

Annual Progress Report (APR)



2021 Air Quality Annual Progress Report (APR) for Dundee City Council

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

June 2021

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Executive Summary: Air Quality in Our Area

Air Quality in Dundee

In 2006 Dundee City Council (DCC) declared the whole of DCC local authority area as an 'Air Quality Management Area' (AQMA) for the nitrogen dioxide (NO₂) annual mean Air Quality Objective (AQO). A single AQMA rather than several connecting AQMAs was declared to enable wider consideration of air quality improvements in Dundee. In 2010, DCC amended the initial AQMA to include the annual mean AQO for particulate matter (PM₁₀) and in 2013 DCC further amended the AQMA to include the 1-hour mean AQO for NO₂. In line with other cities, the predominant source contributing to these exceedances is road traffic.

DCC published its 'Air Quality Action Plan' in January 2011, introducing a set of 32 measures to work towards achievement of the AQOs in the AQMA. The implementation of these measures has helped to reduce pollutant levels across the local authority, with the number of exceedance locations greatly reducing over the 10 years that the AQAP has been in place.

Dundee City Council currently monitors for NO₂, PM₁₀ and PM_{2.5}, the latest results and trends are discussed in Chapter 3. The 2020 monitoring results indicate compliance with the air quality objectives at all locations where continuous monitoring was undertaken. One out of the 88 passive diffusion tube (PDT) monitoring locations showed a potential exceedance of the NO₂ annual mean objective, however it is noted that monitoring results for the months of March, April and May 2020 were not able to be included within the annual mean calculations for this and many other PDT locations. The lockdown measures imposed during 2020 in response to the COVID19 pandemic resulted in a dramatic drop in road traffic within Scotland's cities, including Dundee. It is well established that road traffic is the main source of oxides of nitrogen (NO_x) within cities and therefore measured NO₂ concentrations decreased significantly during the lockdown that commenced in March 2020.

Ricardo Energy & Environment (REAE), on behalf of the Scottish Government, carried out an analysis of the impact of lockdown measures on ambient air quality across Scotland, and have produced reports for each local authority area including DCC. The analysis focuses on NO_x / NO₂ from between January 2020 and January 2021. This report can be found on the Scottish Air Quality website at:

www.scottishairquality.scot/assets/documents//Dundee_City_covid_analysis_updated. The report provides analysis of the reductions in pollutant concentrations at the six NO_x / NO₂ continuous monitoring locations in Dundee (Broughty Ferry Road, Lochee Road, Mains Loan, Meadowside, Seagate and Whitehall Street). The report includes graphs showing the magnitude of changes in monthly and annual average pollutant concentrations.

REAE have also produced a dynamic 'Dundee City Annual Report' for the monitoring at these six locations in 2020, which can also be found on the Scottish Air Quality website at: www.scottishairquality.scot/assets/documents//Dundee_City_annual_2020. The REAE report contains additional data analysis that is unable to be presented in this Annual Progress Report.

Dundee City Council is currently working with Transport Scotland, Scottish Environment Protection Agency (SEPA) and the regional transport partnership TACTRAN to develop a Low Emission Zone (LEZ) for Dundee, which is due to be introduced in the first half of 2022. SEPA also consult with the council on new industrial process applications and provide an annual update on existing processes in the city, however an update for 2020 is unable to be provided.

Actions to Improve Air Quality

Dundee City Council has taken forward a number of measures during the current reporting year of 2020 in pursuit of improving local air quality. Actions taken during the past year have included:

- The ECO Stars schemes for larger commercial vehicles and for taxi / private hire vehicles continued during 2020. There was a 14% increase in the number of members to the Dundee ECO Stars larger commercial vehicles scheme, with 215 members (7793 vehicles) signed up by the end of 2020. The ECO Stars scheme for taxis/private hire vehicles increased its membership to 18 operators (575 vehicles) during 2020.
- The Drive Dundee Electric campaign continued its successful engagement with current and potential electric vehicle (EV) owners (both in public and business) through the local media in the form of EV related articles encouraging people to make the switch to EV. A number of events proposed for 2020 were unable to be held due to the pandemic.
- The continued promotion of EV vehicles and assistance to those who choose to switch to EV has helped result in there now being 161 pure electric taxis in Dundee, up from 97 at the end of 2019.
- DCC continued with the electrification of its fleet with number of electric vehicles increasing by 38 during 2020. There are now 154 electric vehicles in the fleet which includes two electric mini buses, one large electric road sweeper and two electric refuse collection vehicles introduced in 2020.
- The new EV charging hub at the Olympia carpark was installed in March 2020 however it's opening was delayed due to the pandemic. A Heavy Goods Vehicle charging hub was installed at the DCC Marchbanks depot.
- Despite the limitations caused by the pandemic, the Dundee School Active Travel programme was able to engage with 250 pupils from six primary schools to certify across Level 1 & 2 of the Bikeability scheme.
- Projects under the Spaces for People scheme were implemented across Dundee during 2020, including the closure of Union Street in the city centre to through traffic, the introduction of 20mph zones, and modal filters to encourage active travel and create more space for social distancing.
- The construction of the Active Travel Hub at the Dundee Waterfront progressed. Angus Cycle Hub have been identified as the operator of the hub and have already started to provide active travel services in Dundee. The Active Travel Hub is due to be opened to the public in mid-2021.
- The 'Embark Dundee' electric bicycle hire scheme' was launched in December 2020 by Ride-On, with 14 docking stations and 130 e-bikes being included in the initial roll-out. The aim is to have more than 40 docking stations installed by the end of 2021.
- Further progression was made with the development of the Dundee LEZ, with traffic modelling assessments of potential LEZ scenarios carried out. Due to the pandemic, the introduction date for LEZs in Scotland was agreed to be delayed to February – May 2022.
- Traffic modelling of potential road infrastructure improvements and bus prioritisation schemes on the Lochee Road corridor that would reduce congestion and improve air quality commenced during 2020.

Local Priorities and Challenges

Dundee City Council expects the following measures to be completed over the course of the next reporting year:

- Drive Dundee Electric will continue to help raise awareness and encourage uptake of low emission vehicles at various events throughout the year. This will include showcase events in the lead up to COP26 in November 2021.
- A continued expansion of the infrastructure to support uptake of ULEV as well as continued free parking for pure EV vehicles in the multi-storey car parks of the Olympia, Greenmarket, Bell Street and Gellatly Street.
- DCC will continue with improvements to its fleet with a further four electric refuse collection vehicles, one small electric sweeper, and at least 11 electric vans and 14 electric cars to be added during 2021. New EV charging infrastructure is planned to be installed at 12 DCC depot sites to help make them viable for EVs.
- The Innovate UK pop-up charger pilot project is to be operational in summer 2021, with the first pop-up hub to be opened at the Waterfront site next to the V&A Dundee.
- Continuation of both ECOSTARS Schemes for Heavy Duty Vehicles and Taxis / Private Hire vehicles to encourage engagement with and participation of these transport providers in the achievement of air quality improvements in the city.
- Continued support for Active Travel related projects including the delivery of the School Active Travel Delivery programme, the embedding of the Sustrans Cycling Strategy Officer within City Development
- The new Active Travel Hub at the Waterfront is due to open in mid-2021 with the operator, Angus Cycle Hub to provide active travel services to residents and visitors to Dundee.
- The Embark Dundee e-bike hire scheme is to be expanded to make 40 docking stations available by the end of 2021, including locations in the city with higher levels of pollution and health inequality.
- The development of the Dundee LEZ will progress in line with guidance provided in the National Low Emission Framework and the LEZ Regulations. DCC will be represented in all the tiers of governance set up to deliver the LEZ in Scotland.
- A feasibility study of potential options for road infrastructure improvements and bus prioritisation schemes on the Lochee Road corridor that would reduce congestion and improve air quality will be undertaken in 2021.
- A review and update of the existing 2011 Air Quality Action Plan to reflect the improvements made to air quality in Dundee over the 10 years of the plan being in place, identify any areas where new actions are required, and to align the plan with the forthcoming Dundee LEZ and revised Scottish Government Cleaner Air for Scotland strategy. Given the impact of the reduction in NOx as a direct result of the lockdown measures, where possible, these factors will be carefully considered in determining future improvement actions.
- Take forward the other proposed Local Air Quality Management tasks highlighted in **Section 6.3**.

How to Get Involved

Further information on air quality in Dundee can be found on the website at the following location:
www.dundee.gov.uk/air-quality/ . Further information on the Dundee LEZ can be found at
www.dundee.gov.uk/LEZ .



“DCC increased the number of EV in it’s fleet to 154 vehicles, including the delivery of passenger EV’s and an electric mini-bus”

“DCC fleet improvements included the delivery of two Dennis Eagle electric refuse collection vehicles, which have been named ‘Bin Diesel’ and ‘Leonardo de Chargio”



“Projects under the Spaces for People scheme were implemented across Dundee during 2020, including the closure of Union Street in the city centre to through traffic, the introduction of 20mph zones, and modal filters to encourage active travel and create more space for social distancing”



“The ‘Embark Dundee’ electric bicycle hire scheme’ was launched in December 2020 by Ride-On, with 14 docking stations and 130 e-bikes being included in the initial roll-out. The aim is to have more than 40 docking stations installed by the end of 2021.”

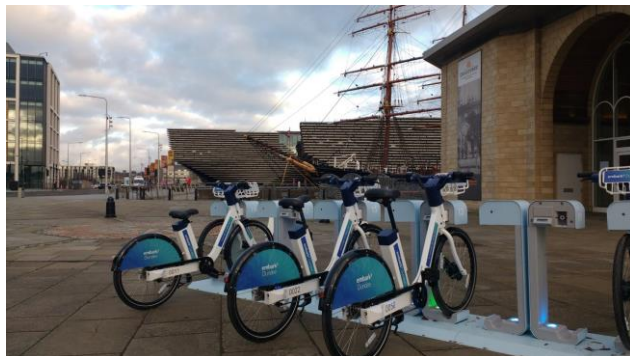


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1 Local Air Quality Management

This report provides an overview of air quality in Dundee City Council during 2020. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

Table 1.1 – Summary of Air Quality Objectives in Scotland

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

2 Actions to Improve Air Quality

Air Quality Management Areas

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

A summary of AQMAs declared by Dundee City Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=365

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	Description	Action Plan
Dundee City Council AQMA	NO ₂ annual mean PM ₁₀ annual mean NO ₂ hourly mean	Dundee	The whole of the local government area of the City of Dundee was declared an AQMA in respect of the annual mean objective for NO ₂ in July 2006. In October 2010 the AQMA Order was amended to include the annual mean objective for PM ₁₀ . The AQMA was further amended in March 2013 to include the hourly mean objective for NO ₂	Air Quality Action Plan for Nitrogen Dioxide (NO ₂) and Fine Particulate Matter (PM ₁₀) - January 2011 www.dundee.gov.uk/sites/default/files/publications/Dundee%20CC%20FinalAQAP_Jan11.pdf

Cleaner Air for Scotland

Cleaner Air for Scotland – The Road to a Healthier Future (CAFS) is a national cross-government strategy that sets out how the Scottish Government and its partner organisations propose to reduce air pollution further to protect human health and fulfil Scotland’s legal responsibilities as soon as possible. A series of actions across a range of policy areas are outlined, a summary of

which is available on [the Scottish Government's website](#). Progress by Dundee City Council against relevant actions within this strategy is demonstrated below.

2.1.1 Transport – Avoiding Travel – T1

All local authorities should ensure that they have a corporate travel plan (perhaps within a carbon management plan) which is consistent with any local air quality action plan.

Dundee City Council has an existing Council Travel Plan to encourage staff to reduce the number of single occupancy car journeys made while on Council business and when commuting to work. Prior to the pandemic, a revised guidance document for staff had been created following the staff travel survey undertaken in October 2020. The launch of the revised Staff Travel Plan was put on hold during 2020 due to the pandemic but is ready to be launched when staff begin returning to offices in 2021.

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

Scottish Government expects any Scottish local authority which has or is currently developing a Sustainable Energy Action Plan to ensure that air quality considerations are covered.

Dundee City Council declared a climate emergency in June 2019 and have worked through the Dundee Partnership to develop and launch a citywide Climate Action Plan in December 2019 in support of the transition to a net-zero and climate resilient future. In line with Scottish Government and Council objectives for CAFS, tackling air quality and decarbonising transport are key objectives of this plan. Of the 62 actions in the plan, 18 are related to air quality.

In an effort to co-ordinate and deliver a clear and consistent message for the city, a 'Sustainable Dundee' brand was established under which all sustainability and climate change initiatives are promoted.

2.1.3 Further actions

Dundee City Council remains committed to working with the Scottish Government and its partner organisations to deliver the aim of improving Scotland's air quality to be the best in Europe. Dundee City Council has participated in the consultation process for the revised CAFS strategy due to be published in 2021.

The development of the Low Emission Zone for Dundee progressed during 2020, with the Greater Dundee City Paramics traffic model being completed in the second half of the year. This traffic model has enabled specific LEZ design scenarios to be assessed for impact on traffic flows in and adjacent to the LEZ area. These scenarios included those within in the 2019 consultation plus variants that included differing length sections of the north west arterial route (Lochee Road / Logie Street). Traffic flow outputs from the modelling will be used during 2021 to update the SEPA AQ City Model for Dundee.

In addition, Dundee City Council participated in an exercise to help understand the impact of the 2020 pandemic on what travel may look like post pandemic across the four Scottish LEZ cities. This exercise was facilitated by Transport Scotland with the 'plausible futures' identified for cities to be included in sensitivity testing of the proposed LEZ scheme, which is due to be undertaken in 2021.

Progress and Impacts of Measures to address Air Quality in Dundee City Council

Dundee City Council has taken forward a number of measures during the current reporting year of 2020 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. More detail on these measures can be found in the air quality Action Plan relating to our AQMA.

Key completed measures are:

- The ECO Stars schemes for larger commercial vehicles and for taxi / private hire vehicles continued during 2020. There was a 14% increase in the number of members to the Dundee ECO Stars larger commercial vehicles scheme, with 215 members (7793 vehicles) signed up by the end of 2020. The ECO Stars scheme for taxis/private hire vehicles increased its membership to 18 operators (575 vehicles) during 2020.
- The Drive Dundee Electric campaign continued its successful engagement with current and potential electric vehicle (EV) owners (both in public and business) through the local media in the form of EV related articles encouraging people to make the switch to EV. A number of events proposed for 2020 were unable to be held due to the pandemic.
- The continued promotion of EV vehicles and assistance to those who choose to switch to EV has helped result in there now being 161 pure electric taxis in Dundee, up from 97 at the end of 2019.
- DCC continued with the electrification of its fleet with number of electric vehicles increasing by 38 during 2020. There are now 154 electric vehicles in the fleet which includes two electric mini buses, one large electric road sweeper and two electric refuse collection vehicles introduced in 2020.
- The new EV charging hub at the Olympia carpark was installed in March 2020 however it's opening was delayed due to the pandemic. A Heavy Goods Vehicle charging hub was installed at the DCC Marchbanks depot.
- Despite the limitations caused by the pandemic, the Dundee School Active Travel programme was able to engage with 250 pupils from six primary schools to certify across Level 1 & 2 of the Bikeability scheme.
- Projects under the Spaces for People scheme were implemented across Dundee during 2020, including the closure of Union Street in the city centre to through traffic, the introduction of 20mph zones, and modal filters to encourage active travel and create more space for social distancing.
- The construction of the Active Travel Hub at the Dundee Waterfront progressed. Angus Cycle Hub have been identified as the operator of the hub and have already started to provide active travel services in Dundee. The Active Travel Hub is due to be opened to the public in mid-2021.
- The 'Embark Dundee' electric bicycle hire scheme was launched in December 2020 by Ride-On, with 14 docking stations and 130 e-bikes being included in the initial roll-out. The aim is to have more than 40 docking stations installed by the end of 2021.
- Further progression was made with the development of the Dundee LEZ, with traffic modelling assessments of potential LEZ scenarios carried out. Due to the pandemic, the introduction date for LEZs in Scotland was agreed to be delayed to February – May 2022.

- Traffic modelling of potential road infrastructure improvements and active travel schemes on the Lochee Road corridor that would reduce congestion and help improve air quality commenced during 2020.

Progress on the following measures has been slower than expected due to the impact of the pandemic during 2020.

- The launch of the Staff Travel Plan has been delayed however is ready to be launched once staff begin returning to the office in 2021.

Dundee City Council expects the following measures to be completed over the course of the next reporting year:

- Drive Dundee Electric will continue to help raise awareness and encourage uptake of low emission vehicles at various events throughout the year. This will include showcase events in the lead up to COP26 in November 2021.
- A continued expansion of the infrastructure to support uptake of ULEV as well as continued free parking for pure EV vehicles in the multi-storey car parks of the Olympia, Greenmarket, Bell Street and Gellatly Street.
- DCC will continue with improvements to its fleet with a further four electric refuse collection vehicles, one small electric sweeper, and at least 11 electric vans and 14 electric cars to be added during 2021. New EV charging infrastructure is planned to be installed at 12 DCC depot sites to help make them viable for EVs.
- The Innovate UK pop-up charger pilot project is to be operational in summer 2021, with the first pop-up hub to be opened at the Waterfront site next to the V&A Dundee.
- Continuation of both ECOSTARS Schemes for Heavy Duty Vehicles and Taxis / Private Hire vehicles to encourage engagement with and participation of these transport providers in the achievement of air quality improvements in the city.
- Continued support for Active Travel related projects including the delivery of the School Active Travel Delivery programme, the embedding of the Sustrans Cycling Strategy Officer within City Development
- The new Active Travel Hub at the Waterfront is due to open in mid-2021 with the operator, Angus Cycle Hub to provide active travel services to residents and visitors to Dundee.
- The Embark Dundee e-bike hire scheme is to be expanded to make 40 docking stations available by the end of 2021, including locations in the city with higher levels of pollution and health inequality.
- The development of the Dundee LEZ will progress in line with guidance provided in the National Low Emission Framework and the LEZ Regulations. DCC will be represented in all the tiers of governance set up to deliver the LEZ in Scotland.
- Development of detailed options for road infrastructure improvements which will consider active travel and public transport on the Lochee Road corridor that would reduce congestion and improve air quality will be undertaken in 2021.
- A review and update of the existing 2011 Air Quality Action Plan to reflect the improvements made to air quality in Dundee over the 10 years of the plan being in place, identify any areas where new actions are required, and to align the plan with the forthcoming Dundee LEZ and revised Scottish Government Cleaner Air for Scotland strategy. Given the impact of the

reduction in NO_x as a direct result of the lockdown measures, where possible, these factors will be carefully considered in determining future improvement actions.

- Take forward the other proposed Local Air Quality Management tasks highlighted in **Section 6.3.**

Table 2.2 – Progress on Measures to Improve Air Quality

2021 updates (on progress in 2020) in blue.

(All previous Annual Progress Reports, Updating and Screening Assessments, and Progress Reports referred to in this table can be accessed at:

<https://www.dundee.gov.uk/service-area/neighbourhood-services/community-safety-and-protection/air-quality-in-dundee/air-quality-reports>)

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Measure M1: Existing Road Infrastructure Improvements	Transport, planning and infrastructure	City Centre Improvements - Union St.	DCC City Development Department (Transportation Division)					<p>Union Street Road Infrastructure improvements were completed December 2011. Two-way traffic was maintained. Pavement widths were altered and the bus stops have been removed to reduce congestion and bus idling. Bus services redistributed to bus stops on Whitehall Street and Nethergate.</p> <p>Although no longer an exceedance location, Union Street between the Nethergate and Whitehall Crescent, was pedestrianised from August 2020. This was put in place and funded through Sustrans Spaces for People,</p> <p>The City Air Quality model for Dundee created by SEPA through the National Modelling Framework (NMF) includes this area. Traffic modelling using the new Paramics Traffic Model for Dundee was undertaken in 2020 of the potential LEZ scenarios, including variations that contained the North West Arterial Route. The outputs of this traffic modelling is to be assessed by SEPA using the AQ City Model during 2021.</p>	Completed 2011	<p>NO₂ concentrations in Union St showed a consistent downward trend to well below the objective from 2010 until monitoring was removed in 2015.</p> <p>All monitoring sites in this area complied with AQO objectives in 2020, however the significant reduction in traffic levels across Dundee due to lockdown restrictions will have been the main contributor to these reductions.</p>
		Transport, planning and infrastructure	North West Arterial Route improvements – Lochee Road	DCC City Development Department (Transportation Division)					<p>Alterations carried out at Lochee Road/Rankine Street in February 2012 removed central reservation to free up road space and reduce congestion</p> <p>Traffic modelling of potential road infrastructure improvements and active travel schemes on the Lochee Road corridor that would reduce congestion and help improve air quality commenced during 2020.</p> <p>The City Air Quality model for Dundee created by SEPA through</p>	Completed 2012 Ongoing	<p>The average long-term trend of annual mean NO₂ at all monitoring locations in Lochee Road is slightly downwards.</p> <p>The number of hourly NO₂ levels exceed had reduced to 2 instances in</p>

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
									the National Modelling Framework (NMF) includes this area. Traffic modelling using the new Paramics Traffic Model for Dundee was undertaken in 2020 of the potential LEZ scenarios, including variations that contained the North West Arterial Route. The outputs of this traffic modelling is to be assessed by SEPA using the AQ City Model during 2021.		2019, well below the 18 instances permitted each year. No hourly exceedances were recorded during 2020. All but one PDT monitoring location in this area complied with AQO objectives in 2020. Data used in the annual mean calculation for the potential exceedance location does not include March, April & May due to lockdown restrictions as described in Chapter 6 of this report.
		Transport planning and infrastructure	Arterial Route Improvements - Stannergate	DCC City Development Department (Transportation Division)					Consultants engaged in 2013 to carry out traffic micro-simulation modelling and air dispersion modelling. Final draft of the AD Modelling was received in April 2016, with the summary of findings presented in the 2016 Annual Progress Report. The City Air Quality model for Dundee created by SEPA through the National Modelling Framework (NMF) includes this area. Traffic modelling using the new Paramics Traffic Model for Dundee was undertaken in 2020 of the potential LEZ scenarios, including variations that contained the North West Arterial Route. The outputs of this traffic modelling is to be assessed by SEPA using the AQ City Model during 2021.	Completed 2016	All monitoring sites in this area complied with AQO objectives in 2020, however the significant reduction in traffic levels across Dundee due to lockdown restrictions will have been the main contributor to these reductions.
		Transport planning and infrastructure	City Centre Improvements - Meadowside	DCC City Development Department (Transportation Division)					Meadowside – in 2012 a trial lane closure at the north end of street to increase separation distance between traffic and receptors was put in place. A temporary paving surface was introduced in October 2013 to allow the impact on monitored concentrations to be studied for a 12month period. Permanent street infrastructure	Completed 2016	The monitoring results since 2015 demonstrate that the air quality improvements attributable to this infrastructure change have been maintained.

