Belfast City Council

2022 Air Quality Progress Report

In fulfilment of the Environment (Northern Ireland) Order 2002

Local Air Quality Management

Date: 8th July 2022

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Executive Summary

Belfast City Council has completed this 2022 Air Quality Progress Report in accordance with the provisions of the Environment (Northern Ireland) Order 2002 and the Northern Ireland Local Air Quality Management Policy Guidance document LAQM.PGNI (09).

In undertaking this report, council Air Quality Officers have completed a review of recent ambient air quality monitoring data across the city in order to identify locations where new or existing exceedances of Air Quality Strategy Objectives and European Commission Limit Values are occurring. The review has also identified those locations where ambient air quality has improved and exceedances are no longer occurring.

Belfast City Council has declared four Air Quality Management Areas (AQMAs) across the city for a combination of exceedances of the nitrogen dioxide annual and hourly mean Air Quality Strategy objectives. A review of the monitoring data for these Air Quality Management Areas and for the city generally indicates that there have been further improvements in ambient nitrogen dioxide concentrations across the city over recent years, notwithstanding the impact of the Covid-19 pandemic on transport and other emissions. As a result, Belfast City Council considers that there may be an opportunity for revocation of the Air Quality Management Area along the Ormeau Road and Upper Newtownards Road, where monitoring data demonstrates sustained improved annual mean nitrogen dioxide concentrations, with levels consistently below the annual mean objective since 2014. However, we are aware that the last two years' (2020 and 2021) ambient air pollution levels have been very much impacted by the Covid-19 pandemic restrictions. Therefore, we will continue to review ambient air pollution levels within these Air Quality Management Areas throughout 2022 (without Covid-19 restrictions) in order to determine whether recent improvements are sustained throughout the ongoing recovery from the pandemic or if air pollution levels revert to their 2019 pre-pandemic levels, and what implications these improvements and prevailing ambient conditions may have for our AQMAs. We will then establish if compelling evidence exists to support the decision to revoke any of our Air Quality Management Areas. This decision will be based on robust monitoring evidence and detailed atmospheric dispersion modelling and be in accordance with the government's Local Air Quality Management Technical Guidance LAQM.TG(16).

Accordingly, the council will liaise with the Department for Agriculture, Environment and Rural Affairs, Department for Infrastructure and other relevant competent authority

partners regarding the revocation process next year, on compilation and analysis of 2022 monitoring data.

Covid-19 pandemic restrictions have caused significant changes in emissions of some air pollutants, especially from the road transport sector; which have notably impacted nitrogen dioxide concentrations at roadside locations. Consequently, we will treat 2020 and 2021 nitrogen dioxide annual mean results with caution and follow Defra guidance, including the Defra Covid-19 Supplementary Guidance for LAQM Reporting in 2021, when undertaking any future year projections that incorporate this somwhat atypical data. For 2020 monitoring data, Defra have advised that, '*Since 2020 data is reflective of real-world events, we encourage presenting and discussing 2020 data. Authorities need to simply make clear how monitoring was impacted and, if appropriate, highlight that the data should be treated with caution'.*

Monitored levels of benzene and sulphur dioxide remain well below the objectives and show no reason for concern.

There have been no monitored exceedances of Air Quality Strategy Objectives for any other ambient pollutant in recent years across the city, and no new sources have been identified which would have the potential to change this position. No other air quality pollutants will therefore be considered within this 2022 Progress Report.

However, the council is aware of the recent evidence from national studies showing that domestic solid fuel burning contributes more than previously thought to particulate emissions.

The contribution of solid fuel combustion to fine particulate matter ($PM_{2.5}$) concentrations has also been recognised within the UK Clean Air Strategy 2019. Moreover, the National Atmospheric Emission Inventory, 'Air Pollutant Inventories for England, Scotland, Wales, and Northern Ireland 2005-2019' publication highlights that for Northern Ireland during 2019, residential combustion alone accounted for 54% of 2019 $PM_{2.5}$ emissions. Emissions from transport have decreased 57% since 2005, due to progressively more stringent exhaust emissions standards over time. However, declines in emissions have been offset by increases in emissions from the residential sector, and in particular, the combustion of wood, as described for the coarser PM fraction, PM_{10}.

Belfast City Council and the Department for Environment, Agriculture and Rural Affairs (DAERA) have therefore decided to undertake a detailed assessment for the city, for fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2) pollutants. The project commenced in early 2021 and is due to conclude in early 2023. The project, which includes detailed atmospheric dispersion modelling, will also assist the council in reviewing the continuing need for its Air Quality Management Areas. It is considered that this detailed atmospheric dispersion modelling, in addition to ambient monitoring data, will provide appropriate evidence to help inform the decision to revoke the Air Quality Management Areas along the Ormeau Road and Upper Newtownards Road.

Numerous new developments have occurred throughout Belfast since the 2020 Progress Report and 2021 Updating and Screening Assessment were published. These developments were identified during the Planning Application process and where necessary, Air Quality Impact Assessments were requested. The air quality impacts of these developments were then assessed, and any necessary development specific air quality mitigation measures were identified and requested by way of planning condition, as part of the planning process.

Moreover, in 2021, the council, its competent authority partners, Translink, Belfast Harbour and other significant transport organisations from across the city finalised a new 2021-2026 Air Quality Action Plan (AQAP) for Belfast city.

The aim of the new AQAP is to continue to reduce NO_2 emissions from transport sources and to promote and enable a shift towards more sustainable modes of transport in order to achieve compliance with UK Air Quality Strategy objectives for NO_2. Where necessary, an additional aim of this Action Plan is to identify, develop and implement mitigation measures to address concentrations of fine particulate matter ($PM_{2.5}$) across the city. Chapter 9 (Table 9.1) provides information on progress with the 2021-2026 Belfast Air Quality Action Plan since its launch.

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1 Introduction

1.1 Description of Local Authority Area

Belfast is the capital city of Northern Ireland and as such, the city, and its wider metropolitan area, is the largest settlement in the region and the second largest city on the island of Ireland with a population of around 342,560. The city lies at the head of Belfast Lough in the lower reaches of the Lagan Valley and is flanked by the Black Mountain to the west and Castlereagh Hills to the east. The Belfast City Council district area sits at the heart of the growing population of the wider Belfast Metropolitan Urban Area, which also comprises part of the surrounding areas of Lisburn and Castlereagh City Council, North Down and Ards District Council, Antrim and Newtownabbey District Council and Mid and East Antrim District Council.

In terms of historical air quality issues, Belfast used to experience sustained elevated levels of sulphur dioxide (SO_2) and particulate matter (PM_{10}), associated principally with the widespread use of solid fuel for domestic heating. However, through the introduction of the Council's smoke control programme in the late 1960s, the Clean Air (Northern Ireland) Order 1981 and the more recent availability of natural gas to domestic, commercial and industrial sectors, levels of particulate matter and sulphur dioxide have declined substantially to the extent that we do not experience exceedances of any air quality strategy objectives, or indeed European Commission limit values, for either of these pollutants. Accordingly, the number of locations where we monitor these ambient pollutants has been reduced over recent years in accordance with the government's risk and exposure-based approach to local air quality management.

Although Belfast city does not experience exceedances of any air quality strategy objectives, or European Commission limit values, for particulate matter (PM_{10}), we are aware of growing concerns around the effects of fine particulate matter ($PM_{2.5}$) on human health. Therefore, although not included in Regulation at present for Northern Ireland councils, Belfast City Council has proactively opted to report $PM_{2.5}$ monitoring data as part of this Progress Report. Moreover, we are aware of the recent evidence from national studies showing that domestic solid fuel burning contributes more than previously thought to particulate emissions.

At the end of 2017, Defra issued a practical guide on open fires and wood burning stoves. This guide (updated in April 2022) provides steps that should be taken to reduce the health impacts of burning solid fuel. This guidance can be found on the Defra smoke control webpage: https://uk-air.defra.gov.uk/library/reports?report_id=948.

The contribution from solid fuel combustion to fine particulate matter ($PM_{2.5}$) concentrations has been also recognised within the UK Clean Air Strategy 2019 and the Clean Air Strategy NI (Public Discussion Document, DAERA November 2020). Therefore, Belfast City Council has decided to undertake a detailed assessment for the city, for fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2) pollutants. This project commenced in February 2021 and includes additional ambient air quality monitoring (using Zephyr small sensor air quality monitors), development of an emissions inventory database for the city and atmospheric dispersion modelling. The project is scheduled to conclude by March 2023.

Over recent years, emissions of nitrogen oxides, associated principally with road transport, have become more prominent. This is a similar situation to that experienced in many other major cities and conurbations across the United Kingdom. Accordingly, as a result of the first round of the review and assessment process, which was completed in 2004, Belfast City Council opted to declare four Air Quality Management Areas across the city. We published our first Air Quality Action Plan for the city back in 2006 and it was completed substantially in 2010, with around 90% of planned actions delivered to schedule. Of the outstanding 10% of actions, it was considered that the majority of these would have had limited additional impact within our Air Quality Management Areas.

In order to address the remaining '*hot spot'* areas of elevated nitrogen dioxide, the council along with relevant partners developed a 2015-2020 Air Quality Action Plan (AQAP) for the city that contained a manageable number of proven air quality mitigation measures. This AQAP concluded at the end of 2020. A final review of the implementation of the various mitigation measures included within 2015-2020 AQAP was undertaken and reported by the council to the Department of Agriculture Environment and Rural Affairs (DAERA) as part of the council's 2020 Action Plan Progress Report, submitted to DAERA in June 2020.

Whilst previous AQAPs have delivered further improvements in ambient air quality across the city, a limited number of NO_2 hotspots still remain. Moreover, fine particulate matter ($PM_{2.5}$) has emerged as an additional ambient air pollutant of concern for the city.

Accordingly, the council, competent authorities and other partner organisations have already developed a new Air Quality Action Plan for the city; the plan was approved by DAERA and Defra's independent technical appraisers in February 2022 and can be viewed on the Belfast City Council website: https://www.belfastcity.gov.uk/Documents/Belfast-City-Air-Quality-Action-Plan-2021-2026

The aim of the new Air Quality Action Plan 2021-2026 is to continue to reduce nitrogen dioxide emissions from transport sources and to promote and enable a shift towards more sustainable modes of transport in order to achieve compliance with UK Air Quality objectives for NO_2. Where necessary, an additional aim of this Action Plan is to identify, develop and implement mitigation measures to address concentrations of fine particulate matter ($PM_{2.5}$) across the city.

1.2 Purpose of Progress Report

This progress report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in the Environment (Northern Ireland) Order 2002, the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess ambient air quality in their areas, and to determine whether or not the air quality objectives are or are likely to be achieved. Where exceedances are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it and competent authority partners intend to put in place in pursuit of the objectives.

For Local Authorities in Northern Ireland, Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the LAQM process.

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

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in **Northern Ireland** are set out in the Air Quality Regulations (Northern Ireland) 2003, Statutory Rules of Northern Ireland 2003, no. 342, and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre µg/m^3 (milligrammes per cubic metre, mg/m^3 for carbon monoxide), together with the averaging period and number of exceedances in each year that are permitted (where applicable).

Table 1.1 - Air Quality Objectives included in Regulations for the purpose of LAQM in Northern Ireland

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m^3	Running annual mean	31.12.2003
	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 mg/m^3	Maximum daily running 8-hour mean	31.12.2003
Lead	0.50 µg/m^3	Annual mean	31.12.2004
	0.25 µg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	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}) (gravimetric)	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m^3	Annual mean	31.12.2004
Sulphur dioxide	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

1.4 Summary of Previous Review and Assessments

As part of the continuing review and assessment process, Belfast City Council completed a 2nd and 3rd stage review and assessment of air quality throughout the city in early 2004. This assessment concluded that modelled and monitored exceedances of short and longer-term objectives for both nitrogen dioxide and particulate matter were occurring in the city and would be likely to continue to do so in some locations beyond 2010. Consequently, in August 2004 the council, in consultation with other relevant authorities, declared four Air Quality Management Areas (AQMA), comprising of the M1 Motorway and Westlink corridor, Cromac Street to the junction of Short Strand, Woodstock Link and the Albertbridge Road, the Upper Newtownards Road and the Ormeau Road.

The M1-Westlink AQMA was declared on the basis that annual and hourly-mean nitrogen dioxide concentrations would exceed the 31st December 2005 Air Quality Strategy objectives. In addition, particulate matter annual and 24-hour mean concentrations were predicted also to exceed relevant objectives at this location. The three other Air Quality Management Areas were declared on the grounds that the annual mean nitrogen dioxide objective would be exceeded at these locations during 2005 and beyond. A subsequent source apportionment study, completed for each of the Air Quality Management Areas, indicated that the principal source of the exceedances was emissions associated with road transport.

Current Air Quality Management Areas are described and depicted in more detail as follows:

1. The M1 / Westlink corridor from the Belfast City boundary at Sir Thomas and Lady Dixon Park to the end of the Westlink at the junction with Great George's Street and York Street including Stockman's Lane and Kennedy Way. This area was declared for predicted exceedances of both the nitrogen dioxide and particulate material annual mean air quality strategy objectives as well as exceedances of the particulate matter 24-hour mean objective and the nitrogen dioxide 1-hour mean objective. The boundary of the Air Quality Management Area is denoted in pink and has been set to take account of dispersion modelling uncertainties. This AQMA was revoked for exceedances of particulate matter objectives in September 2015, but it continues to exceed the air quality objectives for nitrogen dioxide.

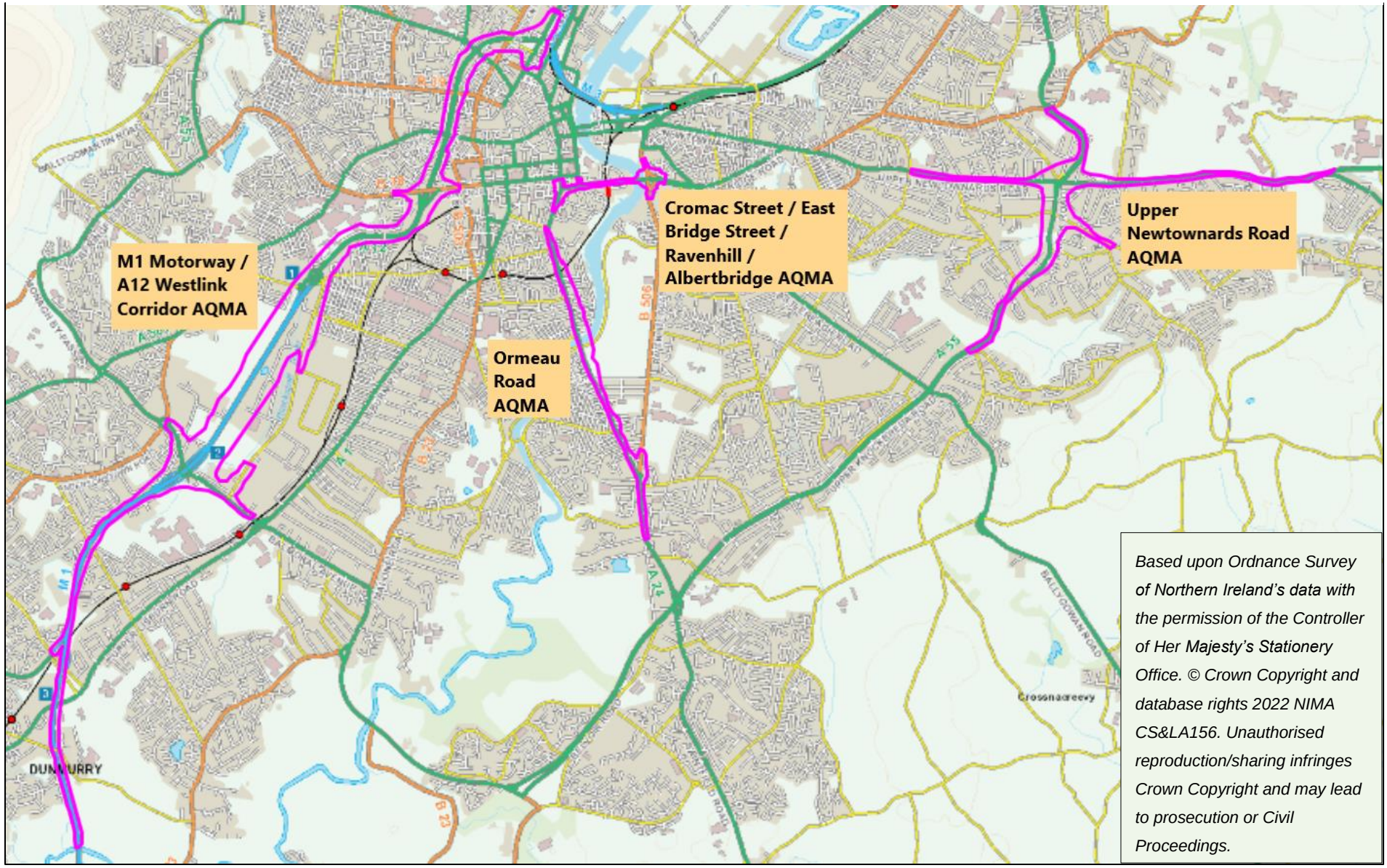
2. Cromac Street to the junction with East Bridge Street and then from East Bridge Street to the junction with the Ravenhill and Albertbridge Roads and Short Strand. This AQMA was declared for predicted exceedances of the nitrogen dioxide annual mean Air Quality Strategy objective.

3. The Upper Newtownards Road from the North Road junction to the Belfast City boundary at the Ulster Hospital, incorporating the Knock Road to the City boundary at Laburnum Playing Fields and Hawthornden Way. This AQMA was declared for predicted exceedances of the nitrogen dioxide annual mean Air Quality Strategy objective.

4. The Ormeau Road from the junction with Donegall Pass to the city boundary at Galwally. This area was declared for predicted exceedances of the nitrogen dioxide annual mean Air Quality Strategy objective.

Please note that the Belfast City Council boundary was revised in 2015 as a consequence of the reform of local government in Northern Ireland. The above-mentioned AQMAs were declared on the basis of the previous council boundary.

Figure 1.1 - Map of AQMA Boundaries



A further detailed air quality review and assessment was completed by Belfast City Council in 2010, informed by the outcome of the 2009 Updating and Screening Assessment. Accordingly, the 2010 Detailed Assessment considered the potential for exceedances of nitrogen dioxide objectives at a number of further locations across the city, including at the junction of the Sydenham Bypass with the Lower Newtownards Road, Shaftesbury Square, Donegall Road and Albertbridge Road, and at locations throughout the city centre. Although atmospheric dispersion modelling studies, undertaken as part of the detailed review and assessment process, did suggest exceedances of the nitrogen dioxide annual mean objective at some the of above-mentioned locations, the review and assessment identified also that there was no relevant public exposure at these locations during 2010. As a result, the 2010 Detailed Air Quality Review and Assessment for Belfast City Council concluded that there was no need to declare further Air Quality Management Areas or to expand or revoke the existing AQMAs. This conclusion was accepted by DAERA.

Ambient air quality monitoring results, as presented in previous annual progress and updating and screening assessment reports, had identified sustained improvements in particulate matter concentrations within the M1 Motorway / A12 Westlink Air Quality Management Area, confirming that it had been in compliance with the particulate matter (PM_{10}) objectives for a number of years. This resulted in the Westlink / M1 AQMA being revoked for particulate matter 24 hour and annual mean objectives in September 2015.

The current stage of the Review and Assessment process requires that a Progress Report be completed. This report therefore addresses the requirements of the April 2021 Defra LAQM.TG(16) technical guidance publication in identifying any significant changes that have occurred since the previous round of Review and Assessment and which may have the potential to adversely affect local air quality.

For reference and additional background information, historical Belfast City Council air quality review and assessment reports are listed in the following table, and are available to download from the Department of Agriculture, Environment & Rural Affairs for Northern Ireland ‘Northern Ireland Air Quality’ website via the follow weblink https://www.airqualityni.co.uk/laqm/district-council-reports#511

Table 1.2 - Historical Belfast City Council Air Quality Reports

• 2021 Updating and Screening Assessment for Belfast City Council - Published: 1st October 2021
• Belfast - Progress Report - 2020 - Published: 11th November 2020
• Belfast - Progress Report - 2019 - Published: 11th November 2020
• Belfast - Updating and Screening Assessment - 2018 - Published: 17th December 2018
• Belfast - Progress Report - 2017 - Published: 17th November 2017
• Belfast - Progress Report - 2016 - Published: 21st October 2016
• Belfast - Updating and Screening Assessment - 2015 - Published: 21st October 2016
• Belfast - LAQM Progress Report - 2014 - Published: 14th November 2014
• Belfast - LAQM Progress Report - 2013 - Published: 1st April 2013
• Belfast - Updating and Screening Assessment report - 2012 - Published: 3rd October 2012
• Belfast - Progress Report - 2011 - Published: 30th April 2011
• Belfast - Detailed Assessment - September 2010 - Published: 30th September 2010
• Belfast - Progress Report - 2010 - Published: 30th April 2010
• Belfast - Updating and Screening Assessment - 2009 - Published: 30th April 2009
• Belfast - Joint Air Quality Progress and Action Plan Progress Report - 2007 - Published: 30th April 2007
• Belfast - Detailed Assessment - April 2007 - Published: 30th April 2007
• Belfast - Joint Air Quality Progress and Action Plan Progress Report - 2008 - Published: 10th June 2008
• Belfast - Updating and Screening Assessment - 2006 Appendix - Published: 31st July 2006
• Belfast - Updating and Screening Assessment - 2006 - Published: 31st July 2006
• Belfast - Health Impact Assessment of the Draft Air Quality Action Plan for Belfast - Published: 1st May 2006
• Belfast - Progress Report - Published: 1st September 2005

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Belfast City Council operates four automatic monitoring stations across the city in order to help inform its air quality management processes and to provide real time information to the public in relation to air pollution levels across the city centre and within our Air Quality Management Areas.

Accordingly, to ensure that the data from our sites is both accurate and representative, the monitors at each site are calibrated on a biweekly (Stockman's Lane AURN site) or on a four-weekly basis by the council's technical staff in accordance with the procedures detailed in the Defra Automatic Urban and Rural Network (AURN) local site operators' manual. In addition, data management, quality assurance and quality control and service and maintenance support are all provided by appointed contractors. The data from our sites is made available to the Department of Agriculture, Environment and Rural Affairs (DAERA) and is reported on the 'Northern Ireland Air' website in near real time (https://www.airqualityni.co.uk/). For consistency, all automatic monitoring data reported in this progress report has been obtained from the 'Northern Ireland Air Quality' website. Automatic monitoring data presented in this report relates to the calendar year (i.e. January – December). 2021 data capture levels exceeded the Department's 75% data capture threshold for the calculation of annual statistics at all council sites. Further information regarding our QA/QC procedures and processes can be obtained in Appendix A to this report.

In addition to the council's automatic monitoring sites, Defra operates an urban background monitoring site at Lombard Street in Belfast City Centre. 2021 data capture levels at the Belfast Centre site were also above the Department's 75% data capture threshold, with the exception of carbon monoxide (70%); air quality monitoring data from this site are referenced within this report.

In relation to correction of our automatic monitoring data, this process is generally of principal concern with regard to the treatment of particulate matter monitoring data. In

2019, the Belfast Centre site employed Filter Dynamics Measurement System (FDMS) equipped Tapered Element Oscillating Microbalances (TEOMs) for particulate matter (PM_{10}) monitoring up until September whereupon the FDMS equipped TEOMs were replaced by a Palas Fidas 200, which complies with DEFRA's UK PM Pollution Climate standard. Government equivalence tests have determined that both of types of equipment meet the equivalence criteria and, on that basis, no correction factors need to be applied to this monitoring data.

The Stockman's Lane site is equipped with a Beta Attenuation Monitor (BAM) with a heated inlet for monitoring particulate matter (PM_{10}). Government technical guidance highlights that a BAM, equipped with a heated inlet, also meets the equivalence criteria for PM_{10} monitoring, provided that the results are corrected for slope. This correction involves dividing measured concentrations by a factor of 1.035. It should be noted that the data presented on the Northern Ireland Air website and in this report has already been corrected to the reference equivalent.

During 2019, Belfast City Council replaced ageing NOx API M200A analysers at two of its monitoring sites, namely the Upper Newtownards Road and Stockman's Lane. In addition, the unheated BAM 1020 particulate matter (PM_{10}) analyser at Stockman's Lane was also replaced with a heated inlet variant in order to continue to collect high quality data and to achieve >90% data collection rates throughout the year. In 2020 the council also replaced a further API M200 NOx analyser at the Ormeau Road site.

A location map showing automatic monitoring site locations across the Belfast City Council area is presented in the following Figure 2.1, with further site-specific monitoring details provided in Table 2.1.

Figure 2.1 - Map of Automatic Monitoring Sites

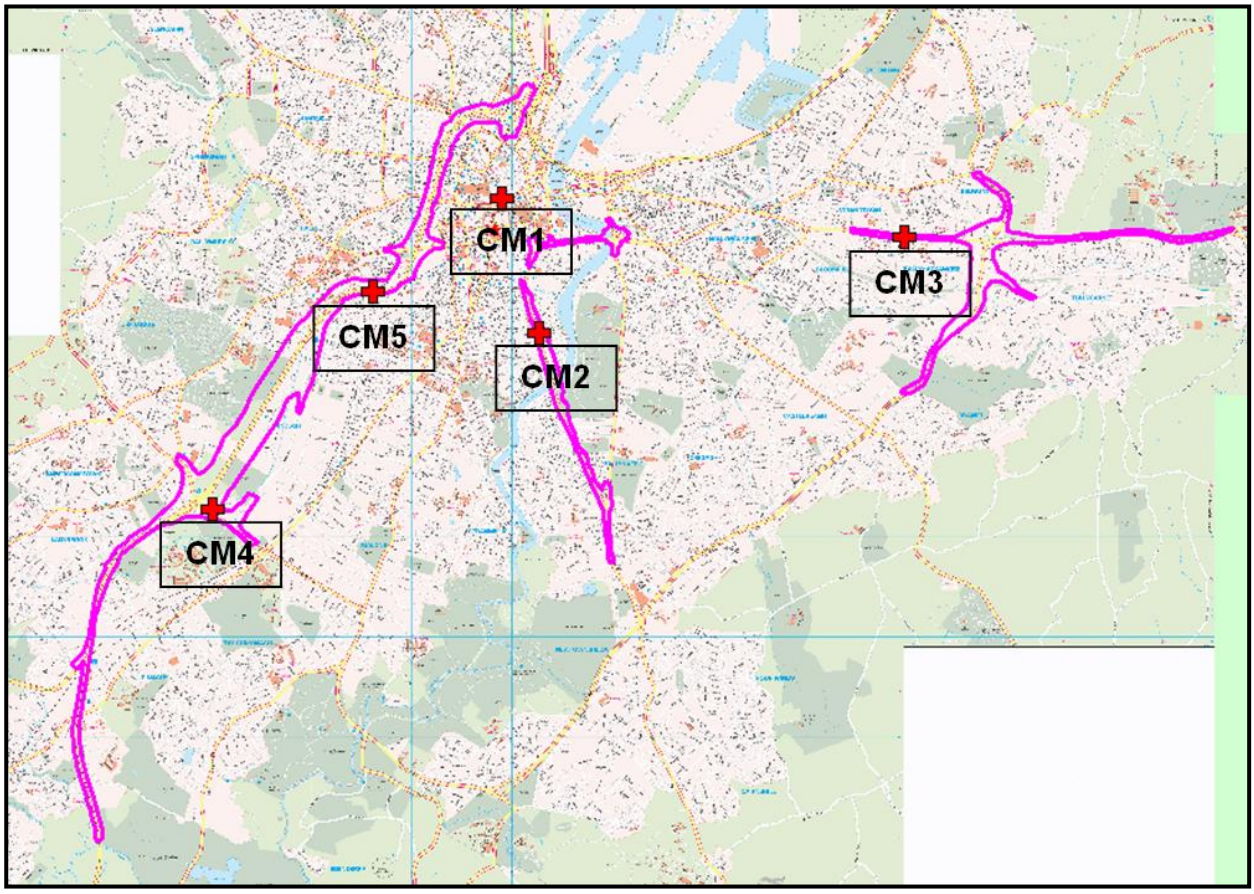


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Table 2.1 - Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
CM1	Belfast Centre AURN site Lombard Street	Urban Background	333898	374358	4.0	Nitrogen dioxide, sulphur dioxide, carbon monoxide, ozone and particulate matter (PM_{10} and $PM_{2.5}$)	N	Chemiluminescence, UV Fluorescence, IR Absorption, UV Absorption, Light-Scattering Monitor (Palas Fidas 200)	Y (monitoring site is located in a city centre pedestrian precinct)	26 m	Y
CM2	Belfast Ormeau Road	Roadside	334272	373012	1.3	Nitrogen dioxide	Y	Chemiluminescence	Y (6 m)	3 m	Y
CM3	Belfast Upper Newtownards Road	Roadside	337911	373972	1.3	Nitrogen dioxide	Y	Chemiluminescence	Y (7 m)	2 m	Y
CM4	Belfast Stockman's Lane	Roadside	331010	371252	3.5	Nitrogen dioxide and particulate matter (PM_{10})	Y	Chemiluminescence Beta Attenuation Monitor	Y (12 m)	3 m	Y
CM5	Belfast Westlink Roden Street	Roadside	332617	373431	2.6	Nitrogen dioxide	Y	Chemiluminescence	Y (17 m)	5 m	Y

2.1.2 Non-Automatic Monitoring Sites

The government's risk and exposure-based approach to local air quality management means that Belfast City Council's principal focus has been on addressing citywide ambient nitrogen dioxide (NO_2) levels over recent years. Accordingly, in order to understand how nitrogen dioxide levels are varying across the city and in addition to our automatic analysers, the council operates a range of passive diffusion tubes for nitrogen dioxide at a range of both background and roadside locations across the city.

The NOx tube monitoring network has changed considerably since the declaration of the Air Quality Management Areas in 2004. The extensive council monitoring network currently comprises 71 tubes throughout the city at 63 locations, which provide annual NO_2 data to assist in the review and assessment process and to aid developers in conducting air quality impact assessments, where deemed necessary. Since the 2021 Updating and Screening Report, we have added an additional 4 tubes to the network; 3 located within the M1/Westlink AQMA and 1 outside the AQMA. These locations are detailed in Figure 2.2 and Table 2.2.

Nitrogen dioxide diffusion tubes comprise a small clear plastic tube containing a chemical reagent supported on stainless steel grids that absorb the pollutant directly from the surrounding ambient air. In this case, triethanolamine is used as the reagent to monitor levels of ambient nitrogen dioxide. Belfast City Council's diffusion tubes are exposed for successive four- or five-week periods, in general accordance with the Defra Diffusion Tube Monitoring Calendar and, as a result, they provide a good general indication of average nitrogen dioxide concentrations, thereby allowing a comparison with the annual mean objective.

