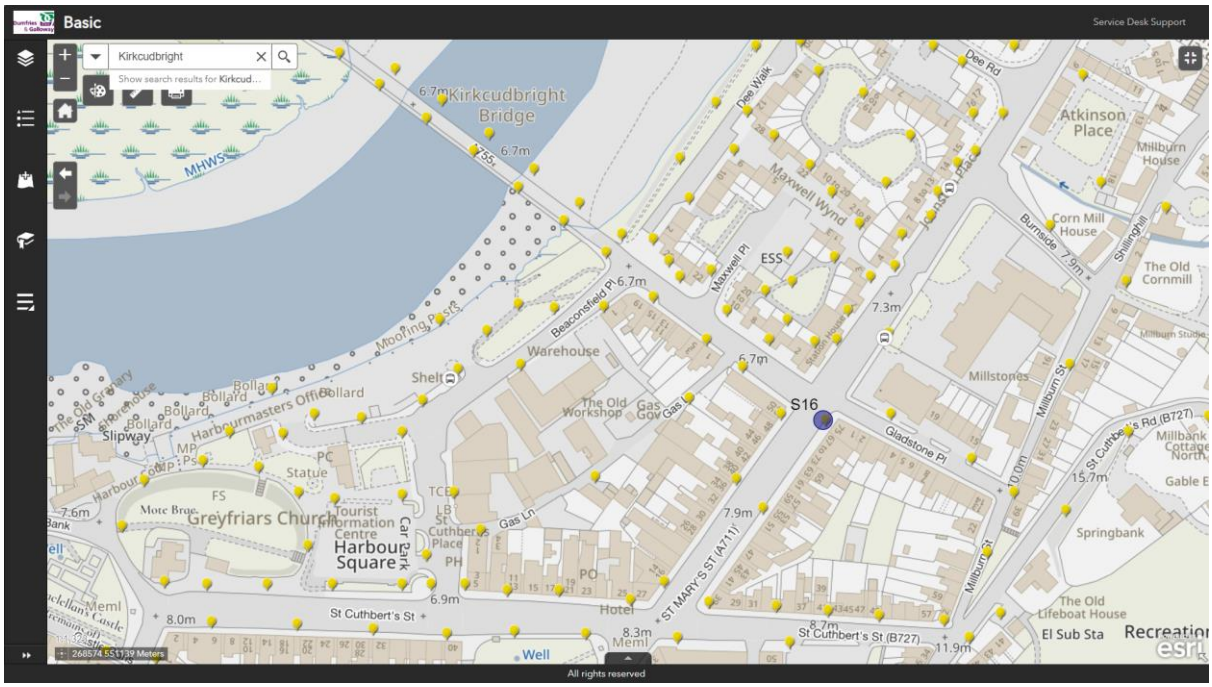


Figure D.18 Map of diffusion tube site at Commerce Road Stranraer (S18) (New Site 2022)