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
									<p>changes were completed in Feb/March 2016.</p> <p>The City Air Quality model for Dundee created by SEPA through the National Modelling Framework (NMF) includes this area. Traffic modelling using the new Paramics Traffic Model for Dundee was undertaken in 2020 of the potential LEZ scenarios, including variations that contained the North West Arterial Route. The outputs of this traffic modelling is to be assessed by SEPA using the AQ City Model during 2021.</p>		All monitoring sites in this area complied with AQO objectives in 2020, however the significant reduction in traffic levels across Dundee due to lockdown restrictions will have been the main contributor to these reductions.
		Transport planning and infrastructure	City Centre Upgrade 13 traffic signals with fibre optic connections	DCC City Development Department (Transportation Division)					A Fibre network was implemented to improve Traffic Signals communication (and revenue saving) with the Control Room in Dundee House. This network will improve reliability and efficiency of Urban Traffic Management and Control (UTC)	Completed 2019	
		Transport planning and infrastructure	City Centre Improvements – Seagate / St. Andrews Street	DCC City Development Department (Transportation Division)					<p>In late 2014, consultants were commissioned to undertake a review of transport activity on the Seagate with a specific focus on identifying actions that would address its poor air quality. The report concluded that there were no affordable actions that could ensure AQ thresholds were met, but a range of actions could help reduce emissions. Air Dispersion modelling demonstrated that if all buses and HDVs were Euro VI then no exceedances of the NO₂ or PM₁₀ objectives would persist in the city centre.</p> <p>Traffic modelling undertaken by SYSTRA with 2016/17 funding showed that the proposed transport management options would be unacceptable on traffic congestion, access and air quality grounds.</p> <p>The City Air Quality model for Dundee created by SEPA through the National Modelling Framework (NMF) includes this area. Traffic modelling using the new Paramics Traffic Model for Dundee was undertaken in 2020 of the potential LEZ scenarios, including variations that contained the North West Arterial Route. The outputs of this</p>	Completed 2017	All monitoring sites in this area complied with AQO objectives in 2020, however the significant reduction in traffic levels across Dundee due to lockdown restrictions will have been the main contributor to these reductions.

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
									traffic modelling is to be assessed by SEPA using the AQ City Model during 2021.		
		Transport planning and Infrastructure	City Centre Improvements – Crichton Street/ Whitehall Street /Nethergate	DCC City Development Department (Transportation Division)					Consultants were commissioned in March 2017 to examine the current bus movements through the city centre. The executive summary of this report is in Appendix C.5 of the 2018 DCC Annual Progress Report.	Completed 2017	
2	Measure M2: DCC will enhance the Urban Traffic Management and Control (UTMC) system to reduce congestion	Traffic management	Real-time traffic monitoring. Improved control regime to smooth out peak traffic.	DCC City Development Department (Transportation Division)	Implementation of UTMC improvements and carry out annual review to measure % reduction in congestion in line with target				<p>UTMC scheme was implemented in March 2013 to expand UTMC to two congested junctions in Lochee Rd AQ hotspots.</p> <p>Seagate / Commercial Street traffic light refurbishment to improve bus and traffic flows completed Feb 2013. Coupled with increased enforcement of waiting restrictions to reduce congestion.</p> <p>TACTRAN funding provided in 2014/15 to expand Bluetooth Traffic Speed Monitoring System to include the Lochee Road. The system was expanded along the eastern corridor on the A92 coming in from Arbroath and Broughty Ferry. Bluetooth journey time monitoring is now undertaken on all major arterial routes leading in to the city centre area.</p>	Completed 2013 Completed 2016	
			Paramics/ AIRE modelling of key junctions –Kingsway / Forfar Rd & Lochee Rd corridor to test improvement options	DCC City Development Department (Transportation Division)					Consultants were engaged in 2013 to carry out traffic micro-simulation modelling and air dispersion modelling. A detailed summary of the options is contained in Appendix C of the 2016 Annual Progress Report.	Completed 2016	
3	Measure M3: DCC to identify partnership and funding to continue benefits of Smarter Choices/Smarter Places: Dundee Travel Active Programme	Promoting travel alternatives	Identify and implement wider partnership to continue programme. Identify funding.	DCC City Development Department (Transportation Division)					<p>Embark Dundee – Electric bike hire Scheme launched in December 2020 with 14 docking stations and roughly 130 e-bikes initially and more on the way. DCC is working closely with Ride-On Scotland to roll-out the scheme to more of the city in 2021 with the aim of 40 docking stations by end of the year.</p> <p>The Active Travel Hub at the Dundee Waterfront is due to be completed and opened to the public by end June 2021. Angus Cycle Hub will be operating the hub and have already started to provide active travel services in Dundee.</p>	ongoing	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
		Promoting travel alternatives	Behavioural Change Primary School programme to promote sustainable travel options in all primary schools	DCC City Development Department (Transportation Division)					Despite the pandemic preventing the School Active Travel team from being able to deliver the same programme as normal, between August and December they were able to get 250 pupils from 6 primaries certified across Level 1 & 2 of Bikeability.	ongoing	
4	Measure M4: DCC will introduce measures to improve bus services and reduce emissions	Transport planning and infrastructure	Statutory Bus Quality Partnership. Voluntary Bus Quality Partnership	DCC City Development Department (Transportation Division)					The Tayside Bus Alliance was established in 2020 to develop a joint submission to the Scottish Government's Bus Partnership Fund. Dundee City Council is a member of this. The alliance has helped lay some foundations for a future Bus Service Improvement Partnership in Dundee.	ongoing	
		Vehicle Fleet efficiency	Fleet Renewal – Emissions Improvements	DCC City Development Department (Transportation Division)					Major bus companies in Dundee were successful in applying for funding for retrofitting buses to EUROVI equivalence through the Bus Emissions Abatement Retrofit (BEAR) 3 programme.	ongoing	
		Vehicle Fleet efficiency	ECO Stars Dundee Fleet Management Recognition Scheme introduced						See measure 6	ongoing	
5	Measure M5: DCC will explore provision of Park and Ride facilities that do not have adverse impact on air quality	Alternatives to private vehicle use	Provision of Park and Ride (P&R) facilities	DCC City Development Department (Transportation Division) & Tayside and Central Scotland Transport Partnership (TACTRAN)					The Southern Park & Ride project is being led by TACTran, SEStrana and Fife Council. Dundee City Council supports this project which is proposed to be located to the south of the Tay Road Bridge.	ongoing	
6	Measure M6: DCC will introduce measures to reduce emissions from Heavy Goods Vehicles	Freight and delivery management	ECO Stars Dundee Fleet Management Recognition Scheme being introduced in 2013 Funding to continue the scheme will be applied for on an annual basis through the AQAP grant scheme.						Dundee City Council received funding from the Scottish Government's Air Quality Support Funding to allow continuation of the ECO Stars scheme for larger commercial vehicles and the separate scheme for Taxis and Private Hire Vehicles. Using the new national Framework Agreement, TRL was again appointed to deliver the two schemes for Dundee City Council in 2020. By the end of 2020 there were 215 members (7793 vehicles) in the commercial scheme,	ongoing	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
7	Measure M7: DCC will seek improvements in emissions standards, including NO ₂ and PM ₁₀ for the council fleet and public service vehicles	Promoting Low Emission Transport	Development of Green Procurement Strategy To set target for Euro category/fuel type	DCC City Development Department (Transportation Division)					See also measure 14. The Fleet Section within Dundee City Council continue to replace older vehicles in its fleet with newer less polluting vehicles. By the end of 2020, there were 154 electric vehicles in its fleet. During 2020 two electric minibuses, one large electric road sweeper and two electric refuse collection vehicles were added to the fleet, in addition to new vans and passenger vehicles. A heavy goods vehicle charging hub was installed at the DCC Marchbanks depot in 2020.	ongoing	
		Vehicle Fleet Efficiency	Participation in ECO Stars Dundee-Fleet Management Recognition Scheme	DCC City Development Department (Transportation Division)					DCC Fleet Achieved 4-Star Rating in ECO Stars Recognition Scheme as recognition for reducing the environmental impact of the Council's Fleet.	ongoing	
8	Measure M8: DCC in consultation with the Taxi Liaison Group will explore means of reducing emissions from taxis and private car hire vehicles in AQMA	Promoting low emission transport	Enforce No idling for taxis. Increase cleaner taxis.						At the end of 2020 there were 161 pure electric taxis in Dundee, up from 97 at the end of 2019.		
		Vehicle Fleet Efficiency	Explore the potential of introducing Licensing Conditions for minimum taxi Euro category for certain classes of vehicles;						In 2015 DCC introduced a condition within the school transport contracts requiring any successful applicant to become a member of the ECOSTARS Scheme for Taxi Operators by July 2016 In 2016 DCC introduced policies that any applications for new Taxi Licences & Private Hire Car would only be granted on the condition that only an electric vehicle from the approved list can be placed on service.	ongoing	
		Vehicle Fleet Efficiency	Expansion of ECOSTARS to include taxi / private hire operators						Funding to expand ECO Stars in Dundee to include taxi and private hire vehicle operators was obtained in 2014/15, with the scheme formally launched on the 11 th March 2015. The number of members of the ECO Stars Dundee taxis/private hire vehicles scheme increased to 18 (575 vehicles) during 2020.	ongoing	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
9	Measure M9: DCC will investigate to initiate a Roadside Emission Testing (RET) scheme inside the AQMA and routes leading to AQMA	Traffic Management	To investigate into the establishment of a programme of RET in the AQMA						Not progressed during 2020.		
10	Measure M10: DCC will ensure local air quality is fully integrated into the Local Development Plan (LDP) process and development scenarios are appropriately assessed with respect to the potential impacts on air quality	Policy Guidance And Development Control	Provide AQ policy within Local Development Plan with commitment to improve air quality Produce air quality Supplementary Planning Guidance (SPG)	DCC City Development (Planning Division) DCC Environment Department.					The 2019 Local Development Plan was adopted in February 2019. Along with this Plan the Supplementary Guidance Air Quality & Land Use Planning document was also adopted.	2019	
11	Measure M11: DCC will ensure effective co-ordination between climate change and air quality strategies and action plan measures	Policy Guidance And Development Control	Strategy to be developed to improve co-ordination between climate change and air quality strategies and action plan measures	DCC Corporate Planning Department DCC City Development - (Property Division) DCC Environment Department					The Sustainability & Climate Change Manager sits on the Corporate Air Quality Steering Group and also the Dundee Low Emission Zone Delivery Group to ensure synergy between AQ and CC policy. Dundee City Council declared a climate emergency in June 2019 and have worked through the Dundee Partnership to develop and launch a citywide Climate Action Plan in support of the transition to a net-zero and climate resilient future. In line with Scottish Government and Council objectives for CAFS, tackling air quality and decarbonising transport are key objectives of this plan. Of the 62 actions in the plan, 18 are related to air quality. In an effort to co-ordinate and deliver a clear and consistent message for the city, a 'Sustainable Dundee' brand was established under which all sustainability and climate change initiatives are promoted.	ongoing	
12	Measure M12: DCC will continue its active involvement and support of TACTRAN	Policy Guidance And Development Control	Regularly attend meetings Provide feedback Provide necessary support						Ongoing support of TACTRAN, with TACTRAN included in the Dundee LEZ Delivery Group. The Council will continue to support TACTRAN and focus on implementation of Regional Transport Strategy throughout the period of this plan. TACTRAN are members of the Dundee Low Emission Zone Delivery Group.	ongoing	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
13	Measure M13: DCC will promote the uptake and use of cleaner and/or alternative fuels where possible for transport DCC will explore the development of electric charging point infrastructure	Promoting low emission transport	Determine strategy/advise note and annually review content Install Electric Charging Facilities in Car Parks						See also measures 7 and 14 The new EV charging hub at the Olympia carpark was installed in March 2020 however the opening of the hub was delayed due to the pandemic. A Heavy Goods Vehicle charging hub was installed at the DCC Marchbanks depot. The Drive Dundee Electric campaign continued its successful engagement with current and potential electric vehicle (EV) owners (both in public and business) through the local media in the form of EV related articles encouraging people to make the switch to EV.	ongoing	
14	Measure M14: DCC will establish and implement a rolling programme for replacing older more polluting vehicles with newer cleaner vehicles, which comply with the prevailing EURO standard	Vehicle Fleet Efficiency	Development of Green Procurement Strategy						See also Measure 7. The Fleet Section within Dundee City Council continue to replace older vehicles in its fleet with newer lower polluting vehicles. By the end of 2020, there were 154 electric vehicles in its fleet.	ongoing	
15	Measure M15: DCC will improve the Council's vehicle fuel consumption efficiency by better management of fleet activities	Vehicle Fleet Efficiency	Develop fleet management plan to improve fuel efficiency.						See also Measures 7, 13 and 14. There are now a number of vehicles fitted with GIS route optimisation software to try and remove excess mileage.	ongoing	
16	Measure M16: DCC will promote options for better travel planning amongst Dundee City Council employees	Promoting Travel Alternatives	Review DCC Travel Plan DCC to investigate use of annual survey on how/what modes of transport employees use to travel to work	DCC City Development (Transportation Division)					See also Measures 3, 17 & 22. A Staff travel survey was completed in October 2019, with over 700 responses were received. A draft Staff Travel Plan was created, with the proposed 2020 launch postponed due to the impact of the pandemic. It remains ready to be launched when staff begin to return to offices in 2021.	2021	
17	Measure M17: DCC will continue to promote and encourage their employees to consider the use of bicycles in their daily duties by providing cycle usage mileage	Promoting Travel Alternatives	Continue to investigate and develop the use of various incentive schemes Develop cycling strategies DCC to investigate use						See also Measures 3, 16 & 22. An updated Dundee Cycling Strategy was launched in September 2019. This refresh of the 2016 strategy sets out how Dundee City Council will deliver its duties, powers and policies to enable and encourage more people to cycle more often.	ongoing	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
			of annual survey on how/what modes of transport employees use to travel to work						Dundee City Council progressed actions contained within the 2019 Dundee Cycling Strategy to enable and encourage more people to cycle more often. The Tax-Free Bikes scheme in partnership with Cyclescheme was made available in 2020. The monthly cycling breakfasts offered to those who cycle in to the city centre was stopped during 2020 as a result of the pandemic.		
18	Measure M18: DCC will assess the Council's energy needs, make recommendations and implement reductions of carbon emissions which result in corresponding reductions of NO ₂ and PM ₁₀ .	Policy Guidance And Development Control	DCC to implement annual energy reduction action plan						The Council continues to invest in a range of energy management projects within its non-domestic building estate. Physical improvements to building fabric, installation of energy efficiency measures and behavioural change campaigns have led to year-on-year reductions in carbon emissions from the Council's buildings. The organisation's carbon footprint has reduced by 42% since 2007/08. The Council also continues its substantial investment in decarbonising its own fleet of vehicles and business travel footprint. Through replacing its older diesel fleet with electric vehicles, the Council has seen a reduction in CO ₂ e of almost 25% in the last 10 years. This is expected to substantially increase in the near future as the organisation completes its fleet decarbonisation and invests in electric refuse collection vehicles and green hydrogen generation.	ongoing	
19	Measure M19: DCC to promote and support localised energy generation that doesn't compromise Air Quality in private households	Promoting Low Emission Plant	Determine strategy/advise note and annually review content	DCC Housing Department Solar Cities					Non-Domestic Energy Efficiency - Basket 2 project is complete with verified annual savings of £270,000 / 730 tCO ₂ . Non Domestic Energy Efficiency - Basket 3 project (known as Climate Action Property Energy Conservation Programme) is due to start in the autumn 2021/22 with projected annual savings of £260,000 / 650tCO ₂ . Feasibility projects to determine the suitability of Photovoltaic installations to several properties are complete and currently being considered.		
20	Measure M20: DCC will provide the public with relevant air quality information.	Public Information	Investigating the potential for uptake of an air pollution	DCC Environment Department					The 2020 Annual Progress Report was submitted in September 2020 and is available for public viewing	ongoing	

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			<p>information system, such as Air Alert</p> <p>Improvements to AQ website information</p> <p>Make up to date air quality information available to the public through Councils digital website</p>	DCC City Development (Transportation Division)					<p>and download through the Dundee City Council website.</p> <p>Historical air quality monitoring data for the 2006 – 2015 period is also directly available, while links to real-time and historical air pollutant data from Dundee's continuous automated monitors presented on the Scottish Air Quality (SAQ) website are also included.</p> <p>The increasing level of air quality information available on the Scottish Air Quality can be accessed through the DCC website. This includes assessments of the impact of pandemic lockdown measures on local air quality in Dundee.</p> <p>A webpage has been set up to provide information on the development of the Dundee Low Emission Zone. www.dundee.gov.uk/LEZ</p>		
21	Measure M21: DCC will continue its work to increase uptake and implementation of School and Workplace Travel Plans, particularly where likely to impact on the AQMA	Promoting Travel Alternatives	DCC to ensure all relevant commercial planning applications have travel plan conditions applied in accordance with current best practice.	DCC City Development Department, (Planning Division, Transportation Division) DCC Education Department					School Travel Plans are discussed at the School Travel and Pupil Safety Working Group with commitment from Executive Director of Children & Families Service to support schools in developing their own travel plans.		
22	Measure M22: DCC will continue working in partnerships with TACTRAN and local active travel networks to ensure that walking and cycling initiatives are promoted and supported in Dundee	Promoting Travel Alternatives	<p>Identify walking & cycling schemes (such as Park & Cycle).</p> <p>Identify walking & cycling promotional opportunities around Dundee City</p>	DCC City Development (Transportation Division)					<p>See also Measures 3, 16 & 17.</p> <p>A Sustrans Cycling Strategy Officer remained embedded within Dundee City Council during 2020.</p> <p>Cycle network improvements included the construction of a section of shared-use path along the Arbroath Road between Fairfield Road and a new toucan crossing to improve access across the main road. There have also been a number of path improvements on the Green Circular, vegetation cutback and path widening / resurfacing and short sections of new path near some schools</p> <p>Various projects under Spaces for People were undertaken in 2020 including, the closure of Union Street to through traffic, 20mph</p>	ongoing	

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									<p>zones were rolled out while modal filters were put in place on Douglas Terrace and the Esplanade to create more space for social distancing.</p> <p>Construction is ongoing on the flood protection works in Broughty Ferry which includes widened shared-use cycle path. DCC secured multi-year funding to develop and build the cycle path from Broughty Ferry to Monifieth including the city's first fully segregated cycle lanes along the Esplanade</p> <p>The 'Embark Dundee' electric bicycle hire scheme was launched in December 2020 by Ride-On, with 14 docking stations and 130 e-bikes being included in the initial phase.</p> <p>The construction of the Active Travel Hub at the Dundee Waterfront progressed.</p> <p>The Sustrans 2019 Bike Life Dundee report was launched in March 2020.</p>		
23	Measure M23: DCC will continue to work with transport providers to support and promote increased uptake of public transport modes	Transport planning and infrastructure	Promote schemes such as the SQUID card including Dundee and surrounding towns. Introduce smart and integrated ticketing						<p>Due to the pandemic the 'Holiday Hop' 20p fare promotion was not undertaken during 2020.</p> <p>The public transport system was significantly impacted upon by the pandemic during 2020, with passenger numbers considerably decreased.</p>	ongoing	
24	Measure M24: DCC will continue to work in partnership with other organisations to promote and implement energy efficiency measures in Dundee	Policy Guidance and Development Control	To implement an Annual Action Plan of energy efficiency measures.	DCC City Development (Property Division)					<p>The Council has now completed its second phase of installation of energy conservation measures within its own estate. In total £4.4 million has been spent on 26 sites with guaranteed energy savings of around £500,000 per annum. This has resulted in annual savings of 1,800 tonnes of CO2. To respond to the climate emergency, a citywide Climate Leadership Group has been established to provide active leadership on Dundee's net-zero challenge, leveraging expertise from across the city in order to engage and inspire collective ownership and a shared commitment to tackling climate change.</p>	ongoing	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
25	Measure M25: DCC Environment Department will comment upon planning applications to ensure that all relevant air quality issues are highlighted and mitigation measures are considered wherever possible	Policy Guidance and Development Control	The Environment Protection section will continue to work with City Development (Planning Division) as Statutory Consultees	DCC City Development Department (Planning Division) DCC Environment Department			Total number of planning applications consultations responded to in each calendar year (changed from financial year)		Officers from the pollution team within Community Safety and Protection check weekly planning lists and provide comments to the Planning Officers on all applications which may adversely impact on local air quality. 40 planning applications were responded to for the 2020 calendar year.	ongoing	
26	Measure M26: DCC will enforce statutory legislation to control smoke, dust, fumes or gas emissions from commercial and domestic premises which are causing a nuisance or are prejudicial to health	N/A	DCC will continue to monitor and enforce statutory legislation in this area	DCC Environment Department			Number of relevant complaints in each financial year. % resolved		For the period up to 31st December, 2020, officers investigated a total of 18 relevant complaints of which 61 % had been resolved and 7 were still being investigated.	ongoing	
27	Measure M27: DCC will enforce relevant legislation to reduce the burning of commercial and domestic waste	N/A	DCC will continue to monitor and enforce legislation in this area	DCC Environment Department			Number of relevant complaints in each financial year. % resolved		During 2020 officers investigated 13 complaints of smoke from commercial waste burning and 75 complaints of smoke from domestic burning (bonfires) under Environmental and Clean Air legislation. 76 of these complaints have been resolved, with 12 still being investigated.	ongoing	
28	Measure M28: DCC will promote composting in a bid to reduce pollution from domestic bonfires	Policy Guidance and Development Control	Reintroduce discount / promotion campaign for compost bins	DCC Environment Department					In March 2020 a charge was introduced for the collection of garden waste. Householders who decided not to sign up were provided with different options for disposal of garden waste and discouraged from using the general waste bin or burning waste. During the first lockdown period in April 2020, messaging through the DCC social media channels and media releases were sent out request that residents refrained from burning waste / garden waste.	ongoing	
29	Measure M29: DCC will continue to monitor a range of air pollutants throughout Dundee and make the monitoring information freely available to the public in an easily understandable form	Public Information	Continued support for Dundee Air Quality Monitoring Network	DCC Environment Department					The existing Particulate Monitors at Broughty Ferry Road was upgraded in January 2020 using Scottish Government grant funding. This has expanded the pollutant monitoring capacity at this location to include PM _{2.5} & PM ₁₀ . See Chapter 3 of this report for details of the automatic and non-automatic monitoring locations in Dundee.	ongoing	

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									See Measure 20 re availability of air quality monitoring data on both the Dundee City Council and Scottish Air Quality websites, and the 2020 Annual Progress Report being available for viewing and download via the DCC website.		
30	Measure M30: DCC will ensure that all air quality monitoring data reported to the public is both accurate and precise by implementing quality control measures	Public Information	Regular calibrations and filter changing of continuous monitoring equipment in DCC's air quality stations At least annual audit of air quality stations' equipment Appropriate use and care of NO ₂ diffusion tubes regularly deployed around the City Council area.	DCC Environment Department					See Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC of main report for details of processes. All diffusion tube changeovers apart from April 2020 were in accordance with the diffusion tube calendar. The April changeovers were on the 2 nd and 30 th of April instead of the 1 st and 29 th of April. This was to limit trips during lockdown and to coincide with Partisol filter changeovers. These dates were within the 48hours either side allowed in the diffusion tube calendar.	ongoing	
31	Measure M31: DCC will establish additional monitoring sites across the City in locations where poor air quality is suspected	N/A	DCC will continue to carry out and report on their statutory duties under the Review & Assessment process for LAQM	DCC Environment Department			Poor air quality sites identified monitored and dealt with through the process of Review & Assessment. Additional monitoring sites established as and when required		See Measure 29 regarding pollutant monitoring locations. New locations for diffusion tube monitoring that commenced in January 2020 included Clepington Road / Mains Loan, Dock Street (Customs House), Dock Street / Gellatly Street, and Victoria Street (Eagle Mill). See Chapter 3 of this report for further details. The existing TEOM Particulate Monitor at the Broughty Ferry Road monitoring station was replaced in January 2020 using Scottish Government grant funding. This has expanded the pollutant monitoring capacity at this location to include PM _{2.5} & PM ₁₀ .	ongoing	See Section 3.1.2. , Table A.3 and Appendix B of the main report for monitoring results for the new tube locations in 2020.
32	Measure M32: DCC will implement road traffic counts to inform the review and assessment process.	Traffic Management	Undertake classified traffic counts	DCC Environment Department					There were no traffic counts undertaken specifically for air quality purposes during 2020. The Paramics traffic model was completed during 2020 and will be used in conjunction with the SEPA AQ City model in 2021 to guide the design of the Dundee LEZ.	ongoing	

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

Dundee City Council undertook automatic (continuous) monitoring at 10 sites during 2020. **Table A.1** in **Appendix A** shows the details of the sites. There are currently three different PM₁₀ monitors (CM3, CM13, CM16) co-located at the Broughty Ferry Road site to help improve data accuracy and validity. During 2020 the particulate analyser (TEOM) at the Urban Industrial site at Broughty Ferry Road was replaced with a new analyser (Palas Fidas 200) capable of monitoring both PM₁₀ and PM_{2.5}, on 8th January 2020. In June 2020 the NO_x analyser at the Meadowside monitoring station developed a fault which was unable to be repaired. Funding for a replacement analyser had been obtained through air quality funding however this was not procured before the end of the calendar year and as such no further automatic (continuous) NO_x monitoring was undertaken from this location during 2020.