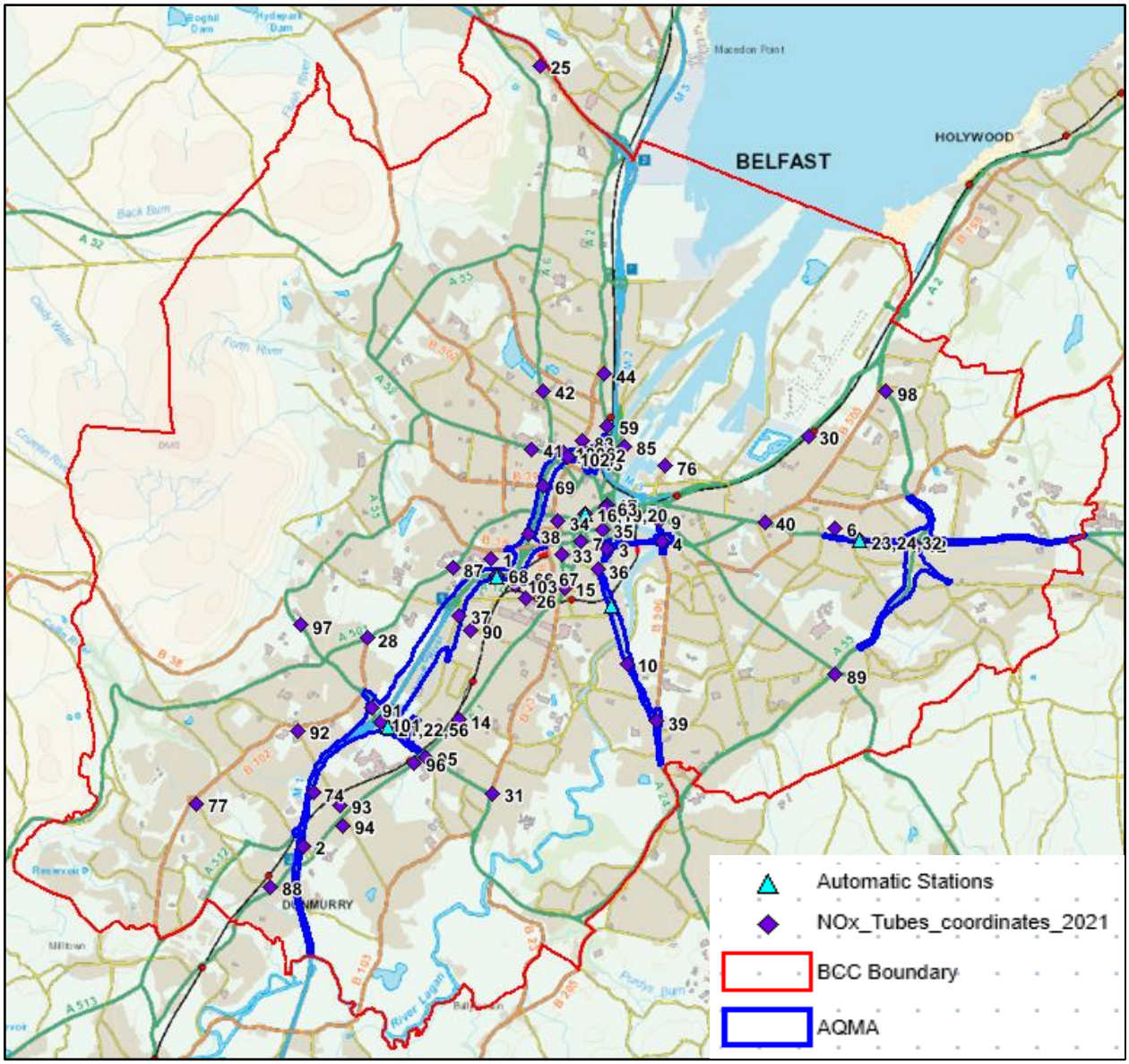
To ensure that experimental error is minimised in the preparation and analysis of its nitrogen dioxide diffusion tubes, Belfast City Council has appointed Gradko International Ltd to supply, analyse and report data for its diffusion tubes. Gradko employs a 20% triethanolamine solution for monitoring ambient nitrogen dioxide and adheres to the requirements of the government's 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users' publication.

To further ensure that its diffusion tube monitoring data is as accurate as possible, the council co-locates a number of diffusion tubes with reference method compliant chemiluminescent nitrogen dioxide analysers at the Lombard Street, Upper Newtownards Road, Westlink/Roden Street and Stockman's Lane monitoring sites. This process allows a bias adjustment factor (with a 95% confidence interval as an estimate of the uncertainty on the bias adjustment factor) to be calculated and used to correct the diffusion tube monitoring data.

In the case of the diffusion tube data presented in this report, the monitoring data has been corrected using a local bias adjustment factor derived from the above-mentioned four co-location studies (Lombard Street, Upper Newtownards Road, Westlink/Roden Street and Stockman's Lane monitoring sites). The bias calculation and data scaling were undertaken using Defra's new Diffusion Tube Data Processing Tool. Outputs from the spreadsheet for treatment of Belfast City Council's 2021 data are included in Appendix A to this report.

Figure 2.2 - Maps of Non-Automatic Monitoring Sites

Belfast City Council Boundary



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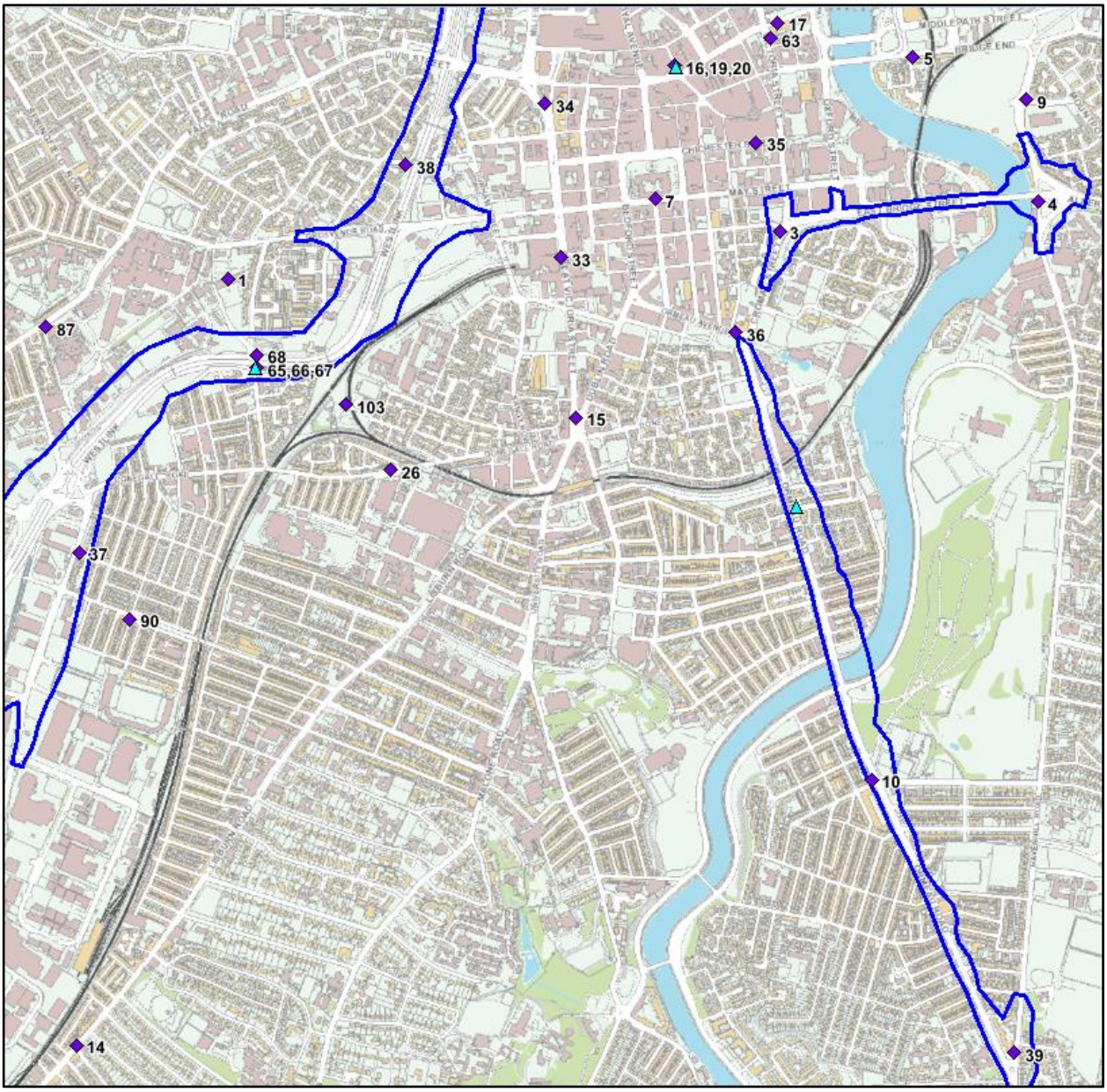
Belfast City Centre



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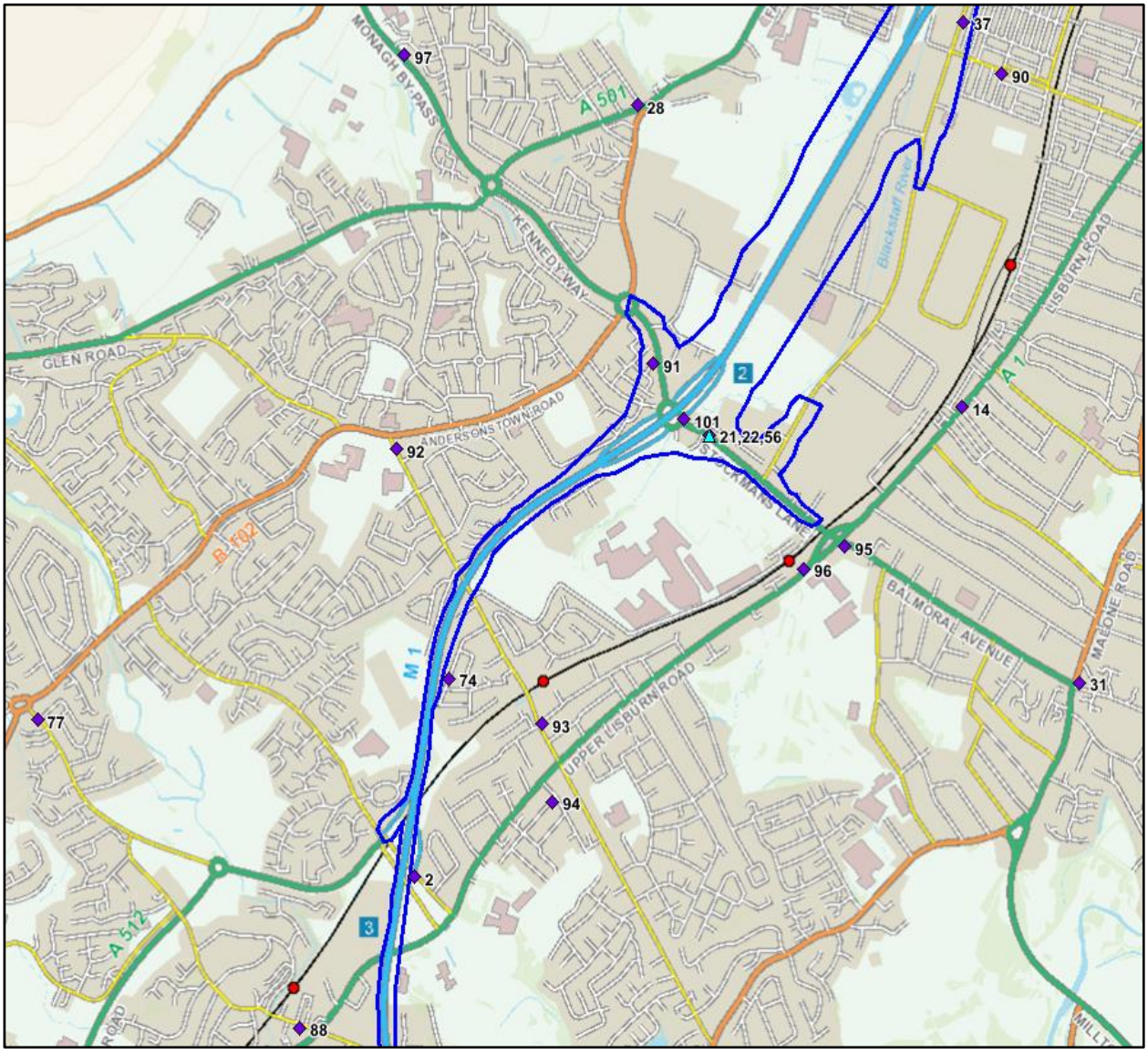
South and West Belfast



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East Belfast

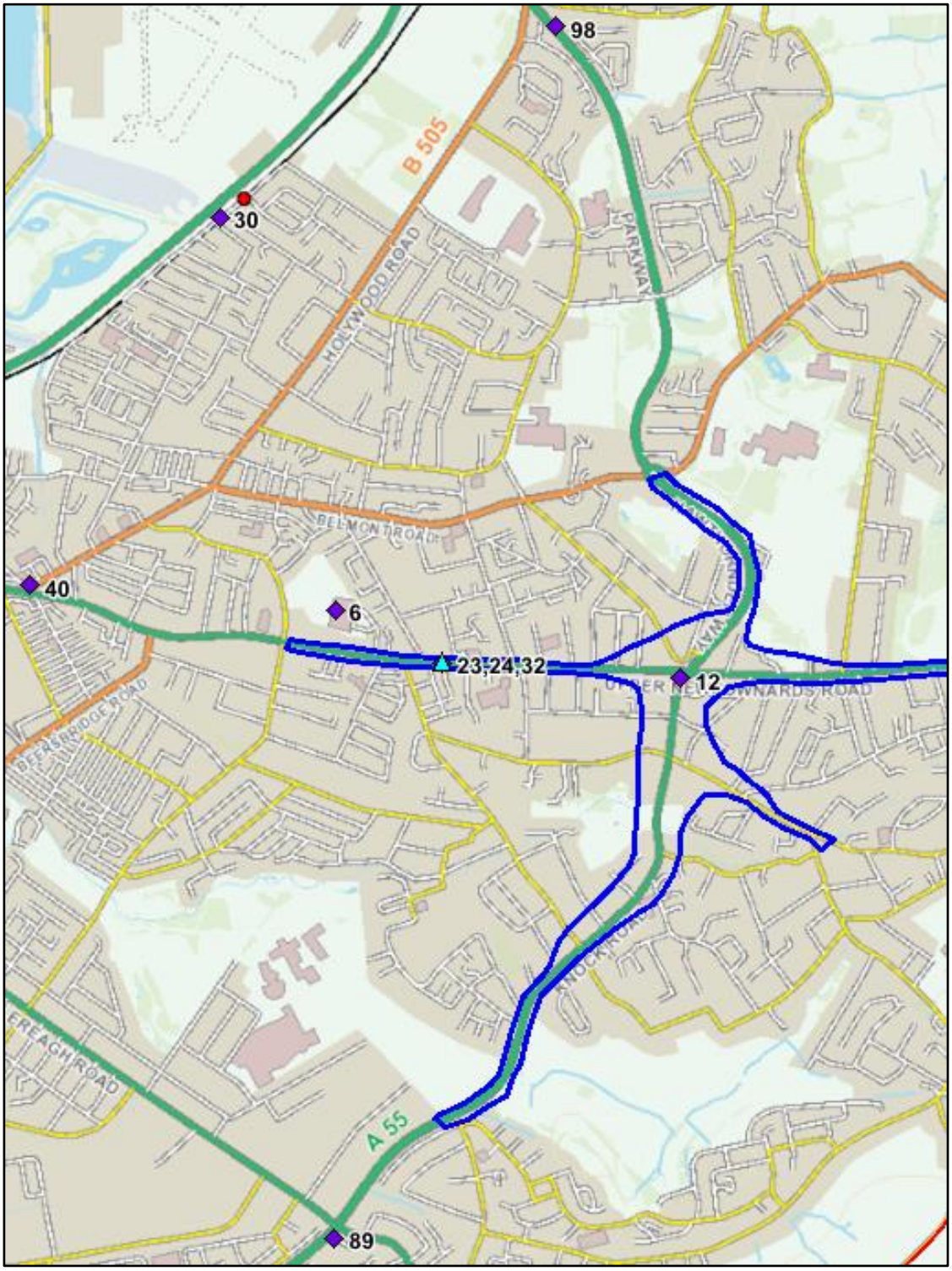

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Table 2.2 - Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
1	Royal Victoria Hospital	Urban Background	332522	373708	3.8	NO_2	N	N	>70	>80	N/A
2	Black's Road	Roadside	329782	369522	2.7	NO_2	Y	N	27	3	Y
3	61 Cromac Street	Roadside	334220	373853	3.0	NO_2	Y	N	10	3	Y
4	Ravenhill Road	Roadside	335014	373942	3.0	NO_2	Y	N	45	5	Y
5	Queen's Bridge	Roadside	334630	374385	3.0	NO_2	N	N	10	2	Y
6	North Road	Urban Background	337551	374151	3.0	NO_2	N	N	On School Wall	135	N/A
7	Donegall Square South	Roadside	333837	373950	3.0	NO_2	N	N	N	5.5	Y
9	Short Strand	Roadside	334980	374254	3.2	NO_2	N	N	21	1	Y
10	301 Ormeau Road	Roadside	334503	372176	3.0	NO_2	Y	N	1	6	Y
12	Knock Road	Roadside	338718	373918	2.5	NO_2	Y	N	17	1.5	Y
13	Great George's Street	Kerbside	333981	375102	3.0	NO_2	Y	N	25	0.5	Y
14	Lisburn Road	Roadside	332056	371364	2.7	NO_2	N	N	6.5	3	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
15	Shaftesbury Square	Kerbside	333594	373283	2.7	NO_2	N	N	N	1	Y
16,19,20	Lombard Street	Urban Background	333898	374358	3.5	NO_2	N	Y	N	26	Y
17	Albert Clock	Roadside	334212	374489	3.1	NO_2	N	N	3.5	2.5	Y
21,22,56	Stockman's Lane	Roadside	331007	371254	3.0	NO_2	Y	Y	12	3.5	Y
23,24,32	Upper Newtownards Road	Roadside	337911	373972	3.0	NO_2	Y	Y	36	2	Y
25	Whitewell Road	Roadside	333230	380877	2.7	NO_2	N	N	5	1	Y
26	Donegall Road	Kerbside	333022	373122	2.7	NO_2	N	N	2	1	Y
28	Falls Road and Andersonstown	Roadside	330707	372547	3.0	NO_2	N	N	15	2	Y
30	Station Road	Roadside	337160	375482	2.7	NO_2	N	N	20	2	Y
31	Malone Road	Roadside	332544	370283	3.0	NO_2	N	N	18	2	Y
33	Great Victoria Street	Roadside	333548	373772	3.2	NO_2	N	N	N	1.5	Y
34	College Square East	Roadside	333498	374241	3.0	NO_2	N	N	3	3	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
35	Chichester Street	Roadside	334147	374123	3.5	NO_2	N	N	3	2	Y
36	Cromac & Ormeau Avenue	Kerbside	334085	373542	2.5	NO_2	Y	N	3	1	Y
37	Glenmachan Street	Roadside	332063	372871	3.0	NO_2	Y	N	3	2	Y
38	Crèche on M1/Westlink	Roadside	333069	374055	3.0	NO_2	Y	N	7	1.5	Y
39	Ormeau Road (junction with Ravenhill Road)	Roadside	334943	371342	3.0	NO_2	Y	N	3	2	Y
40	Upper Newtownards Road & Holywood Road	Roadside	336519	374233	3.0	NO_2	N	N	40	3	Y
41	Crumlin Road	Roadside	333116	375292	3.5	NO_2	N	N	25	2	Y
42	228 Antrim Road	Roadside	333288	376143	2.7	NO_2	N	N	3	2	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
44	Shore Road (Ivan Street end)	Roadside	334174	376384	3.0	NO_2	N	N	2.5	3.5	Y
59	York Street	Roadside	334214	375638	2.7	NO_2	Y	N	5	2	Y
63	Queens Square	Roadside	334192	374441	2.7	NO_2	N	N	Building Façade	5	Y
65,66,67	Westlink AQMS	Roadside	332610	373434	2.6	NO_2	Y	Y	17	5	Y
68	Opposite Westlink AQMS	Roadside	332610	373474	2.5	NO_2	Y	N	70	2	Y
69	Peter's Hill	Kerbside	333281	374767	3.5 (above the canyon)	NO_2	Y	N	48	1	Y
70	Henry Place	Kerbside	333588	375224	3.5 (above the canyon)	NO_2	Y	N	23	1	Y
74	Ardmore Park	Roadside	329923	370300	2.7	NO_2	N	N	6	1.5	Y
76	Titanic Quarter	Roadside	335073	375049	2.7	NO_2	N	N	3	1.5	Y
77	Poleglass	Roadside	328214	370138	2.7	NO_2	N	N	15	1.5	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
82	Molyneux Street	Roadside	334028	375241	2.7	NO_2	Y	N	3	11	Y
83	North Queen Street	Roadside	333857	375412	2.7	NO_2	N	N	9.5	2	Y
84	Portland Place	Roadside	333856	375163	2.7	NO_2	Y	N	5.5	4	Y
85	Sailortown	Roadside	334469	375341	2.7	NO_2	N	N	12	11	Y
86	Little Georges Street	Roadside	333877	375260	2.5	NO_2	Y	N	4	2	N
87	RVH Falls Road	Roadside	331962	373560	2.7	NO_2	N	N	6.5	3	Y
88	Dunmurry Lane	Roadside	329305	368931	2.7	NO_2	N	N	3	2	Y
89	Upper Knockbreda Rd	Kerbside	337547	372019	2.5	NO_2	N	N	18	1	Y
90	Tates Avenue	Roadside	332221	372667	2.5	NO_2	N	N	11	2	Y
91	Stockman's Crescent	Roadside	330772	371532	2.5	NO_2	Y	N	4.5	2	N
92	Andersonstown Road	Roadside	329707	371200	2.5	NO_2	N	N	10	1.5	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
93	Diamond Gardens	Roadside	330313	370121	2.5	NO_2	N	N	3	2	Y
94	Orpen Road	Roadside	330355	369817	2.5	NO_2	N	N	6	2	Y
95	Balmoral Avenue	Roadside	331568	370818	2.7	NO_2	N	N	8	2	Y
96	Upper Lisburn Road	Roadside	331400	370729	2.7	NO_2	N	N	16	3	Y
97	Monagh Bypass	Roadside	329737	372743	2.7	NO_2	N	N	10	3	Y
98	Knocknagoney	Roadside	338297	376131	2.7	NO_2	N	N	5	2	Y
100	Henry Place 2	Roadside	333587	375250	2.5	NO_2	Y	N	3	27	N
101	Stockman's Lane Roundabout	Roadside	330900	371316	2.5	NO_2	Y	N	10	3.5	Y
102	North Queen Park	Roadside	333650	375180	2.5	NO_2	Y	N	7	25	N
103	Blythefield Park	Urban Background	332885	373323	2.5	NO_2	N	N	40	14	N

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide (NO_2)

Automatic Monitoring Data

Tables 2.3 and 2.4 summarise recent monitoring data from the council's nitrogen dioxide automatic analysers for 2021 and preceding years from 2017. In all cases, exceedances of the Air Quality Strategy Objectives are highlighted in bold. In addition, trends in annual mean monitoring data for nitrogen dioxide are summarised in Figure 2.3.

All automatic monitoring sites in Belfast measured NO_2 annual mean concentration below 40µg/m^3. Moreover, there were no NO_2 1-hour means above 200µg/m^3 recorded in Belfast during 2021.

The Belfast Ormeau Road site experienced extensive problems with air conditioning during 2012 and 2013, which prevented the monitoring equipment from working to full capacity. As this was a recurring problem, a decision was made towards the end of 2013 to upgrade the site infrastructure. Taking account of procurement requirements and liaison with NIE, this upgrade took a considerable length of time, to the point that data capture from this site was such that it was considered unreliable to report for 2013. In addition, we would express some reservations about the reliability of the 2012 monitoring data, as it does not appear to follow established trends. Following the site upgrade however, the annual mean concentration has remained reasonably constant at 27 µg/m^3 in 2014, 27 µg/m^3 in 2015, 28 µg/m^3 in 2016, 25 µg/m^3 in 2017, 26 µg/m^3 in 2018 and 24 µg/m^3 in 2019. Although the annual mean results for 2020 and 2021 at this location are markedly lower compared to previous years (17 µg/m^3 and 18 µg/m^3), they still appear to be representative, given that all sites have followed a similar trend, due to behavioural changes caused by the Covid-19 pandemic. The impact of the various Covid-19 lockdowns upon traffic emissions and consequent monitoring results is discussed in Appendix B.

On the basis of this data, which demonstrates nitrogen dioxide concentrations significantly below the annual mean air quality objective, the council had considered the case for

revoking the Ormeau Road Air Quality Management Area (AQMA) for exceedance of the nitrogen dioxide annual mean objective. The council has subsequently liaised with the Department of Agriculture, Environment and Rural Affairs (DAERA) regarding the potential for revocation, but it has been agreed that since nitrogen dioxide annual mean monitoring data from the Ormeau Road site contributes to the derivation of the Draft Programme for Government Framework 2016 – 2021 Indicator 37: Improve air quality, the AQMA will remain in place for the next few years. The council is planning to revisit the Ormeau Road AQMA revocation option next year, after a detailed review and assessment of 2022 data (post Covid-19).

Moreover, by early 2023 we anticipate to finalising a detailed assessment for the city, for fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2) pollutants. It is considered that this detailed atmospheric dispersion modelling, in addition to monitoring data, will provide appropriate evidence to help inform any decision to revoke our Air Quality Management Areas along the Ormeau Road and the Upper Newtownards Road.

From the data in Table 2.3, it can be seen that annual mean concentrations of nitrogen dioxide along the Upper Newtownards Road have remained in the range 21 – 31 µg/m^3 since 2017, meaning that the nitrogen dioxide annual mean objective is now being consistently achieved along the Upper Newtownards Road. As noted above, the 2020 and 2021 annual means show a drop to 20 and 21 µg/m^3 respectively, again due to significant reductions in traffic numbers, as a result of the Covid-19 pandemic restrictions.

The Knock Road non-automatic roadside diffusion tube, located at the junction of the Upper Newtownards Road, Hawthornden Way and the Knock Road (Upper Newtownards Road AQMA worst case location) has recorded exceedances of the annual mean objective in previous years up until 2016. The 2017 calendar year was the first year when the annual mean concentration at the Knock Road junction fell below the air quality objective (36 µg/m^3), which was still the case in 2021 (26 µg/m^3). The council will therefore consider the 2022 monitoring year data for this location, as we recover from the Covid-19 pandemic restrictions, and where such monitoring and the detailed assessment confirms that the annual mean objective for nitrogen dioxide is consistently being achieved, we will liaise with DAERA and Defra in relation to the revocation of this Upper Newtownards Road AQMA.

Moreover, it should be noted that the Belfast Rapid Transit Glider commenced operation along this route from September 2018. In order to facilitate operation of the Glider, a bus lane has been established on the Upper Newtownards Road, Albertbridge Road and East Bridge Street, which operates from 07.00 to 19.00, Monday to Saturday inclusive. Glider operations together with introduction of the bus lane are likely to have had a beneficial impact on traffic movements and pollution levels along the Upper Newtownards Road, Albertbridge Road and East Bridge Street.

Unfortunately, despite the completion of significant structural improvements to the M1 Motorway and A12 Westlink corridor, nitrogen dioxide concentrations at Stockman's Lane have remained high. However, 2020 was the first year when the annual mean (33 µg/m^3) fell below the objective level of 40 µg/m^3, again likely due to Covid-19 travel restrictions. Whilst reductions in nitrogen dioxide annual mean concentrations at the Stockman's Lane site had been following a relatively consistent declining trend over recent years (the 2019 nitrogen dioxide annual mean was 45 µg/m^3, which is a ~8% reduction from the 2018 annual mean of 49 µg/m^3), the Covid-19 pandemic has had an obvious impact on the 2020 and 2021 annual means. The 2021 annual mean (36 µg/m^3) is about 20% lower than the 2019 (pre-pandemic) levels. It is unclear at this stage how long-lasting the behavioural changes associated with the Covid pandemic that have led to this reduction will persist, but it is envisaged that changing working habits and working locations may act as a catalyst to assist in the continued reduction of annual mean nitrogen dioxide concentrations over the coming years.

The 2020 nitrogen dioxide annual mean concentration (24 µg/m^3) monitored at the Westlink Roden Street had also significantly decreased in comparison to the previous year's annual mean (34 µg/m^3). The 2021 nitrogen dioxide annual mean concentration (28 µg/m^3), although slightly higher than in 2020, is still noticeably lower than the 2019 level and comfortably below the annual mean objective of 40µg/m^3.

The nitrogen dioxide annual mean air quality objective has not been exceeded at the Westlink Roden Street since 2011. However, one roadside diffusion tube, located at Henry Place further along the Westlink corridor, recorded an exceedance of the annual mean objective in 2021 (45.7µg/m^3). Moreover, preliminary results from the council's Detailed Assessment also suggest a monitored (by small sensor air quality monitor) exceedance of the annual mean objective at this location. Therefore, the council will continue its

monitoring within the Westlink Corridor / M1 Air Quality Management Area to identify any continuing or further exceedances and nitrogen dioxide concentrations and trends.

Historically, modelled and monitored exceedances of the 1-hour mean objective for nitrogen dioxide were encountered only in the vicinity of the M1 Motorway / A12 Westlink corridor. As a result, this is the only Air Quality Management Area within Belfast that has been declared on the basis of exceedances of the 1-hour objective.

From ambient monitoring data for the Stockman's Lane and Westlink/Roden Street monitoring sites, as summarised in Table 2.4, it can be seen that the number of exceedances of the hourly objective has substantially decreased over recent years, both now demonstrating compliance with the 200 µg/m^3 objective, not to be exceeded more than 18 times per year - since 2013. In fact, there have been no recorded 1-hour mean concentrations greater than 200 µg/m^3 at either monitoring site since 2019. As there are residential properties located directly adjacent to the carriageway at Stockman's Lane and most of these properties have gardens facing onto the roadway, thereby providing for short-term relevant public exposure, we will continue to monitor at this location in order to identify any further exceedances of the 1-hour mean objective and establish trends.