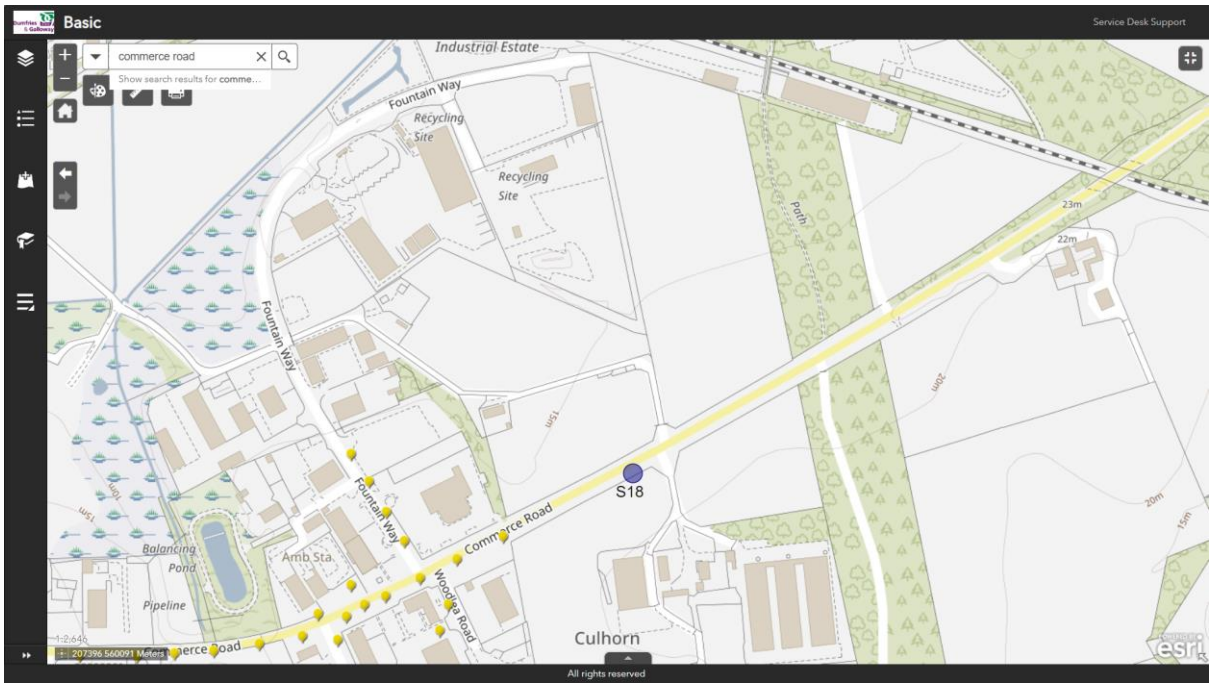
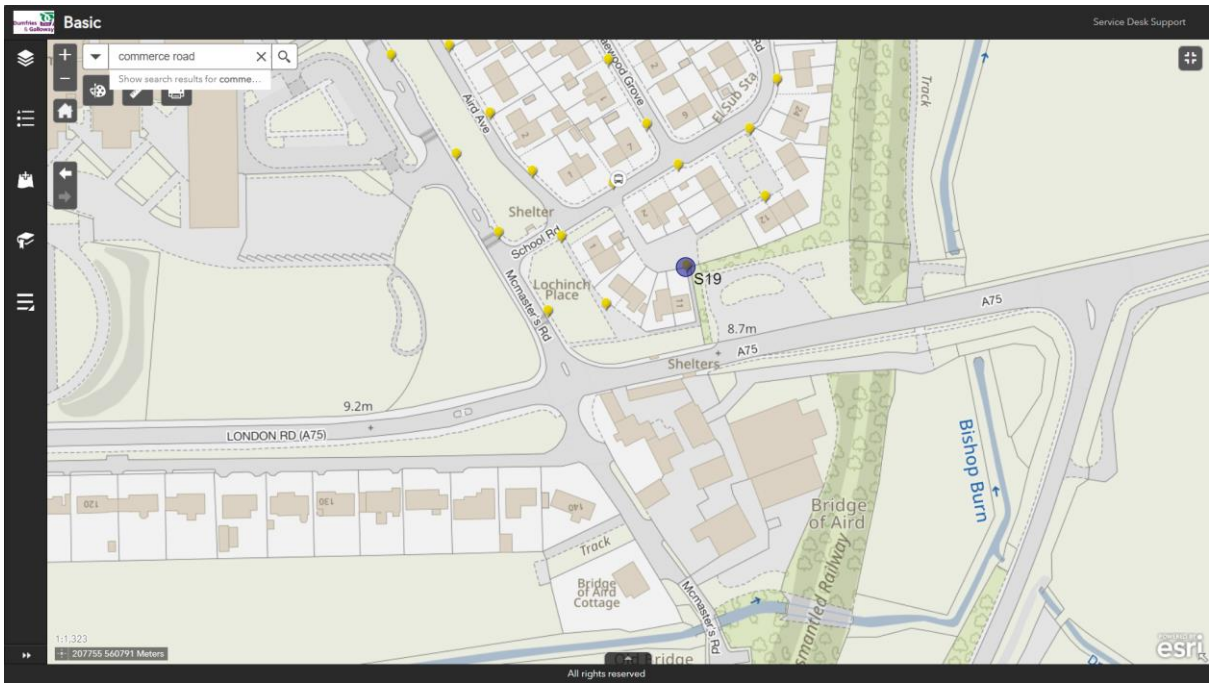


Figure D.19 Map of diffusion tube site at Loch Inch Place, Stranraer (S19) (New Site 2022)



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

1. DEFRA Local Air Quality Management Technical Guidance (TG16) April 2016