National monitoring results are available at www.scottishairquality.co.uk

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

3.1.2 Non-Automatic Monitoring Sites

Dundee City Council undertook non- automatic (passive) monitoring of NO₂ at 88 sites during 2020. **Table A.2** in **Appendix A** shows the details of the sites.

Maps showing the location of the monitoring sites are provided in **Appendix A**. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in **Appendix C.1**. Four (4) new diffusion tube sites were added to the network at the start of 2020 at the following locations where new residential properties had been introduced, proposed or identified close to busy roads:

- Clepington Road / Mains Loan (DT 242)
- Dock Street (Customs House) (DT 241)
- Dock Street / Gellatly Street (DT 240)
- Victoria Street (Eagle Mill) (DT 243)

Due to the impact of the lockdown measures put in place during 2020 on pollutant levels, in particular reduced NO_x emissions as a result of the reduced road traffic, it was decided that no tube locations would be removed or new locations added, with the tube locations from 2020 to continue through 2021.

Individual Pollutants

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

3.1.3 Nitrogen Dioxide (NO₂)

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

For diffusion tubes, the full 2020 dataset of monthly mean values is provided in **Appendix B**. Locations marked in green were new in 2020.

The procedure specified in paragraphs 7.77 to 7.79 of statutory technical guidance LAQM.TG (16) was used to estimate the concentrations at the nearest receptor. The annual mean background concentration used in the calculation was 14.3 µg/m³ (from DT 185) for city centre sites, and 12.9 µg/m³, (the average of concentrations from four urban background locations (DT 7, DT 155, DT 185, and DT 82) for the remainder. The above methodology has been shown in previous reports to under-estimate NO₂ concentrations at building façades in street canyon environments. Potential exceedances (> 36 µg/m³) of the NO₂ annual mean that were identified at relevant locations near the monitoring locations are shown in **Table 3.1**.

Table 3.1 – Locations of Potential Exceedances of the NO₂ annual mean AQO in 2020

Site ID	Location	2020 Bias Adjusted NO ₂ Annual Mean (µg/m ³)	2020 Predicted annual mean NO ₂ concentration at Receptor (µg/m ³)
DT 37	Logie St (114)	40.9	39.2
DT 31	Lochee Rd (140) Traffic Lts	37.6	37.0
DT 205	West Marketgait/Old Mill (23)	36.1	36.0
DT 70	Victoria Rd/Hilltown	38.0	33.0
DT 30	Lochee Rd (138)	39.0	31.1

The highest NO₂ annual mean concentrations predicted at relevant receptors were on the North West arterial route (Logie Street and Lochee Road); the West Marketgait, which is part of the inner ring road; and the main bus corridor (Victoria Road/Hilltown). All of these locations are within the AQMA.

Long term trends in NO₂ concentrations at automatic monitors with at least 5 years data capture are shown in **Figure A.3a**. All show an improving trend except for Broughty Ferry Road which shows an increasing trend. Broughty Ferry Road is included as this is the first time there has been five year's worth of data. The trend at the urban background site at Mains Loan is relatively stable. An analysis of apparent trends in the 76 monitoring locations with at least 5 years data is shown in **Figure A.3b**. Concentrations at the majority of sites (74) show an improving trend or have remained stable. The greatest improvements have been in Meadowside where action plan measures, i.e. to increase the separation distance between the active carriageway and receptors, has been successful in reducing concentrations. Small worsening trends are evident on the main bus corridor (at Whitehall Crescent), and at the urban industrial site on Broughty Ferry Road. NO₂ concentrations at both these locations are below the AQO. The lockdown measures introduced as

a result of the pandemic may have slightly accentuated the long term trend downwards at some sites.

An overview of how NO₂ annual mean concentrations are improving in different areas across the city can be seen in maps and graphs shown in **Appendix C.2**.

Table A.4 in **Appendix A** compares the ratified continuous monitored NO₂ hourly mean concentrations for the past five years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year. No exceedances of the hourly mean objective were identified at automatic monitoring locations in 2020. No exceedances of the hourly mean objective were indicated by the diffusion tube annual mean concentrations in 2020 as none exceeded 60µg/m³. No automatic monitoring locations recorded occasions when the concentration was over 200µg/m³ in 2020.

Previously the only location where the hourly mean objective has been exceeded is at the Lochee Road automatic monitor. However there have been no exceedances of the objective there for the past 7 years. **Figure A.4** shows the long-term trend in the 99.8th percentile concentration of hourly means at Lochee Road. The trend line for the 15-year period that hourly levels have been monitored has been drawn using an Excel simple regression statistical program, with a negative value being shown in 2019 for the first time since the AQMA for the hourly objective was declared in 2013. Diffusion tube monitoring and dispersion modelling show that the automatic monitor is not sited in the most polluted location. In our 2020 Annual Progress Report we advised that there should be an established downward trend before revoking the AQMA for the hourly mean objective.

3.1.4 Particulate Matter (PM₁₀)

Table A.5 in **Appendix A** compares the ratified and adjusted monitored PM₁₀ annual mean concentrations for the past five years with the air quality objective of 18µg/m³.

Table A.6 in **Appendix A** compares the ratified continuous monitored PM₁₀ daily mean concentrations for the past five years with the air quality objective of 50µg/m³, not to be exceeded more than seven times per year.

No exceedances of the PM₁₀ annual mean objective (18µg/m³) were predicted during 2020, within the current AQMA.

Annual mean PM₁₀ concentrations at monitoring sites with at least five years data are shown in **Figure A.5a** and **Figure A.5b**, with an analysis of the trends shown in **Figure A.5c**. An improving trend is evident at all current monitoring locations. The largest decreasing trend is evident at Stannergate (Osiris). Traffic is not the only source of PM₁₀ in the Stannergate area, and two nearby SEPA permitted processes surrendered their licences during 2017. Whitehall Street is included as this is the first time there has been five years worth of data. The lockdown measures introduced as a result of the pandemic may have slightly accentuated the long term trend downwards at some sites.

The PM₁₀ daily mean objective (50µg/m³, not to be exceeded more than 7 times per year) was met at all current monitoring locations during 2020. No monitoring location recorded any potential exceedances of the daily mean objective during 2020.

Figure A.6a shows the frequency of the daily mean PM₁₀ concentrations greater than 50µg/m³ recorded at the real-time monitors. Where the measured data capture is less than 85%, LAQM.TG(16) advises that, it is more appropriate to express short-term concentrations as percentile values for comparison with the objective. Expressing short-term concentrations as

98.08th percentile values provides easier inter-year comparison of data and examination of possible trends. **Figure A.6b** and **Figure A.6c** shows trends for those analysers with at least 5 years data capture. Trend lines have been drawn using an Excel simple regression statistical program.

All of the automatic monitoring sites with at least 5 years data capture show an improving trend. However, it is hard to draw conclusions from the analysis of trends in short-term PM₁₀ exceedances because apart from the influence of annual transboundary events (usually in March and April) most are caused by transient and sometimes unpredictable events such as road works, fires, road gritting and, demolition and construction activities.

3.1.5 Particulate Matter (PM_{2.5})

As of the 1st of April 2016, the Scottish Government introduced the World Health Organisation guideline value for PM_{2.5} into Scottish legislation with an annual mean objective of 10µg/m³ to be achieved by 2020. Scottish local authorities are now required to include PM_{2.5} in the LAQM review and assessment process. Dundee City Council began monitoring for PM_{2.5} at the background site at Mains Loan on the 25th October 2017, a second PM_{2.5} analyser was installed at the Lochee Road monitoring station on the 23rd March 2018. A further three PM_{2.5} monitors (Whitehall Street, Seagate and Meadowside) were installed in March 2019, while on 8th January 2020, a PM_{2.5} monitor was installed at the Urban Industrial site on Broughty Ferry Road.

Table A.7 in **Appendix A** compares the ratified and adjusted monitored PM_{2.5} annual mean concentrations for the past 5 years with the air quality objective of 10µg/m³. No exceedances of the annual mean objective were predicted.

The remaining roadside PM₁₀ monitoring locations represent relevant areas for PM_{2.5}, so the methodology described in LAQM.TG (16) (paragraph 7.109) has been used to estimate the PM_{2.5} annual mean concentrations. **Table 3.2** shows those monitoring locations where the PM_{2.5} objective has been estimated to be exceeded (highlighted in **bold**) since the new requirement was introduced.

Table 3.2 Estimated PM_{2.5} Annual Mean Concentrations 2015 to 2020

Year	2015	2016	2017	2018	2019	2020
<i>Scottish Annual Mean Objective</i>	10	10	10	10	10	10
Logie St (Osiris)	10.9	9.7	10.2	13.2	10.8	9.8
Myrekirk Tce (Osiris)	12.9	10.9	8.4	9.5	8.6	7.7
Albert St (Osiris)	13.3	10.8	10.0	12.3	10.6	9.7
Stannergate (Osiris)	18.8	14.6	9.8	8.3	9.3	8.1

No potential exceedances were estimated at monitoring locations in 2020.

Under section 83(1) of the Environment Act 1995, local authorities have a duty to designate any relevant areas where the air quality objectives are not (or are unlikely to be) met, as Air Quality Management Areas (AQMAs). The concentrations shown in **Table 3.2** are estimated concentrations at indicative analysers using the assumed ratio of PM_{2.5} to PM₁₀ of 0.7 as described in LAQM.TG (16) (paragraph 7.109). However, analysis of the actual ratio of PM_{2.5} to PM₁₀ at monitored roadside sites in Dundee in 2020 gives an average ratio of 0.53. Applying this ratio to the results in **Table 3.2** would bring all the estimated concentrations even further below 10µg/m³, which would indicate, along with actual monitored PM_{2.5} concentrations, that an AQMA for PM_{2.5} is not required.

3.1.6 Sulphur Dioxide (SO₂)

Dundee City Council does not currently monitor SO₂.

3.1.7 Carbon Monoxide, Lead and 1,3-Butadiene

Dundee City Council does not currently monitor any of these pollutants.

4 New Local Developments

Road Traffic Sources

As part of the Cleaner Air for Scotland Strategy 2015 discussed in **Section 2.2**, the Scottish Government, SEPA and Transport Scotland have developed a city air quality model of Dundee's road traffic emissions as part of the National Modelling Framework (NMF). The local NMF model is being utilised to provide a significant proportion of the quantitative evidence required within the detailed options appraisal process for the National Low Emission Framework (NLEF). A comprehensive traffic data collection exercise was undertaken in 2017 in Dundee as shown in previous reports. This was updated in 2019 as part of the wider traffic survey to develop a city-wide Paramics traffic model which was used during 2020 to test preferred scenarios for the Dundee LEZ. The AQ assessment of the scenarios has been delayed and is due to be undertaken during the summer of 2021. Preliminary results from the updated city model using the 2019 traffic data were provided in the 2020 Annual Progress Report. In late 2020, Transport Scotland commissioned a study to consider the impact of the pandemic on how people will travel in the future, with the outcomes of this to be included in sensitivity testing of the various modelling of LEZ scenarios. A range of 'plausible scenarios' were identified for each of the four cities, considering local circumstances for each. For Dundee, the scenario was defined as "Coping as Best We Can" where, following an economic downturn, the projected rate of change towards a cleaner fleet is lower than pre-Covid-19 forecasts (as provided by SEPA) and traffic shrinkage is experienced, similar to the 2010 economic downturn.

Under this section the Council is required to identify any of the following which are new:

- 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;
- Roads with significantly changed traffic flows; and
- Bus or coach stations.

Since the last Annual Progress Report in 2020, there have been no new:

- 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;
- New roads constructed or proposed; and
- Bus or coach stations.

Junctions (including busy roads and junctions in Scotland)

The APR 2017 identified locations (roads with greater than 10,000 vehicles per day (vpd) with relevant exposure within 10m) where although diffusion tube monitoring results are below the annual mean objective for NO₂ it has not been possible to assess whether the PM₁₀ objectives are at risk of being exceeded at these locations. These are:

- Hawkhill (Nr Blackness Primary School); and,
- Dock St close to the busy junction of the A92T and the A991.

It is not anticipated that the PM₁₀ or PM_{2.5} objectives would be breached in the Hawkhill area as none of the reference equivalent automatic monitors in Dundee recorded an exceedance of these objectives in 2020. For the area of Dock Street close to the A92T / A991, modelling was carried out as part of a planning application for a proposed mixed-use development (including flats from first floor), although exceedances of the NO₂ annual mean objective were predicted up to third floor, no exceedances of the objectives PM₁₀ or PM_{2.5} were predicted at receptors in the vicinity.

The APR 2016 reported the results of modelling studies which identified new exceedances of the annual mean objectives for NO₂ and/or PM₁₀ at relevant receptors at the following six locations, all except the Forfar Road / Clepington Road junction are part of the trunk road network.

- A92 (between Broughty Ferry Road and Greendykes Road (PM10 & NO2) (**Figure C.25**);
- Scott Fyfe roundabout (A92/A972/B961/B959/C223) (PM10) (**Figure C.19**);
- Claypotts junction (A92/B978) (PM10);
- A972T (Kingsway – Pitkerro Road roundabout) (NO2) (**Figure C.19**);
- A90 (north of the Kingsway) (NO2) (**Figure C.19**); and
- Forfar Road (A929) / Clepington Road (C244) junction (PM10 & NO2). (**Figure C.19**);

The NO₂ results were checked by diffusion tube monitoring (results shown in **Figure C.19** and **C.25** and **Table A.3**). The monitored concentrations at each of these locations did not breach the annual mean objective.

Each of the eight areas above are within the network of roads and junctions studied by the NMF for Dundee. **Figure C.31** shows no exceedances of the annual mean objective for NO₂ were predicted by the model at these locations. SEPA have indicated that PM₁₀ will be considered as part of the NMF process. These areas are all within the boundary of the current AQMA. There are no specific AQAP actions, currently being pursued, that target trunk road traffic in these areas.

A new housing development with flats proposed closer to the Arbroath Road/ Dalkeith Road junction than existing receptors, was granted planning permission in 2019 (18/00487/FULM). An air quality assessment¹ of road traffic was submitted in support of the application. No exceedances of the relevant air quality objectives were predicted. This should have been reported in last year's APR.

A proposed mixed-use development comprising of retail units on ground floor and 43 flats on upper levels next to the West Marketgait (18/00798/FULL)², which is part of the inner ring road, was granted planning permission in 2019. A condition was attached to the consent requiring a revised air quality assessment to establish any mitigating measures required to protect the amenity of future residents and an assessment of the impact of the development on the existing air quality hotspot in this area. This should have been reported in last year's APR.

¹ http://idoxwam.dundee.gov.uk/idoxpa-web/files/48FD960B9D84802073921BEE81BDF6A4/pdf/18_00487_FULM-AQA_-_REPORT-906535.pdf

² <http://idoxwam.dundee.gov.uk/idoxpa-web/applicationDetails.do?activeTab=documents&keyVal=PFYYQJGCFNO00>

Two new residential developments (3 Gellatly Street -19/00502/FULL³ & Customs House on Dock Street 20/00399/FULL⁴) were granted planning permission in 2020 next to the trunk road (A92 (T)) to the east of the Tay Road Bridge access. Both these developments will introduce new relevant exposure from ground floor into an existing air quality hotspot area. A condition was attached to each consent requiring mitigating measures to protect the amenity of future residents.

Annual road count data (as AADT) from the council's long-term Road Traffic Reduction Act (RTRA) Sites from 2005-2020 are presented in **Table C.6**. Data for some RTRA sites for 2020 was unavailable at the time of writing, however, as shown in the table the lockdown measures put in place as a result of the pandemic greatly reduced road traffic in 2020.

Table C.7 shows the percentage growth at each of the sites since 2005. Only one site, Tay Bridge, had experienced a significant increase (>10%) in traffic flows over the period ending 2019. There is currently no relevant exposure within 10m of this location. Data for 2020 shows the reduction in traffic levels across the sites in Dundee. Consequently, updated assessments of NO₂ and PM₁₀ are not required for those RTRA Sites where there is relevant exposure.

New roads constructed or proposed

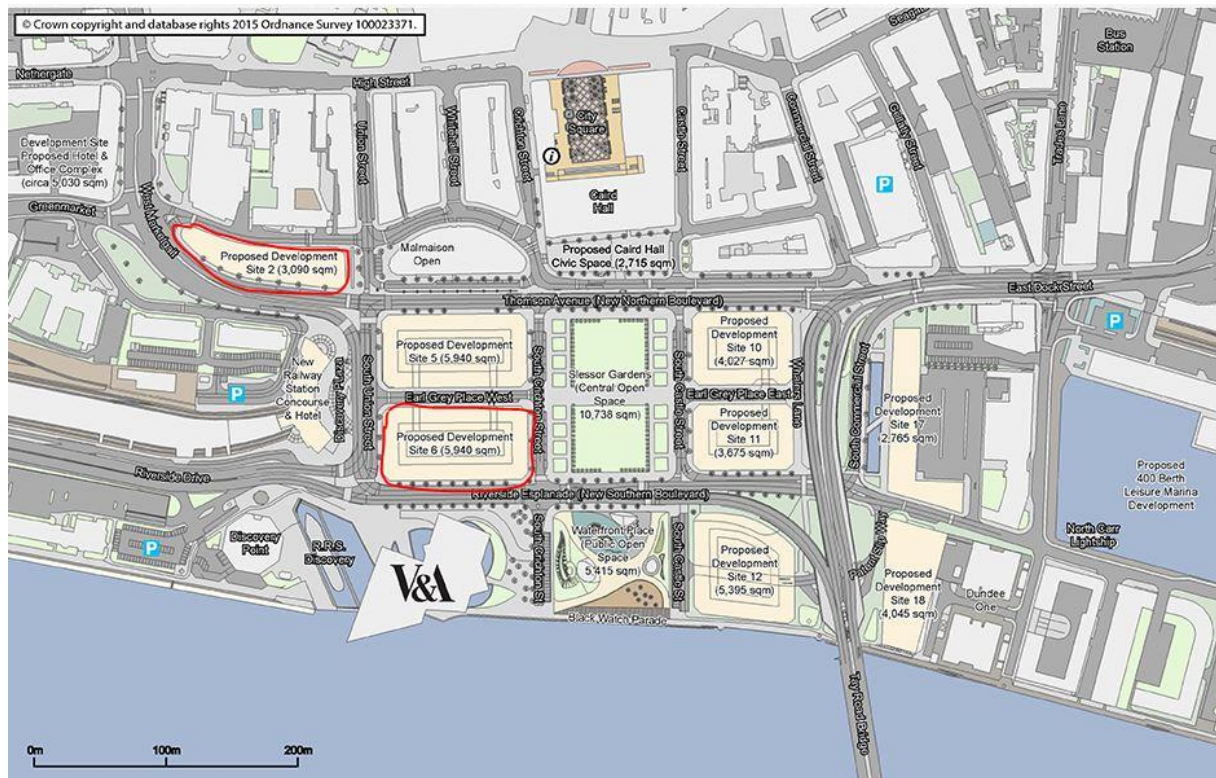
New junctions and roads have been constructed as part of the Central Waterfront Development Masterplan 2001 - 2031, described previously in the Progress Report 2005. The closest receptors to these roads are currently located on Dock Street, which is already an identified exceedance area. New residential developments are proposed within the Central Waterfront Area and the need for review and assessments of the new roads and junctions will be examined in subsequent reports as necessary. Traffic counts of the main roads in the completed road network were undertaken in 2017 as part of the data collection exercise for the city air quality model and updated in 2019. Planning applications were approved in 2017 for the 7 storey mixed use developments including new residential exposure at Site 2 (17/00337/FULM5) and Site 6 (17/00113/FULM6) within the waterfront area as shown in **Figure 4.1**. The planning consents for these developments included conditions requesting air quality assessments for new and existing residential receptors. The assessment of Site 6 was completed in 2018, using traffic count information from the city model, the results of the dispersion modelling indicated that NO₂, PM₁₀ and PM_{2.5} concentrations were predicted to be below the AQOs at all locations of relevant exposure across the development. The results of the air quality assessment of Site 2 will be included in future APR when they become available.