Table 2.3 - Results of Automatic Monitoring for NO_2: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA ?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2021 % [b]	Annual Mean Concentration (µg/m^3)				
					2017* [c]	2018* [c]	2019* [c]	2020* [c]	2021 [c]
Belfast Centre	Urban Background	N	91%	91%	25	27	26[c]	19[c]	21
Belfast Ormeau Road	Roadside	Y (CM2)	99%	99%	25	26	24	17	18
Belfast Upper Newtownards Road	Roadside	Y (CM3)	99%	99%	31	29	27	20	21
Belfast Stockman's Lane	Roadside	Y (CM4)	99%	99%	**52**	**49**	**45**	33	36
Belfast Westlink Roden Street	Roadside	Y (CM5)	98%	98%	34	40	34	24	28

In bold, exceedance of the NO_2 annual mean AQS objective of 40µg/m^3

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

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

[c] Means should be "annualised" as in Boxes 7.9 and 7.10 of LAQM.TG16, if valid data capture is less than 75%

* Annual mean concentrations for previous years are optional

Figure 2.3 - Trends in Annual Mean NO_2 Concentrations Measured at Automatic Monitoring Sites

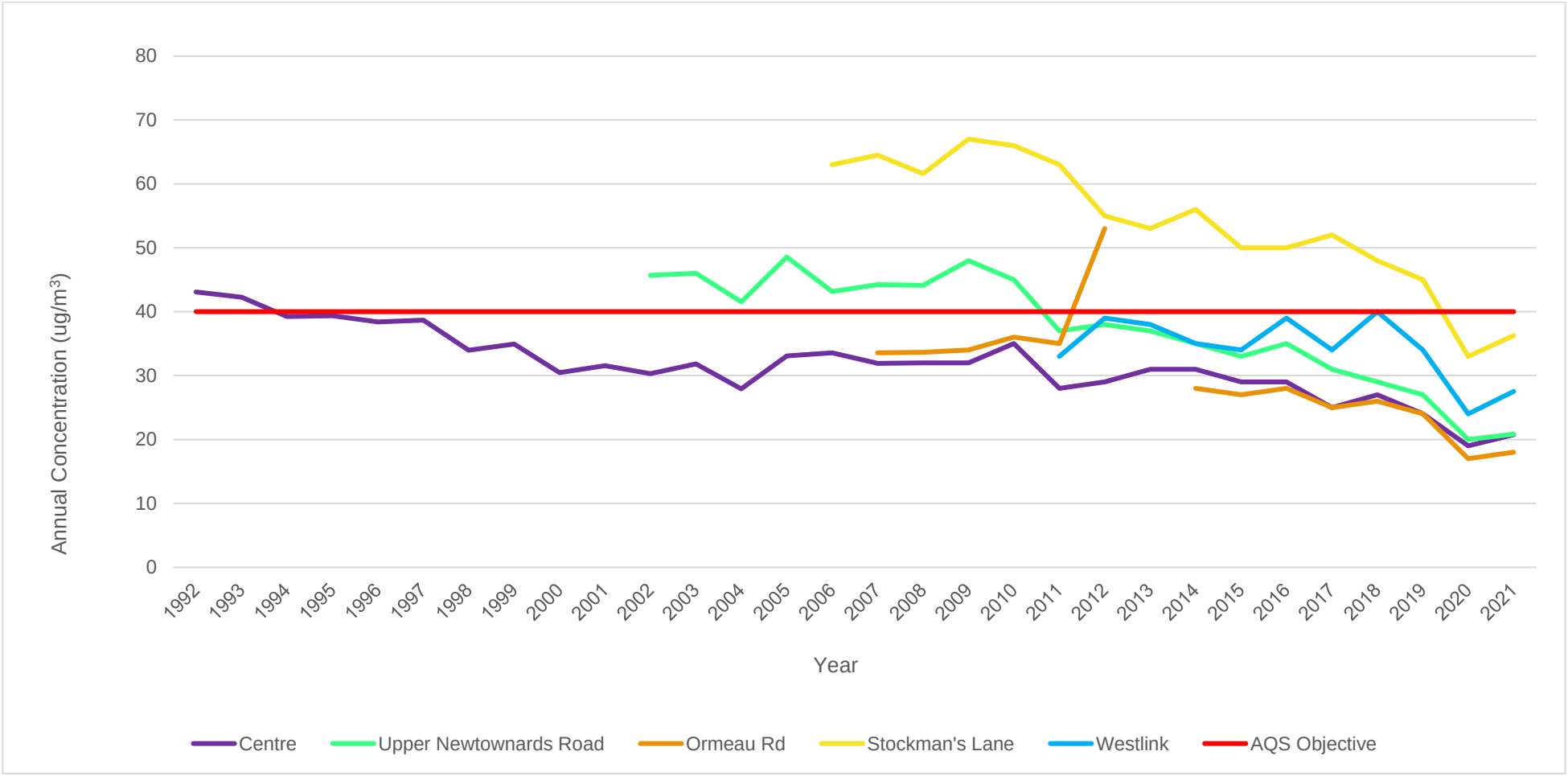


Table 2.4 - Results of Automatic Monitoring for NO_2: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2021 % [b]	Number of Hourly Means > 200µg/m^3				
					2017* [c]	2018* [c]	2019* [c]	2020* [c]	2021 [c]
Belfast Centre	Urban Background	N	91%	91%	1	0	0 (93)	0 (86)	0
Belfast Ormeau Road	Roadside	Y (CM2)	99%	99%	0	0	0 (86)	0	0
Belfast Upper Newtownards Road	Roadside	Y (CM3)	99%	99%	0	0	0	0	0
Belfast Stockman's Lane	Roadside	Y (CM4)	99%	99%	2	3	0	0	0
Belfast Westlink Roden Street	Roadside	Y (CM5)	98%	98%	0	0	0	0	0

In bold, exceedance of the NO_2 hourly mean AQS objective (200µg/m^3 – not to be exceeded more than 18 times per year)

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

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

[c] If the data capture for full calendar year is less than 85%, include the 99.8th percentile of hourly means in brackets

* Number of exceedances for previous years is optional

Diffusion Tube Monitoring Data

In order to obtain a better understanding of how levels of nitrogen dioxide are varying across the city over time and to investigate those locations where previous rounds of the review and assessment process have highlighted areas of concern, Belfast City Council has placed 71 diffusion tubes at 63 relevant locations across the city. Data from these tubes for 2021 has been summarised in Table 2.5 alongside historical data, where it is available in Table 2.6.

In terms of the outcome of the 2021 nitrogen dioxide diffusion tube monitoring, it is noted that concentrations at most locations are still significantly lower than 2019 pre-pandemic levels.

It should also be noted that the 2021 bias adjustment factor (0.79), although the same as in 2020, is lower than the 2019 factor (0.91). Moreover, Belfast City Council added an additional 4 sites to the Belfast diffusion tube monitoring network in 2021; 3 located within the M1/Westlink AQMA and 1 outside this AQMA. These locations are detailed in Figure 2.2 and Table 2.2.

Similar to 2020, only one annual mean exceedance occurred during 2021 at Henry Place (45.7 µg/m^3). This tube is located within the existing M1 Motorway / A12 Westlink Air Quality Management Area and has been the subject of mitigation measures for some time. Nevertheless, Defra NO_2 distance calculations have been provided for the above location to estimate concentrations at relevant receptor locations.

The Diffusion Tube Processing Tool has predicted an annual mean concentration of 29.9 µg/m^3, which indicates that no exceedance is likely at the relevant receptor location (Appendix A). Due to the potential for exceedances at relevant receptors on the opposite side of the A12 Westlink to this location, a new diffusion tube was installed in 2021 at North Queen Park. The 2021 annual mean nitrogen dioxide concentration of 28.3 µg/m^3 recorded at this location is well below UK Air Quality 40 µg/m^3 objective level.

Overall, in 2021 there were only two diffusion tube sites (Henry Place and Great George's Street) located at roadside locations with concentrations above 36 µg/m^3 (within 10% of the annual mean objective of 40 µg/m^3); the distance adjustment has been calculated using the Diffusion Tube Data Processing Tool (Appendix A).

Table 2.5 - Results of NO_2 Diffusion Tubes 2021

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2021 (Number of Months or %) [a]	2021 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.79 [b]
1	Royal Victoria Hospital	Urban Background	N	N	100.0%	18.1
2	Black's Road	Roadside	Y (Westlink)	N	100.0%	30.7
3	61 Cromac Street	Roadside	Y (Cromac Street & Albertbridge Rd)	N	90.1%	24.5
4	Ravenhill Road	Roadside	Y (Cromac Street & Albertbridge Rd)	N	100.0%	20.8
5	Queen's Bridge	Roadside	N	N	100.0%	23.1
6	North Road	Urban Background	N	N	92.3%	12.3
7	Donegall Square South	Roadside	N	N	100.0%	23.4
9	Short Strand	Roadside	N	N	100.0%	32.8
10	301 Ormeau Road	Roadside	Y (Ormeau Rd)	N	90.1%	23.5
12	Knock Road	Roadside	Y (Upper Newtownards Rd)	N	100.0%	26.0
13	Great George's Street	Kerbside	Y (Westlink)	N	100.0%	36.3
14	Lisburn Road	Roadside	N	N	100.0%	22.4
15	Shaftesbury Square	Kerbside	N	N	100.0%	26.4
16,19,20	Lombard Street	Urban Centre	N	Triplicate and Co-located	100.0%	21.1
17	Albert Clock	Roadside	N	N	100.0%	28.1
21,22,56	Stockman's Lane	Roadside	Y (Westlink)	Triplicate and Co-located	100.0%	33.4
23,24,32	Upper Newtownards Road	Roadside	Y (Upper Newtownards Rd)	Triplicate and Co-located	100.0%	19.8
25	Whitewell Road	Roadside	N	N	84.7%	19.0
26	Donegall Road	Kerbside	N	N	92.3%	24.8
28	Falls Road and Andersonstown	Roadside	N	N	100.0%	22.3

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2021 (Number of Months or %) [a]	2021 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.79 [b]
30	Station Road	Roadside	N	N	100.0%	17.2
31	Malone Road	Roadside	N	N	100.0%	26.3
33	Great Victoria Street	Roadside	N	N	100.0%	28.3
34	College Square East	Roadside	N	N	100.0%	27.5
35	Chichester Street	Roadside	N	N	100.0%	32.1
36	Cromac & Ormeau Avenue	Kerbside	Y (Ormeau Rd)	N	100.0%	23.4
37	Glenmachan Street	Roadside	Y (Westlink)	N	82.5%	30.2
38	Crèche on M1/Westlink	Roadside	Y (Westlink)	N	100.0%	22.8
39	Ormeau Road (junction with Ravenhill Road)	Roadside	Y (Ormeau Rd)	N	92.3%	26.7
40	Upper Newtownards Road & Holywood Road	Roadside	N	N	100.0%	20.2
41	Crumlin Road	Roadside	N	N	100.0%	23.2
42	228 Antrim Road	Roadside	N	N	100.0%	26.5
44	Shore Road (Ivan Street end)	Roadside	N	N	100.0%	23.9
59	York Street	Roadside	Y (Westlink)	N	100.0%	29.7
63	Queens Square	Kerbside	N	N	90.4%	34.3
65,66,67	Westlink AQMS	Roadside	Y (Westlink)	Triplicate and Co-located	100.0%	30.1
68	Opposite Westlink AQMS	Roadside	Y (Westlink)	N	100.0%	31.8
69	Peter's Hill	Kerbside	Y (Westlink)	N	100.0%	32.3
70	Henry Place	Kerbside	Y (Westlink)	N	90.4%	**45.7**
74	Ardmore Park	Roadside	N	N	63.0%	23.3
76	Titanic Quarter	Roadside	N	N	100.0%	17.2

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2021 (Number of Months or %) [a]	2021 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.79 [b]
77	Poleglass	Roadside	N	N	92.3%	18.1
82	Molyneux Street	Roadside	Y (Westlink)	N	100.0%	28.3
83	North Queen Street	Roadside	N	N	90.1%	28.8
84	Portland Place	Roadside	Y (Westlink)	N	100.0%	26.9
85	Sailortown	Roadside	N	N	100.0%	23.9
86	Little Georges Street	Roadside	Y (Westlink)	N	100.0%	27.3
87	RVH Falls Road	Roadside	N	N	82.2%	28.1
88	Dunmurry Lane	Roadside	N	N	100.0%	19.2
89	Upper Knockbreda Rd	Kerbside	N	N	100.0%	24.2
90	Tates Avenue	Roadside	N	N	92.3%	21.0
91	Stockman's Crescent	Roadside	Y (Westlink)	N	100.0%	19.5
92	Andersonstown Road	Roadside	N	N	100.0%	25.0
93	Diamond Gardens	Roadside	N	N	100.0%	18.8
94	Orpen Road	Roadside	N	N	100.0%	13.3
95	Balmoral Avenue	Roadside	N	N	92.3%	28.1
96	Upper Lisburn Road	Roadside	N	N	80.8%	20.3
97	Monagh Bypass	Roadside	N	N	90.1%	18.0
98	Knocknagoney	Roadside	N	N	100.0%	33.5
100	Henry Place 2	Roadside	Y	N	100.0%	26.9
101	Stockman's Lane Roundabout	Roadside	Y	N	77.3%	32.6
102	North Queen Park	Roadside	Y	N	84.7%	28.3
103	Blythefield Park	Urban Background	N	N	59.5%	20.2

In bold, exceedance of the NO_2 annual mean AQS objective of 40µg/m^3

Underlined, annual mean > 60µg/m^3, indicating a potential exceedance of the NO_2 hourly mean AQS objective

[a] Means should be "annualised" as in Boxes 7.9 and 7.10 of LAQM.TG16, if full calendar year data capture is less than 75%

[b] If an exceedance is measured at a monitoring site not representative of public exposure, NO_2 concentration at the nearest relevant exposure should be estimated based on the NO_2 fall-off with distance calculator, and results should be discussed in a specific section. The procedure is also explained in paragraphs 7.77 to 7.79 of LAQM.TG16.

Table 2.6 - Results of NO_2 Diffusion Tubes (2017 to 2021)

Site ID	Site Name	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
			2017 (Bias Adjustment Factor = **0.78**)	**2018** (Bias Adjustment Factor = **0.86**)	**2019** (Bias Adjustment Factor = **0.91**)	**2020** (Bias Adjustment Factor = **0.79**)	**2021** (Bias Adjustment Factor = **0.79**)
1	Royal Victoria Hospital	N	18	20	21	17.6	18.1
2	Black's Road	Y (Westlink)	36	36	**42**	33.3	30.7
3	61 Cromac Street	Y (Cromac Street & Albertbridge Rd)	31	30	36	22.4	24.5
4	Ravenhill Road	Y (Cromac Street & Albertbridge Rd)	26	27	28	20.5	20.8
5	Queen's Bridge	N	25	26	27	20.7	23.1
6	North Road	N	14	12	14	10.8	12.3
7	Donegall Square South	N	29	31	32	22.8	23.4
9	Short Strand	N	39	40	40	30.5	32.8
10	301 Ormeau Road	Y (Ormeau Rd)	27	28	30	21.6	23.5
12	Knock Road	Y (Upper Newtownards Rd)	36	35	35	24.8	26.0
13	Great George's Street	Y (Westlink)	36	**44**	**45**	32.8	36.3
14	Lisburn Road	N	26	26	27	23.5	22.4
15	Shaftesbury Square	N	31	32	31	25.1	26.4
16,19,20	Lombard Street	N	25	25	26	19.5	21.1
17	Albert Clock	N	33	39	40	26.5	28.1
21,22,56	Stockman's Lane	Y (Westlink)	**50**	**48**	**45**	29.9	33.4
23,24,32	Upper Newtownards Road	Y (Upper Newtownards Rd)	31	24	27	18.9	19.8
25	Whitewell Road	N	20	23	25	16.1	19.0
26	Donegall Road	N	28	31	31	21.9	24.8
28	Falls Road and Andersonstown	N	25	27	27	19.3	22.3
30	Station Road	N	23	26	22	16.6	17.2
31	Malone Road	N	35	33	31	22.8	26.3

Site ID	Site Name	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
			2017 (Bias Adjustment Factor = **0.78**)	**2018** (Bias Adjustment Factor = **0.86**)	**2019** (Bias Adjustment Factor = **0.91**)	**2020** (Bias Adjustment Factor = **0.79**)	**2021** (Bias Adjustment Factor = **0.79**)
33	Great Victoria Street	N	34	35	36	24.9	28.3
34	College Square East	N	31	33	33	22.1	27.5
35	Chichester Street	N	36	**41**	40	27.8	32.1
36	Cromac & Ormeau Avenue	Y (Ormeau Rd)	30	32	31	21.4	23.4
37	Glenmachan Street	Y (Westlink)	28	36	38	27.9	30.2
38	Crèche on M1/Westlink	Y (Westlink)	24	27	28	20.8	22.8
39	Ormeau Road (junction with Ravenhill Road)	Y (Ormeau Rd)	29	31	36	26.0	26.7
40	Upper Newtownards Road & Holywood Road	N	25	26	27	18.9	20.2
41	Crumlin Road	N	26	28	27	20.6	23.2
42	228 Antrim Road	N	29	33	31	25.1	26.5
44	Shore Road (Ivan Street end)	N	28	28	30	21.3	23.9
59	York Street	Y (Westlink)	32	38	36	26.8	29.7
63	Queens Square	N	32	35	34	25.3	34.3
65,66,67	Westlink AQMS	Y (Westlink)	N/A	N/A	34	27.8	30.1
68	Opposite Westlink AQMS	Y (Westlink)	N/A	N/A	**45**	33.6	31.8
69	Peter's Hill	Y (Westlink)	N/A	N/A	40	30.6	32.3
70	Henry Place	Y (Westlink)	N/A	N/A	**53**	**41.1**	**45.7**
74	Ardmore Park	N	31	32	30	24.3	23.3
76	Titanic Quarter	N	21	24	22	18.1	17.2
77	Poleglass	N	24	26	24	18.3	18.1
82	Molyneux Street	Y (Westlink)	N/A	N/A	36	26.7	28.3
83	North Queen Street	N	N/A	N/A	33	26.5	28.8
84	Portland Place	Y (Westlink)	N/A	N/A	30	25.5	26.9
85	Sailortown	N	N/A	N/A	28	22.9	23.9
86	Little Georges Street	Y (Westlink)	N/A	N/A	33	26.4	27.3

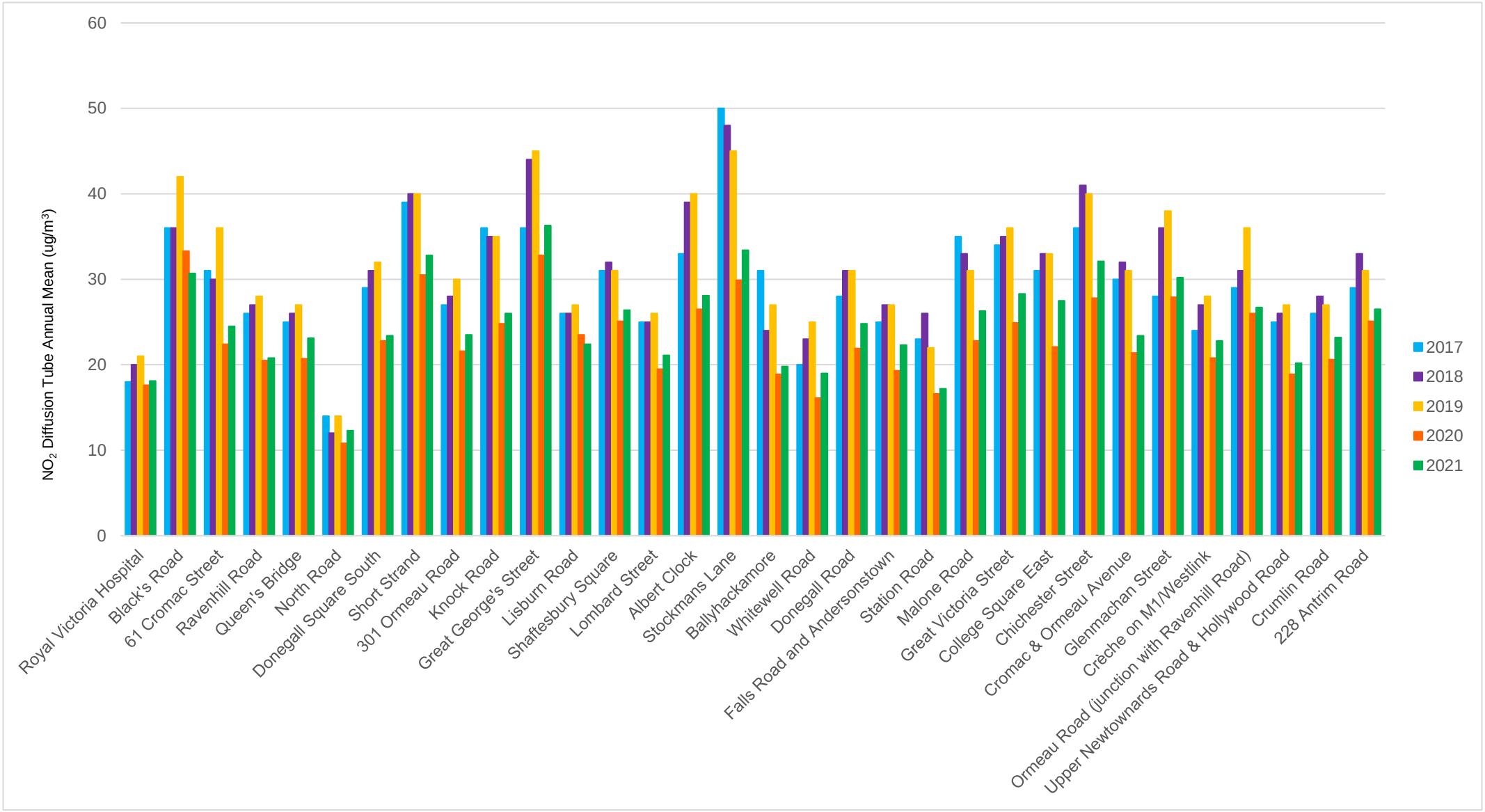
Site ID	Site Name	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
			2017 (Bias Adjustment Factor = **0.78**)	**2018** (Bias Adjustment Factor = **0.86**)	**2019** (Bias Adjustment Factor = **0.91**)	**2020** (Bias Adjustment Factor = **0.79**)	**2021** (Bias Adjustment Factor = **0.79**)
87	RVH Falls Road	N	33	35	33	24.1	28.1
88	Dunmurry Lane	N	23	25	26	17.7	19.2
89	Upper Knockbreda Rd	N	35	33	34	23.0	24.2
90	Tates Avenue	N	N/A	N/A	27	20.5	21.0
91	Stockman's Crescent	Y (Westlink)	N/A	N/A	24	17.7	19.5
92	Andersonstown Road	N	N/A	N/A	N/A	22.5	25.0
93	Diamond Gardens	N	N/A	N/A	24	17.8	18.8
94	Orpen Road	N	N/A	N/A	18	13.3	13.3
95	Balmoral Avenue	N	N/A	N/A	39	25.5	28.1
96	Upper Lisburn Road	N	N/A	N/A	N/A	20.1	20.3
97	Monagh Bypass	N	N/A	N/A	N/A	16.4	18.0
98	Knocknagoney	N	N/A	N/A	N/A	31.4	33.5
100	Henry Place 2	Y	N/A	N/A	N/A	N/A	26.9
101	Stockman's Lane Roundabout	Y	N/A	N/A	N/A	N/A	32.6
102	North Queen Park	Y	N/A	N/A	N/A	N/A	28.3
103	Blythefield Park	N	N/A	N/A	N/A	N/A	20.2

In bold, exceedance of the NO_2 annual mean AQS objective of 40µg/m^3

Underlined, annual mean > 60µg/m^3, indicating a potential exceedance of the NO_2 hourly mean AQS objective

[a] Means should be "annualised" as in Boxes 7.9 and 7.10 of LAQM.TG16, if full calendar year data capture is less than 75%

Figure 2.4 - Trends in Annual Mean NO_2 Concentrations Measured at Diffusion Tube Monitoring Sites



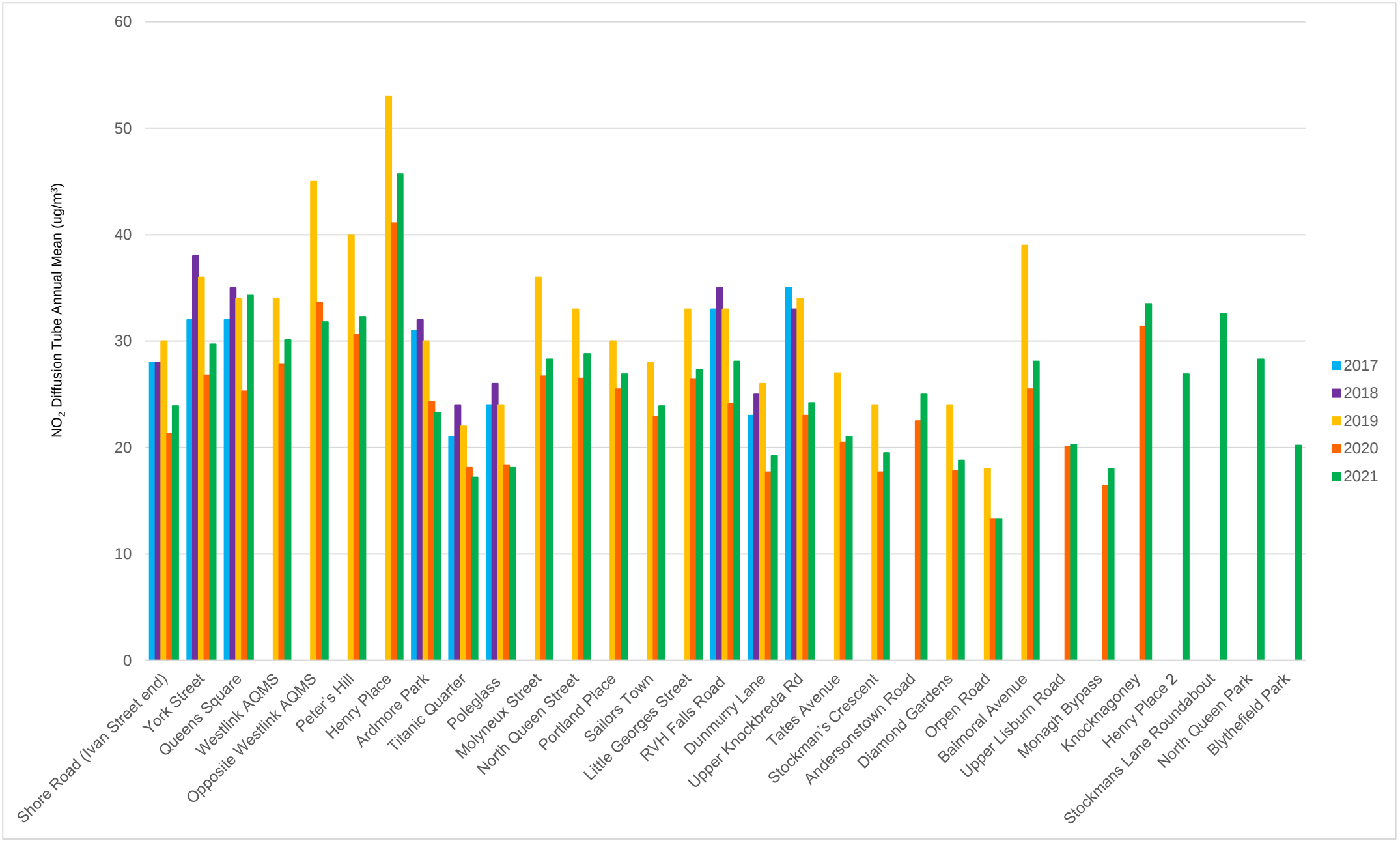
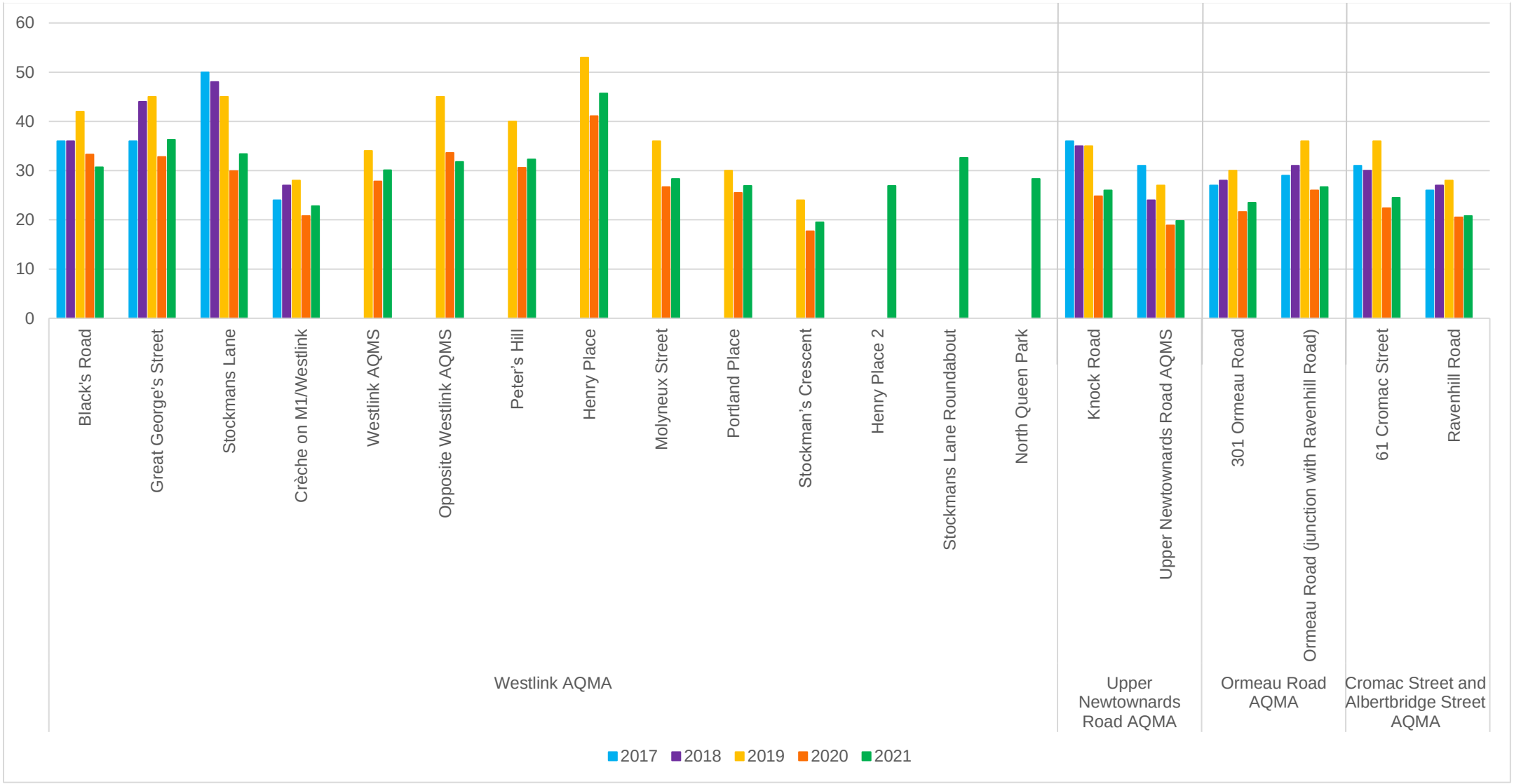

60
50
40
30
20
10
0
NO2 Diffusion Tube Annual Mean (ug/m3)
2017
2018
2019
2020
2021
Shore Road (Ivan Street end)
York Street
Queens Square
Westlink AQMS
Opposite Westlink AQMS
Peter's Hill
Henry Place
Ardmore Park
Titanic Quarter
Poleglass
Molyneux Street
North Queen Street
Portland Place
Sailors Town
Little Georges Street
RVH Falls Road
Dunmurry Lane
Upper Knockbreda Rd
Tates Avenue
Stockman's Crescent
Andersonstown Road
Diamond Gardens
Orpen Road
Balmoral Avenue
Upper Lisburn Road
Monagh Bypass
Knocknagoney
Henry Place 2
Stockmans Lane Roundabout
North Queen Park
Blythefield Park

Figure 2.5 – Trends in Annual Mean NO_2 Concentrations Measured at Diffusion Tube Monitoring Sites by AQMA



2.2.2 Particulate Matter (PM_{10})

As a result of a historic reliance upon solid fuel for domestic heating, Belfast used to experience frequent exceedances of the 24-hour and annual mean objectives for particulate matter (PM_{10}) across the city. However, with completion of the city's smoke control programme and the widespread availability of natural gas to all sectors, emissions of particulate matter have decreased significantly since around 2000. As a result, the council was able to decommission its Belfast Clara Street particulate matter monitoring site in east Belfast in 2007.

However, as domestic and industrial emissions were addressed, so emissions of particulate matter from road transport along the M1 Motorway and A12 Westlink corridor gained in prominence. Upon completion of the council's first review and assessment of air quality in 2004, it was concluded that the M1 Motorway and A12 Westlink corridor should be declared as an Air Quality Management Area on the basis of modelled and monitored exceedances of the 24-hour and annual mean objectives for particulate matter.

As embodied in the subsequent 2006 Air Quality Action Plan for Belfast, a range of structural improvements, designed to relieve traffic congestion, were completed for the M1 Motorway and A12 Westlink. As a result, monitored levels of particulate matter began to decline within this Air Quality Management Area. Monitoring data for this site is summarised and reviewed in the following Tables 2.7, 2.8 and in Figure 2.6.

In terms of exceedances of the 40 $\mu g/m^3$ particulate matter annual mean objective, there have been no exceedances of the annual mean objective within this AQMA since 2008. Monitoring data from the Belfast Westlink site at Roden Street, which was established in 2010 and is located within the M1 Motorway / A12 Westlink Air Quality Management Area, indicated no exceedances of particulate matter objectives up until 2014 whereupon PM_{10} monitoring was discontinued at this site. Particulate matter monitoring continues however at the Stockman's Lane site.

Reflecting upon the particulate matter 24-hour mean objective data, as summarised in Table 2.8, the data has remained comfortably below the objective at all sites during recent years.

On the basis of historical monitoring data, which demonstrated sustained improvements in particulate matter, the council revoked the M1 Motorway / A12 Westlink Air Quality Management Area for exceedances of the particulate matter annual and 24-hour mean objectives in September 2015.

2021 results, with an annual mean of 19 µg/m^3 recorded at the Stockman's Lane site are similar to 2019 results (18 µg/m^3), even with Covid-19 restrictions. It is considered however that data for more monitoring locations across the city would be needed to accurately investigate the impact of the Covid-19 lockdowns on particulate matter concentrations; the consistency in annual means recorded at the Stockman's Lane could be due to increased levels of 'working from home' during the pandemic, which may have resulted in increased domestic combustion processes, replacing commercial combustion particulate matter emissions, which are likely to have been reduced due to Covid-19 restrictions. Nevertheless Figure 2.6 shows that the 2021 levels of PM_{10} are similar to previous several years.

Moreover, Belfast City Council and DAERA have decided to undertake a Detailed Assessment for the city, for $PM_{2.5}$ and NO_2 pollutants. This project commenced in February 2021 and will report by early 2023. Indicative results from the Detailed Assessment in relation to PM_{10} suggest compliance with all AQS Objectives. Ratified results will be reported as part of our 2023 Progress Report.

Table 2.7 - Results of Automatic Monitoring for PM_{10}: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2021 % [b]	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration (µg/m^3)				
						2017* [c]	2018* [c]	2019* [c]	2020* [c]	2021 [c]
CM1 Belfast Centre Lombard Street	Urban Background	N	99%	99%	Y	12	16	15	12	13
CM4 Belfast Stockman's Lane	Roadside	Y (Westlink)	97%	97%	Y	21	15	18	17	19

In bold, exceedance of the PM_{10} annual mean AQS objective of 40µg/m^3

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

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

[c] Means should be "annualised" as in Boxes 7.9 and 7.10 of LAQM.TG16, if valid data capture is less than 75%

* Annual mean concentrations for previous years are optional

Figure 2.6 - Trends in Annual Mean PM_{10} Concentrations

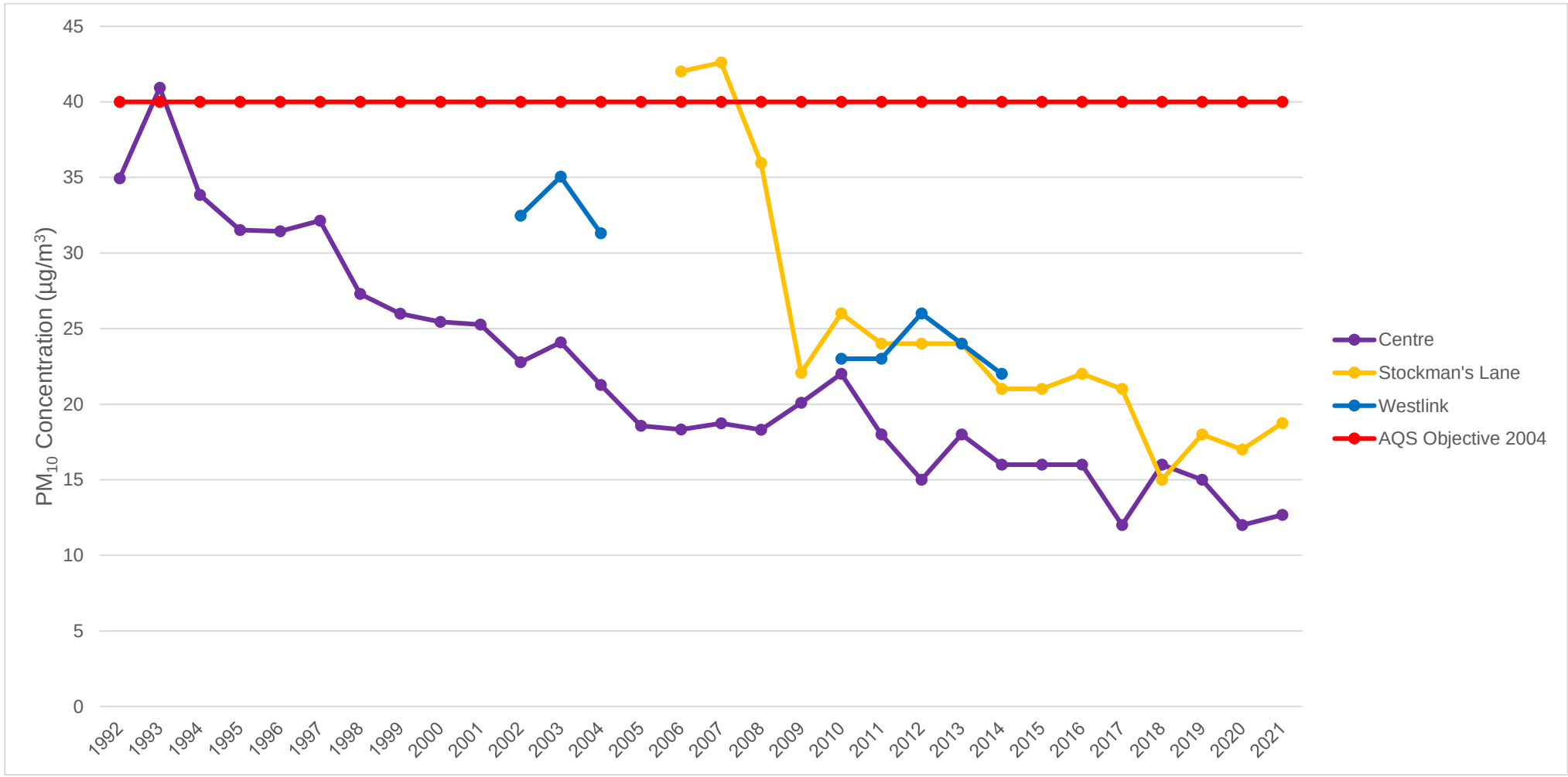


Table 2.8 - Results of Automatic Monitoring for PM_{10}: Comparison with 24-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2021 % [b]	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m^3				
						2017* [c]	2018* [c]	2019* [c]	2020* [c]	2021 [c]
CM1 Belfast Centre Lombard Street	Urban Background	N	99%	99%	Y	1(22)	0	2	1	0
CM4 Belfast Stockman's Lane	Roadside	Y (Westlink)	97%	97%	Y	2	0	4	1	1

In bold, exceedance of the PM_{10} daily mean AQS objective (50µg/m^3 – not to be exceeded more than 35 times per year)

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

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

[c] if data capture for full calendar year is less than 85%, include the 90.4th percentile of 24-hour means in brackets

* Number of exceedances for previous years is optional

2.2.3 Sulphur Dioxide (SO_2)

As a result of a historic reliance upon solid fuel for domestic heating, Belfast City used to experience frequent and widespread exceedances of the 15-minute, 1-hour and 24-hour mean objectives for sulphur dioxide. However, with completion of the city's smoke control programme and the widespread availability of natural gas to all sectors, levels of sulphur dioxide have decreased dramatically since 2000. There have been no exceedances of any sulphur dioxide objective in the city since 2002. Sustained low levels of sulphur dioxide have meant that the council has been able to terminate ambient monitoring at all locations with the exception of the Belfast Centre AURN site at Lombard Street. No Air Quality Management Areas have been declared for sulphur dioxide across Belfast.

Recent sulphur dioxide monitoring data from the Belfast Centre site is summarised in Table 2.9. As indicated, no exceedance of any objective was observed during 2021.

Table 2.9 - Results of Automatic Monitoring for SO_2: Comparison with Objectives

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2021 % [b]	Number of: [c]		
					15-minute Means > 266µg/m^3	1-hour Means > 350µg/m^3	24-hour Means > 125µg/m^3
Belfast Centre Lombard Street	Urban Background	N	93	93	0	0	0

In bold, exceedance of the relevant AQS objective (15-min mean = 35 allowed/year; 1-hour mean = 24 allowed/year; 24-hour mean = 3 allowed/year)

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

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

[c] if data capture for full calendar year is less than 85%, include the relevant percentile in bracket (in µg/m^3): 15-min mean = 99.9th ; 1-hour mean = 99.7th ; 24-hour mean = 99.2th percentile

2.2.4 Benzene

Benzene concentrations have been monitored at the Belfast Centre and Belfast Roadside sites since 2002. The Belfast Centre site monitors benzene exposure for the City Centre whilst the Belfast Roadside site monitored benzene concentrations on the Upper Newtownards Road. Whilst monitoring concluded at the Belfast Upper Newtownards Road site in October 2007, no exceedances of the 2010 Air Quality Strategy objective (3.25 µg/m^3 running annual mean) or the 2010 EU Limit Value (5 µg/m^3 annual mean) for benzene have been recorded in Belfast since 2002.

Previous rounds of R&A and monitoring results going back to 2017, provided in Table 2.10 below, confirm that there have been no exceedances of the running annual mean of 3.25 µg/m$^-$ for benzene within Belfast.

Table 2.10 - Results of Monitoring for benzene: Annual Mean Concentrations for the Belfast Centre Site 2017 – 2021.

Site ID	Site type	Within AQMA? Which AQMA?	Valid Data Capture 2021%	Running annual mean concentrations (µg/m^3)				
				2017	2018	2019	2020	2021
Belfast Centre	Urban Background	N	100	0.46	0.45	0.44	0.37	0.39

2.2.5 Other Pollutants Monitored

Fine particulate matter ($PM_{2.5}$)

Fine particulate matter ($PM_{2.5}$) concentrations have been monitored at the Belfast Centre AURN site since 2008. Although it is not a statutory requirement for NI local authorities to report on $PM_{2.5}$ levels, as this pollutant is not covered by the LAQM regulations, Belfast City Council has included $PM_{2.5}$ results for 2021 in this progress report - Table 2.11 and Figure 2.7 below.

The annual mean for this pollutant in 2021 was 7µg/m^3, which is below the UK air quality annual mean target of 25 µg/m^3 to be achieved by 2020. Moreover, $PM_{2.5}$ concentrations

recorded at the Belfast Centre site are also below the EU (stage 2) limit value of 20µg/m^3 also to be achieved by 2020.

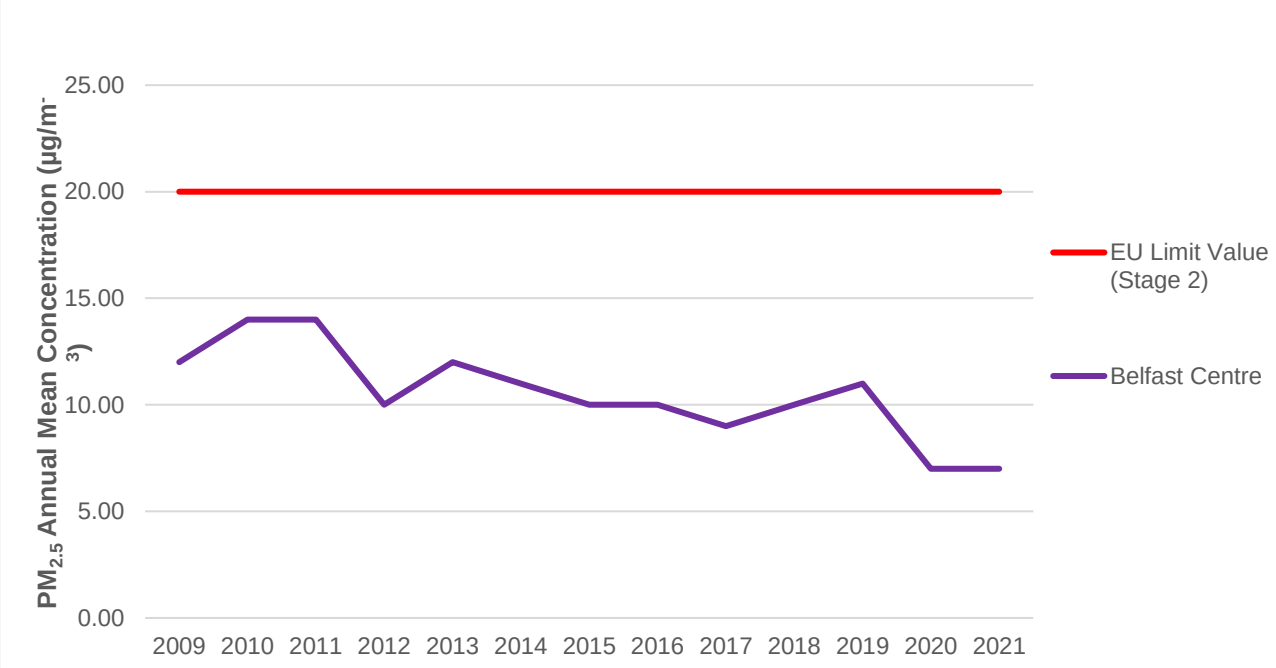
Although Belfast does not experience monitored exceedances of any air quality strategy objectives, or European Commission limit values, for particulate matter, we are aware of growing concerns around the effects of $PM_{2.5}$ on human health. Therefore, although not included in Regulations at present for Northern Ireland councils, Belfast City Council has proactively opted to monitor and assess ambient $PM_{2.5}$ concentrations within Belfast.

Moreover, Belfast City Council and DAERA have decided to undertake a Detailed Assessment for the city, for $PM_{2.5}$ and NO_2 pollutants. This project commenced in February 2021 and will report by early 2023. Indicative results from the Detailed Assessment in relation to $PM_{2.5}$ suggest compliance with all AQS Objectives. Ratified results will be reported as part of our 2023 Progress Report.

Table 2.11 - Results of Monitoring $PM_{2.5}$: Annual Mean Levels for the Belfast Centre Lombard Street 2017-2021.

Site ID	Site type	Within AQMA? Which AQMA?	Valid Data Capture 2020%	Annual mean concentrations (µg/m^3)				
				2017	2018	2019	2020	2021
Belfast Centre	Urban Background	N	100	9.0	10.0	11.0	7.0	7.0

Figure 2.7 - Results of Monitoring $PM_{2.5}$: Annual Mean Levels for the Belfast Centre



2.2.6 Summary of Compliance with AQS Objectives

Belfast City Council has examined the results from monitoring within its district. Concentrations of ambient pollutants, as prescribed in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, outside of existing Air Quality Management Areas, are all below the objectives at relevant receptor locations. It is therefore the council's view that there is no need to proceed to a Detailed Assessment at this time. However, the council will continue to monitor ambient conditions across the city in order to confirm that recent improvements in air quality are sustained and that those locations where poorer air quality persists are addressed.

2.2.7 WHO Global Air Quality Guidelines 2021: Particulate Matter ($PM_{2.5}$ and PM_{10}), Ozone, Nitrogen Dioxide, Sulphur Dioxide and Carbon Monoxide

During development of the council's new Air Quality Action Plan 2021-2026, the People and Communities Committee requested that council air quality officers consider monitored ambient air pollution concentrations across the city in terms of the 2021 World Health Organisation (WHO) global air quality guidelines in subsequent air quality reports. We have therefore added this section to the 2022 Progress Report that considers 2021 air quality monitoring data against the above-mentioned WHO guideline values.

In publishing these 2021 updated guideline values, WHO have advised that the overall objective of the guidelines is to offer quantitative health-based recommendations for air

quality management, expressed as long- or short-term concentrations for a number of key air pollutants. WHO have added that whilst the guidelines are not legally binding, they provide WHO Members States with an evidence-based tool to be used to help inform development of air quality legislation and policy.

WHO have therefore recommended the following 2021 air quality guideline values and interim targets:

Pollutant	Averaging time	Interim Targets				AQG level
		1	2	3	4	
$PM_{2.5}$ $\mu g/m^3$	Annual	35	25	15	10	5
	24 hour	75	50	37.5	25	15
PM_{10} $\mu g/m^3$	Annual	70	50	30	20	15
	24 hour	150	100	75	50	45
O_3 $\mu g/m^3$	Peak season	100	70	-	-	60
	8 hour	160	120	-	-	100
NO_2 $\mu g/m^3$	Annual	40	30	20	-	10
	24 hour	120	50	-	-	25
SO_2 $\mu g/m^3$	24 hour	125	50	-	-	40
CO mg/m^3	24 hour	7	-	-	-	4

It should be noted that 24-hour mean guideline values are to be assessed as the 99th percentile of 24 hour means, i.e. there is an allowance for 3-4 exceedance days per year within these guideline values before the guideline value is considered to be breached.

Moreover, the ozone (0_3) peak season guideline value is to be assessed as the average of daily maximum 8-hour mean of 0_3 concentrations in the six consecutive months with the

highest six-month running-average 0_3 concentration. Ozone is not however, in regulations at present for local authority air quality management.

It should be additionally noted that some of the values and averaging periods of the 2021 WHO guideline values are not comparable to the averaging periods that have been established for the various air quality objectives detailed in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, the Air Quality Regulations (Northern Ireland) 2003 and table 1.1 of this Progress Report. Accordingly, annual statistical data and exceedances of objectives are not currently calculated or reported by DAERA or Defra for the $PM_{2.5}$ 24-hour mean guideline value, the ozone peak season guideline value, the NO_2 24-hour mean guideline value, or the CO 24-hour mean guideline value.

WHO have added that it is important to note that the air quality guidelines recommended in previous WHO air quality reports for those pollutants and those averaging times not covered in the 2021 update report remain valid, i.e. nitrogen dioxide (1 hour) 200 $\mu g/m^3$; sulphur dioxide (10 minute) 500 $\mu g/m^3$ and carbon monoxide (8 hour) 10 mg/m^3, (1 hour) 35 mg/m^3 and (15 minute) 100 mg/m^3. However, as highlighted previously, it is again important to note that some of the values and averaging periods of previous WHO guideline values are not comparable to the averaging periods that have been established for the air quality objectives detailed in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, the Air Quality Regulations (Northern Ireland) 2003 and table 1.1 of this Progress Report, i.e. there is no (10 minute) 500 $\mu g/m^3$ objective for sulphur dioxide (SO_2) and no (1 hour) 35 mg/m^3 and (15 minute) 100 mg/m^3 objectives for carbon monoxide (CO). Accordingly, annual statistical data and exceedances of objectives are not currently calculated or reported in these formats by DAERA or Defra.

2021 Belfast monitoring data, obtained from the DAERA Northern Ireland Air, Air Quality in Northern Ireland website (https://www.airqualityni.co.uk/), has therefore been compared to the 2021 WHO Air Quality Guideline values as follows, where current monitoring, data averaging periods and statistical reporting allows.

Fine particulate matter ($PM_{2.5}$)

As reported in table 2.11, the 2021 annual mean concentration for $PM_{2.5}$ monitored at the Belfast Centre site, located at Lombard Street in Belfast City Centre was 7$\mu g/m^3$; 2 $\mu g/m^3$ above the WHO annual mean air quality guideline of 5 $\mu g/m^3$. There is no current 24 hour

mean objective for $PM_{2.5}$ but calculated from raw 2021 monitoring data, the 24 hour mean, assessed as the 99th percentile of 2021 24-hour means at Lombard Street was 23 μg/m3; 8 μg/m3 above the WHO air quality guideline value of 15 μg/m3.

Particulate matter (PM_{10})

As reported in table 2.7, the 2021 annual mean concentration for PM_{10} monitored at the Belfast Centre site, located at Lombard Street in Belfast City Centre was 13 μg/m3; 2 μg/m3 below the WHO annual mean air quality guideline of 15 μg/m3 and 19 μg/m3 at the Stockman's Lane roadside monitoring site; 4 μg/m3 above the WHO annual mean air quality guideline value of 15 μg/m3.

The 2021 24-hour mean, assessed as the 99th percentile at Lombard Street was 30 μg/m3; 15 μg/m3 below the WHO air quality guideline value of 45 μg/m3. The 2021 24 hour mean, assessed as the 99th percentile at the Stockman's Lane site was 40 μg/m3; 5μg/m3 below the WHO air quality guideline value of 45 μg/m3.

Nitrogen dioxide (NO_2)

The WHO has established an annual mean air quality objective for nitrogen dioxide of 10 μg/m3. By way of comparison, the UK Air Quality Strategy annual mean objective for nitrogen dioxide is 40 μg/m3. This is the basis on which our AQMAs have been declared and our Action Plans have been subsequently developed. Referring to automatic and diffusion tube annual mean monitoring data for 2021, as reported in tables 2.3 and 2.5, it is noted that the WHO annual mean air quality guideline value of 10 μg/m3 was exceeded at all monitoring locations across Belfast during 2021, with the lowest annual mean concentration of 13 μg/m3 monitored at the North Road background site and the highest annual mean of 45.7 μg/m3 monitored at Henry Place, along the canyonised section of the A12 Westlink.

There is no current 24-hour mean objective for nitrogen dioxide but calculated from raw 2021 monitoring data, the 24-hour mean, assessed as the 99th percentile of 2021 24-hour means at Lombard Street was 58 μg/m3; 33 μg/m3 above the WHO air quality guideline value of 25 μg/m3. The 24-hour mean, assessed as the 99th percentile of 2021 24-hour means for the Newtownards Road site was 50 μg/m3; 25 μg/m3 above the WHO air quality guideline value of 25 μg/m3; 45 μg/m3 for the Ormeau Road site; 20 μg/m3 above the WHO

air quality guideline value; 67 μg/m^3 for the Stockman's Lane site; 42 μg/m^3 above the WHO air quality guideline value; and 64 μg/m^3 for the Westlink site; 39 μg/m^3 above the WHO air quality guideline value.

The WHO 1-hour mean guideline value of 200 μg/m^3 is similar to the 200 μg/m^3 1-hour mean objective, assessed as the 99.8th percentile of hour means contained within the UK Air Quality Strategy. During 2021, maximum monitored hourly means at the Belfast monitoring sites were as follows: - Stockman's Lane (143 μg/m^3), Westlink (120 μg/m^3), Ormeau Road (105 μg/m^3), Lombard Street (109 μg/m^3), and the Upper Newtownards Road (123 μg/m^3). Accordingly, the WHO 1-hour mean guideline value of 200 μg/m^3 was not breached at any Belfast monitoring site during 2021.

Sulphur dioxide (SO_2).

The UK Air Quality Strategy includes a 24-hour mean objective of 125 μg/m^3 assessed as the 99.2nd percentile of annual 24 hour means; thereby providing for three 24-hour exceedances per annum before the objective is breached. It is noted that the WHO has introduced a 24-hour mean guideline value of 40 μg/m^3, assessed as the 99th percentile of annual 24 hour means; thereby providing for 3-4 24-hour exceedances per annum before the objective is breached. Referring to annual sulphur dioxide monitoring data for 2021 for the Belfast Centre site at Lombard Street, it is noted that the maximum daily mean was 3 μg/m^3. On this basis, the 40 μg/m^3 WHO guideline value, assessed as the 99th percentile of 24-hour means was not breached at the Belfast Centre monitoring site during 2021.

The WHO have introduced a 10-minute mean guideline value of 500 μgm^{-3} for sulphur dioxide. The closest objective within the UK air Quality Strategy is the 15-minute mean objective, assessed as the 99.9th percentile of annual 15 mean concentrations. Referring to 2021 daily maximum 15-minute mean sulphur dioxide monitoring data for the Belfast Centre site at Lombard Street, it is noted that the highest daily maximum 15-minute mean sulphur dioxide concentration in 2021 was 14 μg/m^3; substantially below the WHO 10-minute mean guideline value of 500 μg/m^3.

Carbon monoxide (CO).

There is no 24-hour mean objective for carbon monoxide within the UK Air Quality Strategy. However, calculated from raw 2021 monitoring data, the 24 hour mean,

assessed as the 99th percentile of 24 hour means at the Belfast Centre Lombard Street site was 0.3 mg/m^3; 3.7 mg/m^3 below the WHO air quality guideline value of 4 mg/m^3.

The UK Air Strategy does contain a maximum daily running 8-hour mean objective of 10mg/m^3 whereas the WHO has introduced a similar 8-hour mean air quality guideline value of 10mg/m^3. The UK Air Strategy was not breached at the Belfast Centre site in 2021 and so the WHO 8-hour mean air quality guideline value would similarly not have been breached.

There is no 1-hour mean objective for carbon monoxide within the UK Air Quality Strategy. However, calculated from raw 2021 monitoring data, the maximum 1-hour mean carbon monoxide concentration monitored at the Belfast Centre Lombard Street site was 1.0 mg/m^3; 34 mg/m^3 below the WHO air quality guideline value of 35 mg/m^3.

There is no 15-minute mean objective for carbon monoxide within the UK Air Quality Strategy. Carbon monoxide monitoring data from the Belfast Centre Lombard Street site is presented at an hourly resolution and so comparison with the WHO 15-minute mean air quality guideline value of 100 mg/m^3 is not possible.

3 New Local Developments

3.1 Road Traffic Sources

The following road traffic sources, which may have an impact on air quality, have been considered since the last Updating and Screening Assessment:

- Narrow congested streets with residential properties close to the kerb.
- Busy streets where people may spend one hour or more close to traffic.
- Roads with a high flow of buses and/or HGVs.
- Junctions.
- New roads constructed or proposed since the last Updating and Screening Assessment.
- Roads with significantly changed traffic flows.
- Bus or coach stations.

Belfast City Council confirms that as there has been no significant change to any of the above-mentioned sources since the 2021 Updating and Screening Assessment, there is no need to proceed to a Detailed Assessment.

3.2 Other Transport Sources

The following additional transport sources, which may have an impact on air quality, have been considered since the Updating and Screening Assessment:

- Airports.
- Locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.
- Locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.
- Ports for shipping.

Belfast City Council confirms that as there has been no significant change to any of the above-mentioned sources since the 2021 Updating and Screening Assessment, there is no need to proceed to a Detailed Assessment.

3.3 Industrial Sources

The following industrial sources, which may have an impact on air quality, have been considered since the last Updating and Screening Assessment:

- Industrial installations: new or proposed installations for which an air quality assessment has been carried out.
- Industrial installations: existing installations where emissions have increased substantially, or new relevant exposure has been introduced.
- Industrial installations: new or significantly changed installations with no previous air quality assessment.
- Major fuel storage depots storing petrol.
- Petrol stations.
- Poultry farms.

Belfast City Council confirms that one industrial installation (Energy Centre, Royal Victoria Hospital - LA04/2021/1492/F) was approved through the planning process in 2021. This approved installation was supported with an Air Quality Impact Assessment. The assessment demonstrated that the proposal would not have an impact on localised air quality or relevant human health receptors. Therefore, there was no need to proceed to a Detailed Assessment. Further information on this installation is provided in Section 4 of this report under Planning Applications.

Belfast City Council confirms that as there has been no other changes to any of the above-mentioned sources since the 2021 Updating and Screening Assessment, there is no need to proceed to a Detailed Assessment.

3.4 Commercial and Domestic Sources

The following commercial and domestic sources, which may have an impact on air quality, have been considered since the last Updating and Screening Assessment:

- Biomass combustion plant – individual installations.
- Areas where the combined impact of several biomass combustion sources may be relevant.
- Areas where domestic solid fuel burning may be relevant.
- Combined Heat and Power (CHP) plant.

Belfast City Council confirms that the above installations are considered as a part of the council's planning process. Where necessary, an Air Quality Impact Assessment is requested to demonstrate that the proposal will not have an impact on localised air quality or relevant receptors. Further information on planning applications, which required an Air Quality Impact Assessment, is provided in Section 4 of this report.

The Assessments submitted to date have demonstrated that proposed developments would not have a significant adverse impact on air quality in the vicinity of the development sites. Accordingly, there is no need to proceed to a Detailed Assessment.

3.5 New Developments with Fugitive or Uncontrolled Sources

The following new developments with fugitive or uncontrolled sources, which may have an impact on air quality, have been considered since the last Updating and Screening Assessment:

- Landfill sites.
- Quarries.
- Unmade haulage roads on industrial sites.
- Waste transfer stations, etc.
- Other potential sources of fugitive particulate matter emissions.

Belfast City Council confirms that as there has been no significant changes to any of the above-mentioned sources since the 2021 Updating and Screening Assessment, there is no need to proceed to a Detailed Assessment.

Belfast City Council confirms that there are no new or newly identified local developments, which may have an impact on air quality, within the Local Authority area. Belfast City Council further confirms that all the following sources have been considered:

- **Road traffic sources**
- **Other transport sources**
- **Industrial sources**
- **Commercial and domestic sources**
- **New developments with fugitive or uncontrolled sources.**

4 Planning Applications

During 2021, Belfast City Council's Environmental Protection, Public Health and Housing Unit considered numerous planning applications for developments that had the potential to negatively impact upon air quality.

Detailed or screening air quality impact assessments were requested for all of the proposed developments that in the council's view had the potential to have a negative impact on air quality or to introduce new receptors into an existing area of poor air quality. A summary of Planning Applications and Air Quality Impact Assessments (AQIA) submitted or requested during 2021, in support of larger developments is presented in the following Table 4.1.

Table 4.1 - Major New Development Which Had Potential to Have a Negative Impact on Air Quality in the 2021 Period.

Location	Development Description	Actions Taken
Lands at 102-127 Grosvenor Road and adjoining The Westlink/Grosvenor Road junction Belfast BT12 4GH.	Demolition of existing two storey building and erection of an office development with heights of 9-14 storeys with landscaping, parking, and associated development. Ref: LA04/2020/1666/F	An AQIA was submitted and reviewed, with a response provided on the NIPP 04/11/2020 noting concerns regarding the assessment, therefore a revised AQIA was requested. A subsequent AQIAs were submitted and reviewed with a response provided on NIPP on 09/02/2021. *'Based on this information this Service is able to conclude that estimated transport emissions, as a result of the proposed development, are likely to have a 'negligible' impact on nitrogen dioxide and particulate matter concentrations in the local area… Irwin Carr has also stated that the proposed combustion plant (boiler) is not expected to exceed the 450kW threshold for additional assessment. However, it is additionally stated within the letter dated 15 January 2021 that the design for the combustion plant including information regarding the exact emission location points is not currently available.* The recommended conditions were applied: • **The flue termination point of any combustion plant to serve the hereby permitted development shall be installed at a height and location to maximise dispersion and shall not terminate within any external terrace area accessible by future users of the development.** • **The individual or combined NOx emission rate for the proposed gas boilers installed at the hereby permitted development shall not exceed 5mg/sec unless the applicant submits an Air Quality Impact Assessment to the Planning Authority for approval in writing.** **Reason: Protection of human health.** The proposal is ongoing.
3-19 (Former Warehouse) Rydalmere Street Belfast BT12 6GF.	Residential conversion of the existing listed warehouses to form 57 (1 to 3 bed) units, including 60% social and affordable to include a minimum of 20% social housing. Ref: LA04/2020/1943/F	An AQIA was submitted and reviewed, with a response provided on the NIPP 18/11/2020 noting concerns regarding the assessment, therefore a revised AQIA was requested. A subsequent revised AQIA was submitted and reviewed on 12/01/2021. '*Therefore, based on the provided information and air quality monitoring results in the vicinity of the development and despite some inaccuracies within the assessment's methodology, it is this Service view that exceedances of the Air Quality Objectives are not expected at the modelled receptor locations. As a result, this Service has no concerns regarding the air quality impacts of the development proposal.'* The following condition was attached: • **Dust management measures, as detailed within Appendix A of the Irwin Carr Letter 001 2020025 (30 November 2020) shall be implemented throughout the duration of the construction phase of the development.** The proposal is ongoing.