NO₂ diffusion tube monitoring close to Site 2 began in 2017 (DT 218) (see **Figure C.22**). The vacant site is currently being used as a ground level temporary carpark. The monitoring result for this site was below the objective in 2020 (20.6_{µg/m3}). NO₂ diffusion tube monitoring close to Site 6 began in 2018 (DT 228). The monitoring result for this site was below the objective in 2020 (20.6_{µg/m3}).

³ <http://idoxwam.dundeeecity.gov.uk/idoxpa-web/applicationDetails.do?activeTab=documents&keyVal=PUFHQSGCL4C00>

⁴ <http://idoxwam.dundeeecity.gov.uk/idoxpa-web/applicationDetails.do?activeTab=documents&keyVal=QCS79ZGCJCR00>

Figure 4.1 Central Waterfront Site Map



Other Transport Sources

None of the following transport sources have been identified as new since the Annual Progress Report 2020:

- 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; and
- Ports for shipping.

Industrial Sources

Under this section the local authority is required to identify any of the following which are new:

- **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; and
- Poultry farms.

Industrial sources are regulated by the Scottish Environment Protection Agency (SEPA) under the Pollution Prevention and Control Regulations (PPC). Local authorities also have controls over smaller industrial and commercial sources, largely through the Clean Air Act and its associated control of stack heights. As a result of these controls, there should be few sources that may be relevant to local authorities under the Local Air Quality Management (LAQM) regime. The majority of these sources will have been addressed during previous rounds of Review and Assessment and the focus is, therefore, on new installations and those with significantly changed emissions or new exposure.

The technical guidance (LAQM.TG(16)) states that industrial sources are unlikely to make a significant contribution to annual mean concentrations, but may contribute to elevated short-term concentrations, which may lead to exceedances of the short-term air quality objectives (e.g. 15-minute mean for SO₂, 1-hour mean for NO₂ or 24-hour mean for PM₁₀). The assessment should consider the potential impact of specific industrial processes or chemical storage for all of the regulated pollutants. Generally, industrial sources most likely to require further assessment work are those that emit NO₂, PM₁₀ and potentially SO₂.

A list of industrial processes in the city which were regulated by the Scottish Environmental Protection Agency (SEPA) at the end of 2019 is provided in **Appendix C.4**. This Appendix also includes a screening assessment of all the SEPA regulated processes, however at the time of writing updates for 2020 have not been able to be provided by SEPA.

- **New or Proposed Installations for which an Air Quality Assessment has been Carried Out**

SEPA were consulted however advised that they were unable to provide updates on any new or proposed sites in Dundee for 2020. Dundee City Council however approved planning applications for the following proposed installations which were accompanied with air quality assessments during 2020.

18/01000/FULL | Proposed External Cladding & Installation of Flues to Roof of Annex Building | 7 Faraday Street Dryburgh Industrial Estate Dundee DD2 3QQ⁵

The above application involved the installation of a large coffee roasting facility. The Air Quality Assessment concluded that there was no risk of exceeding any of the relevant AQO's at nearby sensitive receptors. Conditions were placed on the planning consent regarding minimum stack heights and abatement technologies. (approved Oct 2019)

- **Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced**

SEPA were consulted however advised that they are unable to provide an update on existing installations for this report. Dundee City Council however approved planning applications for the

⁵ <http://idoxwam.dundee.gov.uk/idoxpa-web/applicationDetails.do?activeTab=documents&keyVal=PI8LIXGCGM200>

following proposed installations which were accompanied with air quality assessments during 2020.

19/00922/FULM | Application under Section 42 of the Town and Country Planning (Scotland) Act 1997 (as amended) for permission to vary Condition 17 of Planning Permission 16/00916/FULM to allow for parallel operations of both facilities for a period of up to 10 years. | Land at Forties Road Baldovie Industrial Estate Dundee DD4 0NS ⁶

APR 2018 reported on the proposed replacement energy from waste facility. Planning permission 16/00916/FULM was granted for the construction of an energy from waste combined heat and power plant in June 2017. The new energy from waste plant was intended to replace the existing DERL facility. Condition 17 was applied to the planning permission to ensure that there was minimal overlap of the two plants operating at the same time because a full assessment of any dual operation was not undertaken, as it was not considered to be necessary at that time.

Due to the requirements for waste incineration, imposed by the ban of sending municipal waste to landfill by 2025, the applicants wished that both plants would remain operational for a period of up to 10 years. This application sought to vary Condition 17 in order to remove the restriction for parallel operation of the plants, and replace with the following:

“The operational overlap between the existing plant and the new plant shall be no more than 10 years, taking into account commissioning and decommissioning periods. The existing waste incinerator (DERL) facility shall not incinerate waste at the same time as the new energy from waste combined heat and power plant from 31st January, 2031.”

Updated air quality assessments, considered the increases in operational traffic and parallel operations of both plants and the cumulative impacts at sensitive receptors. Overall, the impacts on air quality were judged to be ‘not significant’. The parallel operations will not be responsible for leading to a breach of the EU Limit values or any statutory air quality objectives at any of the nearby sensitive locations.

The proposal to vary condition 17 of planning permission in 16/00916/FULM was approved in November 2020, subject to conditions in relation to the original planning permission 16/00916/FULM.

- **New or Significantly Changed Installations with No Previous Air Quality Assessment**

SEPA were consulted however advised that they are unable to provide an update on existing installations for this report.

- **Major Fuel (Petrol) Storage Depots**

The assessment considers benzene, with respect to the 2010 objective. There are no major fuel (petrol) storage depots within the Local Authority area.

⁶<http://idoxwam.dundee.gov.uk/idoxpa-web/applicationDetails.do?activeTab=documents&keyVal=Q1QB0IGC0AX00>

▪ **Petrol Stations**

The assessment considers benzene with respect to the 2010 objective. Large petrol stations, where the annual throughput is more than 2000m³ of petrol (2 million litres per annum) and with a busy road nearby (i.e. >30,000 annual average daily traffic flows) require consideration where there is relevant exposure (e.g. residential properties) within 10m of the pumps. All existing petrol stations have been assessed previously and there are no residences within 10m of the pumps.

Dundee City Council confirms that there are no new petrol stations meeting the specified criteria.

▪ **Poultry Farms**

Farms housing in excess of: 400,000 birds if mechanically ventilated; 200,000 birds if naturally ventilated; and, 100,000 birds for any turkey unit, require consideration if there is residential exposure within 100m of the poultry units. The assessment needs to consider only PM₁₀.

Dundee City Council confirms that there are no poultry farms meeting the specified criteria in Dundee.

Commercial and Domestic Sources

Under this section the Council is required to identify any of the following which are new since the last Annual Progress Report:

- Biomass⁷ combustion plant – individual installations (50kW to 20MW);
- Areas where the combined impact of several biomass combustion sources may be relevant;
- Areas where domestic solid fuel burning may be relevant; and
- Combined Heat and Power (CHP) Plant.

Since the APR 2020, there have been no new biomass combustion installations nor areas identified where the combined impact of several biomass sources may be relevant. Smoke Control Orders cover most of the local authority area and there are currently no areas identified with significant solid fuel use, though regular enquiries/complaints to the Council about domestic solid fuel burning, and planning applications for the installation of wood/solid fuel burning stoves are received.

The requirement to consider CHP Plant is a new requirement that local authorities have had to report since the APR 2016. No new CHP plants were identified during 2020.

⁷ Note (from Defra FAQ 2009): the term 'biomass' strictly applies to all solid fuels made from plants, i.e. coal, smokeless fuels, wood, straw etc... However, the term biomass is now frequently taken to be synonymous with renewable fuels such as wood and straw. For the purposes of air quality review and assessment the strict definition of biomass is applicable.

New Developments with Fugitive or Uncontrolled Sources

Under this section the Council is required to identify any of the following potential sources of fugitive or uncontrolled particulate matter, which are new:

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

APR 2018 Section 4.3, discussed sources of fugitive or uncontrolled particulate matter, proposed within the port area, associated with oil and gas decommissioning activities (PPC/A/1151594) however this application was withdrawn. The proposed activities are still be carried out but under the Waste Management Licensing Regime instead, with an application (WML/L/1194617) being commented on during 2020. The activities will still be regulated by SEPA, but there is the potential for other fugitive dusts to arise from uncontrolled sources across the licensed area, with increased movements of heavy vehicles over unmade ground.

The findings of a study into potential sources of elevated PM₁₀ concentrations at the Stannergate monitoring station (CM 18) to the east of the port, were reported in APR 2018. Road traffic, wind-blown dust from road surfaces, port activities, sea salt and secondary PM from the European continent were identified as potential sources influencing PM₁₀ concentrations at this location. Measured PM₁₀ concentrations at Stannergate (CM 18) reduced since 2017 and are now estimated to be below both the annual mean and daily mean objectives. Monitoring will continue around the port to determine whether further action plan measures are necessary.

5 Planning Applications

Dundee City Council have been advised by the LAQM Helpdesk that this section is not mandatory.

6 Impact of COVID-19 upon LAQM

1. **Did your local authority maintain diffusion tube monitoring networks as normal (exposure and analysis in-line with DEFRA calendar) during 2020, including over the lockdown period?**

No. There were periods early on in the 2020 lockdown where only a limited number of diffusion tubes were changed over, resulting to no data being obtained for up to 5 months in some locations. Initially, only co-location study sites were maintained, with background monitoring areas and exceedance locations re-introduced from May 2020 onwards.

- 1.1. **If no, over what time period(s) was diffusion tube monitoring impacted?**

Results for March and April 2020 are limited to co-location sites only at monitoring stations. From May, we have data for the co-location sites, some known exceedance locations and background locations. Further sites were added in June and July, with full data collection not returning until August 2020. Diffusion tube monitoring has remained at full status since August 2020.

2. **Did your local authority maintain automatic air quality monitoring sites as normal (LSO visits, etc.) during 2020, including over the lockdown period?**

Yes

- 2.1. **If no, how and over what time period(s) was automatic monitoring impacted?**

N/A

3. **Did your local authority carry out any low-cost monitoring during 2020, including over the lockdown period?**

Yes

- 3.1. **If yes, outline what types of monitoring were carried out and how these have been impacted by the lockdown period.**

We maintained five (5) OSIRIS units for monitoring PM10. The lockdown impacted on some data capture from these due to the ability to maintain these being restricted. In addition, the enclosures for the units have not been able to be checked / cleaned as per normal due to being unable to use a cherry picker.

4. **Are there any ongoing issues with your local air quality monitoring network related to the Covid-19 response?**

Yes.

- 4.1. **If yes, please provide details as to nature of issues and how these will impact air quality monitoring.**

The 72-hour gap between visits by personnel to monitoring stations was and is an ongoing issue for timeous response to issues at the station. This has, and will, impact on data capture due to increases in response times.

5. Please provide any additional information relating to current or planned local air quality monitoring which may be relevant.

There were also issues with collection / delivery delays of monitoring equipment that can be associated with home working during 2020. In addition, some repair work of monitoring equipment by engineers took longer possibly due to limited staff in workshops. These issues have affected data capture due to units being out of service for longer periods than they normally would be.

Due to the low data capture at some sites the data has needed to be annualised. In addition, the data for months that have been missed during the lockdown are likely to have shown lower NO₂ levels due to the lockdown measures in place during those months affecting road traffic levels. As such, the missed lower levels will mean that annualised average figures will be higher than what would have been observed with full data capture during 2020.

Finally, in respect of our LAQM duty to "review and assess" AQ we normally review tube locations and redeploy a small number to new sites of potential concern. Owing to low data capture and lower than normal traffic pollution this has not been possible.

7 Conclusions and Proposed Actions

Conclusions from New Monitoring Data

Due primarily to the lockdown measures put in place during 2020 which significantly reduced road traffic levels across Scotland, there were no potential exceedances of the NO₂ annual mean objective (40µg/m³) at receptor locations, within the Dundee AQMA.

An analysis of trends in NO₂ annual mean concentrations at monitoring locations with at least 5 years data indicates that the majority of sites show an improving trend with the greatest improvement taking place in Meadowside where action plan measures have been successful in reducing concentrations. Small worsening trends are evident on the main bus corridor (at Whitehall Crescent), and at the urban industrial site at Broughty Ferry Road. NO₂ concentrations at both these locations are below the AQO. The lockdown measures introduced as a result of the pandemic may have slightly accentuated the long-term trend downwards at some sites.

No exceedances of the NO₂ hourly mean objective were identified by automatic monitors or indicated by diffusion tubes in 2020. Lochee Road is the only area of the city where the hourly AQO has been exceeded previously. No exceedances of the hourly mean were recorded in 2020, and for the past 7 years the objective has been achieved (18 exceedances are allowed). The trend line in the 99.8th percentile concentration showed at negative value for the first time in 2019 since the AQMA for the hourly mean was declared in 2013. Until there is an established downward trend the AQMA for the hourly mean AQO should remain.

No exceedances of the PM₁₀ annual mean objective (18µg/m³) were predicted during 2020.

An improving trend is evident at all current monitoring locations. The largest decreasing trend is evident at Stannergate (Osiris). Traffic is not the only source of PM₁₀ in the Stannergate area, and two nearby SEPA permitted processes surrendered their licences during 2017. Whitehall Street is included as this is the first time there has been five years' worth of data. The lockdown measures introduced as a result of the pandemic may have slightly accentuated the long-term trend downwards at some sites.

The PM₁₀ daily mean objective (50µg/m³, not to be exceeded more than 7 times per year) was met at all monitoring locations during 2020.

All of the automatic monitoring sites with at least 5 years data capture show an improving trend. However, it is hard to draw conclusions from the analysis of trends in short-term PM₁₀ exceedances because apart from the influence of annual transboundary events (usually in March and April) most are caused by transient and sometimes unpredictable events such as road works, fires, road gritting and, demolition and construction activities.

No monitored exceedances of the PM_{2.5} annual mean objective (10µg/m³) were recorded in Dundee during 2020. Potential exceedances of the PM_{2.5} annual mean objective (10µg/m³) have been estimated from the PM₁₀ annual mean concentrations using the methodology described in LAQM.TG(16). No potential exceedances were estimated at any locations.

Conclusions relating to New Local Developments

The work being undertaken as part of CAFS to set up an air quality model of Dundee's road traffic sources was highlighted in **Section 4.1**. Areas of the city meeting the criteria for assessment for PM₁₀ are listed and these will be included in the city model in due course. An air quality assessment for a new flatted development close to Arbroath Road is discussed, no exceedances of the relevant Air Quality objectives were predicted.

An air quality assessment is awaited for a proposed mixed-use development (including residential and other receptors) within the Central Waterfront Area. Another proposed mixed-use development comprising of retail units on ground floor and 43 flats on upper levels next to the West Marketgait, which is part of the inner ring road, was granted planning permission in 2019. A condition was attached to the consent requiring a revised air quality assessment to establish any mitigating measures required to protect the amenity of future residents and an assessment of the impact of the development on the existing air quality hotspot in this area. This should have been reported in last year's APR. These assessments will be reviewed in subsequent reports when available.

Two new residential developments were granted planning permission in 2020 next to the trunk road (A92 (T)) to the east of the Tay Road Bridge access. Both these developments will introduce new relevant exposure from ground floor into an existing air quality hotspot area. A condition was attached to each consent requiring mitigating measures to protect the amenity of future residents.

Traffic flows from the council's Road Traffic Reduction Act Sites from 2020 were reviewed, the lockdown measures put in place as a result of the pandemic greatly reduced road traffic in 2020.

No new areas requiring assessment were identified. There were no new 'other transport' sources identified in **Section 4.2** during 2020.

One new industrial source was identified in 2020, as discussed **Section 4.3** this application for a large coffee roasting facility was approved in 2019. The Air Quality Assessment concluded that there was no risk of exceeding any of the relevant AQO's at nearby sensitive receptors. Conditions were placed on the planning consent regarding minimum stack heights and abatement technologies.

Planning approval was also given in 2020 to allow the existing municipal waste incinerator to continue operating for a further 10 years alongside the new energy from waste facility. Updated air quality assessments, considered the increases in operational traffic and parallel operations of both plants and the cumulative impacts at sensitive receptors. Overall, the impacts on air quality were judged to be 'not significant'. The parallel operations will not be responsible for leading to a breach of the EU Limit values or any statutory air quality objectives at any of the nearby sensitive locations.

Commercial and domestic sources were reviewed in **Section 4.4**. No new areas or installations meeting the criteria were identified in 2020.

There is the potential for an increase in uncontrolled fugitive particulate matter as a consequence of additional movements of heavy vehicles over unmade ground associated with oil and gas decommissioning facilities proposed within the port. Activities within the port were previously identified as contributing to elevated PM₁₀ concentrations measured at the Stannergate monitoring station. There are ongoing changes within the port area, and although this location has seen a reduction in the measured concentrations of PM₁₀, monitoring will continue to determine if further action plan measures are needed.

Proposed Actions

The 2020 monitoring data did not identify the need to declare an AQMA for any additional pollutants or objectives. None of the new diffusion tubes deployed in 2020 identified a new area of exceedance outside of the known hotspots, although the lockdown measures put in place as a result of the pandemic is likely to have resulted in reduced concentrations. The following actions are proposed following the review and assessment of monitoring data and new developments:

- Continue monitoring of fugitive PM₁₀ sources around the port area;
- Review the air quality assessment awaited for the mixed use development in the Central Waterfront Area and West Marketgait;
- Report on any new or significantly changed SEPA prescribed process;
- Report on the new diffusion tubes installed in 2020. Four diffusion tubes were installed in areas where new residential developments are planned or have been identified close to busy roads and junctions in Dundee. The results obtained in 2020 are unlikely to have been representative;
 - Clepington Road / Mains Loan
 - Dock St (Customs House)
 - Dock Street / Gellatly Street
 - Victoria Street (Eagle Mill)
- Monitor planning applications for new pollution sources, relevant exposure and creation of 'street canyons';
- Provide an update on the outcomes of modelling carried out using the NMF AQ City model for Dundee during the NLEF process for LEZ development;
- Liaise with Transport Scotland as part of the NLEF process to discuss whether any additional actions are possible to reduce pollutant concentrations at relevant locations close to the trunk road network in Dundee;
- Implement the action plan measures being taken forward in 2021/22;
- Consider whether specific action plan measures are possible to target the identified exceedance areas on the West Marketgait (part of the inner ring road);
- Commence a review and update of the existing 2011 Air Quality Action Plan to reflect the improvements made to air quality in Dundee over the 10 years of the plan being in place, identify any areas where new actions are required, and to align the plan with the forthcoming Dundee LEZ and revised Scottish Government Cleaner Air for Scotland strategy; and,
- Submit the next Annual Air Quality Progress Report in 2022.

Appendix A: Monitoring Results

Table A.1 Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? (Y/N)	Monitoring Technique	Distance to Relevant Exposure? (m) ⁽¹⁾	Distance to Kerb of Nearest Road (m) ⁽²⁾	Inlet Height (m)
CM 3	Broughty Ferry Road Rollalong	Urban Industrial	341970	730977	PM ₁₀	Y	TEOM	0	6.88	2.93
					NO ₂		Chemiluminescent ^g		6.63	2.97
					PM ₁₀ & PM _{2.5}		Fidas ^k		6.63	2.86
CM 13	Broughty Ferry Road Partisol	Urban Industrial	341971	730978	PM ₁₀	Y	Partisol	0	6.11	2.84
CM 4	Lochee Road Romon	Roadside	338861	730773	NO ₂	Y	Chemiluminescent ^{b f}	2.15 (2.24)	1.00 (1.15)	1.95 (1.77)
					PM ₁₀		Beta Attenuation (BAM) ^f	2.24	1.15	2.06
					PM ₁₀ & PM _{2.5}		Fidas ^f	1.98	1.36	2.21
CM 9	Logie Street Osiris	Kerbside	338176	731298	PM ₁₀	Y	Osiris (nephthalometer)	1.65	0.57	3.31
CM 12	Mains Loan	Urban Background	340972	731893	NO ₂	Y	Chemiluminescent ^c	0	n/a	1.80
					PM ₁₀ & PM _{2.5}		Fidas ^e			2.43
CM 5	Seagate Romon	Roadside	340487	730446	NO ₂	Y	Chemiluminescent ^b	2.00	1.10	1.70
					PM ₁₀		Beta Attenuation (BAM)			2.06
					PM ₁₀ & PM _{2.5}		Fidas ^h			1.81
CM 2	Union Street Rollalong ^j	Roadside	340235	730091	NO ₂	Y	Chemiluminescent ^b	3.55	1.64	2.92
					PM ₁₀		Beta Attenuation (BAM) ^a		1.64	3.00
CM 6	Whitehall Street Romon	Roadside	340278	730156	NO ₂	Y	Chemiluminescent ^b	1.86	3.26	1.80
					PM ₁₀		Beta Attenuation (BAM)	1.79	3.33	2.06

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? (Y/N)	Monitoring Technique	Distance to Relevant Exposure? (m) ⁽¹⁾	Distance to Kerb of Nearest Road (m) ⁽²⁾	Inlet Height (m)
					PM ₁₀ & PM _{2.5}		Fidas ^h	1.63	3.52	2.62
CM 14	Meadowside Romon	Roadside	340243	730653	NO ₂	Y	Chemiluminescent ^d	0.42	3.59 (1.60) ⁱ	2.26
					PM ₁₀		Beta Attenuation (BAM)			3.65 (1.63) ⁱ
					PM ₁₀ & PM _{2.5}		Fidas ^h	0.79	3.53	2.63
CM 15	Albert Street Osiris	Kerbside	341090	731105	PM ₁₀	Y	Osiris (nephthalometer)	1.54	0.89	3.15
CM 16	Broughty Ferry Road Osiris	Urban Industrial	341970	730977	PM ₁₀	Y	Osiris (nephthalometer)	0	7.15	3.00
CM 17	Myrekirk Osiris	Roadside	335438	731740	PM ₁₀	Y	Osiris (nephthalometer)	0.4	14.00	3.11
CM 18	Stannergate Osiris	Roadside	343322	731073	PM ₁₀	Y	Osiris (nephthalometer)	1.93	1.16	3.11

Notes:

- (1) "0" if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property or representative of a residential area).
- (2) N/A if not applicable. 'Kerb' is taken as being the edge of the carriageway with flowing traffic
 - ^a During 2013 equipment was updated from TEOM to BAM
 - ^b During 2013 equipment was updated from model ML 9841A to model API T200
 - ^c Equipment is model Thermo 42i
 - ^d Equipment is model ML 2041
 - ^e During 2017 equipment was updated from TEOM to Palas Fidas
 - ^f On 23rd March 2018 monitoring station upgraded with new enclosure and Palas Fidas replaced BAM. NOx inlet position changed slightly old measurements shown in brackets
 - ^g API T200 NOx analyser relocated from closed Union Street Station in January 2016
 - ^h During March 2019 equipment was updated from BAM to Palas Fidas
 - ⁱ Measurements amended to reflect change in pavement width, see Erratum in Appendix C.5 APR2020, old measurements shown in brackets
 - ^j CM2 Union Street – was discontinued in January 2016
 - ^k On 8th January 2020 equipment was updated from TEOM to Palas Fidas