8-10 Clarence Street 27-37 Linenhall Street and existing car park at the corner of Linenhall Street and Clarence Street Belfast.	Demolition of Nos. 27 to 37 Linenhall Street and Nos. 8-10 Clarence Street and erection of seven storey office building. Ref: LA04/2020/2200/F	Technical information of any combustion plant proposed as part of the application was requested on 04/02/2021. An appeal to the proposal is in progress.
81-107 York Street Belfast.	Installation of roof top plant equipment and extraction flues. Ref: LA04/2020/1810/F	Additional information was requested in relation to roof top plant equipment in responses on NIPP dated 07/10/2020 and 10/12/2020. Additional information submitted was reviewed and a response provided on NIPP on 06/01/2021, stating, '*This Service has no concerns in relation to air quality impact of the proposal. Accordingly, this Service would request the following condition is attached in the event that planning permission is granted:* • **The installed combustion plants for the proposal shall meet the technical specification as indicated within Mechanical Technical Submittal (Boilers) document (Michael Nugent Ltd). Moreover, the emissions should be released from stacks in a location and at a height that provides adequate dispersion and in accordance to range of drawings submitted on 14 September 2020 by Hester Architects.'** Permission granted 21/04/2021.
Land to a section of existing Tesco car park Ballygomartin Road Belfast BT13 3LD.	The erection of a freestanding McDonald's restaurant with car parking, drive-thru facility, landscaping and associated works to the site. Installation of 2no. customer order displays (COD) with canopies and play space. Ref: LA04/2020/0550/F	An AQIA was submitted and reviewed, with a response provided on NIPP on 11/11/2020, stating no concerns with air quality at all relevant receptors, however clarification was sought in relation to any combustion plant proposed as part of the development. Additional information submitted and reviewed on 11/02/2021 confirmed that there would be no combustion plant associated with the proposal. Permission granted 27/05/2021.
52-54 Dublin Road Belfast BT2 7HN.	Demolition of existing building and erection of 8-storey building with retail/coffee shop at ground floor and 45No serviced apartments for both long- and short-term occupancy on the floors above. Ref: LA04/2021/0244/F	An AQIA was submitted and reviewed, with a response provided on NIPP on 19/03/2021. *'The assessment has sufficiently demonstrated, based on the local air quality data and estimated transport emissions, that exceedances of the Air Quality Objectives are not expected at any receptor locations… Irwin Carr Consulting has also advised that the proposed development will not include any centralised combustion plant where the single or combined NOx emission rate is more than 5mg/sec… The consultant has also considered the potential effects of dust emissions associated with the construction phase of the proposed development.'* The following conditions were applied to the response: • **In the event that any centralised combustion sources (boilers/CHP, biomass), where the single or combined NOx emission rate is more than 5mg/sec are proposed as part of this development, this Service would request that a revised Air Quality Impact Assessment be carried out and submitted to the Planning Authority. Information submitted must be sufficient to demonstrate that there will be no adverse impact on human health due to emissions. In accordance with the Environmental Protection UK and the Institute of Air Quality Management, Land-use Planning & Development Control: Planning For Air Quality (January 2017).** • **During the construction phase of the development, dust management measures, as detailed within the Chapter 3.2 of the Air Quality Impact Assessment Dublin Road Apartments, Belfast, Irwin Carr (17 December 2020) should be implemented.** The proposal is ongoing.
101 Corporation Street, Belfast.	Proposed Mixed Use Development Comprising Retail Unit and 41 No Apartments. Ref: LA04/2020/1499/F	Revised AQIA submitted and reviewed, with response provided 13/04/2021. '*The assessment has sufficiently demonstrated based on the local air quality data and estimated transport emissions, that exceedances of the Air Quality Objectives are not expected at any receptor locations… The consultant has also considered the potential effects of dust emissions associated with the construction phase of the proposed development.'* The following condition was appended: - **Accordingly this Service would request that dust management measures, as detailed within Appendix B of the *Air Quality Impact Assessment, AONA Environmental, 101 Corporation Street (uploaded 16/03/2021)* shall be implemented throughout the duration of the construction phase of the development.** Proposal outcome: unknown

140 Donegall Street Belfast BT1 2FJ.	Erection of a Purpose-Built Managed Student Accommodation development comprising 724 no. units, courtyards, ancillary accommodation and facilities, cycle and car parking and all other associated site and access works. (Amendment to planning approval LA04/2015/0609/F). Ref: LA04/2021/0516/F	This proposal is an amendment to LA04/2015/0609/F, of which the AQIA was reviewed on 24/11/2015, concluding no concerns. The response supplied in relation to LA04/2021/0516/F, dated 28/04/2021 confirms that the same 2015 AQIA was submitted with some additional clarifications in relation to road traffic movements and combustion sources. It was therefore considered that the conclusions within the original AQIA are still valid. *'A revised assessment based on new air quality, meteorological and traffic data as well as using the up-to-date Emissions Factors Toolkit v9.0 would provide this Service with more confidence in the model predictions. However, on this occasion, and also considering recent known air quality levels in the vicinity of the development, it is this Service's view that the RSK report (February 2021) sufficiently demonstrates that exceedances of the Air Quality Objectives are not expected at any receptor locations and that air quality impact of the development is not likely to be significant.'* The following condition was appended to the AQIA response: - **An Air Quality Impact Assessment shall be submitted to the planning authority, for review and approval in writing, prior to installation, where any centralised combustion sources (boilers/CHP, biomass), resulting in a single or combined NOx emission rate of more than 5mg/sec are proposed as part of this development. The assessment shall include a specification for the combustion plant to be installed, to include emission rates and flue termination heights of the proposed combustion systems and must sufficiently demonstrate that there will be no unacceptable ambient air quality impacts on human health receptors. Reason: protection against adverse air quality.** The proposal is ongoing.
Land between dwelling at 238 and 240 Cambrai Street Belfast BT13 3BB	Renewal of retrospective approval for the temporary retention of existing biomass boiler, supplying the heating system for adjacent sheltered accommodation at Cambrai Court. Ref: LA04/2020/2419/F	Response provided on 06/05/2021: *'The biomass boiler has been assessed with regards to impacts on local air quality utilising the Defra Biomass Boiler Calculator Tool. Calculations show no issues with regard to air quality within the locality. Therefore, we have no objections to the proposed development and would suggest the following informative is attached to the decision notice should planning permission granted: The applicant is advised to ensure that all plant and equipment is so situated, operated and maintained as to prevent the transmission of noise, odour or dust to nearby premises.'* Proposal granted 12/05/2021.
Queens Quay Belfast (lands between M3 and odyssey complex).	Renewal of outline planning permission ref. Z/2009/1309/O for mixed use development including a maximum of 798 residential units (up to 73,420 sq. m) with associated amenity space, two hotels (up to 22,438 sq.m), offices 9up to 4370 sq.m), retail services (up to 905 sq.m), leisure facilities (up to 1303 sq.m), community and cultural uses (up to 1570 sq.m), cafes/bars/restaurants (up to 2824 sq.m), public open space, multi storey car parking (up to 55,612 sq.m) and associated works including related infrastructure improvements. Ref: LA04/2019/2882/O	An AQIA was submitted and reviewed, with a response provided on the NIPP 30/10/2020 noting concerns regarding the assessment, therefore additional information was requested, which was submitted and reviewed on 09/07/2021. *'This Service does acknowledge that the risk of exceedances of UK Air Quality Objectives is low; however, considering the size and residential nature of the proposed development, and also to fully advise the Planning Service on the likely impact of this development, we would recommend that the impact of traffic emissions during Odyssey event periods (now known as the SSE Arena) is assessed based on worst-case assumptions regarding the increase in local traffic flows and would recommend the following condition:* - **At the reserved matters stage, the applicant shall submit an Air Quality Impact Assessment which considers traffic emissions during SSE Arena event periods. The assessment shall be based on worst-case assumptions with regard to the increase in local traffic flows during event periods and should demonstrate that that there will be no significant adverse air quality impacts at proposed residential receptors during the operational phase of the development. The assessment shall employ a suitably robust atmospheric dispersion model and should have regard to recent, up-to-date guidance and best practice for air quality such as Local Air Quality Management Technical Guidance document LAQM.TG(16) and Environmental Protection UK and the Institute of Air Quality Management, Land Use Planning & Development Control: Planning For Air Quality (January 2017).** The proposal is ongoing.
Thompson Dock Pump House and Car Park of Northern Ireland Science Park (Innovation Centre) Queens Road Belfast BT3 9DT.	Change of use from pump house and cafe/restaurant to distillery with associated ancillary visitor tour facilities. Ref: LA04/2020/0755/PAD	An AQIA was submitted and reviewed, with a response provided on 23/09/2021. '*Given the inaccuracies of the report provided, this Service has based its conclusions on technical data sheets of the boilers in question, provided by the consultants (email dated 20/09/2021), calculations using Defra screening tools and the assumption that the Air Quality Impact Assessment carried out by Irwin Carr is a conservative estimate. The results demonstrated that there are no short-term exceedances of NO_2 from the proposed development. Therefore, this Service has no concerns.* *Furthermore, it is noted that 1 boiler (17.2MW steam boiler) will be regulated under the Medium Combustion Plant Directive into Northern Ireland legislation via the Pollution Prevention and Control (Industrial Emissions) (Amendment) Regulations (Northern Ireland) 2018. This Legislation is enforced by the Northern Ireland Environment Agency*

		and Local Authorities. The relevant statutory body for this plant will contact the applicant with details of the authorisation process in due course.' Proposal outcome: unknown.
807 - 809 Lisburn Road Belfast BT9 and incorporating part of Kingsbridge Private Hospital at Nos 811- 815 Lisburn Road Belfast BT9	Alterations and 3 storey extension to existing private hospital including vehicular access and car parking (amendment to previously approved two storey permission granted under LA04/2017/0005/F). (Amended address and further information received.)	Proposal is linked to LA04/2021/0188/PAD. An AQIA was requested within the PAD response and again on 20/08/2021 in relation to flue termination point concerns. An AQIA was subsequently submitted and reviewed, with a response provided on NIPP on 10/12/2021. *'The proposed energy centre is not predicted to result in any exceedances of the air quality objectives at relevant receptors (including existing and new hospital buildings) in the surrounding area. As a result, this Service has no concerns regarding the air quality impacts of an operational phase of the development proposal.'* The following condition was appended to the response: - **Accordingly, this Service would request that installed combustion plants for the proposed development shall meet the technical specification as detailed within the air quality assessment (Kingsbridge Hospital, Air Quality Assessment, RPS, October 2021). Moreover, the emissions should be released from stack in a location and at a height that provides adequate dispersion and in accordance to the Consultants specification (5m).** The proposal is ongoing.
Havelock House Ormeau Road Belfast BT7 1EB.	Demolition of existing buildings and erection of 270 no. apartment building comprising 8, 5 and 3 storey elements, provision of hard and soft landscaping including communal courtyard gardens, public realm, provision of 40 no. car parking spaces, cycle parking, substation and associated works. (Further information and amended plans received).	Permission was refused on 19/11/2020, however information provided at the appeal stage was submitted and reviewed, with a response provided on 23/06/2021, stating no concerns. The following condition was appended to the response: - **Accordingly, this Service would request that dust management measures, as detailed within the Chapter 5.2 of the *Redmore Environmental*, *Air Quality Assessment, Ormeau Road, Belfast (12th February 2021)* shall be implemented throughout the duration of the construction phase of the development.** Appeal dismissed on 05/10/2021.
Lands at the Gasworks Northern Fringe site; bounded to the north by McAuley Street Stewart Street and Raphael Street; Cromac Street to the west; the River Lagan and Belfast-Newry railway line to the east; and the Gasworks Business Park to the south.	Outline planning permission (with all matters reserved) for mixed use development on Sites A, B, C, D. Comprising up to 7,710 sqm GEA mixed use to include tourist hostel, residential, office, retail, commercial including community enterprise, community infrastructure and social enterprise floor space (A1 or A2 or B1 or B2 or C1 or C2 or D1) units on Site A, up to 6,980 sqm GEA of Hotel (C2) floorspace on Site B, the erection of a multi-storey car park comprising of up to 231 spaces (4,130 sqm GEA) and up to 7,130 sqm GEA of employment or community (A1 or A2 or B1 or B2) floorspace on Site C and up to 1,110 sqm GEA mixed use to include residential, office, retail, commercial including community enterprise, community infrastructure and social enterprise (A1 or A2 or B1 or B2 or D1) floorspace on Site D. Outline planning permission (with no matters reserved) for the erection of 94 residential dwellings (social housing). Comprising of 44 residential units on Site A and 50 residential units on Site D/NIE. Access to be provided from Raphael Street and Stewart Street respectively. Along with the provision of	An AQIA was submitted and reviewed, with a response provided on NIPP on 05/10/2021 stating concerns and requesting a revised AQIA. A revised AQIA was submitted and reviewed, with a response provided on NIPP 28/04/2022, stating *'estimated road transport emissions, as a result of the proposed development, are likely to have a 'negligible' impact on nitrogen dioxide and particulate matter concentrations in the local area… there is no predicted risk of exceedances of air quality objectives as a result of railway emissions (stationary/moving diesel locomotives)… this Service has no concerns in relation to air quality impacts from domestic combustion sources.'* For the aspects of this application (so-called phases 2 and 3) which are for outline planning permission with all matters reserved, this following condition were requested: - **At full or reserve matters stage the applicant shall provide to and have agreed in writing by the Planning Authority, an air quality impact assessment. The assessment should have regard to recent up-to-date guidance and best practice for air quality, such as Local Air Quality Management Technical Guidance document LAQM.TG(16) and Environmental Protection UK and the Institute of Air Quality Management, Land-use Planning & Development Control: Planning For Air Quality (January 2017). The assessment must demonstrate that there will be no significant adverse air quality impacts or exceedances of Air Quality Strategy objectives at relevant human receptor locations, associated with the development. Where exceedances of air quality objectives are identified at relevant human receptor locations, the AQIA shall include appropriate mitigation measures to demonstrably achieve compliance with the objectives in the development year of opening. Reason: Protection of human health against adverse air quality impact.** The proposal is ongoing.

	landscaping, parking, public open space, pumping station and associated works. Ref: LA04/2021/1672/O	
Lands bounded by Little Victoria Street, Bruce Street and Holmes Street Belfast.	Erection of new 15no storey purpose-built student accommodation building and associated development (amended scheme from that previously approved under application reference LA04/2018/2602/F). Ref: LA04/2021/2242/F	An AQIA was submitted and reviewed, with a response provided on NIPP dated 03/11/2021, stating *'estimated transport emissions, as a result of the proposed development, are likely to have a 'negligible' adverse impact on nitrogen dioxide and particulate matter concentrations in the local area. However, it is noted by this Service that no information concerning heating and hot water provisions (combustion plant) has been confirmed at this stage of the development proposal. This Service would advise that any combustion plant where the single or combined NOx emission rate is more than 5 mg/sec could give rise to adverse impacts… Consequently, in the event that any substantial centralised combustion sources (boilers, CHP or biomass) are proposed as part of this development and there is a risk of impact at relevant receptor locations as per the criteria detailed within the Environmental Protection UK and Institute of Air Quality Management, Land-use Planning & Development Control: Planning For Air Quality (January 2017), this Service would request that an updated Air Quality Impact Assessment be submitted to and approved in writing by the Planning Authority prior to the installation of the plant... Furthermore, as part of this air quality assessment, RPS consultants have undertaken a construction impact assessment in accordance with Guidance on the assessment of dust from demolition and construction IAQM (2014).'* The following condition was applied: - **Accordingly this Service would request that dust management measures, as detailed within the Chapter 5 of the RPS *Air Quality Impact Assessment (AQIA), Proposed Student Accommodation, Little Victoria Street, Belfast, October 2018* shall be implemented throughout the duration of the construction phase of the development.** Proposal granted 18/03/2022.
Land at Kings Hall and RUAS site south of Upper Lisburn Road/Balmoral Avenue West of Harberton Park and North East of Balmoral Golf Club Belfast BT9 6GW.	Outline planning permission for a mixed use regeneration proposal with all matters reserved for retirement living at plot 6, medical or health services at plot 9, multi storey car park, local retail uses, restaurant and cafe uses, leisure and gym facilities at plot 8, associated internal access roads, associated new public realm and amenity open space including central plaza and access from Upper Lisburn Road (as per planning approval reference LA04/2018/0040/F); and no matters reserved for residential development (81 apartments) at plot 3 with ground floor local retail use/restaurant and cafe uses/leisure and gym facilities, associated landscaping, car parking and access from Upper Lisburn Road (as per planning approval reference LA04/2018/0040/F) and reconfiguration of temporary car park to the rear of King's Hall (approved under LA04/2018/0040/F). Further information and amended drawings received including addendum to Environmental Statement. Amendments include temporary parking arrangements adjacent to the southern boundary with Harberton Crescent and part of the south western boundary with Balmoral Golf Club.	There have been several planning applications submitted to the Belfast City Council Planning Service for the former King's Hall site. The Environmental Health Service final response (ref ST/JC/526104) in relation to planning application LA04/2020/0845/O was provided on 11 November 2020 stating: *…impacts associated with the proposed development are predicted to be negligible before 2026, when the proposed development is to be fully operational. Also, there are no predicted exceedances of the nitrogen dioxide annual mean air quality objective at modelled human health receptor locations after 2023... It is noted by this Service that the Consultants have indicated that a series of mitigation measures are to be implemented, aimed at enhancing the attractiveness of sustainable forms of travel, which would further reduce the impact of road transport sources.*' The following condition has been appended: - ***Any installed combustion plant to the hereby permitted phased developments shall meet the technical specification as provided in ES Addendum Appendix 12.8. Moreover, the flues to all proposed combustion plant must terminate above the roof level of the building for which that combustion plant serves and as per location as presented in Figure 12.6 in ES Addendum Appendix 12.6.*** - ***Prior to commencement of demolition and construction phases associated with the development of plot 3, the applicant shall submit to the planning authority, for review and approval in writing, a Construction Environmental Management Plan (CEMP). The plan shall consider the management of noise, dust and vibration impacts as a result of demolition, excavation and construction works at the development site. Regard shall be paid to BS: 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. The CEMP shall be implemented as agreed. Recommended dust mitigation measures in relation shall be implemented as outlined in the dust risk assessment and recommendations detailed by Air Quality Consultants presented in the ES Addendum Chapter 12 (Air Quality) and Appendices 12.7.*** Additional information (Technical Note, AQC, 25 February 2021) was submitted to the Planning Authority on 1st March 2021. This Service reviewed this additional documentation and concluded that there was not any new information in relation to air quality impact, Proposal granted 02/12/21.

	Ref: LA04/2020/0845/O	
Lands adjacent to and south east of the river Lagan west of Olympic Way of Queen's road Queen's Island Belfast BT2 9EQ.	Mixed use, mixed tenure residential-led development of 778 apartments in three buildings with internal and external amenity space; flexible commercial/community floorspace (convenience store with hot food counter/A1/A2/D1 uses/cafe/bar/restaurant); public realm including public square and waterfront promenade; cycle and car parking and associated landscaping, access roads, plant and site works including to existing river revetment (further environmental information received). Ref: LA04/2021/2280/F	An AQIA was submitted and reviewed, with a response provided on NIPP dated 21/01/2022. The response stated, '*this Service is able to conclude that estimated transport emissions, as a result of the proposed development, are likely to have a 'negligible' impact on nitrogen dioxide and particulate matter concentrations in the local area. However, it is also noted by this Service that DfI Roads have considered this development proposal unacceptable as submitted (DfI Road's response dated 17th December 2021). DfI have advised within their response the following: the applicant's Transport Assessment and the accompanying documents is ongoing. This process requires further discussion with the developer. Consequently, this Service would wish to emphasise that road transport data is principally a matter for the Department for Infrastructure Roads. Accordingly, traffic information provided within the Chapter 6, Traffic & Transportation of the Environmental Statement, will need to be considered and approved by the Department. Any amendments required by the Department to the proposed development may have to be reflected in the Air Quality Impact Assessment. RPS consultants have also stated within the Air Quality chapter that the building (s) will be served by air to water heat pumps, located on the roof. These pumps will not have an emission point (s), as they are electric based. Therefore, no emissions of nitrogen dioxide are predicted.* *Consequently, the operational phase of the proposed development is not predicted to hav adverse impact on local air quality*… Furthermore, as part of this air quality assessment, RPS consultants have undertaken a construction impact assessment in accordance with *Guidance on the assessment of dust from demolition and construction IAQM (2014).'* The following condition was applied: - **This Service therefore would request that prior to the commencement of construction works on site, a final Dust Management Plan must be submitted to and agreed by the Planning Service. The Dust Management Plan must be based on the dust risk assessment and recommendations detailed by the RPS consultant within the Environmental Statement (Volume 2, Chapter 8 *Air Quality*).** The proposal is ongoing.
Royal Victoria Hospital Grosvenor Road Belfast BT12 6BA.	Proposed energy centre including ancillary development, access, landscaping and associated miscellaneous works. Ref: LA04/2021/1492/F	An AQIA was submitted and reviewed, with a response provided on NIPP dated 06/12/2021 stating, '*All air pollution sources applicable to the development have been considered within the assessment… As a result, this Service has no concerns regarding the air quality impacts of an operational phase of the development proposal'*. The following condition was applied: - **The installed combustion plants for the proposed development shall meet the technical specification as detailed within the air quality assessment (Royal Victoria Hospital Energy Centre, Revised Air Quality Assessment due to updated Energy Centre Design, Mott Macdonald, February 2021). The emissions should be released from stack in a location and at a height that provides adequate dispersion and in accordance to the Consultants specification (70m).** Proposal granted 22/12/2021.
Grosvenor Road, Belfast. BT12 4GR.	Weaver's Cross Regeneration Project. Ref: LA04/2021/1840/DETEIA	Advice in relation to the forthcoming AQIA methodology was provided on 14/10/2021.In principle, this Service is satisfied with the proposed air quality assessment methodology detailed within chapter 6.2 (Air Quality) and letter dated 1st October 2021, but would provide the following comments: - the assessment should acknowledge recommendations raised in the PAD response from Belfast City Council, City and Neighbourhood Services Department (dated 11 February 2021) - This Service has previously advised that all air pollution sources should be considered when assessing the impact of the proposed development It is noted by this Service that the proposed method of heating in the development is unknown at this outline stage. Consequently, this Service would request that the following **condition** is considered in the event that outline planning permission is granted: - **At the reserved matters stage, for each phase of the development, the applicant shall submit an air quality impact assessment providing full specification details, including emission rates and flue termination heights, of the proposed combustion systems for heating and hot water. The assessment must demonstrate that there will be no significant adverse air quality impacts or exceedances of Air Quality Strategy objectives at relevant human receptor locations, associated with operation of the proposed combustion plant and with the overall development**

		- **The assessment should also evaluate the impact of rail sources.** - This Service would advise that in accordance with 'Environmental Protection UK and the Institute of Air Quality Management, Land-use Planning & Development Control: Planning for Air Quality (January 2017) the AQIA assessment should be carried out for the first year of the proposed development and where development is phased, it may also be appropriate to assess conditions for the opening years of each new phase. Proposal outcome: unknown.
1-2 Duncrue Pass, Belfast.	Change of Use and re-development of a Waste Management Facility. Ref: LA04/2021/2233/PAD	All information provided was reviewed by the AQO and an AQIA was requested in response dated 09/12/2021. Proposal outcome: unknown.
Lands north of 14 Mill Race and 15 Belfield Heights, and south of 2-15 St Gerard's Manor, Ballymurphy, Belfast.	Proposed social housing development comprising 122 No. residential dwellings, associated internal road network, pedestrian and cycle ways, public open space, children's play area, landscaping (including 8 metres landscaped buffer to western boundary), parking, access (provision of a right turn lane) and ancillary site works. Ref: LA04/2021/1503/PAD	All information provided was reviewed by the AQO and an AQIA was requested in response dated 19/07/2021. Proposal outcome: unknown.
21-29 Corporation Street & 18-24 Tomb Street Belfast.	Demolition of existing multi-storey car park and the erection of 298no. build for rent apartments (19 storey) including ground floor commercial unit (A1/A2), car/cycle parking provision along with associated development. (Further information and amended drawings received). Ref: LA04/2021/2016/F	An AQIA was submitted and reviewed, with a response provided on NIPP, dated 23/11/2021, requesting an updated AQIA to address comments and considerations outlined by the AQO. The proposal is ongoing.
35-41 Queen's Square Belfast BT1 3FG.	Proposed erection of 15no. storey building comprising 60no. apartments with ancillary facilities and all other associated site works (amendment to previous approval Z/2011/0472/F). Ref: LA04/2021/1985/F	An AQIA was submitted and reviewed, with a response provided to NIPP dated 27/10/2021, requesting an updated AQIA to address comments and considerations outlined by the AQO. The proposal is ongoing.
Blackstaff Road (lands to the south and west of (north, of Westwood shopping Centre), Belfast.	Proposed mixed tenure social and affordable residential development. Ref: LA04/2020/0700/PAD (linked to LA04/20211325/PAD below)	All information submitted was reviewed and advice was provided on 29/10/2021, requesting an AQIA. Proposal outcome: unknown.
Blackstaff Road (lands to the south and west of (north, of Westwood shopping Centre), Belfast.	Sewage Treatment Works. Ref: LA04/20211325/PAD (linked to LA04/2020/0700/PAD above)	All information submitted was reviewed and advice was provided on 05/07/2021, requesting an AQIA. Proposal outcome: unknown.
22-34 Clifton Street, Belfast.	Redevelopment of existing HMO'S & apts to provide 22 no. self-contained apartments. Ref: LA04/2021/0918/PAD	All information submitted was reviewed and advice was provided on 24/05/2021, requesting an AQIA. Proposal outcome: unknown.
Dargan Road Landfill Site,	Giant's Park EIA Scoping Assessment.	All information submitted was reviewed and advice was provided on 24/09/2021 requesting an AQIA.

Dargan Road, Belfast.	Ref: LA04/2019/0409/DET	Proposal outcome: unknown.
"The Oval", Parkgate Drive, Belfast.	Demolition of existing spectator stands to be replaced with 2 new all seater stands totalling 4000 capacity and reconfiguration of existing standing terracing at goal ends to provide an additional 2000-person capacity. New turnstiles and associated site work to include additional car parking and improved circulation routes with the site. Ref: LA04/2021/1605/PAD	All information submitted was reviewed and advice was provided on 24/09/2021, requesting further information in relation to transport sources. It is noted that an AQIA may be required. Proposal outcome: unknown.
Surface level car park to east of Lanyon Place Train Station, Mays Meadows, Belfast. BT1 3NR.	Erection of a 11 storey Grade A office building with active ground floor uses (retail, food beverage offers and retail services); car parking; bike storage; and public realm improvements. Ref: LA04/2021/2060/PAD	An Air Quality Scoping Assessment was submitted and reviewed, with a response provided on 26/10/2021 requesting an AQIA. Proposal outcome: unknown.
Vacant lands at access road to Olympia Leisure Centre – directly opposite and approx. 70m east of nos. 9-15 Boucher Road Belfast BT12 6HR.	Erection of discount supermarket, drive thru cafe, landscaping, car parking, and associated site works. Ref: LA04/2021/2007/PAD	An AQIA was submitted and reviewed, with a response provided on 09/12/2021, stating *'this Service is able to conclude that estimated transport emissions, as a result of the proposed development, are likely to have a 'negligible' impact on nitrogen dioxide and particulate matter concentrations in the local area. However, this assessment has seemingly considered only the impact from road transport emissions on a series of human health receptors; This Service would advise that all air pollution sources should be considered when assessing the impact of the proposed development… Consequently, in the event that any centralised combustion sources (boilers, CHP or biomass) are proposed and there is a risk of impact at relevant receptor locations as per the criteria detailed within the Environmental Protection UK and Institute of Air Quality Management, Land-use Planning & Development Control: Planning For Air Quality (January 2017), this Service would request that an updated Air Quality Impact Assessment will be required… Furthermore, as part of this air quality assessment, Irwin Carr consultants have undertaken a construction impact assessment in accordance with Guidance on the assessment of dust from demolition and construction IAQM (2014'*. The following condition was applied: - **Accordingly, this Service would request that dust management measures, as detailed within the Chapter 7 of the Irwin Carr Consulting, Air Quality Impact Assessment, Lidl Boucher Road, Belfast, (10 September 2021) shall be implemented throughout the duration of the construction phase of the development.** Proposal outcome: unknown.
188-202 Shore Road, Belfast. BT15 3QA	Lidl, Shore Road, Belfast. Ref: LA04/2021/0165/F	An AQIA was submitted and reviewed, with a response provided on 10/08/2021, stating *'no concerns regarding the air quality impacts of the operational phase of the development proposal* Irwin Carr consultants have also considered the potential effects of dust emissions associated with the construction phase of the proposed development in accordance with the IAQM *Guidance on the Assessment of Dust from Demolition and Construction 2014. The consultants have predicted that before the implementation of mitigation measures, the risk of dust impacts is predicted to be 'low to high''*. The following condition was applied: - **Accordingly, this Service would request that dust management measures, as detailed within the Chapter 3.2.3 of the *Air Quality Impact Assessment, Lidl, Shore Road, Belfast, Irwin Carr (6 May 2021)* shall be implemented throughout the duration of the construction phase of the development.** Proposal outcome: permission granted
Site bounded by Little York St, Great George's St & Nelson St, Belfast. BT15	11 storey Purpose Built Managed Student Accommodation (PBSA) development comprising 774 beds with shared sports and recreation facilities. Ref: LA04/2021/2278/PAD	An AQIA was submitted and reviewed, with a response provided on 25/11/2021, requesting a revised AQIA at the next stage of planning to take into consideration additional information and clarifications requested by the Air Quality Officer. Proposal outcome: unknown.

McDonalds Restaurants Ltd., the Westwood Centre, Kennedy Way, Belfast. BT11 9AP.	Variation of condition No. 2 of planning permission Z/1995/2284 - Amendment of opening hours to allow drive thru to operate 24hrs every day of the year including Bank Holidays. (Amended Description/ Plans). Ref:LA04/2020/1473/F	An AQIA was requested on NIPP in response dated 27/11/2020. The AQIA was subsequently submitted and reviewed, with a response provided on NIPP dated 07/05/2021. The response confirmed, '*The air quality impact assessment has focused on those pollutants that are produced by vehicular traffic, especially the pollutants for which the Westlink/M1 Air Quality Management Area (AQMA) has been designated… The assessment has also demonstrated that all relevant receptors, located in the vicinity of the proposed development, will not be exposed to air quality concentrations exceeding UK Air Quality objectives as a consequence of the operational phase of the proposed development. As a result, this Service would have no concerns regarding the air quality impacts of the development proposal*'. Proposal granted 21/12/2021.
Land immediately to the West of 402 Newtownards Road Belfast BT4 1HH. On the corner of Connswater Street.	Construction of a new 21 Bedroom hotel, including ground level cafe/bar facilities, and integration with and extension to the existing "Freight" restaurant. Ref: LA04/2020/1176/F	An AQIA was submitted and reviewed, with a response provided on NIPP dated 01/02/2021 stating that despite some modelling errors, '*this Service is able to conclude that estimated transport emissions, as a result of the proposed development, are likely to have a 'negligible' impact on nitrogen dioxide and particulate matter concentrations in the local area. However, it is noted by this Service that according to a drawing 'Proposed Plans Sections and Elevations Hall Black Douglass Architects', a plant room is proposed on the ground floor of the development. Consequently, it is unclear whether the proposed development is to include any centralised combustion plant and whether this combustion plant might require an Air Quality Assessment*… This Service would advise that there are sensitive human health receptors located in close proximity to the proposed development. To ensure that there will be no significant adverse dust effects arising from the construction phase of the proposed development, this Service would request that the following INFORMATIVE be considered for attachment to any planning permission granted: Construction dust management measures shall be developed in accordance with the provisions of the IAQM Guidance on the Assessment of Dust from Demolition and Construction 2014. These dust management measures shall be implemented throughout the duration of the construction phase of the development. Reason: Protection of human health and amenity'. The following condition was also applied: - **In the event that any centralised combustion sources (boilers/CHP, biomass), where the single or combined NOx emission rate is more than 5mg/sec are proposed as part of this development, this Service would request that a revised Air Quality Impact Assessment be carried out and submitted to the Planning Authority prior to the installation of the plant. Information submitted must be sufficient to demonstrate that there will be no unacceptable ambient air quality impacts on human health receptors.** **Reason: protection of human health** The proposal is ongoing.
Lands at Tillysburn, bounded by the A2 Sydenham Bypass and the A55 Holywood Road, Belfast	Park and Ride facility providing 499 car parking spaces (comprising 491 no. standard spaces and 8 no. disabled spaces), including bus shelters, cycle stands, security kiosk, security fencing, lighting and CCTV columns, footways, surface water attenuation pond, drainage and culverting, landscaping and all associated site works. Existing access road off A55 Hollywood Road will be widened to incorporate one entrance lane and two exit lanes, an additional entrance only access will be provided from the A2 Sydenham Bypass. Ref: LA04/2021/1926/PAD	All information submitted was reviewed and advice was provided on 13/10/2021 requesting an AQIA. Proposal outcome: unknown.
Carlton House 1-6 Shaftesbury Square Belfast BT2 7DA.	Proposed re-cladding of and front extension to existing Carlton House office building, erection of six additional floors of office accommodation and public realm enhancement works extending along site frontage and Fulton Street.	All information was submitted and reviewed, with a response provided on NIPP dated 06/10/2021 stating, '*this Service is able to conclude that estimated transport emissions, as a result of the proposed development, are likely to have a 'negligible' impact on nitrogen dioxide and particulate matter concentrations in the local area. However, it is noted by this Service that no information concerning heating and hot water provisions (centralised combustion plant) has been provided for the development proposal. This Service would advise that any combustion plant where the single or combined NOx emission rate is more than 5mg/sec could give rise to impacts. Additionally, it is noted*

	Ref: LA04/2021/1964/F	*that in accordance with the drawings provided the proposed development is to include roof terrace spaces… This Service would advise that there are sensitive human health receptors located in close proximity to the proposed development. To ensure that there will be no significant adverse dust effects arising from the demolition and construction phase of the proposed development, this Service would request that the following informative be considered for attachment to any planning permission granted. Construction dust management measures shall be developed in accordance with the provisions of the Institute of Air Quality Management publication Guidance on the Assessment of Dust from Demolition and Construction (February 2014). These dust management measures shall be implemented throughout the duration of the construction phase of the development'*. The following condition was applied: • **In the event that any centralised combustion sources (boilers/CHP, biomass), where the single or combined NOx emission rate is more than 5mg/sec are proposed as part of this development, an Air Quality Impact Assessment shall be submitted to the Planning Authority for approval. The Assessment must demonstrate that there will be no adverse impact on human health from emissions.** **Reason: In the interests of human health.** The proposal is ongoing.

5 Air Quality Planning Policies

Most developments across the city are subject to the Planning process, which provides an opportunity to identify and prevent potential air quality problems from arising in the first place.

In June 2009 and in view of the need for a consistent approach to air quality management as part of the planning process, Belfast City Council launched its *'Air quality and land use planning: A Belfast specific guidance note for developers and air quality consultants*' document. The document outlines what the council's Environmental Protection Unit, as an internal consultee to the Belfast Planning Service, would look for in forming its opinion on a proposed development and its potential impact on ambient air quality.

Since production of this Belfast specific guidance document, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have produced their 2017 guidance document entitled, '*Land-Use Planning & Development Control: Planning For Air Quality Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes'*. The council's Environmental Protection Unit now refers to the qualifying criteria set out in this document in order to determine when an Air Quality Impact Assessment is required.

Belfast City Council is currently developing its Local Development Plan (LDP) that outlines how land across the city will be used and developed in the future. The Belfast Local Development Plan - Draft Plan Strategy 2035 consultation document includes numerous references and commitments to improving air quality across the city. In addition, Appendix E: List of Supplementary Planning Guidance indicates that a new Supplementary Planning Guidance document (ENV1) will be published specifically to address 'Environmental Quality'. Ambient air quality will be a key component and consideration of this supplementary planning guidance document and it is noted that where relevant to a particular development proposal, Supplementary Planning Guidance will be taken into account as a material consideration in making planning decisions.

6 Local Transport Plans and Strategies

The Belfast Metropolitan Transport Plan (BMTP) 2015 is the current extant Transport Plan. It was developed to deliver an integrated transport network, improving opportunities for interchange between different modes of transport and providing real travel choices, particularly in the Belfast Metropolitan Area's main transport corridors. In general, most of the key elements of the Transport Plan have been delivered or are under review. A new Belfast Metropolitan Transport Plan is currently under development to integrate with the Belfast Local Development Plan. The new Transport Plan is expected to include transport projects which will improve air quality in the city.

Whilst not explicitly listed within BMTP 2015, the Department for Infrastructure has continued to take forward a number of high-profile transport projects. These include the Belfast Transport Hub, Belfast Rapid Transit Phase 2 (if confirmed as part of the final Belfast Region City Deal), Park and Ride facility expansion, improved active travel interconnectivity and general public transport route improvements. Delivery of these projects will contribute to this Action Plan's goals of reducing NO_2 and $PM_{2.5}$ emissions from transport activities.

7 Climate Change Strategies

In October 2019, Members of Belfast City Council declared a climate emergency and agreed that urgent action was needed to prepare for climate change, agreeing to take forward its adaptation and mitigation plans in tandem in order to expedite the process.

The plans form part of the Council's wider Resilience Strategy which aims to transition Belfast to an inclusive low-carbon, climate-resilient economy within a generation.

Belfast City Council is committed to:

- becoming a carbon-neutral organisation as urgently as possible
- producing an action plan setting out how we will become a carbon-neutral organisation
- work with partners across Belfast and with central and devolved government to seek to ensure that Belfast district's net carbon emissions are reduced by 80% compared to 2005 levels as quickly as possible

Currently the council is working towards publishing a council climate risk assessment, climate plan and climate investment plan. In parallel a city climate action plan and climate investment plan will be developed in 2022/2023. When published in 2022/23, the plans will aim to deliver the vision set out in the draft Belfast Resilience Strategy - to transition to a low-carbon economy in a generation.

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The plan is being developed in consultation with a number of cities as part of Belfast's membership of the Resilient Cities Network.

Our climate plan will focus actions that we can take as a council in relation to:

- climate adaptation - actions taken to prepare for the effects of climate change, such as building flood defences
- climate mitigation - processes associated with preventing or alleviating the impacts of climate change, such as reducing greenhouse gas emissions by reducing our carbon footprint.

8 Implementation of Action Plans

In 2006, the council, along with relevant partner organisations launched its first Air Quality Action Plan (AQAP) for the city designed to address areas of air quality concern, safeguard good air quality and to achieve national air quality strategy objectives and EU limit values by 2010. Around 90 percent of the action plan was completed by the 2010 deadline but, although the air quality limit values for particulate matter have now been achieved across the city, limit values for nitrogen dioxide continue to be exceeded and give cause for concern in a few remaining locations.

In mid-2012, the Council commenced development of a new Air Quality Action Plan for the city to address the remaining NO_2 hotspots. Concentrations of PM_{10} were complying with annual and daily mean objectives at this time within the M1 Motorway / A12 Westlink corridor AQMA.

The Council published a second AQAP for the city in 2015, which concluded at the end of 2020. A final review of the implementation of various mitigation measures included within 2015-2020 AQAP was undertaken and reported by the Council to the Department of Agriculture Environment and Rural Affairs (DAERA) as part of the Council's 2020 Air Quality Progress Report, submitted to DAERA in June 2020.

Whilst the previous AQAP delivered improvements in ambient air quality within our AQMAs and across the city, a limited number of transport related nitrogen dioxide (NO_2) hotspots remain. Moreover, fine particulate matter ($PM_{2.5}$) has emerged as an additional air pollutant of concern. Consequently in 2021 the Council with partner organisations developed a new 5-year Air Quality Action Plan 2021-2026 for the city.

The aim of this new AQAP is to continue reducing emissions from transport sources and to promote and enable a shift onto more sustainable modes of transport to achieve compliance with the air quality objectives for nitrogen dioxide. In addition, the aim of the Plan is also to identify, develop and implement mitigation measures, where necessary, to address concentrations of $PM_{2.5}$ across the city.

A summary of mitigation measures proposed as part of the new AQAP is provided within Table 8.1. Belfast City Council will monitor implementation of the Air Quality Action Plan 2021-2026 via at least annual meetings of the Action Planning Steering Group and will report on its progress as part of Progress Reports and/or Annual Status Reports.

Table 8.1 - Action Plan Progress

No.	Measure	Category / Classification	Lead Authority	Description	Implementation Date	Estimated Completion Date	Air Quality Benefits	Progress to Date
1.	Zero Emission Public Transport	Promoting Low Emission Transport / Public Vehicle Procurement	Translink	Introduce circa 100 new zero-emission buses to the Greater Belfast area.	Nov 2020 to April 2022	Dec 2022	Replaces c.100 diesel buses with zero emission vehicles.	Delivery programmes are ongoing and on course for completion by Dec 2022.
2.	Zero Emission Public Transport	Promoting Low Emission Transport / Public Vehicle Procurement	Translink	Develop Programme to decarbonise the bus fleet in the Greater Belfast area.	Nov 2022 to Dec 2025	Dec 2030	To remove all diesel buses in Belfast Metro and replace with a zero-emission fleet by 2030.	Delivery programmes are ongoing and on course for completion by Dec 2030.
3.	Bus Fleet Improvement	Vehicle Fleet Efficiency / Vehicle Retrofitting Programmes	Translink	Through vehicle modification, deliver minimum Euro 6 emission standards for all buses and coaches operating in Belfast.	Oct 2020 to Dec 2022	Dec 2022	Significant reduction in NOx and particulate matter emissions.	Delivery programmes are ongoing and on course for completion by Dec 2022.
4.	Decarbonisation of the rail network	Promoting Low Emission Transport / Public Vehicle Procurement	Translink	Work ongoing on a feasibility assessment to decarbonise the rail network including the potential roll out of electrification, battery traction and hydrogen technologies.	Oct 2020	Dec 2023	Ultimately, zero emission on the rail network by 2040.	Rail technological road map is being considered and will be finalised by Dec 2023.
5.	Future Ticketing System	Transport Planning and Infrastructure / Public Transport Improvements	Translink	Contactless payment on Metro / Glider. Account-based ticketing on all bus and rail services.	2018	2022	Provide greater ease of use, improved integration and best value for customers, thereby encouraging modal shift to public transport and a reduction in emissions from cars.	Contactless Tap On Only EMV rolled out on Metro services on 28th March 2022. Full Account Based Ticketing due to be rolled out on all Bus and Rail services during 2022 completing in 2023.
6.	Belfast Transport Hub	Transport Planning and Infrastructure /	Translink	Major new multi-modal transport hub for Belfast.	2020 Procurement of the main works contractor is on-	2025	Provide a new integrated transport hub, including facilities for active travel to	Construction works for the new station and surrounding infrastructure are

		Public Transport Improvements			going and work on the new station is due to commence in Q1 2022.		encourage and facilitate increased modal shift towards sustainable transport.	ongoing and on course for completion late 2025.
7.	Promote Public Transport	Promoting Travel Alternatives / Other – Promoting Public Transport	Translink All BCC stakeholders	Undertake engagement across companies, organisations and agencies to incentivise reduced use of the private car and greater use of public transport. Provide information at our stations, on Personalised Travel Planning, Corporate Commuter Initiatives (CCIs), providing best value fares information and promotional activity to attract modal switch onto public transport. Promote the use of low and zero emission buses with the development of new branding and messaging to highlight their benefits.	Nov 2020	Ongoing	Modal shift from car use to public transport/active travel will reduce emissions.	Engagement ongoing throughout 2022 across a broad range of stakeholders promoting benefits of public transport, encouraging active, sustainable travel and modal shift from the private car. Programme of Personalised Travel Planning, Best Value Fares and Corporate Commuter Initiatives delivered. Ongoing promotion during 2022 of low and zero emission buses, including livery branding and marketing / communications campaigns.
8.	Belfast Rapid Transit Phase 2	Transport Planning and Infrastructure / Public Transport Improvements	A Belfast Region City Deal (BRCD) Infrastructure project being developed by DfI	If confirmed, as part of final Belfast Region City Deal, advance the development of Phase 2 BRT – bus priority measures, enhanced facilities & new vehicles. One of 3 infrastructure projects being taken forward by DfI as part of BRCD	TBC – depends on BRCD prioritisation	TBC – depends on BRCD prioritisation	The proposed BRT 2 route options appraisal, which launched for public consultation on 26 July 2021, encompasses the City Centre and Ormeau Road AQMA. BRT will have a beneficial impact on modal shift, traffic movements and direct pollution levels along the route. For example, the	Public Consultation closed in October 2011. Report to be issued following Ministerial approval. Feedback used to inform draft Outline Business Case, which is currently awaiting Ministerial direction.

							Glider vehicles are demonstrating a 90% reduction in NO_2 and particulate matter emissions relative to the oldest vehicles in the Metro fleet.	
9.	Bus & Rail based Park & Ride / Interchange	Alternatives to Private Vehicle Use / Bus and Rail based Park & Ride	DfI Translink	1500 additional Bus & Rail Park and Ride spaces by 2023 across NI. Promotion of active travel links.	April 2018	March 2023	Modal shift from car use to Public Transport / Active Travel will reduce GHG emissions.	Trooperslane - completed and due to open May 2022 (230 spaces). Ballymartin - construction started March 2022. Planned opening Dec 2022 (170 spaces). Mossley West - planning approved, construction due to commence Sep 2022. Planned opening Dec 2023 (320 spaces). Ballymena - planning approved April 2022, (390). Moira – planning ongoing with expected construction 2023 (490 spaces). Bellarena - detailed design ongoing (215 spaces). Newtownards - business case / detailed design ongoing with expected construction 2023 (450 spaces).
10.	Bus Route Improvements	Transport Planning and Infrastructure / Bus Route Improvements	DfI Translink	Bus priority on all key Metro corridors in Belfast equivalent to that provided on the BRT Glider corridors.	April 2020	March 2025	By converting general traffic lanes to bus lanes, journey times are reduced and consequently fuel	Steering Group established June 2021 to provide direction on the development of bus priority proposals and co-ordination of

				Bus stop 'balancing' to reduce stop/start.			consumption and emissions are reduced. By better balancing the location and number of bus stops, dwell times are reduced, reducing idling, stop/start and associated emissions.	implementation. The aim is to have the measures introduced on routes to complement the roll-out of the zero-emission vehicles. Bus stop 'balancing' projects established for the Shankill Road and the first zero-emission routes (Castlereagh, Cregagh & Holywood Rd). Roll-out of stop rationalisation and installation of new shelters with RTPI and Living/Solar Roofs programmed to start March 2023.
11.	Park and Ride	Alternatives to Private Vehicle Use / Bus and Rail based Park & Ride	DfI Translink	The current Park & Ride Strategic Delivery Programme aims to deliver circa 2,000 additional spaces by 2025 (dependent on budget allocation)	2013	2025	This extension to the programme will have positive impacts on improving air quality for Belfast by providing alternative transportation for commuters travelling into the city rather than relying upon the private car.	DfI progressing business cases for Downpatrick, Comber, Cairnshill, Dungiven and Tillysburn with further feasibility studies for Stangmore and Lough Road. Delivery dependant on statutory approvals and funding.
12.	Improved walking and cycling connectivity to public transport interchanges	Transport Planning and Infrastructure / Other - Active Travel Network Improvements	DfI Translink	Enhance walking and cycling infrastructure to bus and rail stations, halts and Park and Ride sites.	2021	Ongoing	Improve infrastructure to make it easier and more attractive to walk and cycle to and from public transport interchanges, thereby reducing car usage and associated emissions.	Translink working with key stakeholders to improve Integration between Active Travel and Public Transport.
13.	Bicycle Strategy for NI	Transport Planning and	DfI Sustrans	The Bicycle Strategy will be followed with a Belfast Cycling Network to guide the	2017	Published June 2021	Increased levels of cycling could reduce congestion, improved air	Delivery plan published in March 2022. Est £100m cost over 10

	Belfast Cycling Network	Infrastructure / Cycle Network		development and operation of cycling infrastructure across the city for the next 10 years. A public consultation on the draft Belfast Cycling Network was held in early 2017. A consultation report was published in 2018.			quality, reduce noise pollution and contribute to a cleaner environment.	years. 1 cycle lane started in north Belfast, now stalled.
14.	Blue / Green Infrastructure Funding	Transport Planning and Infrastructure / Other – Blue and Green Infrastructure	DfI	Capital grant funding for Councils to construct greenways. The following greenway projects have been allocated a grant over the 2020/21 and 2021/22 period: - Lagan Gateway greenway (BCC) - Forth Meadow greenway (BCC) - Strathfoyle greenway (DC&SDC) - Strabane North greenway (DC&SDC) - Banbridge Riverside lighting (ACB&CBC)	2020-2022 depending on available Budget allocation	March 2022	Greenways have the potential to bring significant benefits to us all in terms of more physically active lifestyles, active travel, improved mental and physical health and wellbeing, social inclusion, tackling climate change, the strengthening of the local economy and tourism.	Strathfoyle greenway under construction and due to open in September 2022. Lagan gateway bridge opened and work underway to complete greenway path on the Annadale side of the bridge. Banbridge Lighting project complete. Lighting on the urban section of the Comber Greenway due to commence winter 2022. Blaris Greenway completed to the Halftown Road, providing a virtually traffic free route of around 24 kilometres into Belfast city centre.
15.	Green Recovery	Traffic Management / Strategic Highway Improvements	DfI	Temporary reallocation of road space to aid social distancing and active travel: - Pedestrianisation of Hill Street/Gordon Street - Reallocation of parking spaces for extended footway use	2020/21	Ongoing	Increased levels of walking and cycling could reduce congestion, improved air quality, reduce noise pollution and contribute to a cleaner environment.	£13.5m invested in active travel schemes in 2021/22, the highest amount ever. This year's funding allocation (including the Belfast Cycling Network) is £22m.

				- Pop-up cycle lanes to connect main hospitals for key workers – Dublin Road, Donegall Road and Grosvenor Road				Pop up cycle infrastructure to become permanent
16.	Belfast Multi-Modal Transport Model	Traffic Management / Other	DfI	It is expected that the Multi-Modal Transport Model will be enhanced and updated as part of the development of the Belfast Metropolitan Transport Plan in conjunction with the Belfast City Council Local Development Plan. However, this is currently 'in abeyance' in light of the COVID emergency and the programming of work for the Transport Plans. A key use of the model will be in transport and land-use option generation and testing. The transport model will provide forecasts of traffic flows and speeds to enable the estimation of air quality using separate detailed atmospheric dispersion modelling software held by Belfast City Council.	2022	Ongoing	This model will provide the capability to estimate the likely changes in air quality arising from changes in population and employment (BCC Planning inputs) and different transport investment options (DfI). Note that the decision to develop this model is currently 'in abeyance' in light of the COVID pandemic and the continuing impact on travel patterns.	Following the appointment of partner consultant Atkins in February 2022, a Model Enhancement Specification development has begun including tasks relating to Gap Analysis, software and early data collation and collection. The Model Enhancement Specification is due to be completed in July / August 2022 with enhancement due thereafter in preparation for the BMTP development.
17.	Belfast Metropolitan Transport Plan (BMTP)	Transport Planning and Infrastructure / Other	DfI	A new BMTP will be prepared to integrate with the Belfast City Council LDP. The BMTP will assess total transport demands arising from planned developments and the achievement of a range of agreed objectives. The new BMTP will become the extant Transport Plan and will include a range of schemes covering road, rail, bus, cycling and pedestrian networks.	2023 estimated in line with LDP programme	2030 in line with LDP assumed	It is expected that the balance of measures in the BMTP will impact positively on ambient air quality.	BMTP Initiation has commenced with the appointment in February 2022 of Atkins as a partnership consultant for the project. Initial tasks on methodology development, policy and legislation review, data analysis gap review, communications strategy and council

				Whilst the contents of the new BMTP cannot be assumed in advance, it is expected to include substantial demand management measures to restrict the use of private cars in the city centre and for commuting purposes in particular. These measures are expected to complement and reinforce any measures delivered as part of the Belfast City Council Parking Strategy and Action Plan.				engagement have begun. BMTP Methodology to be finalised in July / August 2022 with core work packages starting thereafter in line with BMTP councils' Local Policies Plan development.
18.	Electric Vehicles	Promoting Low Emission Transport / Procuring Alternative Refuelling Infrastructure to Promote LEV, EV recharging, gas fuel recharging	DfI	DfI is assisting the current public charge point network operator as it seeks to replace approx. 60 charge points i.e. 30 charge posts and a further 5 Rapid charge points to upgrade and improve the reliability of the existing public network. • Department officials are engaging with OZEV and the Energy Saving Trust (EST), who administer the On-street Residential Charge Point Scheme (ORCS), in particular, with reference to councils in Northern Ireland. • As part of the work being carried out on the transport elements of the Executive Energy Strategy the Department is considering how to chart a pathway to support vehicle electrification and seek to address financial and non-	2015	Ongoing	There are significant benefits to both the environment and to the driver in the use of electric vehicles.	ESB is continuing with its upgrade to its public charging network which it received funding through the Levelling Up Fund towards. A consortium of local councils led by Derry City and Strabane District Council has been submitted an application for ORCS funding. The Department fulfilled an advisory role to the consortium. The Department has established an EV Infrastructure Task-Force made up of organisations from the public and private sectors with an interest in this area. It has been tasked with producing and EV Infrastructure

				financial barriers to the uptake of EVs in Northern Ireland, taking into account the wider UK policy, legislative and funding environment as part of a wider clean transport strategy. The Department is developing a charging infrastructure plan, in partnership with key stakeholders from government, public, private and third sectors to develop the charging network.				Action Plan by the autumn 2022.
19.	Lagan Pedestrian and Cycle Bridge	Transport Planning and Infrastructure / Cycle Network	A Belfast Region City Deal (BRCD) Infrastructure project being developed by DfI	If confirmed in the final Belfast Region City Deal, the proposed bridge, is one of 3 infrastructure projects being taken forward by DfI as part of BRCD. It will span the River Lagan from the Gasworks to the Ormeau Embankment aiming to improve accessibility to the city centre for residents and communities east of the River Lagan. The Bridge also aims to encourage both people from the city centre and local communities to use Ormeau Park for recreational use.	TBC – depends on BRCD prioritisation	TBC – depends on BRCD prioritisation	Increased levels of walking and cycling could reduce congestion, improve air quality, reduce noise pollution and contribute to a cleaner environment.	Full approval for the bridge is progressing. The current expectation is to award the Design & Build contract by June 2023 with construction completing Spring/Summer 2025.
20.	Promoting travel alternatives: Behaviour change programmes	Promoting Travel Alternatives / Promotion of Cycling, Walking, Schools and Workplace Travel Plans	PHA, DfI and DAERA, Belfast City Council, EU Interreg	Sustrans works in a range of settings: • Schools with the Active School Travel Programme; • Workplaces with the Leading the Way Programme; • Communities – to promote walking and cycling as a mode of transport.	Ongoing 2015 2016	Ongoing - Currently all these programmes are underway, with a review of extension.	Changing people's travel habits – swapping the car for walking, cycling and public transport.	Sustrans still waiting to see if Active School Travel programme contract will continue beyond July 2022. Recruiting new schools for Sept 2022 as instructed by funders but no written contract yet.

			(delivered by Sustrans) Cycling UK/ Sustrans/ European Cycling Federation Sustrans	In addition: • Active Travel Hub in CS Lewis Square, east Belfast and more recently Whiterock Community Centre in west Belfast – provides a base for range of interventions with community groups, individuals and workplaces. • Project to encourage walking and cycling in new Forthmeadow Greenway • Applied to run Active Travel Hub at Cathedral Gardens **Cycle-friendly Employer Accreditation Scheme** – Cycling UK run this in N. Ireland with support from Sustrans. **Pedal Perks** cycling discount scheme offered by range of businesses to encourage cycling to premises.	2017 2018 2017		Active Travel Hubs are visible in the community to provide info & encourage travel alternatives. Provide facilities to encourage active travel e.g. cycle parking; changing facilities; mileage incentives. Incentivises active travel to shops and facilities.	PHA is completing an evaluation of active travel behaviour change initiatives delivered by Sustrans. Communities project on-going, supporting those living in deprived communities to travel actively. No confirmation of funding from DAERA may mean Active Travel Hub at CS Lewis Square will close. No other funding streams. Whiterock Hub set to open In July 2022. Active Travel Centre open (currently until March 2023) in the North West Transport Hub in Derry / Londonderry. 30 Ride and Walk Leaders recruited on the Forthmeadow greenway project. Waiting news on Active Travel Hub at Cathedral Gardens. New companies continue to sign up to Employer Accreditation scheme. Increasing number of retailers joining Pedal Perks.

								DAERA's Air and Environmental Quality Team (AEQ) are currently delivering Clean Air Day presentations to primary schools across NI. Over sixty schools responded to our offer to give a short presentation. The first 35 schools to respond are now receiving the presentation. The schools have also been given a factsheet with an air pollution word search and useful air quality links. The talks began in mid-May and will conclude on 16th June 2022. The talks have received a very positive response with pupils asking great questions and offering lots of suggestions as to how they can help by being 'Clean Air Heroes'.
21.	Transport planning and infrastructure: Build safe protected cycling infrastructure	Transport Planning and Infrastructure / Cycle Network	DfI Sustrans	**Belfast Bike Life report** – produced every 2 years in collaboration with DfI. Provides evidence of support for cycling and progress to date, includes a public survey of attitudes to cycling. **Belfast Cycling Network** – published in June 2021, the	2015 Latest Bike Life report published in March 2020 2017	Ongoing Next report due Spring 2022	Safety is biggest barrier to people cycling. Traffic-free greenways enable more people to walk or cycle. Urban greenways used by commuters as well as leisure trips.	New Belfast report published in May. It is now called the Walking and Cycling Index. Shows very little infrastructure built in past 2 years in Belfast. Sustrans funded to coordinate Council's development of

				Strategy sets out government plans to develop cycle routes in Belfast. The Bicycle Strategy will be followed with a Cycling Network for Belfast to guide the development and operation of cycling infrastructure in the city for the next 10 years. A public consultation on the draft Belfast Cycling Network was held in January 2017 and in early 2018, a consultation report was published. **Safe Routes to School campaign** – to enable children to walk and cycle rather than being driven. **Strategic plan for Greenways** – Paths for Everyone. Funding pot for Councils to develop greenways. Sustrans can assist Councils with community consultation and feasibility plans.	Ongoing Part of Active School Travel Programme/ lobbying work 2016	Report published June 2021 Ongoing Ongoing		greenways. Progress report delivered to DfI in May.
22.	Traffic management	Traffic Management / Strategic Highways Improvements, reduction of speed limits, 20mph zones	DfI Sustrans	Introduction of 20 mph speed limits **School Streets** – closing area around schools to traffic. This is a proposed pilot scheme, which has proved successful and popular in GB. **Low Traffic Neighbourhoods** – implement car-free areas.	2019 TBC	Ongoing	As above, as we saw in lockdown less traffic encourages people to walk or cycle. Traffic restraint measures necessary to reduce volume of traffic and polluting vehicles.	Sustrans lobbying for a School Streets programme. No progress reported to date. Low Traffic Neighbourhoods to be created. Walking & cycling Index shows 5% of Belfast streets have a 20mph

								speed limit; down from 7% in 2019.
23.	Dust monitoring	Other / Air Quality Monitoring and Assessment	Belfast Harbour Commissioners	Monitor particulate matter from bulk cargoes in Port operational areas of Belfast Harbour Estate and implement mitigation measures.	Commenced	Ongoing	Identify areas of high concentration for action.	Monitoring ongoing. High concentration areas identified.
24.	AQ Modelling	Other / Air Quality Monitoring and Assessment	Belfast Harbour Commissioners	Complete Baseline Air Quality Modelling of the Belfast Harbour Estate.	Commenced	2022	Establish theoretical baseline & identify areas for attention.	Baseline modelling completed.
25.	NO_2 Monitoring	Other / Air Quality Monitoring and Assessment	Belfast Harbour Commissioners	Conduct monthly diffusion tube monitoring of NO_2 at 18 sites within the Belfast Harbour Estate.	Commenced	Ongoing	Establish baseline of NO_2 levels & identify areas for attention.	Monitoring ongoing & baseline established.
26.	Real Time AQ Monitoring stations	Other / Air Quality Monitoring and Assessment	Belfast Harbour Commissioners	Implement real time Air Quality Monitoring for air pollution at 5 locations within the Belfast Harbour Estate.	2021	Ongoing	Accessible Air Quality information/ potential link to SMART traffic controls.	5 real time AQ sensors installed. 2021 data validated for NO_2 and PMs.
27.	Strategy	Policy Guidance and Development Control/Other	Belfast Harbour Commissioners	Publish a Harbour Air Quality Strategy.	2021	2021	Public commitment to improve Air Quality.	Air Quality Strategy commitment published. Final Strategy in development.
28.	Low/zero carbon fuels	Promoting Low Emission Transport / Company Vehicle Procurement	Belfast Harbour Commissioners	Replace the light vehicle fleet with electric/alternative fuels.	2021	2025	Reduced air emissions from vehicles.	Ongoing. Further options being considered. COVID-19 and supply specification issues encountered.
29.	EV Charging	Promoting Low Emission Transport / Procuring Alternative Refuelling Infrastructure to Promote LEV, EV recharging, gas fuel recharging	Belfast Harbour Commissioners	Work with tenants to encourage installation of EV charging points.	2021	2025	Reduced air emissions from vehicles.	Potential partners identified; however further scoping work required.
30.	Car sharing	Alternatives to Private Vehicle	Belfast Harbour	Introduce a Car Sharing Scheme for tenants.	2021	Ongoing	Reduced air emissions from vehicles (subject to	No progress.