Figure A.1 Automatic Monitoring Sites 2020

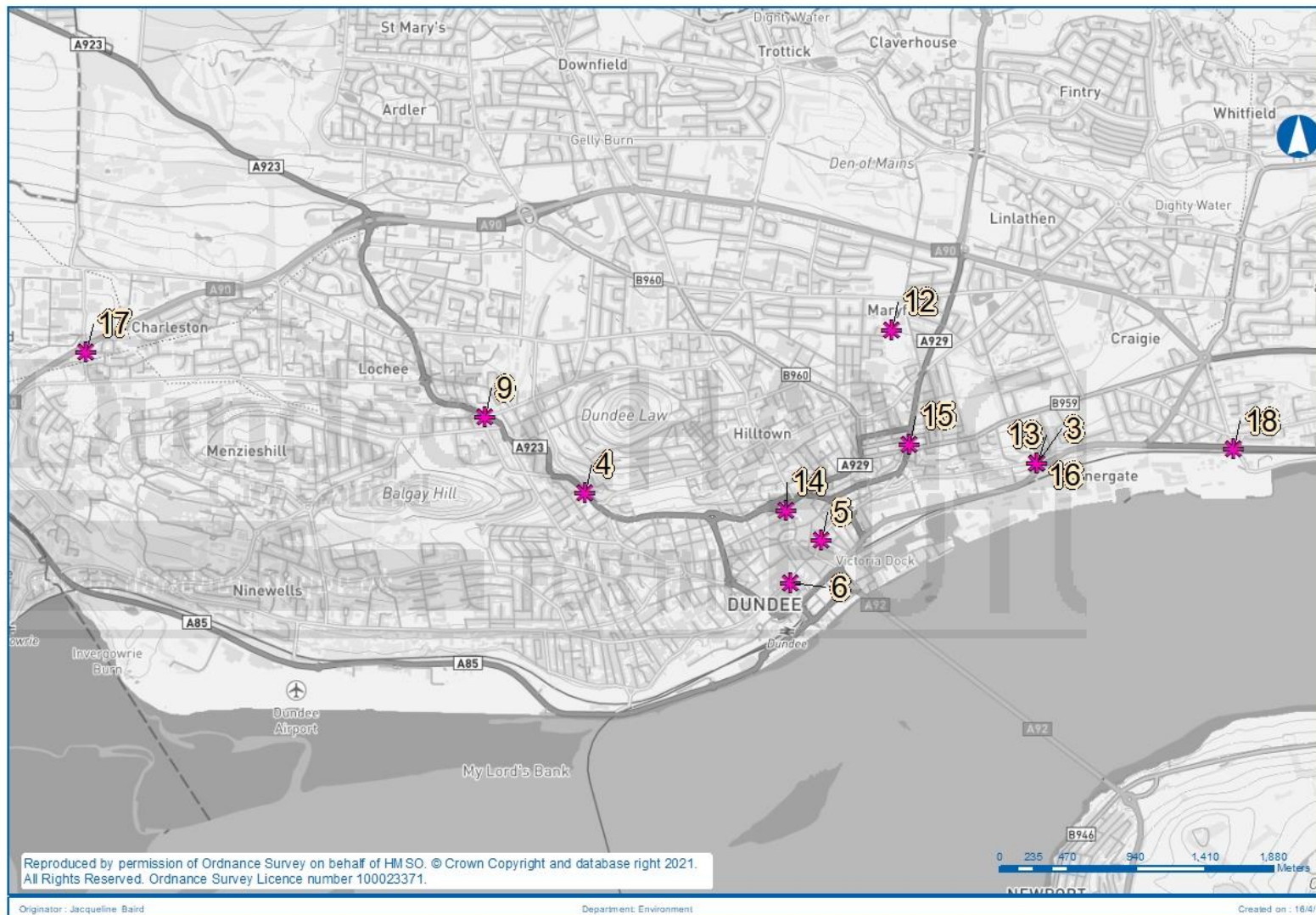


Table A.2 Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type (1)	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ? (Y/N)	Monitoring Technique	Distance to Relevant Exposure ? (m) (2)	Distance to Kerb of Nearest Road (m) (3)	Tube collocated with a Continuous Analyser ?
DT 92	Abertay 2	R	340019	730612	NO ₂	Y	PDT	2.01	1.95	N
DT 179	Albert St (15) (Facade)	R	341092	731121	NO ₂	Y	PDT	0.25	2.04	N
DT 180	Albert St (15) (Rdside)	K	341091	731121	NO ₂	Y	PDT	1.75	0.54	N
DT 167	Albert St (191)	K	341161	731535	NO ₂	Y	PDT	2.70	0.62	N
DT 5	Arbroath Rd (13)	K	341111	731070	NO ₂	Y	PDT	2.52	0.73	N
DT 7	Balgavies Place	UB	343082	731465	NO ₂	Y	PDT	n/a	n/a	N
DT 9	Birnam Place	UB	337531	730914	NO ₂	Y	PDT	n/a	n/a	N
DT 223	Broughty Ferry Rd – Lower (Cyclesign)	UB	343530	730937	NO ₂	Y	PDT	n/a	2.84	N
DT 204	Broughty Ferry Rd (129)	R	342244	731066	NO ₂	Y	PDT	3.57	2.27	N
DT 139	Broughty Ferry Rd (141 Downpipe)	R	343317	731072	NO ₂	Y	PDT	0.20	4.32	N
DT 11	Broughty Ferry Rd (141)	R	343322	731073	NO ₂	Y	PDT	1.98	1.32	N
DT 145	Broughty Ferry Rd (Greendykes)	R	342662	731112	NO ₂	Y	PDT	7.72	4.10	N
DT 155	Carolina Court LP6	UB	342353	731058	NO ₂	Y	PDT	n/a	n/a	N
DT 171	Claypotts / Arbroath Rd (502)	R	345347	732080	NO ₂	Y	PDT	5.30	11.20	N
DT 242	Clelington Rd / Mains Loan	R	341050	732111	NO ₂	Y	PDT	n/a	1.94	N
DT 13	Clelington Rd/ Forfar Rd	K	341385	732121	NO ₂	Y	PDT	8.28	0.78	N
DT 188	Commercial St (9)	R	340544	730291	NO ₂	Y	PDT	2.44	2.57	N
DT 84	Commercial St/Dock St (40)	R	340565	730263	NO ₂	Y	PDT	0.17	2.78	N
DT 85	Dock St (21)	R	340524	730216	NO ₂	Y	PDT	0.34	5.13	N
DT 156	Dock St (57)	R	340656	730343	NO ₂	Y	PDT	3.25	2.53	N
DT 241	Dock St (Customs House)	R	340691	730344	NO ₂	Y	PDT	1.42	3.24	N
DT 243	Dock St / Gellatly St	R	340638	730328	NO ₂	Y	PDT	0.65	5.00	N
DT 233	Dock St/Trades Lane	R	340690	730382	NO ₂	Y	PDT	-0.39	6.14	N
DT 227	Dudhope Crescent Road (40)	K	339830	730619	NO ₂	Y	PDT	1.99	0.83	N
DT 20	Dura St (100)	K	341150	731576	NO ₂	Y	PDT	1.65	0.57	N

Site ID	Site Name	Site Type (¹)	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ? (Y/N)	Monitoring Technique	Distance to Relevant Exposure ? (m) (²)	Distance to Kerb of Nearest Road (m) (³)	Tube collocated with a Continuous Analyser ?
DT 214	East Dock Street (26)	R	340725	730417	NO ₂	Y	PDT	0.20	3.70	N
DT 22	Eastport Roundabout	R	340651	730623	NO ₂	Y	PDT	1.56	1.00	N
DT 83	Forfar Rd (104)	K	341437	732360	NO ₂	Y	PDT	7.68	0.67	N
DT 177	Kingsway / Strathmartine Rd (279)	R	339179	732896	NO ₂	Y	PDT	3.63	3.14	N
DT 26	Kingsway East Roundabout	R	343107	731740	NO ₂	Y	PDT	14.30	2.90	N
DT 27	Kingsway/ Mains Loan	R	341124	732468	NO ₂	Y	PDT	15.40	6.20	N
DT 30	Lochee Rd (138)	K	338936	730680	NO ₂	Y	PDT	2.06	0.44	N
DT 31	Lochee Rd (140) Traffic Lts	R	338927	730685	NO ₂	Y	PDT	0.25	2.22	N
DT 32	Lochee Rd (184)	K	338767	730856	NO ₂	Y	PDT	3.19	0.73	N
DT 158	Lochee Rd (Romon) Average	R	338861	730773	NO ₂	Y	PDT	2.03	1.34	Y
DT 36	Lochee Rd/Polepark Rd	K	339016	730586	NO ₂	Y	PDT	9.21	0.95	N
DT 37	Logie St (114)	R	338184	731293	NO ₂	Y	PDT	0.53	1.73	N
DT 38	Logie St (98)	K	338252	731258	NO ₂	Y	PDT	n/a	0.84	N
DT 39	Loons Rd (1)	R	338211	731293	NO ₂	Y	PDT	0.50	1.90	N
DT 237	Lower Princess St	R	340964	730855	NO ₂	Y	PDT	0	2.44	N
DT 149	Meadowside (Romon) Average	R	340243	730653	NO ₂	Y	PDT	0.33	3.68	Y
DT 42	Muirton Rd (6)	R	338156	731294	NO ₂	Y	PDT	0.30	1.11	N
DT 185	Murraygate (46)	UB	340409	730484	NO ₂	Y	PDT	n/a	n/a	N
DT 189	Myrekirk Rd (29)	R	335420	731726	NO ₂	Y	PDT	5.17	2.00	N
DT 47	Nethergate (40)	R	340230	730124	NO ₂	Y	PDT	2.72	1.26	N
DT 45	Nethergate (6)	R	340274	730171	NO ₂	Y	PDT	2.51	1.25	N
DT 213	Nethergate (64)	R	340196	730089	NO ₂	Y	PDT	2.40	4.15	N
DT 44	Nethergate (88)	K	340163	730061	NO ₂	Y	PDT	5.00	0.86	N
DT 46	Nethergate (95)	K	340033	729957	NO ₂	Y	PDT	1.84	0.86	N
DT 48	Nethergate(132) / Marketgait	R	340074	729984	NO ₂	Y	PDT	3.60	1.33	N
DT 239	Princes St (185)	K	341077	731031	NO ₂	Y	PDT	2.40	0.60	N

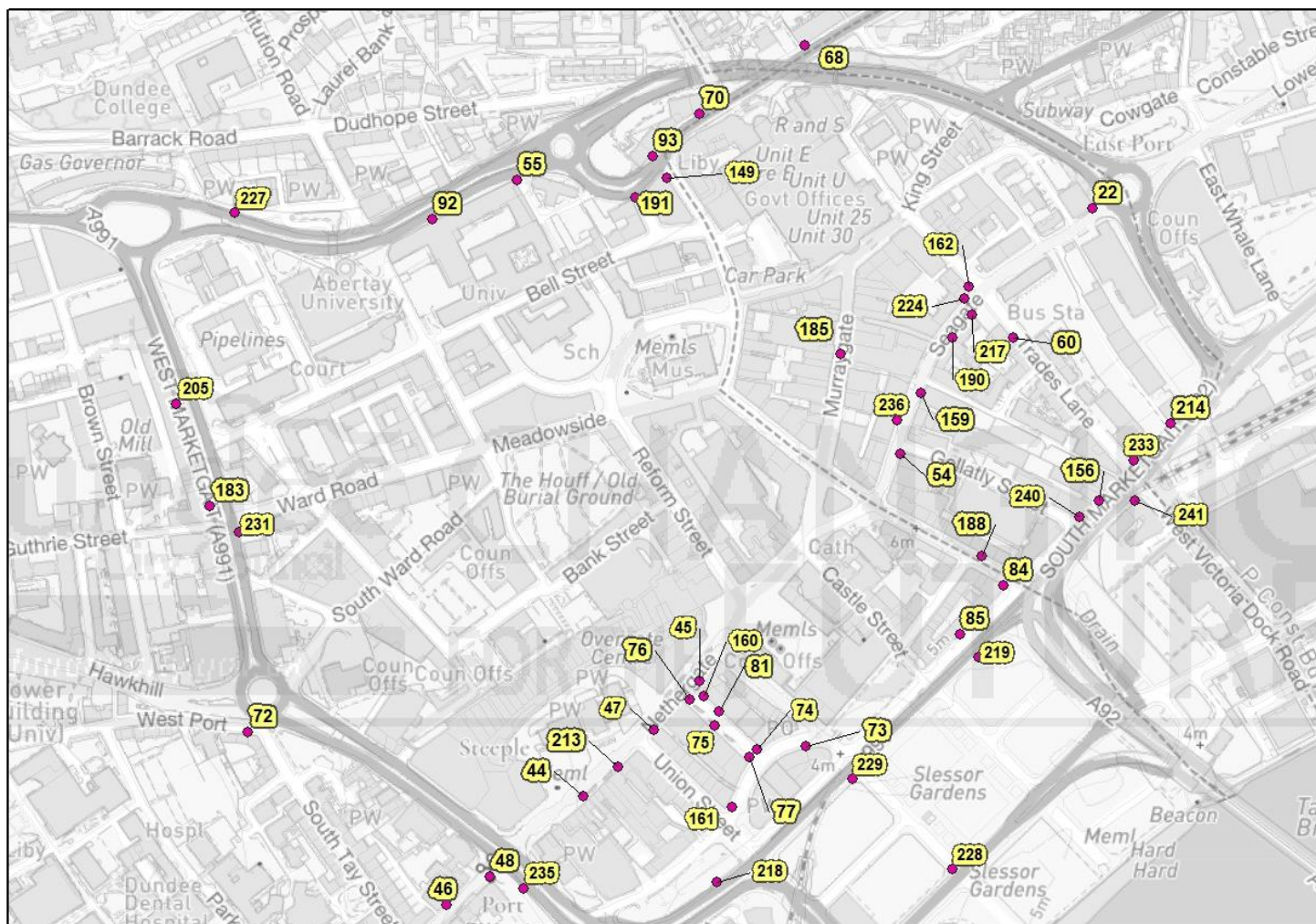
Site ID	Site Name	Site Type (1)	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ? (Y/N)	Monitoring Technique	Distance to Relevant Exposure ? (m) (2)	Distance to Kerb of Nearest Road (m) (3)	Tube collocated with a Continuous Analyser ?
DT 49	Rankine St (2)	R	338768	730900	NO ₂	Y	PDT	0.40	1.76	N
DT 228	Riverside Esplanade / S. Crichton St.	R	340516	729991	NO ₂	Y	PDT	1.17	2.74	N
DT 224	Seagate (112)	R	340528	730537	NO ₂	Y	PDT	0	2.64	N
DT 236	Seagate (36-40)	R	340463	730420	NO ₂	Y	PDT	0.20	2.76	N
DT 54	Seagate (9)	R	340467	730388	NO ₂	Y	PDT	0.90	1.70	N
DT 190	Seagate (97)	R	340516	730499	NO ₂	Y	PDT	0	2.26	N
DT 217	Seagate (99)	R	340535	730522	NO ₂	Y	PDT	0	2.35	N
DT 159	Seagate(Romon) Average	R	340487	730446	NO ₂	Y	PDT	1.81	1.29	Y
DT 55	Soapwork Lane	R	340099	730650	NO ₂	Y	PDT	0	3.51	N
DT 218	South Marketgait (Lampost 18)	R	340291	729979	NO ₂	Y	PDT	n/a	2.58	N
DT 235	South Marketgait/Nethergate ^(e)	R	340106	729972	NO ₂	Y	PDT	0.15	2.88	N
DT 151	South Rd (1 Denbank)	R	335188	731528	NO ₂	Y	PDT	0.28	1.79	N
DT 162	St Andrews St / Seagate (116)	R	340532	730548	NO ₂	Y	PDT	0.18	2.53	N
DT 59	Strathmore Avenue (353)	K	339609	731871	NO ₂	Y	PDT	1.45	0.67	N
DT 219	Thomson Avenue (Street Sign)	R	340542	730194	NO ₂	Y	PDT	1.80	2.20	N
DT 229	Thomson Avenue / S. Crichton St.	K	340421	730078	NO ₂	Y	PDT	3.05	0.86	N
DT 60	Trades Lane (31)	K	340575	730500	NO ₂	Y	PDT	1.82	0.44	N
DT 184	Victoria Rd (104) / William St	R	340697	730950	NO ₂	Y	PDT	1.50	1.36	N
DT 93	Victoria Rd (10b)	K	340230	730673	NO ₂	Y	PDT	2.70	0.30	N
DT 191	Victoria Rd (4) - India Buildings	R	340213	730633	NO ₂	Y	PDT	0	2.77	N
DT 68	Victoria Rd (60)	R	340375	730779	NO ₂	Y	PDT	0.56	2.18	N
DT 70	Victoria Rd/Hilltown	R	340274	730714	NO ₂	Y	PDT	2.01	1.15	N
DT 243	Victoria St (Eagle Mill)	R	340836	731026	NO ₂	Y	PDT	0.27	1.73	N
DT 71	Victoria St/Albert St	K	341071	731072	NO ₂	Y	PDT	1.70	0.75	N
DT 183	West Marketgait / Guthrie St	R	339805	730338	NO ₂	Y	PDT	2.02	1.16	N
DT 205	West Marketgait/ Old Mill (23)	R	339773	730436	NO ₂	Y	PDT	0.05	2.80	N

Site ID	Site Name	Site Type ⁽¹⁾	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ? (Y/N)	Monitoring Technique	Distance to Relevant Exposure ? (m) ⁽²⁾	Distance to Kerb of Nearest Road (m) ⁽³⁾	Tube collocated with a Continuous Analyser ?
DT 231	West Marketgait/ Ward Road	R	339834	730314	NO ₂	Y	PDT	0	2.70	N
DT 72	Westport (2)	R	339842	730122	NO ₂	Y	PDT	2.50	0.46	N
DT 73	Whitehall Cr (4)	K	340376	730109	NO ₂	Y	PDT	3.00	0.88	N
DT 161	Whitehall Cr /Union St (50)	K	340305	730051	NO ₂	Y	PDT	4.78	0.64	N
DT 76	Whitehall St (1)	K	340265	730153	NO ₂	Y	PDT	5.57	0.88	N
DT 81	Whitehall St (12)	R	340293	730142	NO ₂	Y	PDT	2.67	3.00	N
DT 77	Whitehall St (15)	K	340322	730098	NO ₂	Y	PDT	4.55	0.75	N
DT 74	Whitehall St (40)	K	340330	730106	NO ₂	Y	PDT	3.57	0.78	N
DT 75	Whitehall St (5)	R	340289	730128	NO ₂	Y	PDT	3.17	2.51	N
DT 160	Whitehall St (Romon) Average	R	340278	730156	NO ₂	Y	PDT	1.66	3.49	Y
DT 82	Woodside Ave	UB	340776	732307	NO ₂	Y	PDT	n/a	0.55	N

Notes:

- a) R=Roadside, K=Kerbside, UB=Urban Background, 'Kerb' is taken as being the edge of the carriageway with flowing traffic.
- b) "0" if the monitoring site is at a location of exposure (e.g. installed on, adjacent to, or equivalent to the façade of a residential property, or is representative of a residential area).
- c) "n/a" if measurement not applicable (e.g.PDT at background).
- d) New sites are highlighted in green.
- e) Erratum - DCC Report APR2020 had incorrect x,y coordinates for DT235. These coordinates have been updated in this table.

Figure A.2a NO₂ Diffusion Tube Locations (City Centre)



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Figure A.2b NO₂ Diffusion Tube Locations (East)

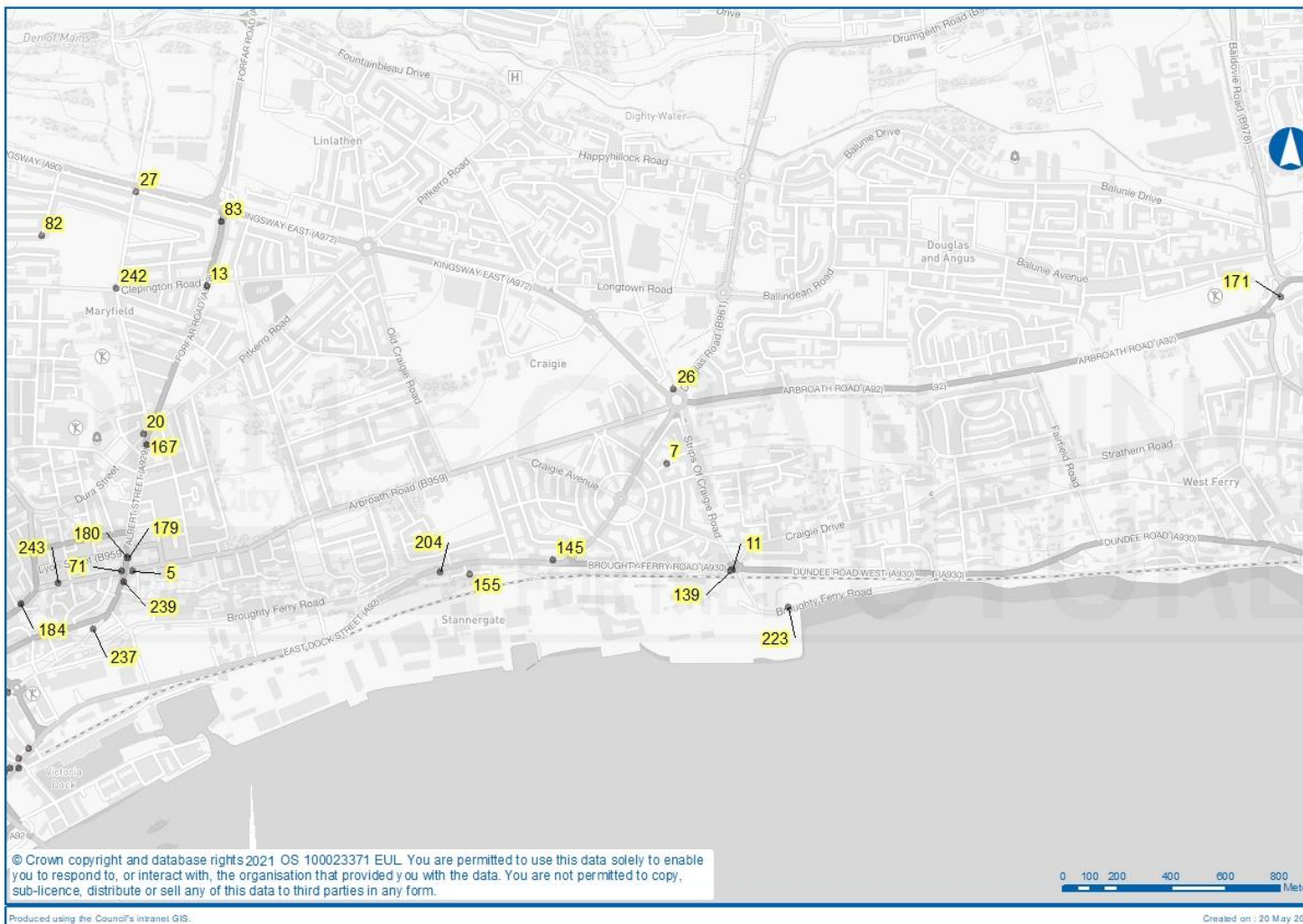


Figure A.2c NO₂ Diffusion Tube Locations (West)

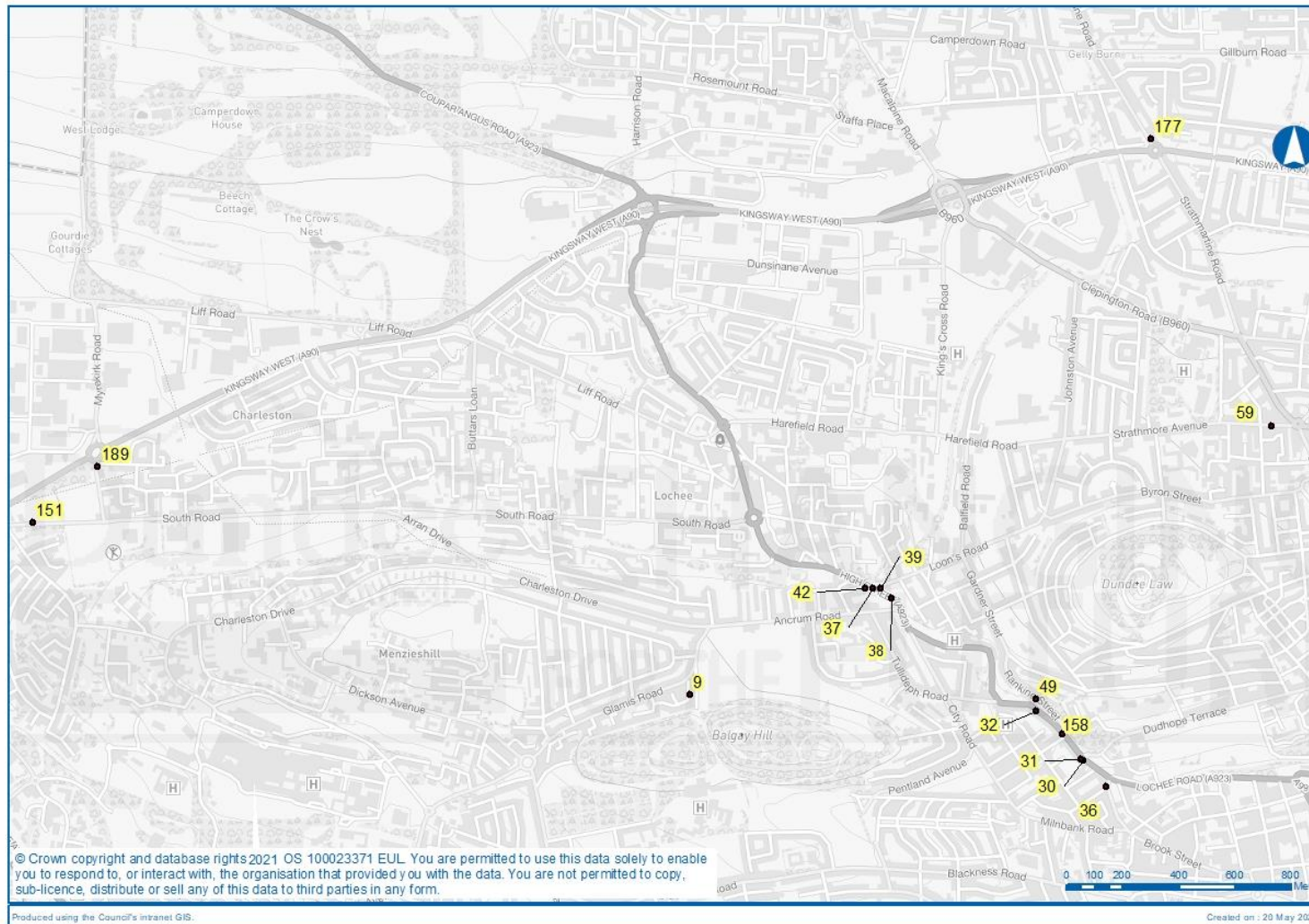


Table A.3 – Annual Mean NO₂ Monitoring Results

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2020 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2016	2017	2018	2019	2020
DT 92	Abertay 2	R	PDT	75.0	38.5	35.9	37.9	36.5	26.2
DT 179	Albert St (15) (Facade)	R	PDT	75.0	33.7	31.5	33.2	30.3	24.5
DT 180	Albert St (15) (Rdside)	K	PDT	75.0	35.5	33.0	35.1	31.7	25.2
DT 167	Albert St (191)	K	PDT	58.3	33.5	30.1	32.5	30.6	20.8
DT 187	Albert St (81)	K	PDT		31.3	27.9	29.7	27.1	
DT 5	Arbroath Rd (13)	K	PDT	75.0	36.5	33.7	35.0	32.1	27.2
DT 147	Arbroath Rd (38)	K	PDT		35.0	34.3			
DT 212	Arbroath Rd (89)	R	PDT		29.4				
DT 7	Balgavies Place	UB	PDT	75.0	16.3	16.7	15.2	14.3	12.6
DT 9	Birnam Place	UB	PDT	58.3	9.5	9.9	9.3	8.5	6.5
DT 140	Broughty Ferry Rd (L/P 66)	R	PDT		33.1	33.5			
DT 164	Broughty Ferry Rd - Lower	UB	PDT		14.9	18.6			
DT 204	Broughty Ferry Rd (129)	R	PDT	66.7	36.0	38.2	40.1	37.0	27.0
DT 139	Broughty Ferry Rd (141 Downpipe)	R	PDT	66.7	33.3	34.0	31.1	30.1	24.4
DT 11	Broughty Ferry Rd (141)	R	PDT	66.7	40.4	40.0	36.4	36.3	26.7
DT 145	Broughty Ferry Rd (Greendykes)	R	PDT	58.3	35.0	34.1	33.6	32.2	24.7
CM 3	Broughty Ferry Road	UI	Automatic	82.9	12.7	19.7	23.3	22.9	19.6
DT 223	Broughty Ferry Road Lower (Cyclesign)	UB	PDT	50.0		24.4	20.2	22.0	19.1
DT 155	Carolina Court LP6	UB	PDT	75.0	19.1	20.4	19.7	19.4	15.7
DT 171	Claypotts / Arbroath Rd (502)	R	PDT	58.3	26.6	29.1	25.9	24.8	21.0
DT 210	Cleghorn Street (57)	R	PDT		27.1				
DT 232	Clelington Rd (164)	R	PDT					24.2	
DT 242	Clelington Rd / Mains Loan	R	PDT	75.0					16.4
DT 13	Clelington Rd/ Forfar Rd	K	PDT	58.3	31.8	30.6	30.6	29.4	21.7

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2020 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2016	2017	2018	2019	2020
DT 226	Commercial St (84)	R	PDT				26.2		
DT 188	Commercial St (9)	R	PDT	75.0	37.4	34.2	35.1	33.8	25.7
DT 84	Commercial St/Dock St (40)	R	PDT	75.0	34.8	34.3	33.1	31.6	24.7
DT 192	Dock St (12)	R	PDT		26.1	25.8	25.9		
DT 85	Dock St (21)	R	PDT	75.0	37.6	36.7	33.7	33.1	25.7
DT 156	Dock St (57)	R	PDT	75.0	49.3	49.4	46.4	44.2	32.6
DT 241	Dock St (Customs House)	R	PDT	75.0					27.8
DT 240	Dock St / Gellatly St	R	PDT	83.3					28.5
DT 233	Dock St/Trades Lane	R	PDT	75.0				33.5	27.8
DT 206	Drumgeith Road (2)	R	PDT		18.4	19.6			
DT 227	Dudhope Crescent Road (40)	K	PDT	58.3			39.3	38.8	28.9
DT 20	Dura St (100)	K	PDT	58.3	37.5	33.5	33.2	32.7	24.7
DT 214	East Dock Street (26)	R	PDT	75.0	34.7	31.8	31.6	32.9	27.1
DT 22	Eastport Roundabout	R	PDT	75.0	31.7	30.0	31.1	30.0	21.7
DT 83	Forfar Rd (104)	K	PDT	58.3	46.3	40.6	41.0	38.1	28.5
DT 211	Forfar Rd (83a)	R	PDT		31.3				
DT 225	Grays Lane (3)	R	PDT				21.4		
DT 221	Harcourt Street (CCTV)	R	PDT			17.8			
DT 209	Hawkhill (251)	R	PDT		21.4				
DT 202	High St Lochee (22-24)	R	PDT		30.2				
DT 216	King Street (3)	K	PDT		30.9	28.5	32.8		
DT 177	Kingsway / Strathmartine Rd (279)	R	PDT	58.3	34.8	32.0	33.7	28.7	23.2
DT 26	Kingsway East Roundabout	R	PDT	58.3	37.2	37.9	38.3	34.1	27.6
DT 27	Kingsway/ Mains Loan	R	PDT	75.0	31.5	27.6	28.4	27.5	20.5
DT 30	Lochee Rd (138)	K	PDT	75.0	48.9	47.3	48.4	45.8	39.0
DT 31	Lochee Rd (140) Traffic Lts	R	PDT	83.3	53.0	48.1	48.8	46.2	37.6

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2020 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2016	2017	2018	2019	2020
DT 32	Lochee Rd (184)	K	PDT	75.0	35.1	34.5	33.7	32.4	29.2
DT 158	Lochee Rd (Romon) Average	K	PDT	100.0	43.8	42.6	43.1	41.5	32.4
CM 4	Lochee Rd Romon	R	Automatic	99.8	44.6	43.6	43.4	43.0	31.2
DT 36	Lochee Rd/Polepark Rd	K	PDT	75.0	27.6	26.7	25.4	25.7	20.1
DT 37	Logie St (114)	R	PDT	75.0	53.8	47.9	48.2	47.1	40.9
DT 38	Logie St (98)	K	PDT	75.0	34.3	32.9	31.5	30.2	26.2
DT 39	Loons Rd (1)	R	PDT	75.0	38.6	35.6	35.5	35.1	28.9
DT 237	Lower Princess St	R	PDT	58.3				29.8	21.2
CM 12	Mains Loan	UB	Automatic	97.4	11.4	12.1	12.3	11.0	8.5
DT 182	Meadowside (28)	K	PDT		35.9	34.8	35.0		
DT 149	Meadowside (Romon) Average	R	PDT	100.0	41.0	39.3	40.4	37.7	27.9
DT 238	Meadowside Halls	R	PDT					28.4	
CM 14	Meadowside Romon	R	Automatic	32.0	35.9	34.8	34.3	33.9	25.6
DT 42	Muirton Rd (6)	R	PDT	75.0	26.6	23.4	25.0	24.1	19.0
DT 222	Muirton Road (2)	R	PDT			24.3	26.1		
DT 185	Murraygate (46)	UB	PDT	83.3	21.2	20.0	21.0	21.6	14.3
DT 189	Myrekirk Rd (29)	R	PDT	58.3	33.7	30.7	29.4	28.3	21.4
DT 47	Nethergate (40)	R	PDT	58.3	35.4	33.8	36.7	33.3	22.0
DT 45	Nethergate (6)	R	PDT	75.0	36.8	35.7	37.2	32.2	24.6
DT 213	Nethergate (64)	R	PDT	75.0	38.4	34.6	37.6	34.6	25.9
DT 44	Nethergate (88)	K	PDT	75.0	41.9	39.1	41.3	39.0	26.5
DT 46	Nethergate (95)	K	PDT	66.7	30.5	29.0	30.2	30.7	19.0
DT 48	Nethergate(132) / Marketgait	R	PDT	75.0	29.9	27.8	28.4	27.2	20.3
DT 207	Pitkerro Road (42)	R	PDT		32.6	32.5	33.0		
DT 239	Princes St (185)	K	PDT	75.0				39.9	30.6
DT 49	Rankine St (2)	R	PDT	75.0	36.5	39.3	38.5	36.7	28.6

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2020 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2016	2017	2018	2019	2020
DT 228	Riverside Esplanade / S. Crichton St.	R	PDT	75.0			29.1	25.4	20.6
CM 5	Seagate	R	Automatic	99.8	47.0	44.3	45.9	44.5	28.5
DT 50	Seagate (101)	R	PDT		38.7	35.5	38.3		
DT 224	Seagate (112)	R	PDT	75.0		34.1	37.6	37.1	29.1
DT 236	Seagate (36-40)	R	PDT	75.0				35.1	26.6
DT 54	Seagate (9)	R	PDT	75.0	33.2	30.3	29.5	28.8	21.3
DT 190	Seagate (97)	R	PDT	75.0	41.8	38.7	41.7	41.0	29.0
DT 217	Seagate (99)	R	PDT	75.0		42.5	41.3	37.9	28.3
DT 159	Seagate(Romon) Average	K	PDT	100.0	41.3	38.4	40.0	39.1	26.5
DT 55	Soapwork Lane	R	PDT	75.0	35.4	33.9	34.2	33.7	25.6
DT 218	South Marketgait (Lampost 18)	R	PDT	75.0		30.0	32.4	29.3	20.6
DT 235	South Marketgait/Nethergate	R	PDT	75.0				23.7	17.4
DT 151	South Rd (1 Denbank)	R	PDT	58.3	33.4	33.6	32.5	30.6	23.2
DT 56	St Andrews St (26)	K	PDT		30.9	29.0		26.2	
DT 162	St Andrews St PB (façade)	R	PDT	75.0	35.1	32.8	33.7	32.4	25.3
DT 208	St Ann Street (2)	R	PDT		18.3				
DT 220	Strathmartine Road (15)	R	PDT			17.7			
DT 59	Strathmore Avenue (353)	K	PDT	58.3	39.4	33.2	32.4	31.6	23.6
DT 219	Thomson Avenue (Street Sign)	R	PDT	75.0		31.1	31.6	30.3	22.7
DT 229	Thomson Avenue/S.Crichton St	K	PDT	75.0			28.9	27.9	21.7
DT 60	Trades Lane (31)	K	PDT	75.0	27.4	26.3	25.3	23.8	18.3
DT 184	Victoria Rd (104) / William St	R	PDT	58.3	29.7	27.4	28.4	27.2	20.2
DT 93	Victoria Rd (10b)	K	PDT	75.0	31.7	29.8	31.5	31.3	24.8
DT 191	Victoria Rd (4) - India Buildings	R	PDT	75.0	30.2	28.6	29.3	28.9	21.9
DT 68	Victoria Rd (60)	R	PDT	75.0	34.7	33.0	33.4	33.0	26.8
DT 70	Victoria Rd/Hilltown	R	PDT	83.3	50.8	51.5	49.2	48.3	38.0

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2020 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2016	2017	2018	2019	2020
DT 243	Victoria St (Eagle Mill)	R	PDT	58.3					16.2
DT 71	Victoria St/Albert St	K	PDT	75.0	30.9	28.0	28.0	26.8	21.8
DT 183	West Marketgait / Guthrie St	R	PDT	75.0	46.1	44.1	41.4	38.3	34.0
DT 231	West Marketgait/ Ward Road	R	PDT	83.3			31.2	33.5	24.5
DT 205	West Marketgait/Old Mill (23)	R	PDT	83.3	51.6	45.1	47.0	47.1	36.1
DT 72	Westport (2)	R	PDT	58.3	31.2	33.1	31.5	28.4	19.9
DT 73	Whitehall Cr (4)	K	PDT	75.0	33.7	33.2	32.3	30.7	23.6
DT 161	Whitehall Cr /Union St (50)	K	PDT	75.0	24.9	24.4	24.1	23.2	16.9
DT 76	Whitehall St (1)	K	PDT	75.0	43.0	40.9	42.5	40.3	31.8
DT 81	Whitehall St (12)	R	PDT	75.0	35.0	34.5	38.4	35.4	27.9
DT 77	Whitehall St (15)	K	PDT	66.7	32.3	31.8	32.9	31.0	22.9
DT 74	Whitehall St (40)	K	PDT	66.7	35.2	33.7	36.8	33.4	24.9
DT 75	Whitehall St (5)	R	PDT	75.0	40.1	39.5	39.3	35.8	27.7
DT 160	Whitehall St (Romon) Average	R	PDT	100.0	36.6	35.0	38.3	34.6	23.8
CM 6	Whitehall St Romon	R	Automatic	92.7	37.2	35.3	37.5	33.4	24.0
DT 82	Woodside Ave	UB	PDT	83.3	13.7	13.3	13.4	11.4	9.1

Notes: Exceedences of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**. Borderline values are shown in **orange**. NO₂ annual means exceeding 60µg/m³, indicating a potential exceedence of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

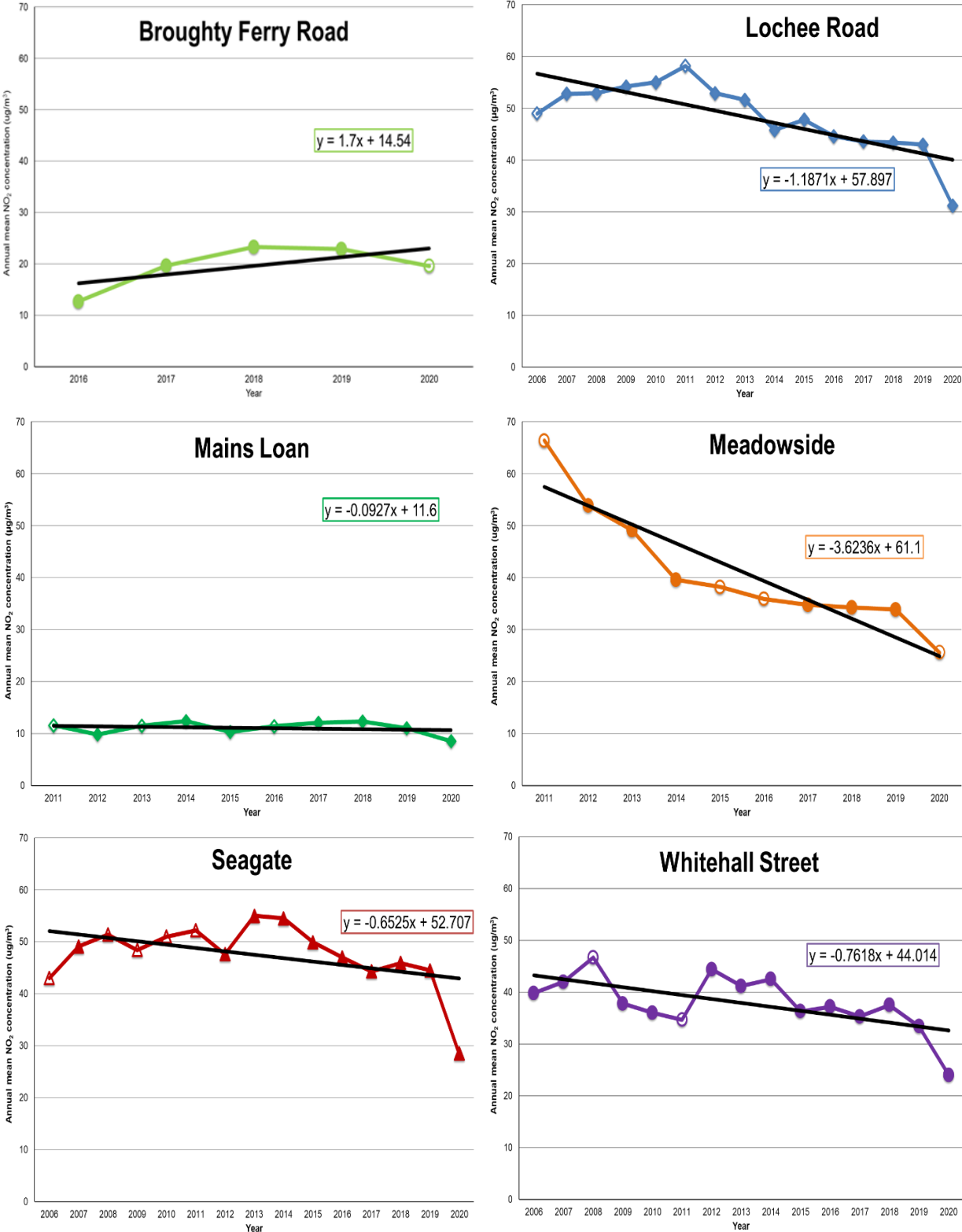
(1) R=Roadside, K=Kerbside, UB=Urban Background

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

(3) Means for diffusion tubes have been corrected for bias.

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

Figure A.3a Trends in Annual Mean NO₂ at Automatic monitors



- Notes:**
- 1) Graphs show the trends in the NO₂ annual mean concentrations measured at the continuous monitors (other locations nearby may have higher concentrations.)
 - 2) A minimum of five years data is required to show a valid trend. More years (data points) give greater certainty in the trend.
 - 3) For strict comparison with the annual mean objective of 40µg/m³, data capture should be greater than 85%. Annual means where data capture were below 85% are shown by a 'hollow' marker.
 - 4) Means have been "annualised" as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%. See **Appendix C** for details.