		Use / Car & Lift Sharing Schemes	Commissioners				relaxation of Covid-19 restrictions).	
31.	Active Travel	Promoting Travel Alternatives / Promotion of cycling and walking	Belfast Harbour Commissioners	Encourage active travel, including walking and cycling to; from and within the estate for local journeys.	2021	Ongoing	Reduced air emissions from vehicles.	No campaign delivered to date.
32.	SMART traffic control	Traffic Management / Other	Belfast Harbour Commissioners	Queens Road Mobility project / SMART traffic system.	2021	2023	Reduced air emissions from vehicles.	Smart Traffic implemented with one screen left to connect between PRONI and Olympic House - planned connectivity 4th July. Collecting environmental data at 7 locations on Queens Road together with vehicle information such as counts, etc.
33.	Integrated commuter plans	Promoting Travel Alternatives / Workplace Travel Planning	Belfast Harbour Commissioners	Integrated commuter plans to reduce private car use including first and last mile connectivity.	2022	2025	Reduced air emissions from vehicles.	Strategic Transport Masterplan (STMP) for Queen's Island under development (it will include sustainable travel measures with the aim of encouraging modal shift; current target 30%).
34.	Cycle lanes	Transport Planning and Infrastructure / Cycle Network	Belfast Harbour Commissioners	Additional cycle lanes and crossing points.	2020	2025	Reduced air emissions from vehicles.	Improved cycle lanes on Airport Road and Sydenham Road.
35.	Green corridors	Transport Planning and Infrastructure / Other – Blue and Green Infrastructure	Belfast Harbour Commissioners	Introduce Green spaces and screening/corridors.	2021	2025	Absorb vehicle emissions.	No progress to date.
36.	Shore-side power	Promoting Low Emission Plant / Shift to	Belfast Harbour	Assess feasibility of shore power – cruise/ferry vessels.	2021	2025	Reduced air emissions from vessels.	Feasibility study completed and Phase 2 funding for capital

		installations using low emission fuels for stationary and mobile sources	Commissioners					works expected next year.
37.	Decarbonise port cranes & HGV's	Promoting Low Emission Plant / Shift to installations using low emission fuels for stationary and mobile sources	Belfast Harbour Commissioners	Substitute hydrocarbon fuels with low carbon alternatives – cranes/plant & HGV's.	2021	2025	Reduced air emissions from port plant & equipment.	HVO trial completed on first heavy machinery and selected marine assets; namely 2 No. Pilot Boats viable for Phase 2 trial identified.
38.	Decarbonise work & pilot boats	Promoting Low Emission Plant / Shift to installations using low emission fuels for stationary and mobile sources	Belfast Harbour Commissioners	Trial alternative marine fuels - Work and Pilot Boats.	2022	2025	Reduced air emissions from vessels.	As above.
39.	Commercial incentive	Promoting Low Emission Plant / Other - Feasibility Study	Belfast Harbour Commissioners	Assess feasibility of Clean Vessel Incentive Scheme.	2022	2023	Reduced air emissions from vessels.	Initial assessment carried out. No immediate plans to implement it.
40.	Ship planning	Other – Vessel Management	Belfast Harbour Commissioners	Optimise Vessel Passage Plans & Berth Utilisation.	2020	Ongoing	Reduced air emissions from vessels.	Port Management Information Systems (PMIS) in use.
41.	Zero carbon vessel	Promoting Low Emission Plant / Shift to installations using low emission fuels for stationary and mobile sources.	Belfast Harbour Commissioners	Introduce electric/hybrid workboat.	2021	Ongoing	Reduced air emissions from vessels.	Electric workboat (Sea Sweeper) purchased and operated as proof of concept.

42.	Driver ECO Skills	Vehicle Fleet Efficiency / Driver Training and ECO Driving Aids	Belfast City Council	Driver ECO Training & Refresher Driver ECO Training & Monitoring by GPS.	From 2020/21 onward	Ongoing	Fuel consumption reduction.	All Drivers are now trained in ECO driving as part of induction process and refresher training is also carried out where appropriate
43.	Promoting Cleaner commercial vehicles	Promoting Low Emission Transport / Company Vehicle Procurement- Prioritising uptake of low emission vehicles	Belfast City Council	Replacing older commercial EU3-4 vehicles above 3.5 ton with EU6 cleaner standard.	From 2020/21 onward	Ongoing	Emission level reduction.	An ongoing replacement plan has been carried out and all remaining EU3-4 vehicles will be replaced with EU6 cleaner emission standard vehicles by 31st March 2023.
44.	Vehicle Emission Testing	Vehicle Fleet Efficiency / Testing Vehicle Emissions	Belfast City Council	All fleet vehicles tested annually to manufacturers approved EU standard.	From 2020/21 onward	Ongoing	Ensuring vehicles meet their EU approved Standard.	Of 432 vehicles presented to DVLA in the last 12 months for their GVC/MOT annual test, over 98% passed the test. No vehicles failed for not achieving emissions standards.
45.	Promoting Electric Commercial panel vans	Promoting Low Emission Transport / Company Vehicle Procurement	Belfast City Council	Replacing older commercial panel vans up to 3.5 ton with Electric.	From 2020/21 onward	Ongoing	Reduction in the commercial panel van fleet carbon footprint.	Under current capital vehicle replacement plans, the number of electric vans in service will increase from 12 to 24 by 31st March 2023.
46.	Promoting Vehicle Electric Bin-lifts	Promoting Low Emission Transport / Company Vehicle Procurement	Belfast City Council	Replacing Refuse Collection Vehicles with rear electric bin-lifts.	From 2020/21 onward	Ongoing	Refuse Collection Vehicle fuel consumption reduction.	Under current vehicle capital plans, the number of RCVs with electric bin lifts will increase to 40 (out of 74) by 31st March 2023, with the overall number of RCVs reducing from 74 to 70 in the same period.

47.	Just Eat Belfast Bikes	Transport Planning and Infrastructure / Public Cycle Hire Scheme	Belfast City Council	Public Bike Scheme in City Centre – 300 bikes and 30 docking sites originally in 2015 in public places, including Titanic Quarter, the Gasworks, Queen's University and York Street. This has now increased to 47 docking stations.		From 2015 onward	Ongoing	Cutting congestion and improving air quality.	Expansion plan approved; a further four stations will be delivered in June 2022 and eight more later in 2022.
48.	Local Development Plan	Policy Guidance and Development Control / Other Policy	Belfast City Council	Number of planning permissions granted on zoned Open Space. Policy: draft Plan Strategy LDP policy OS1	Belfast City Council Planning decisions and liaising with CNS.	The plan is currently out for public consultation (until 7th July 2022) on a number of modifications to the draft Plan Strategy	2035	To limit the net loss of zoned open space for uses other than those ancillary or compatible with open space use.	Monitoring of its indicators will commence once the LDP Plan Strategy has been adopted.
			Belfast City Council	Number of planning permissions that secure Green and Blue Infrastructure improvements, including through Developer Agreements. Policy: SP8 GB1	Belfast City Council through Major Planning decisions (BCC) and S76 Agreements.		2035	75% of major permissions contributing to G & B Infrastructure improvements.	
			Belfast City Council	The number of applications granted for renewable energy development. Policy: ITU4	BCC monitoring major planning decisions with Development Management		2035	Increase in number of renewable energy schemes.	

			Belfast City Council	Number of people travelling by sustainable modes – active travel, bus rail & BRT. Policy: TRAN1 TRAN3 TRAN4 TRAN5 TRAN9	Travel survey for Northern Ireland (TSNI) (DfI).		2035	An increase in the number of people travelling by sustainable modes.	
			Belfast City Council	Number of new dwellings permitted annually outside settlement limits. Policy: DC policies	Housing Monitor and Planning decisions (BCC).		2035	To sustainably manage the number of new dwellings in the countryside.	
			Belfast City Council	Number of non-residential proposals permitted annually outside settlement limits. Policy: DC policies	Planning decisions (BCC).		2035	To sustainably manage the amount of new non-residential development in the countryside.	
49.	Additional Air Quality Monitoring	Other / Air Quality Monitoring and Assessment	Belfast City Council	Additional NO_2 and PM Monitoring using Small Sensors and Diffusion Tube Technologies to assess air quality within Belfast City Council area.		Ongoing	Ongoing	To provide more detailed and real time information on pollution levels across the city.	Six small scale air quality sensors (Zephyrs) to monitor NO_2, PM_{10} and $PM_{2.5}$ were installed in July 2021 as part of the Detailed Air Quality Assessment Project – as per measure 50

								below; also, council officers are continually reviewing air quality data, to determine where new diffusion tube sensors can be placed to fill any information gaps. To date, an additional 5 NO_2 diffusion tubes have been placed throughout the city since the end of 2021. The results will be reported in next year's Progress Report.
50.	Detailed Air Quality Assessment for Fine Particulate Matter ($PM_{2.5}$) and Nitrogen Dioxide (NO_2) for the Belfast City Council area	Other / Air Quality Monitoring and Assessment	Belfast City Council/ DAERA	The purpose of this project is to generate, through the application of ambient monitoring and atmospheric dispersion modelling, detailed information on fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2) concentrations within the city boundary in order to ascertain whether UK air quality objectives, European Commission limit values or WHO guideline values are being achieved in relevant human health receptor locations.	February 2021	March 2023	The outcome of the modelling study may serve to assist in the development of mitigation policies and measures to better address $PM_{2.5}$ and NO_2 concentrations across the city.	Belfast City Council is currently undertaking a detailed assessment for the city, for fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2) pollutants. This project commenced in February 2021 and is to be finalised in early 2023. The Monitoring Phase of this project is now finalised; Emissions Inventory Compilation and Dispersion Modelling is ongoing. We will report on outcomes of this project within the next year's Progress Report.
51.	Enforcement within Smoke Control areas and	Other / Enforcement Charges and	Belfast City Council	Belfast City Council will undertake greater enforcement within the city's smoke control	Ongoing	Ongoing	Reduced smoke emissions and greater levels of compliance	Enforcement within Smoke Control Areas is continuously monitored.

	education concerning the use of polluting fuels.	Public Awareness		areas, and it will develop and deliver an awareness campaign to educate Belfast residents of the adverse air quality impacts of using polluting fuels within their homes.			within Smoke Control Areas	Belfast City Council also provides information on its website in relation to Smoke Control Areas within Belfast City. An awareness campaign was also carried out on 16th June 2022 (Clean Air Day), publicising Smoke Control Areas within Belfast, as well as other measures which individuals can take to improve air quality in the city. The campaign also provided links to the council's website in relation to Air Quality information. A public information scheme is planned for autumn 2022 and will be promoted through the council social and other media channels.
					Awareness Campaign August 2022	Ongoing	Greater awareness about polluting fuels and their adverse ambient impacts on air quality.	

9 Conclusions and Proposed Actions

9.1 Conclusions from New Monitoring Data

Belfast City Council has presented a range of monitoring data within this Progress Report that addresses a number of the pollutants prescribed within the UK Air Quality Strategy. Although these pollutants are routinely measured across the city, the council's focus remains principally upon addressing existing Air Quality Management Areas and upon those areas of the city centre where traffic congestion might lead to further exceedances of the nitrogen dioxide annual mean and hourly objectives. There were no monitored exceedances for any of the Air Quality Strategy objectives for sulphur dioxide, benzene and particulate matter during 2021.

Nevertheless, 2021 monitoring data for nitrogen dioxide confirms continuing exceedances of the annual mean objective for nitrogen dioxide within the M1 Motorway / A12 Westlink Air Quality Management Area at Henry Place. Defra NO_2 distance calculations have been provided for the above location to calculate expected concentrations at a relevant receptor locations.

The Diffusion Tube Processing Tool has predicted a nitrogen dioxide annual mean concentration of 29.9 µg/m^3, which indicates that no exceedance was likely at the relevant human health receptor location (Appendix A).

Due to risk of exceedance at relevant receptors on the opposite side of the A12 Westlink to this location, an additional diffusion tube was located at North Queen Park during 2021. We also installed a further tube at Henry Place (Henry Place 2), located closer to residential premises than the original Henry Place tube, which is located at a worst-case kerbside location (directly adjacent to the A12 Westlink). 2021 monitoring results from these additional diffusion tubes have demonstrated that no exceedances of the nitrogen dioxide annual mean objective were likely at the relevant human health receptor locations.

There were no other monitored exceedances of Air Quality Strategy objectives for nitrogen dioxide within the council area during 2021. In addition, 2021 was the second year when the annual mean objective was achieved at the Stockman's Lane AQMS. Whilst the 2021 reduction in annual mean nitrogen dioxide levels continues the overall declining trend, it is

acknowledged that the Covid-19 pandemic has had an extraordinary impact on the monitored 2020 and 2021 nitrogen dioxide annual means.

Historically, modelled and monitored exceedances of the 1-hour mean objective for nitrogen dioxide were encountered only in the vicinity of the M1 Motorway / A12 Westlink corridor. As a result, this is the only Air Quality Management Area within Belfast that has been declared on the basis of exceedances of the 1-hour objective.

From ambient monitoring data for the Stockman's Lane and Westlink/Roden Street sites, as summarised in Table 2.4, it can be seen that the number of exceedances of the hourly objective has substantially decreased over recent years, demonstrating compliance with the 200 µg/m^3 objective, not to be exceeded more than 18 times per year - since 2013. In fact, there have been no exceedances of the 1-hour mean objective of 200 µg/m^3 at either site since 2018. This is in keeping with the relationship between the nitrogen dioxide annual mean and 1-hour mean objectives, detailed within Section 7.90 of the April 2021 Defra LAQM.TG(16) guidance, which states that previous research carried out on behalf of Defra and the Devolved Administrations has identified that exceedances of the NO_2 1-hour mean objective are unlikely to occur where the annual mean is below 60µg/m^3. This assumption is considered valid and local authorities should therefore refer to it if NO_2 1-hour mean monitoring data is not available; typically if monitoring NO_2 using passive diffusion tubes.

The nitrogen dioxide annual mean concentration at the Ormeau Road AQMS has been reasonably consistent since 2014 (24-27 µg/m^3). Although results for 2021 (similarly like in 2020) at this location are markedly lower when compared to previous years (17 µg/m^3), they still appear representative, given that all sites have followed the same declning trend, due to behavioural changes and restrictions as a result of the Covid-19 pandemic.

On the basis of this data, which demonstrates that nitrogen dioxide concentrations are significantly below the annual mean air quality objective, the council has previously considered the case for revoking the Ormeau Road Air Quality Management Area (AQMA) for exceedances of the nitrogen dioxide annual mean objective. During 2019, the council liaised with the Department of Agriculture, Environment and Rural Affairs regarding a potential revocation but it was subsequently decided that since monitoring data from the Ormeau Road site forms part of the calculation of the draft Programme for Government

Framework 2016 – 2021 Indicator 37: Improve air quality, this AQMA and associated monitoring will remain in place over the next few years. The council is planning to revisit options for revocation of the Ormeau Road AQMA next year, upon review and assessment of post Covid-19 2022 monitoring data.

The magnitude of the decrease in nitrogen dioxide levels along the Upper Newtownards Road has been beyond the year-on-year reductions that might have been reasonably predicted using Defra's forward projection factors; even before Covid-19. From the data in Table 2.3, it can be seen that annual mean concentrations of nitrogen dioxide along the Upper Newtownards Road have remained in the range 31 – 20 µg/m^3 since 2017, meaning that the nitrogen dioxide annual mean objective is now being consistently achieved along the Upper Newtownards Road. As noted above, the 2020 annual mean revealed a drop to 20 µg/m^3, whilst the 2021 annual mean was only slightly higher at 21 µg/m^3; the 2020 and 2021 annual means both being due to significant reductions in traffic numbers, as a result of the Covid-19 pandemic restrictions and subsequent home-working.

Furthermore, the Knock Road non-automatic roadside diffusion tube, located at the junction of the Upper Newtownards Road, Hawthornden Way and the Knock Road (worst case scenario location within this AQMA) has not recorded exceedances of the nitrogen dioxide annual mean objective since 2016. The 2017 calendar year was the first year when the annual mean concentration at the Knock Road junction fell below the 40 µg/m^3 air quality objective (36µg/m^3), which was still the case in 2021 (26 µg/m^3). The council will continue to monitor nitrogen dioxide concentrations along the Upper Newtownards Road and at the junction with the Knock Road throughout 2022 in order to determine whether this improvement in ambient conditions is sustained throughout the ongoing recovery from the Covid 19 pandemic and what implications it may have for this Air Quality Management Area.

Moreover, by early 2023 we anticpiate having finalised a detailed assessment for the city, for fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2) pollutants. It is considered that this detailed atmospheric dispersion modelling, in addition to our monitoring data, will provide appropriate evidence to help inform decisions to revoke the Air Quality Management Areas along the Ormeau Road and Upper Newtownards Road. We will liaise with DAERA concerning revocation of these AQMAs.

In conclusion, Belfast City Council will continue to monitor ambient nitrogen dioxide levels at all current monitoring locations in order to ensure that recent downward trends are maintained. We are however aware that the 2020 and 2021 pollution levels were atypical and very much impacted by Covid-19 restrictions and home working. The above-mentioned decreases in nitrogen dioxide annual mean concentrations are much greater than would have been predicted and so we will keep these results under review and follow Defra's advice when undertaking any future year projections for air pollution levels in Belfast that incorporate this data.

Finally, Belfast City Council confirms that no new Air Quality Management Areas need to be declared for the city at this time. There have been no monitored exceedances of Air Quality Strategy Objectives for any pollutant other than nitrogen dioxide over recent years across the city, and no significant new sources of air pollution have been identified, which would have the potential to alter this position.

Nevertheless, the council is aware of the recent evidence from national studies showing that domestic solid fuel burning contributes more than previously thought to particulate emissions. The contribution of solid fuel combustion to for fine particulate matter ($PM_{2.5}$) concentrations has also been recognised within the UK Clean Air Strategy 2019. Moreover, the National Atmospheric Emission Inventory, 'Air Pollutant Inventories for England, Scotland, Wales, and Northern Ireland 2005-2019' publication highlights that for $PM_{2.5}$, residential combustion alone accounts for 54% of 2019 emissions. Emissions from transport have decreased 57% since 2005, due to progressively more stringent exhaust emissions standards over time but declines in emissions have been offset by increases in emissions from the residential sector, and in particular, the combustion of wood, as described for the coarser PM fraction, PM_{10}.

Belfast City Council and the Department for Environment, Agriculture and Rural Affairs (DAERA) have therefore decided to undertake a detailed assessment for the city, for fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2) pollutants. This project commenced in February 2021 and is to be finalised in early 2023. We would anticipate reporting outcomes of this project within the June 2023 Progress Report.

9.2 Conclusions relating to New Local Developments

Of the planning applications received and reviewed during 2021, it was concluded that they would have no significant negative impact on existing local air quality. In addition, no significant changes in local circumstances were identified within Belfast, which would require detailed consideration. It is not considered necessary therefore to proceed to a 'Detailed Assessment' based on new local developments or potential sources.

9.3 Proposed Actions

In conclusion, this 2022 Progress Report has not identified the need to proceed to a Detailed Assessment for any pollutant under consideration.

The council is however aware of recent evidence from national studies showing that domestic solid fuel burning contributes more than previously thought to particulate emissions. Belfast City Council has therefore decided to undertake a detailed assessment for the city, for fine particulate matter $PM_{2.5}$ and nitrogen dioxide pollutants. This project commenced in February this year and we would anticipate reporting on its outcomes within the June 2023 Progress Report.

Furthermore, Belfast City Council has already highlighted that it operates an expansive air quality monitoring network across the city, predominantly for nitrogen dioxide. However, in 2022, we have already added additional three diffusion tubes to our monitoring network. On this basis, the council is content that current monitoring locations provide a detailed representation of pollution levels for the city and, as a consequence, do not need to be expanded further at this time. There may however be a need for additional monitoring for $PM_{2.5}$ by reference methodology on the basis of the outworkings of the detailed assessment project. it is noted that the Environment Act 2021 requires the UK government to set at least one long-term air-quality target, as well as a target for fine particulate matter ($PM_{2.5}$). These targets are to be laid before Parliament by the 31st October 2022.

Moreover, as part of the council's ongoing Detailed Assessment project for fine particulate matter and nitrogen dioxide, five new monitoring locations, employing small sensor air quality monitoring equipment, were installed in July 2021; that will provide a more detailed analysis of particulate matter and nitrogen dioxide concentrations over the coming years.

To ensure that we continue to collect high quality data, in 2019/2020 Belfast City Council replaced its ageing API NOx analysers at three monitoring sites; the Upper Newtownards Road, Stockman's Lane and Ormeau Road. The non-heated Met One Instruments BAM 1020 PM_{10} particulate matter analyser, located at the Stockman's Lane site, has also been upgraded to a new heated inlet instrument. The only analyser, which has not been yet replaced is the API Model 200E NOx analyser, located at Westlink/Roden street site, which still continues to perform satisfactorily and remains supported by the manufacturer.

With regard to our four Air Quality Management Areas, a review of the monitoring data within the AQMAs and for the city generally indicates that there have been improvements in annual mean nitrogen dioxide levels across the city for many years. As a result, Belfast City Council will consider options for revocation of the Ormeau Road and Upper Newtownards Road AQMAs upon consideration of annual statistics for the 2022 monitoring year and the outcome of the detailed assessment for $PM_{2.5}$ and NO_2 for the city. Accordingly, the council will liaise with the Department of Agriculture, Environment and Rural Affairs, Department for Infrastructure and other relevant authority partners regarding these potential revocations.

In conclusion, Belfast City Council will continue to monitor ambient nitrogen dioxide levels at all current monitoring locations in order to ensure that recent downward trends are maintained. We are however aware that 2020 and 2021 nitrogen dioxide annual mean concentrations were very much impacted by Covid-19 restrictions. The decreases in nitrogen dioxide annual mean concentrations in 2020, continuing through 2021, were much greater that would have been predicted and so we will keep these results under review and follow Defra's advice when undertaking any future year projections for air pollution levels in Belfast that incorporate data for these two years.

In terms of forward actions, in 2021 the council, along with competent authority and other partner organisations across the city, developed a new 5-year Air Quality Action Plan for the Belfast that will cover the period 2021-2026. The Action Plan was approved by Defra's technical assessors and DAERA in February 2022 and is currently available on the council's website via the following weblink:
https://www.belfastcity.gov.uk/Documents/Belfast-City-Air-Quality-Action-Plan-2021-2026

The primary aim of this new Air Quality Action Plan is to continue to reduce NO_2 emissions from transport sources and to promote and enable a shift towards more sustainable modes of transport in order to achieve compliance with UK Air Quality Objectives for NO_2. Where necessary, an additional aim of this Action Plan is to identify, develop and implement mitigation measures to address concentrations of fine particulate matter ($PM_{2.5}$) across the city.

Belfast City Council will monitor implementation of the Air Quality Action Plan 2021-2026 via at least annual meetings of the Air Quality Action Planning Steering Group and will report progress to the Department of Agriculture, Environment and Rural Affairs (DAERA) via our various Action Plan Progress Reports or alternatively via Annual Status Reports, when they are introduced.

10 References

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Environment (Northern Ireland) Order 2002.
https://www.legislation.gov.uk/nisi/2002/3153/contents/made

DAERA Northern Ireland Air – Air Quality in Northern Ireland website
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11 Appendices

Appendix A: Quality Assurance / Quality Control (QA/QC) Data

Appendix B: Impact of COVID-19 upon LAQM

Appendix A: QA/QC Data

QA/QC Diffusion Tube Monitoring

In 2021, Belfast City Council appointed Gradko International Ltd. to supply, analyse and report data for its diffusion tubes. Gradko employs a 20% triethanolamine solution for monitoring ambient nitrogen dioxide and adheres to the requirements of the government's 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users' publication.

Government provides an additional layer of surety for local authorities operating nitrogen dioxide diffusion tubes through the independent analytical proficiency-testing scheme, the AIR PT scheme.

AIR is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combined two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme. As part of this scheme laboratories are provided with a number of test samples that are designed to test their proficiency in undertaking chemical analysis of diffusion tubes.

For the 2021 sampling period, Gradko's performance was assessed as follows:

gradko environmental
(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 email:diffusion@gradko.com

AIR PT Nitrogen Dioxide Proficiency Scheme Results 2021

Methods: GLM 7 – CARY 60 Spectrophotometer

AIR PT Proficiency Scheme - Nitrogen Dioxide 2021					
			Procedure GLM 7		
Date	Round	Assigned value	Measured concentration	z-Score	% Bias
Feb-21	AIR PT 42-1	1.71	1.13	-4.17	-33.9%
Feb-21	AIR PT 42-2	1.74	0.81	-6.29	-53.4%
Feb-21	AIR PT 42-3	1.40	0.83	-5.43	-40.7%
Feb-21	AIR PT 42-4	1.37	1.16	-1.91	-15.3%
Mar-21	AIR PT 42-1 Rpt	1.71	1.79	0.62	4.7%
Mar-21	AIR PT 42-2 Rpt	1.74	1.75	0.08	0.6%
Mar-21	AIR PT 42-3 Rpt	1.40	1.40	0	0.0%
Mar-21	AIR PT 42-4 Rpt	1.37	1.41	0.39	2.9%
May-21	AIR PT 43-1	1.19	1.23	0.35	3.4%
May-21	AIR PT 43-2	1.19	1.22	0.26	2.5%
May-21	AIR PT 43-3	2.00	1.97	-0.2	-1.5%
May-21	AIR PT 43-4	1.94	1.98	0.26	2.1%
Aug-21	AIR PT 45-1	1.58	1.58	0	0.0%
Aug-21	AIR PT 45-2	1.57	1.56	-0.08	-0.6%
Aug-21	AIR PT 45-3	2.43	2.41	-0.08	-0.8%
Aug-21	AIR PT 45-4	2.42	2.37	-0.28	-2.1%
Oct-21	AIR PT 46-1	2.7	2.77	0.33	2.6%
Oct-21	AIR PT 46-2	2.71	2.6	-0.49	-4.1%
Oct-21	AIR PT 46-3	2.17	2.06	-0.65	-5.1%
Oct-21	AIR PT 46-4	2.13	2.15	0.13	0.9%

Results from AIR-PT 42 showed a significant negative bias. An investigation was carried out and a repeat set of samples ordered (Mar-21) to confirm results.

Results from the investigation showed for AIR PT samples, extraction of nitrite was not complete and required further time on the shaker to extract all nitrite from the tubes. Successful extraction was demonstrated on the repeat Air PT samples in March 2021.

The investigation also showed that for laboratory standards and customer samples, extraction of nitrite from tubes was complete without further shaking, and there was no risk associated with results reported to customers.

For any queries please contact the Laboratory Manager at linda@gradkolab.com

Linda Gates 05/05/2022

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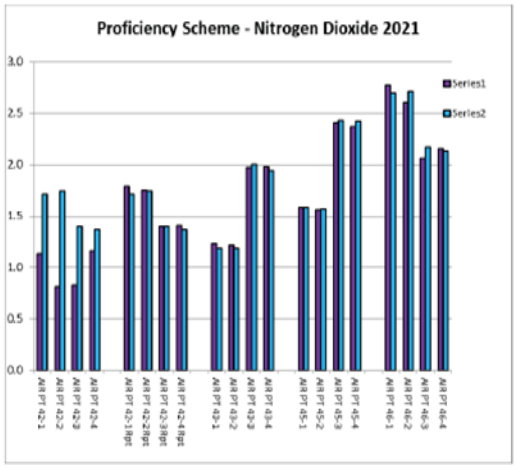
gradko environmental
(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 email:diffusion@gradko.com



The council's monitoring network currently comprises 71 diffusion tubes situated throughout the city at 63 locations. The monitoring has been completed in adherence with Defra's *Local Air Quality Management Technical Guidance document LAQM.TG(16)* and 2021 Defra's *Diffusion Tube Monitoring Calendar*.

Diffusion Tube Annualisation

Guidance for the treatment of diffusion tube monitoring data, as provided in table 2.5 of this report, requires that where annual mean results are based upon monitoring data of less than 9 months sampling, these means should be “annualised” in accordance with the procedure outlined in Box 7.10 of the government’s local air quality management technical guidance LAQM.TG16.

In order to complete the annualising process, councils are required to identify nearby long-term background continuous monitoring sites for nitrogen dioxide or alternatively use a number of background diffusion tube sites with 12 months of data.

Based on 2021 monitoring data, annualisation was required for two non-automatic diffusion tube monitoring sites; Ardmore Park (63% data capture) and Blythefield Park (59.5% data capture). All tubes were annualised using automatic monitoring results from Belfast Lombard Street and Ballymena Ballykeel automatic monitoring stations, both of which had >85% data capture.

Table A.1 - Annualisation Summary for Diffusion Tubes

Annualisation Summary - Information Only

Diffusion Tube ID	Annualisation Factor Lombard Street AURN	Annualisation Factor Ballymena Ballykeel	Annualisation Factor Site 3 Name	Annualisation Factor Site 4 Name	Average Annualisation Factor	Raw Data Simple Annual Mean (µg/m3)	Annualised Data Simple Annual Mean (µg/m3)
74	0.8880	0.9139			0.9010	32.7	29.4
103	0.8796	1.1015			0.9906	25.8	25.5

Diffusion Tube Bias Adjustment Factors

To further ensure that its diffusion tube monitoring data is as accurate as possible, the council co-locates a number of diffusion tubes with reference method compliant chemiluminescent nitrogen dioxide analysers at the Lombard Street, Newtownards Road, Westlink/Roden Street and Stockman's Lane monitoring sites. This process allows a bias adjustment factor (with a 95% confidence interval as an estimate of the uncertainty on the bias adjustment factor) to be calculated and used to correct the diffusion tube monitoring data. In the case of the diffusion tube data presented in this 2022 report, the monitoring data has been corrected using a bias adjustment factor derived from three roadside co-location studies undertaken at the Upper Newtownards Road, Westlink/Roden Street and Stockman's Lane monitoring sites.

Precision calculations undertaken for all of the above sites in the co-location study indicated a "good" precision rating for all measurement periods. Automatic monitoring data capture rates were considered "good" at all sites with more than 90% data capture for all measurement periods.

The local bias adjustment factor was calculated using the Defra Diffusion Tube Processing Tool (with a 95% confidence interval as an estimate of the uncertainty on the bias adjustment factor). Calculations are presented within Table A.5.

For those local authorities that do not wish or are unable to undertake a triplicate diffusion tube colocation study, government publishes a database of bias adjustment factors derived from other local authority co-location studies throughout the United Kingdom. These factors are used subsequently to calculate a combined bias adjustment factor for a range of nitrogen dioxide diffusion tube laboratories.

The latest factors were published in April 2022 and the derived bias adjustment factor for Gradko Laboratories for a 20% solution of triethanolamine was 0.84. This factor is slightly higher than the council's 2021 locally derived bias adjustment factor of 0.79. The council therefore considered both factors within this assessment, although our locally derived factor is considered acceptable and of the good precision. As we have always used our own bias adjustment factors, we will continue with the same

methodology for consistency in results.

Consequently, Belfast City Council have applied a local bias adjustment factor of 0.79 to the 2021 monitoring data. A summary of bias adjustment factors used by the Council over the past five years is presented in Table A.2.

Belfast City Council also undertook adjustment of diffusion tubes results using the national factor of 0.84. The purpose of this additional exercise was to identify all locations within the city where possible exceedances of the nitrogen dioxide annual mean objective might occur. The additional results are included within the below Table A.4.

Table A.2 - Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local	-	0.79
2020	Local	-	0.79
2019	Local	-	0.91
2018	Local	-	0.86
2017	Local	-	0.78

NO_2 Fall-off with Distance from the Road

Only one annual mean exceedance occurred during 2021 at Henry Place (45.7µg/m^3). This tube is located within existing the M1 Motorway / A12 Westlink Air Quality Management Area and has been the subject of mitigation measures for some time. Nevertheless, Defra NO_2 distance calculations have been provided for the above location to predict annual mean concentrations at relevant receptor locations.

The Diffusion Tube Processing Tool has predicted a nitrogen dioxide annual mean concentration of 29.9 µg/m^3, which indicates that no exceedance of the objective was likely at the relevant receptor location (Table A.3) during 2021. It was previously noted within the *2021 Updating and Screening Assessment for Belfast City Council* that there may have been risk of exceedance at relevant receptors on the opposite side of the M1 Motorway to this location. A new diffusion tube was therefore placed at North Queen Park to identify if receptors are exposed to exceedances in the area. Annual mean results for this receptor location for 2021 have indicated a concentration of 28.3 µg/m^3. Therefore, no exceedance is evident at this location.

Also, as distance correction should be considered at any monitoring site where the annual mean concentration is greater than 36µg/m^3, and the monitoring site is not located at a point of relevant exposure, an additional diffusion tube located at Great Georges Street (36.3 µg/m^3) required distance correction during 2021.