Figure A.3b Trend Analysis at Long-term NO₂ Monitoring Locations

Site Id.	Location	Site Type	No. of years for trend	Trend	Site Id.	Location	Site Type	No. of years for trend	Trend
CM 14	Meadowside	R	10	-3.624	CM 6	Whitehall Street	R	15	-0.762
DT 190	Seagate (97)	R	8	-2.994	DT 71	Victoria St/Albert St	K	15	-0.760
DT 205	West Marketgait/Old Mill (23)	R	6	-2.891	DT 47	Nethergate (40)	R	15	-0.745
DT 149	Meadowside (Romon) Average	R	10	-2.733	DT 27	Kingsway/ Mains Loan	R	15	-0.731
DT 213	Nethergate (64)	R	5	-2.495	DT 20	Dura St (100)	K	15	-0.730
DT 183	West Marketgait / Guthrie St	R	8	-2.070	DT 30	Lochee Rd (138)	K	15	-0.727
DT 177	Kingsway / Strathmartine Rd (279)	R	8	-1.869	DT 48	Nethergate(132) / Marketgait	R	15	-0.725
DT 188	Commercial St (9)	R	8	-1.835	DT 5	Arbroath Rd (13)	K	15	-0.717
DT 167	Albert St (191)	K	8	-1.564	DT 158	Lochee Rd (Romon) Average	K	15	-0.714
DT 171	Claypotts / Arbroath Rd (502)	R	5	-1.557	DT 59	Strathmore Avenue (353)	K	15	-0.708
DT 180	Albert St (15) (Rdside)	K	8	-1.491	DT 31	Lochee Rd (140) Traffic Lts	R	15	-0.696
DT 204	Broughty Ferry Rd (129)	R	6	-1.474	DT 11	Broughty Ferry Rd (141)	R	15	-0.688
DT 189	Myrekirk Rd (29)	R	8	-1.454	DT 145	Broughty Ferry Rd (Greendykes)	R	10	-0.670
DT 161	Whitehall Cr /Union St (50)	K	9	-1.442	DT 39	Loons Rd (1)	R	15	-0.655
DT 214	East Dock Street (26)	R	5	-1.419	CM 5	Seagate	R	15	-0.653
DT 179	Albert St (15) (Facade)	R	8	-1.408	DT 77	Whitehall St (15)	K	15	-0.645
DT 184	Victoria Rd (104) / William St	R	8	-1.289	DT 37	Logie St (114)	R	15	-0.631
DT 162	St Andrews St PB (facade)	R	9	-1.265	DT 45	Nethergate (6)	R	15	-0.611
DT 156	Dock St (57)	R	10	-1.251	DT 36	Lochee Rd/Polepark Rd	K	15	-0.585
CM 4	Lochee Road	R	15	-1.189	DT 22	Eastport Roundabout	R	15	-0.541
DT 92	Abertay 2	R	12	-1.179	DT 26	Kingsway East Roundabout	R	15	-0.535
DT 185	Murraygate (46)	UB	8	-1.125	DT 155	Carolina Court LP6	UB	9	-0.528
DT 191	Victoria Rd (4) - India Buildings	R	8	-1.102	DT 82	Woodside Ave	UB	15	-0.522
DT 159	Seagate(Romon) Average	K	15	-1.069	DT 42	Muirton Rd (6)	R	15	-0.486
DT 75	Whitehall St (5)	R	15	-1.067	DT 85	Dock St (21)	R	15	-0.448
DT 54	Seagate (9)	R	15	-1.009	DT 160	Whitehall St (Romon) Average	R	15	-0.447
DT 72	Westport (2)	R	15	-0.972	DT 76	Whitehall St (1)	K	15	-0.440
DT 46	Nethergate (95)	K	15	-0.952	DT 32	Lochee Rd (184)	K	15	-0.432
DT 139	Broughty Ferry Rd (141 Downpipe)	R	10	-0.946	DT 81	Whitehall St (12)	R	15	-0.427
DT 151	South Rd (1 Denbank)	R	10	-0.941	DT 49	Rankine St (2)	R	15	-0.422
DT 93	Victoria Rd (10b)	K	12	-0.918	DT 38	Logie St (98)	K	15	-0.348
DT 60	Trades Lane (31)	K	15	-0.855	DT 7	Balgavies Place	UB	15	-0.283
DT 83	Forfar Rd (104)	K	15	-0.845	DT 74	Whitehall St (40)	K	15	-0.279
DT 68	Victoria Rd (60)	R	15	-0.836	DT 55	Soapwork Lane	R	15	-0.215
DT 13	Clelington Rd/ Forfar Rd	K	15	-0.830	DT 9	Birmam Place	UB	15	-0.212
DT 70	Victoria Rd/Hilltown	R	15	-0.818	CM 12	Mains Loan	UB	10	-0.093
DT 84	Commercial St/Dock St (40)	R	15	-0.790	DT 73	Whitehall Cr (4)	K	15	0.097
DT 44	Nethergate (88)	K	15	-0.780	CM 3	Broughty Ferry Rd	UI	5	1.700

Note: (1) Locations where the 2020 NO₂ annual mean is exceeded at the monitor are shown in **bold**, borderline locations are **orange**
 (2) Blue is an improving trend, red is a worsening trend
 (3) Methodology explained after **Figure A.5c**

Table A.4 – 1-Hour Mean NO₂ Monitoring Results, Number of 1-Hour Means > 200µg/m³

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2020 (%) ⁽²⁾	NO ₂ 1-Hour Means > 200µg/m ³ ⁽³⁾				
					2016	2017	2018	2019	2020
CM3	Broughty Ferry Rd	UI	Automatic	82.9	0	0	0	0	0 (61.1)
CM4	Lochee Rd Romon	R	Automatic	99.8	4	6	6	2	0
CM12	Mains Loan	UB	Automatic	97.4	0 (77.2)	1	0	0	0
CM14	Meadowside Romon	R	Automatic	32.0	0 (102.4)	0	0	0	0 (95.1)
CM5	Seagate	R	Automatic	99.8	0	0	0	0	0
CM6	Whitehall St Romon	R	Automatic	92.7	0	0	0	0	0

Notes: Exceedences of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

(1) R=Roadside, K=Kerbside, UB=Urban Background, UI=Urban Industrial

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

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

Figure A.4 Trend in 99.8th percentile of hourly mean NO₂ concentrations at Lochee Road

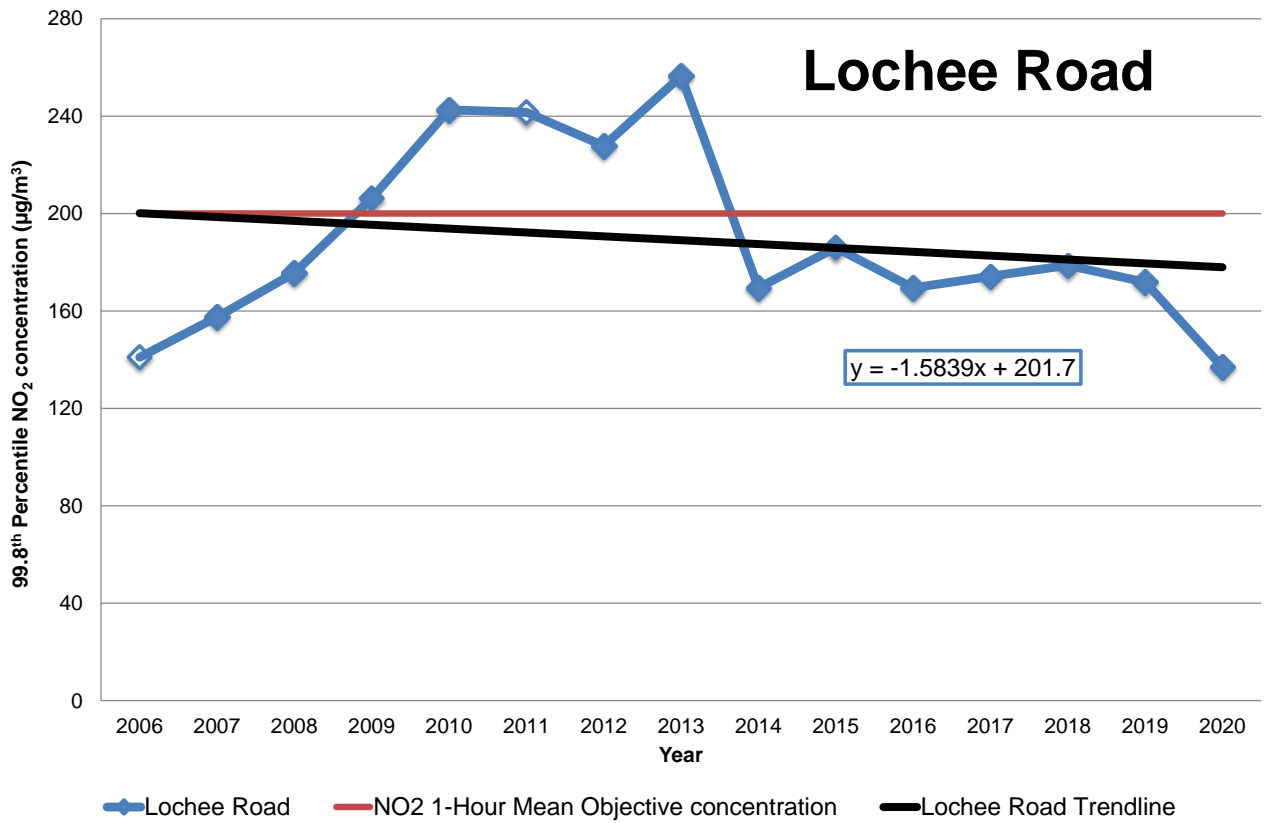


Table A.5 – Annual Mean PM₁₀ Monitoring Results

Site ID	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2019 (%) ⁽²⁾	PM ₁₀ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2016	2017	2018	2019	2020
CM 4	Lochee Rd (BAM/Fidas)	R	Automatic	86.6	18.9	17.5	12.6	11.8	9.8
CM 5	Seagate (BAM/Fidas)	R	Automatic	99.7	13.7	15.8	15.6	13.7	9.6
CM 14	Meadowside (BAM/Fidas)	R	Automatic	99.0	16.4	14.7	15.3	14.1	9.1
CM 6	Whitehall Street (BAM/Fidas)	R	Automatic	99.3	15.1	14.7	15.7	11.9	7.9
CM 12	Mains Loan (TEOM/Fidas)	UB	Automatic	99.7	10.0	9.5	9.1	9.2	7.0
CM 3	Broughty Ferry Rd (TEOM/Fidas)	UI	Automatic	99.5	12.1	11.4	12.3*	13.6	8.9
CM 13	Broughty Ferry Rd (Partisol)	UI	Automatic	76.6	11.5	11.1	11.2	11.3	10.0*
CM 16	Broughty Ferry Rd (Osiris)	UI	Automatic	87.7	11.5	11.1	11.3*	11.2	9.7
CM 9	Logie St (Osiris)	K	Automatic	71.8	13.8	14.5	18.9	15.4*	14.0*
CM 17	Myrekirk Tce (Osiris)	R	Automatic	88.8	15.6	12.0	13.5	12.3*	11.0
CM 15	Albert St (Osiris)	K	Automatic	70.4	15.4	14.3	17.5*	15.1	13.9*
CM 18	Stannergate (Osiris)	R	Automatic	88.8	20.8	14.0	11.9*	13.3*	11.5

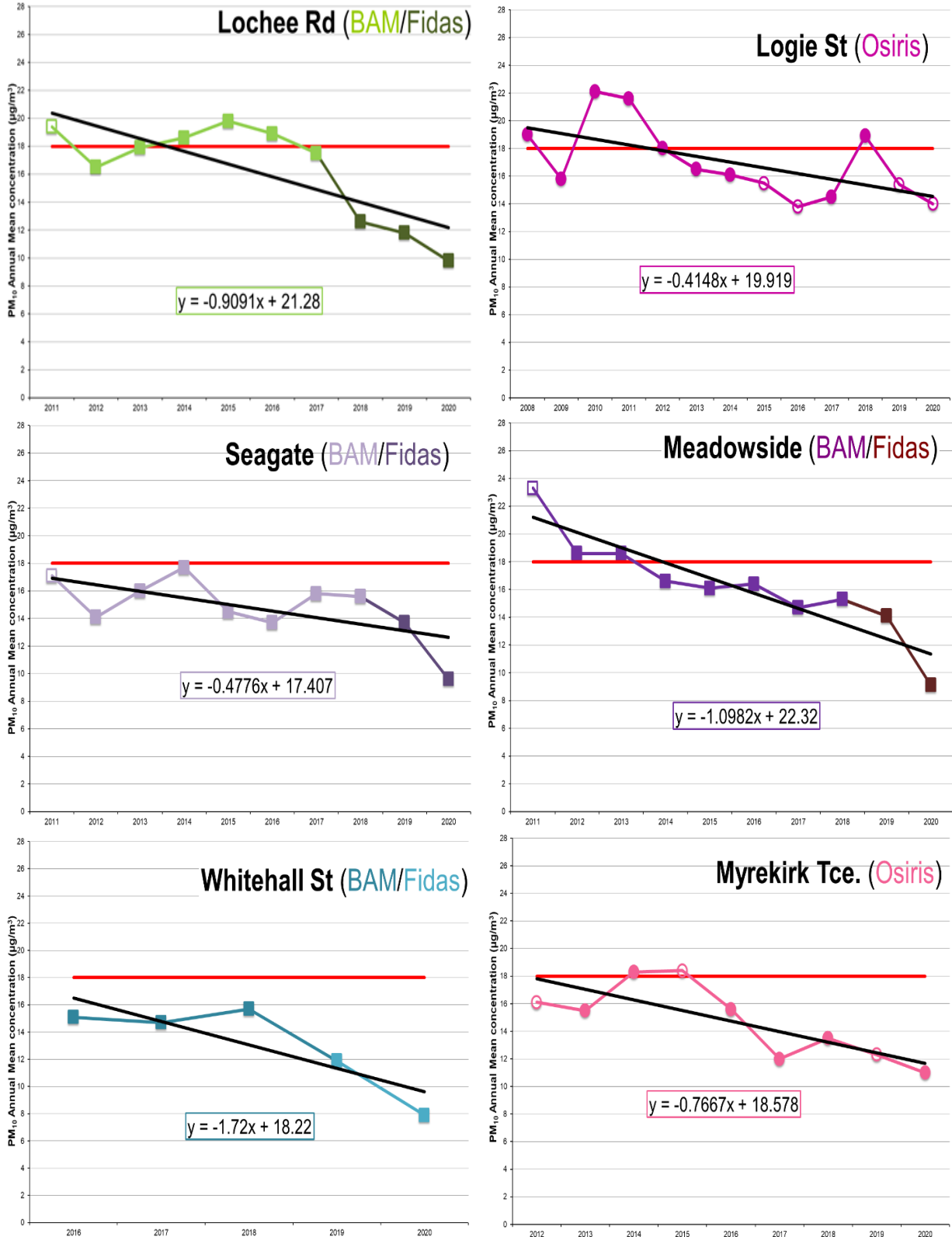
Notes: Exceedences of the PM₁₀ annual mean objective of 18µg/m³ are shown in **bold** (borderline values are orange).

(1) R=Roadside, K=Kerbside, UB=Urban Background, UI=Urban Industrial

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%). * indicates data capture less than 85%

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

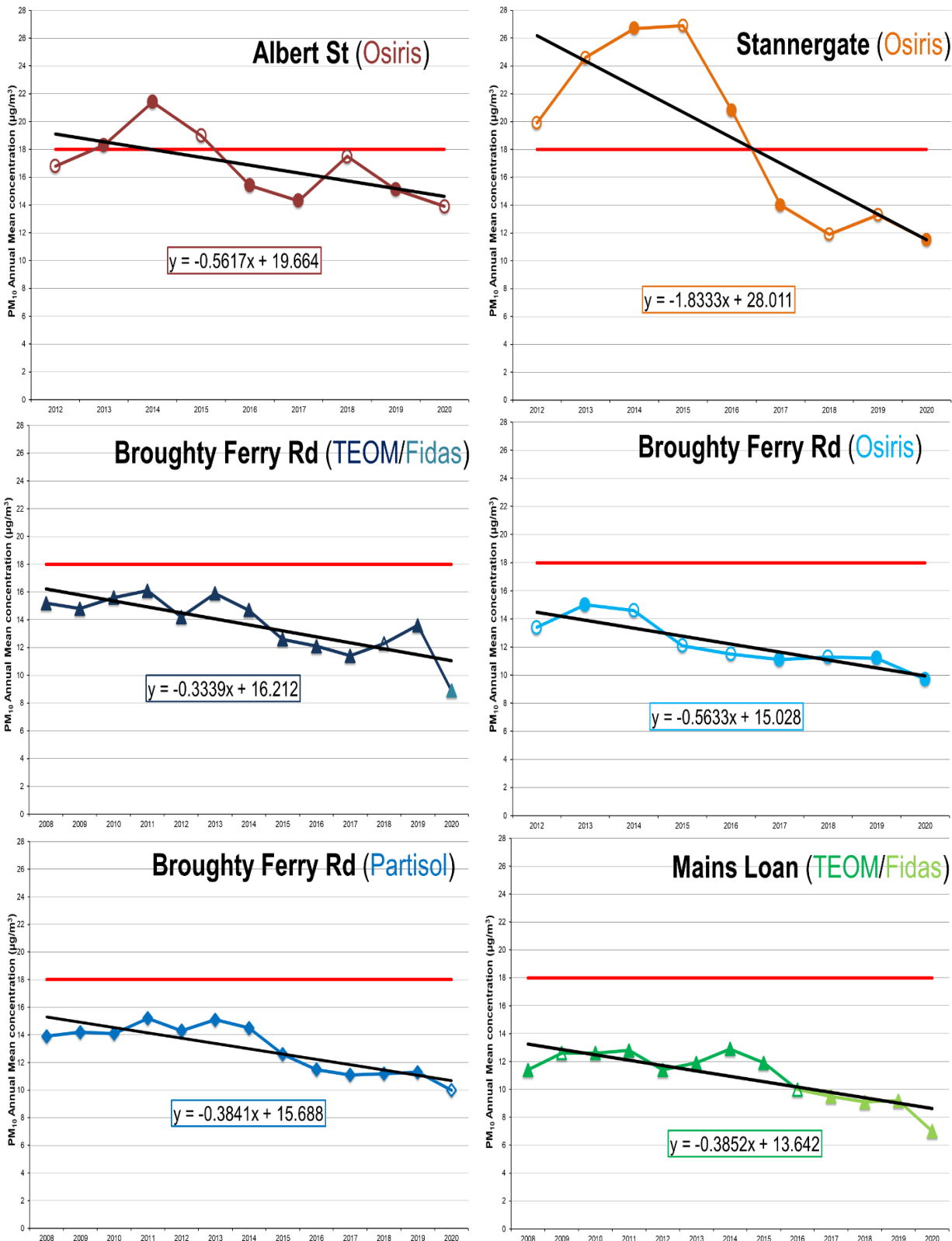
Figure A.5a Trends in Annual Mean PM₁₀ concentrations at Automatic monitors



Notes:

- 1) Graphs show the trends (black lines) in the PM₁₀ annual mean concentrations measured at the continuous analysers.
- 2) A minimum of five years data is required to show a valid trend. More years (data points) give greater certainty in the trend.
- 3) The trend line equation is shown. Decreasing trends have a negative "x" value, increasing trends a positive "x" value.
- 4) For strict comparison with the annual mean objective of 18µg/m³(shown by the red line), data capture should be greater than 85%. Annual means where data capture were below 85% are shown by a 'hollow' marker.
- 5) Means have been "annualised" as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A5.b Trends in Annual Mean PM₁₀ concentrations at Automatic monitors



Notes:

- 1) Graphs show the trends (black lines) in the PM₁₀ annual mean concentrations measured at the continuous analysers.
- 2) A minimum of five years data is required to show a valid trend. More years (data points) give greater certainty in the trend.
- 3) The trend line equation is shown. Decreasing trends have a negative "x" value, increasing trends a positive "x" value.
- 4) For strict comparison with the annual mean objective of 18µg/m³(shown by the red line), data capture should be greater than 85%. Annual means where data capture were below 85% are shown by a 'hollow' marker.
- 5) Means have been "annualised" as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A5.c Trend analysis of PM₁₀ annual means at long term monitoring sites

Site Id.	Location ^(1,2)	No. of years for trend	Trend ⁽³⁾
CM 18	Stannergate (Osiris)	9	-1.833
CM 6	Whitehall St (BAM/Fidas)	5	-1.720
CM 14	Meadowside (BAM/Fidas)	10	-1.098
CM 4	Lochee Rd (BAM/Fidas)	9	-0.909
CM 17	Myrekirk Tce (Osiris)	8	-0.767
CM 16	Broughty Ferry Rd (Osiris)	9	-0.563
CM 15	Albert St (Osiris)	9	-0.562
CM 5	Seagate (BAM/Fidas)	10	-0.478
CM 3	Broughty Ferry Rd (TEOM/Fidas)	13	-0.432
CM 9	Logie St (Osiris)	13	-0.415
CM 12	Mains Loan (TEOM/Fidas)	13	-0.385
CM 13	Broughty Ferry Rd (Partisol)	13	-0.384

- Notes:**
- (1) Locations where the 2020 PM₁₀ annual mean is exceeded are shown in **bold**, borderline locations are **orange**
 - (2) Locations shaded grey had less than 75% data capture in 2020, so the annual mean was "annualised"
 - (3) **Blue** is an improving trend, **red** a worsening trend.

Explanation of Methodology for **Figures A.3b** and **A.5c** have been generated using the LINEST function in Microsoft Excel. This function can be used to return a value that describes the slope of a best fit straight line for a number of points (in this case 5 or more values) i.e. simple linear regression. A negative value denotes a downwards slope hence an improving trend and, a positive value denotes an upwards slope or worsening trend. The magnitude of the number generated by the LINEST function can be used to compare the magnitude of the (improving or worsening) trend.

Table A.6 – 24-Hour Mean PM₁₀ Monitoring Results, Number of PM₁₀ 24-Hr Means > 50µg/m³

Site ID	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2020 (%) ⁽²⁾	PM ₁₀ 24-Hour Means > 50µg/m ³ ⁽³⁾				
					2016	2017	2018	2019	2020
CM 4	Lochee Rd (BAM/Fidas)	R	Automatic	86.3	2	4	1	1	0
CM 5	Seagate (BAM/Fidas)	R	Automatic	100.0	0	3	1	1	0
CM 14	Meadowside (BAM/Fidas)	R	Automatic	99.2	3	1	4	3 (43.4)	0
CM 6	Whitehall Street (BAM/Fidas)	R	Automatic	99.5	1	1	4 (39.8)	1	0
CM 12	Mains Loan (TEOM/Fidas)	UB	Automatic	100.0	0 (27.5)	0	0	1	0
CM 3	Broughty Ferry Rd (TEOM/Fidas)	UI	Automatic	100.0	0	0	0 (25.6)	1	0
CM 13	Broughty Ferry Rd (Partisol)	UI	Automatic	76.6	0	0	0	0	0 (24.5)
CM 16	Broughty Ferry Rd (Osiris)	UI	Automatic	87.2	1 (26.2)	0	1 (34.2)	1	0
CM 9	Logie St (Osiris)	K	Automatic	71.3	0 (28.6)	2	11	3 (41.1)	0 (30.3)
CM 17	Myrekirk Tce (Osiris)	R	Automatic	88.5	1	0	2	1 (39.7)	0
CM 15	Albert St (Osiris)	K	Automatic	69.9	2	3	5 (46.0)	7	0 (38.5)
CM 18	Stannergate (Osiris)	R	Automatic	88.5	4	2	0 (25.7)	1 (32.9)	0

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

(1) R=Roadside, K=Kerbside, UB=Urban Background, UI= Urban Industrial

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

(3) If the period of valid data is less than 85%, the 98.08th percentile of 24-hour means is provided in brackets (and shaded grey).