A summary of the LAQM NO_2 fall-off with distance calculator is presented in Table A. 3.

Table A.3 - NO_2 Fall-off with Distance Inputs

Fall off with Distance Inputs

Enter data into the pink cells

Diffusion Tube ID	Distance (m)		NO_2 Annual Mean Concentration (µg/m^3)		
	Monitoring Site to Kerb	Receptor to Kerb	Bias Adjusted and Annualised	Background	Predicted at Receptor
13	0.5	5.5	36.3	21.0	29.8
70	1.0	24.0	45.7	21.0	29.9

Table A.4 - Results of NO_2 Diffusion Tubes 2021with National Bias Adjustment Factor

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2021 (Number of Months or %) [a]	2021 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.84 [b]
1	Royal Victoria Hospital	Urban Background	N	N	100.0%	19.2
2	Black's Road	Roadside	Y (Westlink)	N	100.0%	32.6
3	61 Cromac Street	Roadside	Y (Cromac Street & Albertbridge Rd)	N	90.1%	26.0
4	Ravenhill Road	Roadside	Y (Cromac Street & Albertbridge Rd)	N	100.0%	22.1
5	Queen's Bridge	Roadside	N	N	100.0%	24.5
6	North Road	Urban Background	N	N	92.3%	13.0
7	Donegall Square South	Roadside	N	N	100.0%	24.8
9	Short Strand	Roadside	N	N	100.0%	34.8
10	301 Ormeau Road	Roadside	Y (Ormeau Rd)	N	90.1%	24.9
12	Knock Road	Roadside	Y (Upper Newtownards Rd)	N	100.0%	27.6
13	Great George's Street	Kerbside	Y (Westlink)	N	100.0%	38.4
14	Lisburn Road	Roadside	N	N	100.0%	23.8
15	Shaftesbury Square	Kerbside	N	N	100.0%	28.0
16,19,20	Lombard Street	Urban Centre	N	Triplicate and Co-located	100.0%	22.4
17	Albert Clock	Roadside	N	N	100.0%	29.8
21,22,56	Stockman's Lane	Roadside	Y (Westlink)	Triplicate and Co-located	100.0%	35.5
23,24,32	Upper Newtownards Road	Roadside	Y (Upper Newtownards Rd)	Triplicate and Co-located	100.0%	21.0
25	Whitewell Road	Roadside	N	N	84.7%	20.1
26	Donegall Road	Kerbside	N	N	92.3%	26.3
28	Falls Road and Andersonstown	Roadside	N	N	100.0%	23.7

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2021 (Number of Months or %) [a]	2021 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.84 [b]
30	Station Road	Roadside	N	N	100.0%	18.2
31	Malone Road	Roadside	N	N	100.0%	27.9
33	Great Victoria Street	Roadside	N	N	100.0%	30.1
34	College Square East	Roadside	N	N	100.0%	29.2
35	Chichester Street	Roadside	N	N	100.0%	34.0
36	Cromac & Ormeau Avenue	Kerbside	Y (Ormeau Rd)	N	100.0%	24.8
37	Glenmachan Street	Roadside	Y (Westlink)	N	82.5%	32.0
38	Crèche on M1/Westlink	Roadside	Y (Westlink)	N	100.0%	24.2
39	Ormeau Road (junction with Ravenhill Road)	Roadside	Y (Ormeau Rd)	N	92.3%	28.3
40	Upper Newtownards Road & Holywood Road	Roadside	N	N	100.0%	21.4
41	Crumlin Road	Roadside	N	N	100.0%	24.6
42	228 Antrim Road	Roadside	N	N	100.0%	28.1
44	Shore Road (Ivan Street end)	Roadside	N	N	100.0%	25.3
59	York Street	Roadside	Y (Westlink)	N	100.0%	31.5
63	Queens Square	Kerbside	N	N	90.4%	36.3
65,66,67	Westlink AQMS	Roadside	Y (Westlink)	Triplicate and Co-located	100.0%	32.0
68	Opposite Westlink AQMS	Roadside	Y (Westlink)	N	100.0%	33.8
69	Peter's Hill	Kerbside	Y (Westlink)	N	100.0%	34.3
70	Henry Place	Kerbside	Y (Westlink)	N	90.4%	**48.5**
74	Ardmore Park	Roadside	N	N	63.0%	24.7
76	Titanic Quarter	Roadside	N	N	100.0%	18.3

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2021 (Number of Months or %) [a]	2021 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.84 [b]
77	Poleglass	Roadside	N	N	92.3%	19.2
82	Molyneux Street	Roadside	Y (Westlink)	N	100.0%	30.0
83	North Queen Street	Roadside	N	N	90.1%	30.5
84	Portland Place	Roadside	Y (Westlink)	N	100.0%	28.6
85	Sailortown	Roadside	N	N	100.0%	25.4
86	Little Georges Street	Roadside	Y (Westlink)	N	100.0%	29.0
87	RVH Falls Road	Roadside	N	N	82.2%	29.8
88	Dunmurry Lane	Roadside	N	N	100.0%	20.3
89	Upper Knockbreda Rd	Kerbside	N	N	100.0%	25.7
90	Tates Avenue	Roadside	N	N	92.3%	22.3
91	Stockman's Crescent	Roadside	Y (Westlink)	N	100.0%	20.6
92	Andersonstown Road	Roadside	N	N	100.0%	26.5
93	Diamond Gardens	Roadside	N	N	100.0%	20.0
94	Orpen Road	Roadside	N	N	100.0%	14.1
95	Balmoral Avenue	Roadside	N	N	92.3%	29.8
96	Upper Lisburn Road	Roadside	N	N	80.8%	21.6
97	Monagh Bypass	Roadside	N	N	90.1%	19.1
98	Knocknagoney	Roadside	N	N	100.0%	35.5
100	Henry Place 2	Roadside	Y	N	100.0%	28.5
101	Stockman's Lane Roundabout	Roadside	Y	N	77.3%	34.6
102	North Queen Park	Roadside	Y	N	84.7%	30.1
103	Blythefield Park	Urban Background	N	N	59.5%	21.4

QA/QC of Automatic Monitoring

Belfast City Council operates four automatic monitoring stations across the city in order to help inform its air quality management processes and to provide real time information to the public in relation to air pollution levels across the city centre and within our Air Quality Management Areas.

Accordingly, to ensure that the data from our sites is both accurate and representative, the monitors at each site are calibrated on a biweekly (Stockman's Lane AURN site) or on a four-weekly basis by the council's technical staff in accordance with the procedures detailed in the Defra Automatic Urban and Rural Network (AURN) local site operators' manual.

For our automatic nitrogen dioxide analysers, we complete a two-point calibration using zero air and a nitric oxide span gas of certified concentration. We obtain our calibration gases under contract from Air Liquide and BOC Ltd. who also provide similar gases to government owned AURN monitoring stations. By considering instrument operating parameters and the results of successive calibrations, we can make a determination regarding the ongoing performance of our analysers.

Where an instrument is found not to be operating within normal operating parameters, we refer the matter promptly to *Enviro Technology*, who provided service and maintenance support for our equipment throughout 2021. In addition, data management support including data collection, scaling, reporting and ratification was provided by *Ricardo-AEA Limited*.

The data from our sites is made available to the Department of Agriculture, Environment and Rural Affairs and is reported on the 'Northern Ireland Air' website in near real time.

Finally, Belfast City Council in 2021 appointed suitably qualified equipment engineers (*NPL*) to provide quality assurance and quality control support for the monitoring equipment to ensure compliance with the requirements of the National Air Quality Strategy as detailed within the Defra Technical Guidance Document LAQM.TG(16). NPL staff visit our sites on a six-monthly basis and compare the performance of our analysers against a

range of laboratory grade standards. NPL subsequently provides a series of calibration and scaling factors that are used to correct our automatic monitoring data. These scaling procedures enable the council to robustly compare our air quality data with Air Quality Strategy Objectives and European Union Limit Values.

For consistency, all automatic monitoring data reported in this Progress Report has been obtained from the 'Northern Ireland Air' website. Automatic data presented in this report relates to the calendar year (i.e. January – December). 2021 ratified data capture levels exceeded the Department's 75% data capture threshold for the calculation of annual statistics at all council sites.

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

In relation to the correction of our automatic monitoring data, this process is generally of principal concern with regard to the treatment of particulate matter monitoring data. In 2019, the Belfast Centre site employed Filter Dynamics Measurement System (FDMS) equipped Tapered Element Oscillating Microbalances (TEOMs) for particulate matter (PM_{10}) monitoring up until September whereupon the FDMS equipped TEOMs were replaced by Palas Fidas 200, which complies with DEFRA's UK PM Pollution Climate standard. Government equivalence tests have determined that both of types of equipment meet the equivalence criteria and, on that basis, no correction factor needs to be applied to this monitoring data.

The Stockman's Lane site is equipped with a Beta Attenuation Monitor (BAM) with a heated inlet for monitoring particulate matter. Government technical guidance highlights that a BAM, equipped with a heated inlet, meets the equivalence criteria for PM_{10} monitoring, provided that the results are corrected for slope. This correction involves dividing measured concentrations by a factor of 1.035. It should be noted that the data presented on the Northern Ireland Air website and in this report has already been corrected to the reference equivalent.

Automatic Monitoring Annualisation

All automatic monitoring locations within Belfast City Council recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data.

NO_2 Fall-off with Distance from the Road

No automatic NO_2 monitoring locations within Belfast City Council required distance correction during 2021.

Table A.5 - Local Bias Adjustment Calculations

	Lombard Street	Stockman's Lane	Westlink/Roden Street	Upper Newtownards Road
Periods used to calculate bias	10	12	12	12
Bias Adjustment Factor A	0.79 (0.76 - 0.83)	0.85 (0.79 - 0.92)	0.71 (0.67 - 0.76)	0.83 (0.79 - 0.86)
Diffusion Tube Bias B	26% (20% - 32%)	18% (9% - 27%)	40% (32% - 49%)	21% (16% - 27%)
Diffusion Tube Mean (µg/m^3)	25.7	42.5	38.3	24.9
Mean CV (Precision)	3.6%	3.2%	4.5%	3.0%
Automatic Mean (µg/m^3)	20.4	36.0	27.3	20.6
Data Capture	100%	100%	99%	99%
Adjusted Tube Mean (µg/m^3)	20 (20 - 21)	36 (34 - 39)	27 (26 - 29)	21 (20 - 21)

Overall Diffusion Tube Precision	**Good Overall Precision**	**Good Overall Precision**	**Good Overall Precision**	**Good Overall Precision**
Overall Continuous Monitor Data Capture	**Good Overall Data Capture**	**Good Overall Data Capture**	**Good Overall Data Capture**	**Good Overall Data Capture**

Notes: A single local bias adjustment factor has been used to bias adjust the 2021 diffusion tube results.

Appendix B: Impact of COVID-19 upon LAQM

COVID-19 has had a significant impact on society. Inevitably, COVID-19 has also had an impact on the environment, with implications to air quality at local, regional and national scales. COVID-19 has continued to present various challenges for Local Authorities with respect to undertaking their statutory LAQM duties in the 2021 reporting year.

These challenges were most notable in diffusion tube data collection for 2020. Unfortunately, many businesses had to temporarily close during the pandemic to prevent the spread of Covid-19, one of which was Gradko Ltd., the laboratory which the council employs to carry out analyses on its diffusion tubes.

The lab formally ceased activities between March and May 2020, which meant that no new diffusion tubes were sent to replace the tubes already in situ. Therefore, a two-month exposure period was undertaken between 30th March 2020 and 3rd June 2020 for all diffusion tubes. The calculations used in the 2020 Updating and Screening Assessment therefore had to time weighted to take account of this extended exposure period.

In addition, the reduced data capture has had an impact on the results reported and also resulted in the need for annualisation calculations on an additional four diffusion tubes, which ordinarily would have surpassed the 75% data capture threshold (Ravenhill Road, North Road, Queens Square and North Queen Street). Queens Bridge and RVH Falls Road were the only locations which would have required annualisation, were it not for the Covid-19 restrictions.

In contrast, no such restrictions on Gradko Ltd. occurred in 2021, which therefore meant that diffusion tube data capture was not impacted, and thus time weighting or additional annualisation was not required.

Despite the challenges that the pandemic has given rise to, it has also provided Local Authorities and other organisations with an opportunity to quantify the air quality impacts associated with wide-scale and extreme intervention and changes in behaviour such as reduced road traffic and working from home.

Ambient air quality improvements have been a key consideration for government and local councils over recent years. As an addition, it is considered that we now have an opportunity to achieve and sustain cleaner air as Belfast City continues to recover from the Covid-19 pandemic.

There is no doubt that Covid-19 has had significant and long lasting impacts on our society. Figure B.1 below illustrates the overall percentage change in traffic numbers during 2020 as compared to 2018/2019 pre-lockdown data. The graph demonstrates an initial drop-off of approximately 70% in traffic numbers at the height of the first lockdown in March 2020. Figure B.2, which illustrates monthly NO_2 mean concentrations at each automatic air quality monitoring station (AQMS) within Belfast, also follows a similar trend, depicting a significant drop-off in NO_2 concentrations at all AQMSs, except the A12 Westlink site during the same period, which is likely due to the A12 Westlink's function as an arterial route through Belfast from western and southern regions of Northern Ireland. The same trends are depicted during the second lockdown, with a correlation between the reduction in traffic on Belfast's roads and monitored NO_2 concentrations.

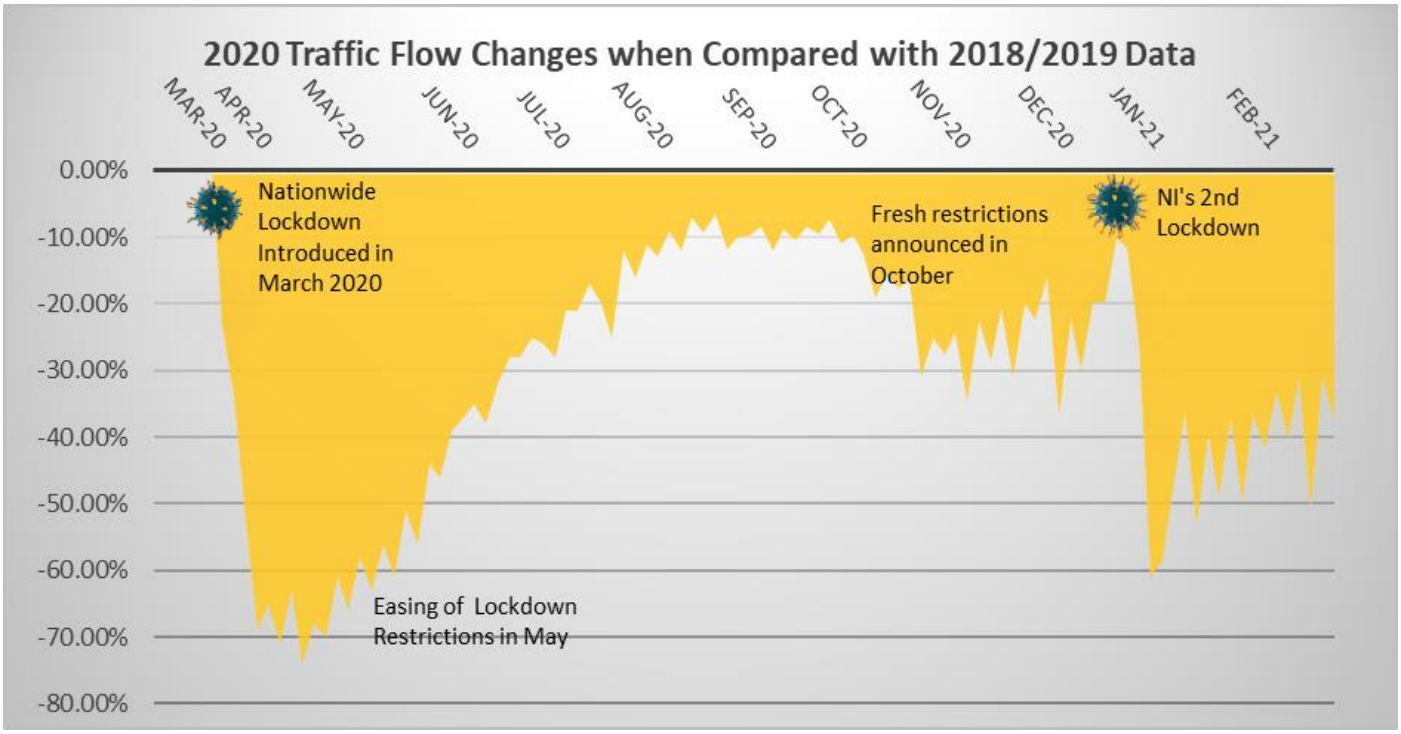


Figure B.1 - DfI Published Covid-19 Traffic Flow Figures Comparison for 2020/21

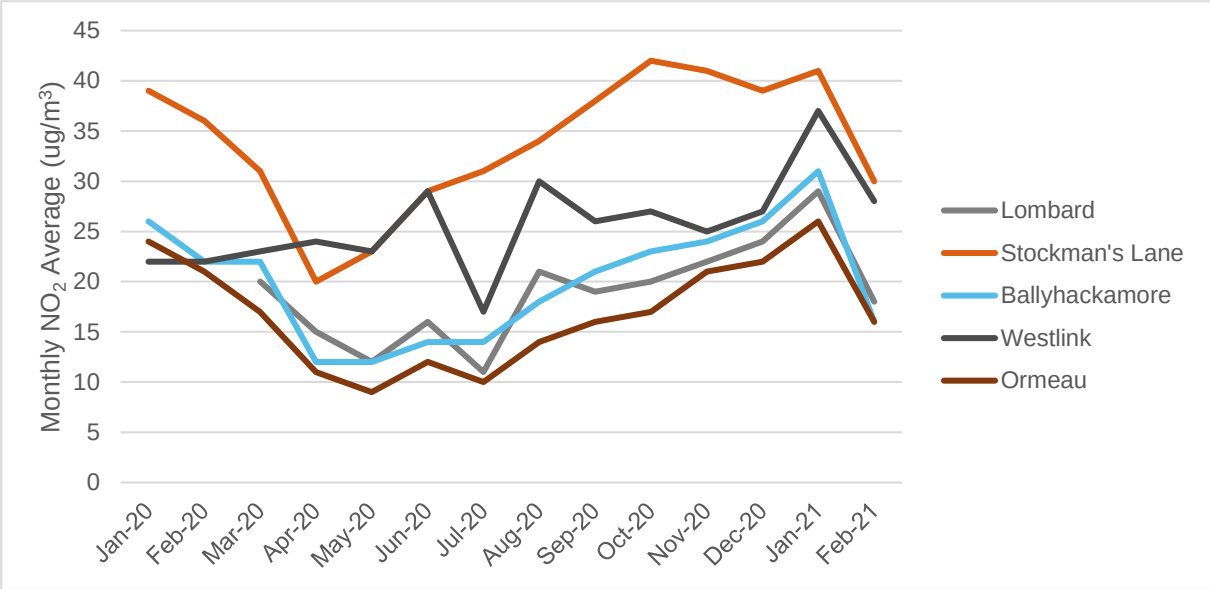


Figure B.2 - Belfast AQMS Monthly NO_2 Averages during Covid-19 Pandemic

Whilst both graphs demonstrate the established link between road traffic and ambient NO_2 concentrations, they also show that when restrictions were eased in the summer and autumn months of 2020, road traffic did not fully return to normal levels, instead returning to around 90% of original levels.

Traffic flow changes to pre-pandemic levels continued to be monitored up until June 2021. Figure B.3 below demonstrates how traffic flow slowly returned to near normal levels over the period of 6 months. While traffic flows appear to have returned to near normal levels by June 2021, unfortunately traffic flow percentages are unavailable for after June 2021, leaving some ambiguity as to how the Covid-19 pandemic is now impacting traffic movements.

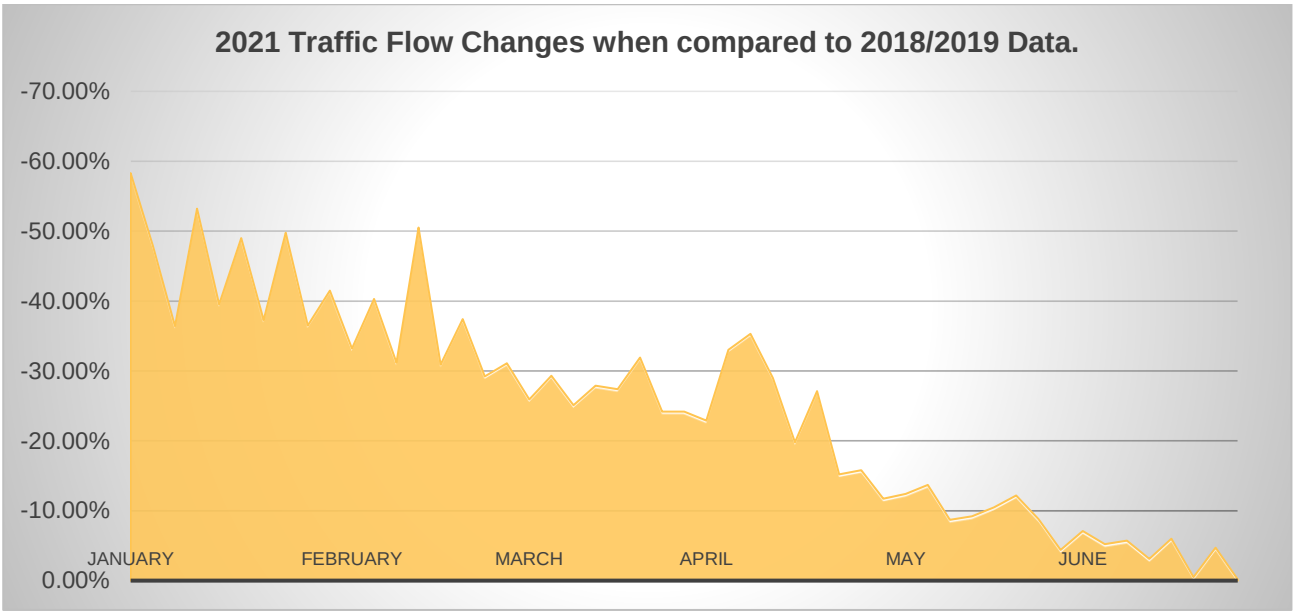


Figure B.3 - DfI Published Covid-19 Traffic Flow Figures Comparison for January to June 2021

As the past year has confirmed that some businesses are able to 'work from home', it is unclear whether these businesses might maintain this manner of working. If this is the case, the reduced levels of traffic depicted in Figures B1 and B3 may well average out to become the new 'normal' and in turn, be beneficial to ambient air quality across Belfast City.

A significant portion of the traffic flow reduction during the 2020 Covid-19 Lockdowns may also have been associated with reduced public transport timetables, which were introduced at the beginning of the first lockdown in March 2020. Given the need to stay at home and reduce close contact with individuals as much as possible, it is unsurprising that public transport use within Northern Ireland was significantly impacted. Figure B.4 below illustrates the impact of the pandemic on public transport use. The graph shows that use of NI Railways, Metro and Ulsterbus services reduced to less than 50% of pre-lockdown levels.

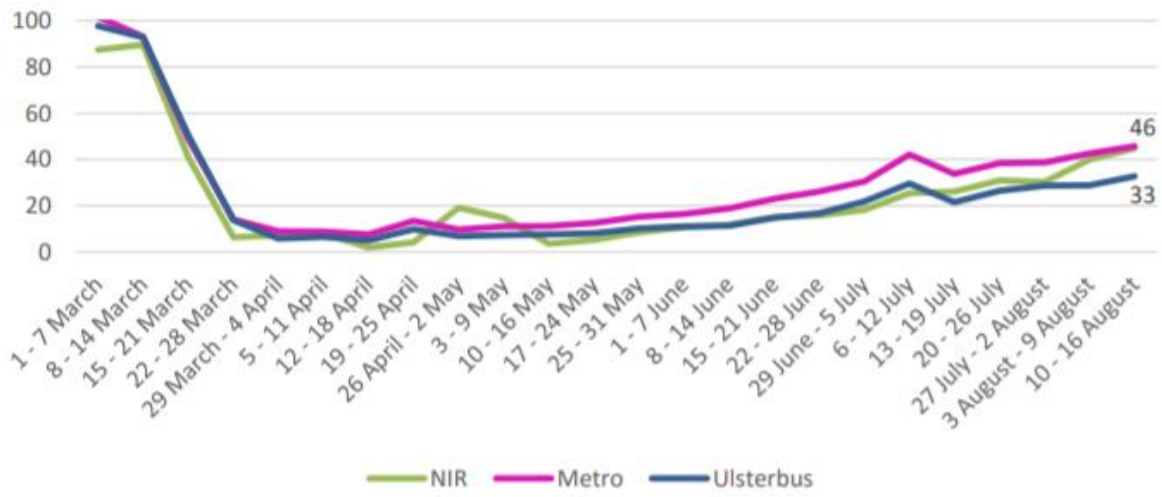


Figure B.4 - Patronage (%) NIR, Metro and Ulsterbus 1st March – 16th August 2020, as compared with 2019

The challenges of maintaining safety and social distancing on public transport, and by extension the usage of this mode of transport, have been an unfortunate consequence of the Covid-19 pandemic, which is likely to play a role in determining how effective proposed public transport actions outlined within this Progress Report may be.

Although public transport use had been significantly reduced in 2020, it should be noted that when restrictions were relaxed, patronage levels on some services, such as the Glider in West Belfast, recovered very quickly to over 70% of pre-Covid levels. This demonstrates the importance of this type of investment and how important public transport is to key workers and people in areas of higher deprivation.

Furthermore, there is also some evidence that the pandemic has actually initiated an increase in the use of active travel, with usage of the Comber Greenway up by more than 75% between April 2020 and March 2021, when compared with pre-lockdown levels in the same period during 2019/20, comprised of around 55% cycling and 45% walking. It is worth noting, however, that active travel tends to be more susceptible to poor weather, and so drop-offs in cycling and walking numbers are also typically reported during the colder, wetter winter months.

DAERA formally commissioned Ricardo Energy & Environment consultants to undertake an, '*Investigation of Effects of Covid-19 Restrictions on Air Quality in Northern Ireland*'.

The resultant report consequently focuses on the period from the 1st January 2020 to 31st May 2020, spanning the early weeks of the pandemic.

The consultants identified that emissions from industrial processes were likely to have decreased, though it was not possible to quantify this. They noted however that electricity demand statistics for the lockdown period indicated that any reduction in emissions from the power generation sector was likely to be small: probably less than 1% of the Northern Ireland total, in the cases of both sulphur dioxide (SO_2) and oxides of nitrogen (NOx).

Ricardo Energy & Environment further identified that as road vehicles usually account for some 30% of Northern Ireland's total NOx emissions, the lockdown restrictions were estimated to have resulted in a short-term reduction of 20% in the region's emitted NOx during the first few weeks of lockdown. Flights and rail services also demonstrated dramatic decreases during the lockdown period.

In terms of the impact of the lockdown on ambient air quality concentrations, Ricardo Energy & Environment idenitified that measured ambient NOx and NO_2 concentrations fell substantially during lockdown. On average, over the period from the beginning of lockdown to the end of June 2020, nitrogen dioxide concentrations were 44% lower than under normal conditions; corresponding to an absolute average reduction of 13μgm^{-3}. The Belfast Stockman's Lane monitoring site, which had exceeded the 40 μgm^{-3} annual mean objective for nitrogen dioxide in recent years, had a mean concentration of less than 30 μgm^{-3} during the lockdown period (31 μgm^{-3} in March 2020, 20 μgm^{-3} in April 2020, 23 μgm^{-3} in May 2020 and 29 μgm^{-3} in June 2020).

This reduction in NO_2 concentration during the Covid-19 lockdown can still be seen in 2021 results, depicted in Figure B.5 below. The average NO_2 concentration for 2018 and 2019 was identified (in line with traffic flow comparison graphs above), and compared with 2021 results. As can be seen in the graph, 2021 concentraions at Belfast Stockman's Lane still remain below the pre-pandemic levels.

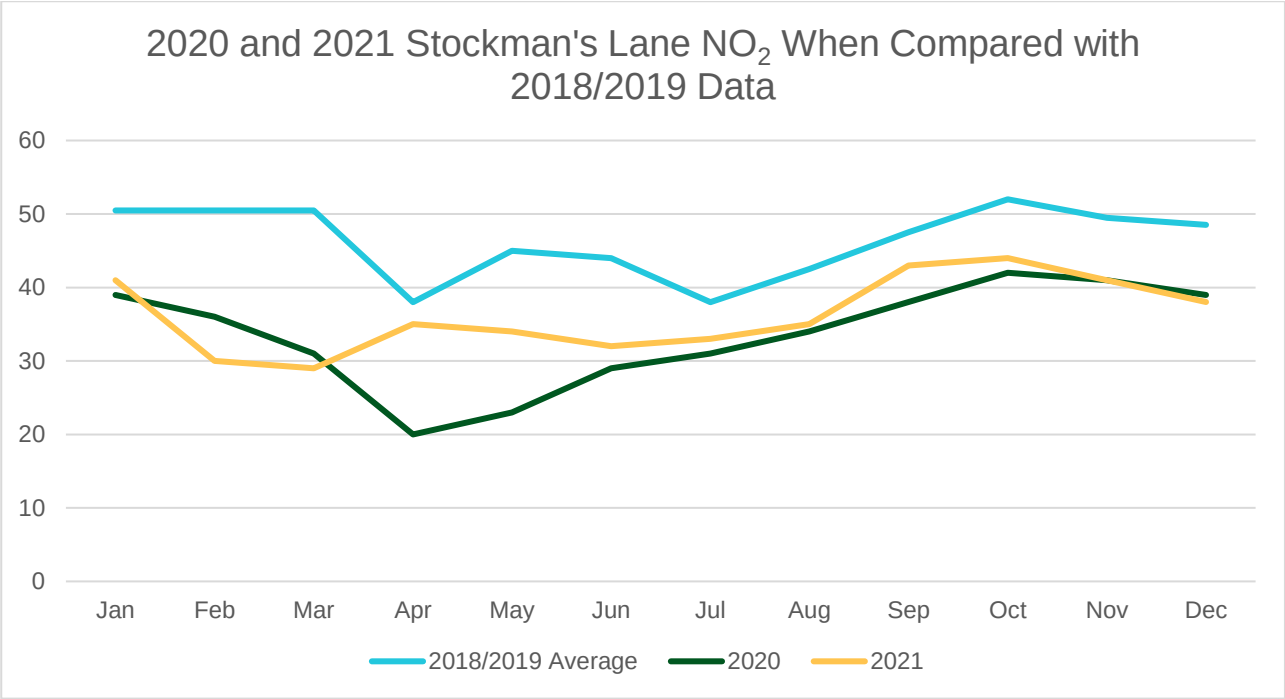


Figure B.5 - 2020 and 2021 Stockman's Lane NO_2 When Compared with 2018/2019 Data

Ricardo Energy & Environment also advised that an analysis of the impact of the Covid-19 pandemic and associated lockdown on ambient concentrations of particulate matter (PM_{10}) was more challenging, as particulate matter pollution tends to be dominated by regional background levels rather than local primary emissions. Accordingly, the consultants concluded that trends were less clear for PM_{10} than for other ambient pollutants, with some NI monitoring sites showing an increase and others showing a decrease. They therefore concluded that on average, there was a small increase ($<1 \mu gm^{-3}$) in PM_{10} concentations over the lockdown period when compared to normal conditions.

In summarising, Ricardo Energy & Environment advised that notwithstanding the clear reduction in emissions and ambient concentrations of NOx, it would be an over-simplification to state that overall ambient air quality in Northern Ireland had improved during the lockdown.