Figure A6.a Trends in 98.08th percentile PM₁₀ concentrations at Automatic monitors

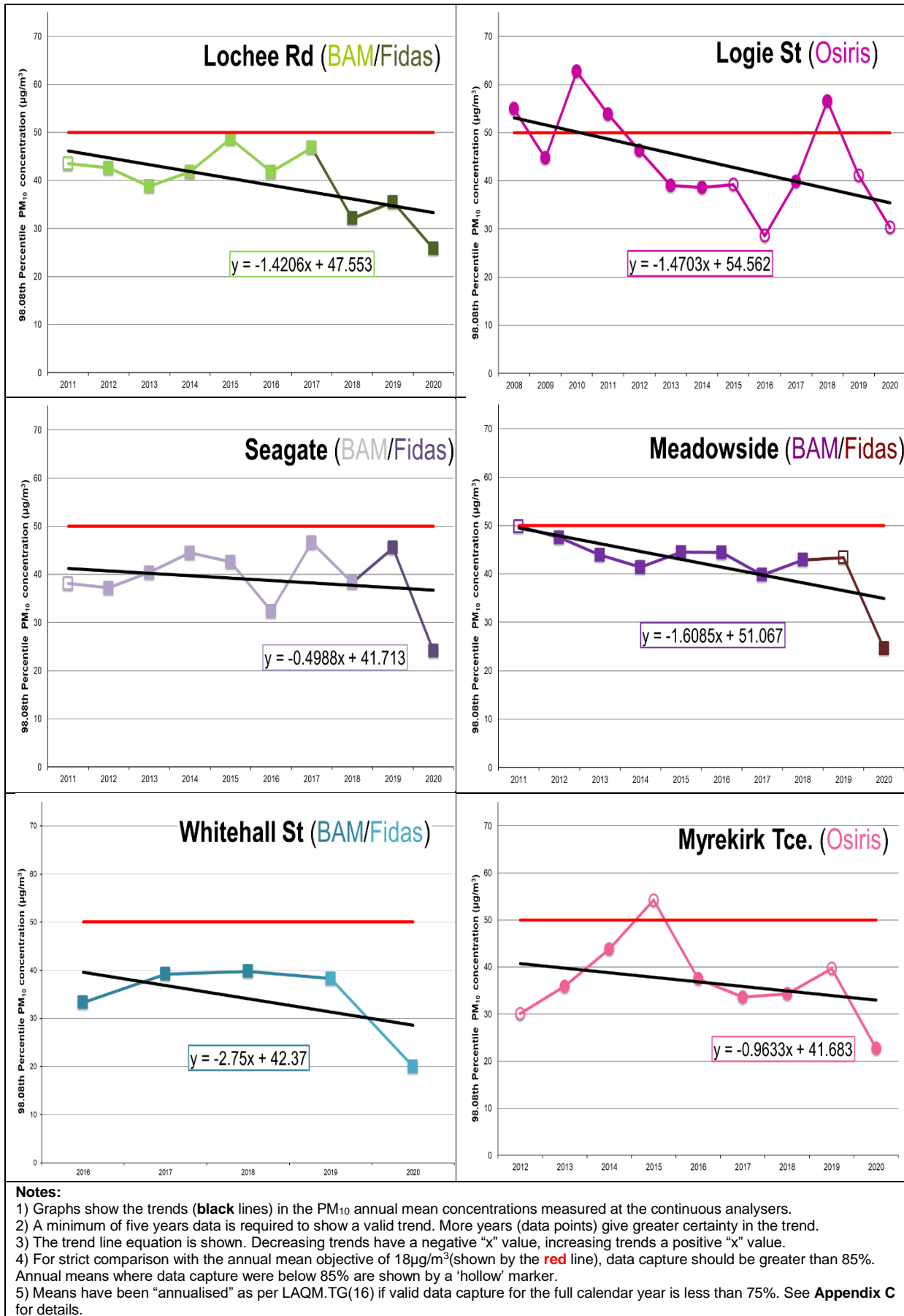
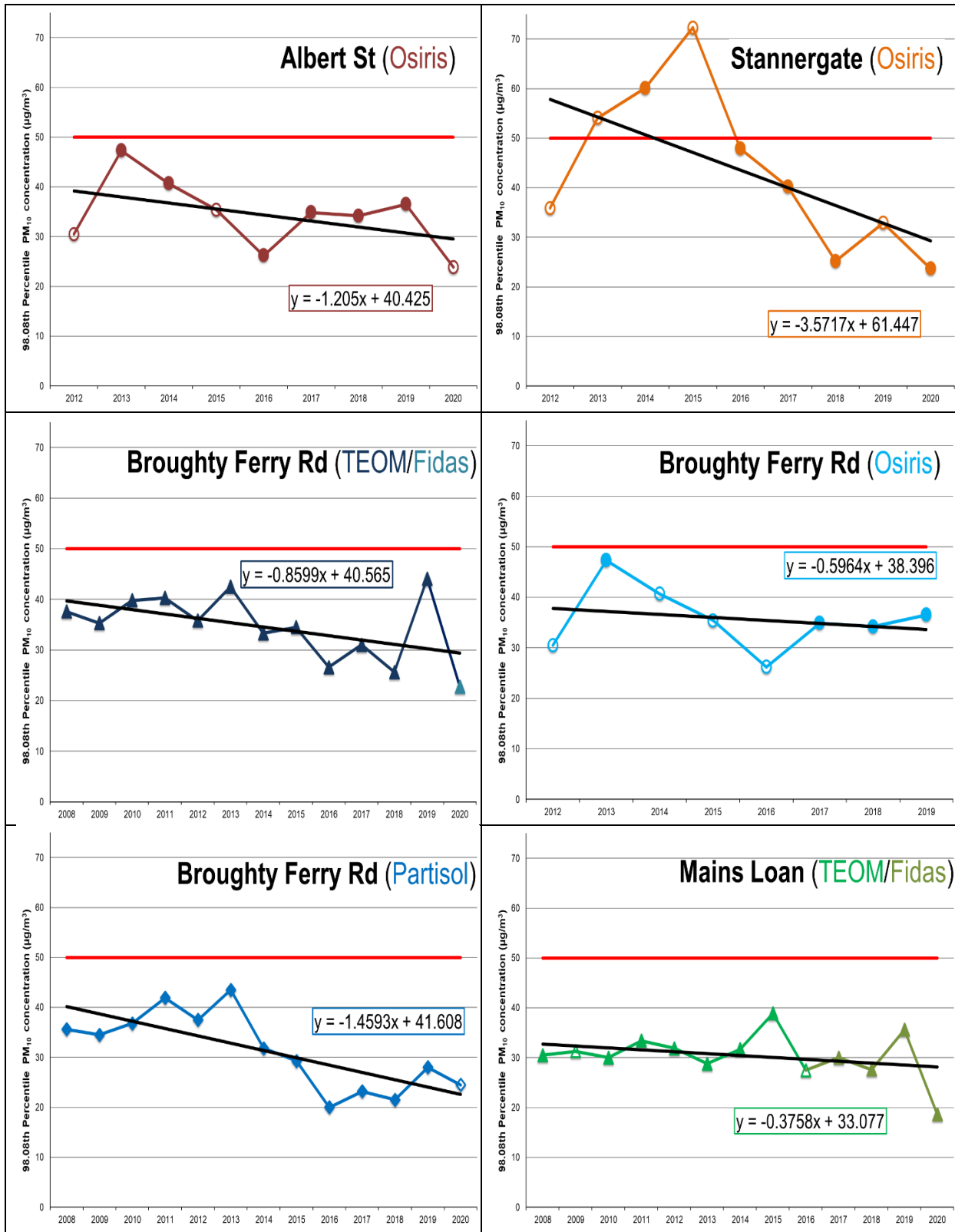


Figure A6.b Trends in 98.08th percentile PM₁₀ concentrations at Automatic monitors



Notes:

- 1) Graphs show the trends (black lines) in the PM₁₀ annual mean concentrations measured at the continuous analysers.
- 2) A minimum of five years data is required to show a valid trend. More years (data points) give greater certainty in the trend.
- 3) The trend line equation is shown. Decreasing trends have a negative "x" value, increasing trends a positive "x" value.
- 4) For strict comparison with the annual mean objective of 18µg/m³(shown by the red line), data capture should be greater than 85%. Annual means where data capture were below 85% are shown by a 'hollow' marker.
- 5) Means have been "annualised" as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.7 – Annual Mean PM2.5 Monitoring Results ($\mu\text{g}/\text{m}^3$)

Site ID	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2020 (%) ⁽²⁾	PM2.5 Annual Mean Concentration ($\mu\text{g}/\text{m}^3$) ⁽³⁾⁽⁴⁾				
					2016	2017	2018	2019	2020
CM 3	Broughty Ferry Rd (Fidas)	UI	Automatic	97.5	n/a	n/a	n/a	n/a	4.4
CM 4	Lochee Rd (Fidas)	R	Automatic	86.6	n/a	n/a	5.7	6.4	5.2
CM 5	Seagate (Fidas)	R	Automatic	99.7	n/a	n/a	5.5	6.9*	5.0
CM 14	Meadowside (Fidas)	R	Automatic	99.0	n/a	n/a	n/a	6.6	4.6
CM 6	Whitehall Street (Fidas)	R	Automatic	99.3	n/a	n/a	n/a	6.3*	4.3
CM 12	Mains Loan (Fidas)	UB	Automatic	99.7	n/a	n/a	5.5	5.5	4.1

Notes: Exceedences of the PM2.5 annual mean objective of $10\mu\text{g}/\text{m}^3$ are shown in **bold** (borderline values are orange).

(1) R=Roadside, K=Kerbside, UB=Urban Background, UI=Urban Industrial

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

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

(4) * indicates data capture less than 85%

Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO₂ Monthly Diffusion Tube Results for 2020

Site Id. (DT)	Location	x	y	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.85)
92	Abertay 2	340019	730612	36.2	36.6	M	M	M	24.5	18.5	24.9	29.5	32.0	36.6	38.7	30.8	75.0	1.0	30.8	26.2
179	Albert St (15)(Façade)	341092	731121	31.7	31.6	M	M	M	23.6	16.9	30.2	26.7	31.4	30.9	36.4	28.8	75.0	1.0	28.8	24.5
180	Albert St (15)(Roadside)	341091	731121	34.3	31.2	M	M	M	25.1	17.0	30.3	27.4	32.9	31.9	37.2	29.7	75.0	1.0	29.7	25.2
167	Albert St (191)	341161	731535	25.2	25.1	M	M	M	M	M	34.7	26.3	31.8	30.3	34.7	29.7	58.3	0.825	24.5	20.8
5	Arbroath Rd (13)	341111	731070	41.2	43.1	M	M	M	21.0	20.0	23.7	30.4	32.7	41.1	34.8	32.0	75.0	1.0	32.0	27.2
223	B/ Ferry Rd Lower (Cyclesign)	343530	730937	42.6	37.4	M	M	18.6	M	M	M	12.2	M	26.7	25.2	27.1	50.0	0.828	22.5	19.1
204	B/Ferry Rd (129)	342244	731066	48.2	40.6	M	M	M	26.6	20.3	29.9	28.1	M	36.8	37.3	33.5	66.7	0.949	31.8	27.0
139	B/Ferry Rd (141) Downpipe	343317	731072	47.8	46.1	M	M	M	14.6	17.8	18.6	26.8	M	39.0	31.0	30.2	66.7	0.949	28.7	24.4
145	B/Ferry Rd Greendykes	342662	731112	42.9	38.9	M	M	M	M	18.3	24.9	30.2	M	36.3	36.2	32.5	58.3	0.895	29.1	24.7
7	Balgavies Pl	343082	731465	25.4	20.1	M	M	7.3	6.9	5.5	8.0	16.3	M	22.0	22.3	14.9	75.0	1.0	14.9	12.6
9	Birnam Pl	337531	730914	11.0	8.6	M	M	M	M	M	6.0	7.4	8.7	12.7	10.9	9.3	58.3	0.825	7.7	6.5
11	Broughty Ferry Rd (141)	343322	731073	55.0	43.8	M	M	M	19.8	21.3	24.5	32.6	M	39.6	28.6	33.2	66.7	0.949	31.5	26.7
155	Carolina Court Lp6	342353	731058	27.4	25.3	M	M	11.4	10.6	10.5	11.8	18.3	M	24.7	26.1	18.5	75.0	1.0	18.5	15.7
171	Claypotts / Arbroath Rd (502)	345347	732080	43.0	36.8	M	M	M	M	15.2	13.1	23.9	M	31.1	29.8	27.6	58.3	0.895	24.7	21.0
13	Clelington Rd/ Forfar Rd	341385	732121	37.6	34.7	M	M	M	M	M	22.7	24.6	30.0	31.1	35.8	30.9	58.3	0.825	25.5	21.7
242	Clelington Rd/ Mains Loan	341050	732111	25.6	19.9	M	M	M	12.6	9.7	15.3	16.7	22.5	24.5	26.8	19.3	75.0	1.0	19.3	16.4
188	Commercial St (9)	340544	730291	39.0	35.0	M	M	M	19.4	17.9	31.1	27.6	34.0	31.9	35.9	30.2	75.0	1.0	30.2	25.7
84	Commercial St /Dock St (40)	340565	730263	42.4	32.2	M	M	M	16.6	17.9	25.6	26.9	29.4	34.2	36.3	29.1	75.0	1.0	29.1	24.7
85	Dock St (21)	340524	730216	42.4	37.3	M	M	M	16.9	19.5	25.5	29.8	35.5	32.5	33.2	30.3	75.0	1.0	30.3	25.7
156	Dock St (57)	340656	730343	61.8	53.2	M	M	21.3	25.9	26.2	32.3	37.2	43.7	M	43.4	38.3	75.0	1.0	38.3	32.6

Site Id. (DT)	Location	x	y	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.85)
241	Dock St (Customs House)	340691	730344	44.5	38.7	M	M	M	23.1	18.8	29.7	31.9	35.1	35.7	37.0	32.7	75.0	1.0	32.7	27.8
240	Dock St/Gellatly St	340638	730328	48.9	47.0	M	M	20.2	21.7	19.4	29.1	32.6	37.9	39.4	39.0	33.5	83.3	1.0	33.5	28.5
233	Dock St/Trades Lane	340690	730382	44.4	44.3	M	M	M	22.2	21.1	28.7	29.8	34.2	35.8	33.5	32.7	75.0	1.0	32.7	27.8
227	Dudhope Crescent Road (40)	339830	730619	49.6	43.4	M	M	M	M	21.3	27.6	34.5	M	45.5	44.3	38.0	58.3	0.895	34.0	28.9
20	Dura St (100)	341150	731576	41.5	36.0	M	M	M	M	M	28.3	30.1	36.5	37.1	37.2	35.2	58.3	0.825	29.1	24.7
214	East Dock St (26)	340725	730417	41.2	39.1	M	M	M	23.8	18.8	27.5	29.1	35.5	34.6	37.2	31.9	75.0	1.0	31.9	27.1
22	Eastport Roundabout	340651	730623	37.8	26.6	M	M	M	16.3	12.2	20.6	24.6	29.3	29.1	33.2	25.5	75.0	1.0	25.5	21.7
83	Forfar Rd (104)	341437	732360	48.6	43.5	M	M	M	M	M	31.3	36.3	41.2	43.1	40.3	40.6	58.3	0.825	33.5	28.5
26	Kingsway East Roundabout	343107	731740	52.5	36.0	M	M	M	M	17.1	32.7	36.0	M	41.0	39.1	36.3	58.3	0.895	32.5	27.6
27	Kingsway/ Mains Loan	341124	732468	24.2	24.0	M	M	M	22.0	14.0	25.6	22.7	27.0	27.7	30.0	24.1	75.0	1.0	24.1	20.5
177	Kingsway/Strathmartine Rd (N)	339179	732896	44.8	33.4	M	M	M	M	M	22.4	23.8	32.3	40.2	34.3	33.0	58.3	0.825	27.2	23.2
30	Lochee Rd (138)	338936	730680	61.5	56.0	M	M	M	27.7	32.5	39.4	43.9	49.2	49.4	53.2	45.9	75.0	1.0	45.9	39.0
31	Lochee Rd (140)(Traffic Lts)	338927	730685	62.8	48.8	M	M	27.0	29.1	33.2	40.5	43.3	50.9	53.0	53.8	44.2	83.3	1.0	44.2	37.6
32	Lochee Rd (184)	338767	730856	52.2	44.2	M	M	M	17.8	20.8	27.4	28.6	33.3	43.0	41.9	34.4	75.0	1.0	34.4	29.2
	Lochee Rd (Romon 1)			60.3	55.3	39.4	21.5	21.9	25.4	29.2	32.8	38.8	43.1	43.6	45.1	38.0	100.0	1.0	38.0	32.3
	Lochee Rd (Romon 2)			60.3	41.5	40.8	21.7	20.7	23.3	27.5	33.8	40.6	43.7	47.6	49.6	37.6	100.0	1.0	37.6	32.0
	Lochee Rd (Romon 3)			60.9	54.5	40.9	21.2	21.8	25.2	27.8	34.6	39.9	41.1	49.3	47.3	38.7	100.0	1.0	38.7	32.9
158	Lochee Rd (Romon) Average	338861	730773	60.5	50.4	40.4	21.5	21.5	24.6	28.2	34.2	39.8	42.6	46.8	47.3	38.1	100.0	1.0	38.1	32.4
36	Lochee Rd/Polepark Rd	339016	730586	36.1	27.6	M	M	M	14.2	12.4	19.0	22.1	25.1	27.7	28.6	23.6	75.0	1.0	23.6	20.1
37	Logie St (114)	338184	731293	69.2	59.5	M	M	M	32.8	32.5	38.0	45.9	54.4	55.0	45.8	48.1	75.0	1.0	48.1	40.9
38	Logie St (98)	338252	731258	46.4	41.5	M	M	M	17.1	18.4	21.0	29.3	30.9	35.3	37.0	30.8	75.0	1.0	30.8	26.2
39	Loons Rd (1)	338211	731293	41.7	35.0	M	M	M	24.1	19.8	34.4	30.0	40.8	38.7	41.7	34.0	75.0	1.0	34.0	28.9
237	Lower Princess St	340964	730855	34.8	29.8	M	M	M	M	M	25.0	23.2	33.1	32.8	33.3	30.3	58.3	0.825	25.0	21.2
	Meadowside (Romon 1)			45.0	44.0	37.3	19.1	15.2	19.7	21.5	31.5	35.0	37.8	40.1	39.1	32.1	100.0	1.0	32.1	27.3
	Meadowside (Romon 2)			50.8	44.2	37.7	19.3	15.2	19.5	22.5	32.6	35.1	40.1	41.8	41.1	33.3	100.0	1.0	33.3	28.3

Site Id. (DT)	Location	x	y	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.85)
	Meadowside (Romon 3)			49.2	46.4	37.9	19.5	15.0	19.5	21.3	31.9	35.3	39.5	41.9	39.4	33.1	100.0	1.0	33.1	28.1
149	Meadowside (Romon) Average	340243	730653	48.3	44.9	37.8	19.3	15.1	19.6	21.8	32.3	35.1	39.1	41.3	39.9	32.8	100.0	1.0	32.8	27.9
42	Muirton Rd (6)	338156	731294	24.1	22.9	M	M	M	20.4	11.9	26.7	17.8	23.2	25.2	29.4	22.4	75.0	1.0	22.4	19.0
185	Murraygate (46)	340409	730484	28.1	25.3	M	M	10.0	13.2	8.6	12.9	14.3	16.3	20.8	18.3	16.8	83.3	1.0	16.8	14.3
189	Myrekirk Rd (29)	335420	731726	41.3	28.7	M	M	M	M	M	21.7	24.9	33.1	31.2	32.4	30.5	58.3	0.825	25.1	21.4
48	Nethergate (132)/Marketgait	340074	729984	31.6	31.2	M	M	M	14.5	12.2	20.7	20.0	27.1	25.3	32.4	23.9	75.0	1.0	23.9	20.3
47	Nethergate (40)	340230	730124	34.4	M	M	M	M	15.8	18.6	27.3	25.8	M	29.9	31.1	26.1	58.3	0.990	25.9	22.0
45	Nethergate (6)	340274	730171	44.7	38.0	M	M	M	14.3	20.1	24.6	28.0	32.3	30.5	28.0	28.9	75.0	1.0	28.9	24.6
213	Nethergate (64)	340196	730089	43.6	44.5	M	M	M	16.0	18.5	27.2	25.8	31.9	33.5	33.1	30.5	75.0	1.0	30.5	25.9
44	Nethergate (88)	340163	730061	41.3	40.8	M	M	M	18.5	20.9	32.7	28.2	32.8	33.3	32.2	31.2	75.0	1.0	31.2	26.5
46	Nethergate (95)	340033	729957	35.5	33.6	M	M	M	12.9	13.3	M	20.5	26.8	26.7	28.4	24.7	66.7	0.905	22.4	19.0
239	Princes St (185)	341077	731031	40.3	37.6	M	M	M	31.5	18.5	39.7	32.3	39.1	40.7	44.4	36.0	75.0	1.0	36.0	30.6
49	Rankine St (2)	338768	730900	52.1	43.9	M	M	M	18.8	21.3	22.7	30.3	36.4	38.2	38.8	33.6	75.0	1.0	33.6	28.6
228	Riverside Esplanade/S. Crichton St.	340516	729991	30.9	30.5	M	M	M	15.6	13.2	23.5	20.3	28.9	27.7	27.7	24.3	75.0	1.0	24.3	20.6
224	Seagate (112)	340528	730537	48.1	43.1	M	M	M	17.1	19.3	26.2	32.0	44.0	39.9	38.2	34.2	75.0	1.0	34.2	29.1
236	Seagate (36-40)	340463	730420	47.6	41.7	M	M	M	16.2	20.1	25.0	30.3	32.8	33.7	34.2	31.3	75.0	1.0	31.3	26.6
54	Seagate (9)	340467	730388	33.4	30.6	M	M	M	15.4	14.9	23.2	21.7	26.8	28.0	31.0	25.0	75.0	1.0	25.0	21.3
190	Seagate (97)	340516	730499	47.6	47.4	M	M	M	21.6	19.4	33.6	31.7	35.8	37.6	32.7	34.2	75.0	1.0	34.2	29.0
217	Seagate (99)	340535	730522	47.0	38.9	M	M	M	21.1	21.8	34.4	32.9	37.4	32.1	34.1	33.3	75.0	1.0	33.3	28.3
	Seagate (Romon 1)			47.5	44.6	32.1	21.6	16.5	20.3	20.6	31.4	32.2	35.6	36.6	35.8	31.2	100.0	1.0	31.2	26.5
	Seagate (Romon 2)			49.0	44.1	34.2	21.4	15.8	19.8	21.4	31.4	31.5	34.7	36.9	33.8	31.2	100.0	1.0	31.2	26.5
	Seagate (Romon 3)			48.1	43.1	33.4	21.7	16.3	19.2	21.2	31.4	30.5	35.2	36.2	37.0	31.1	100.0	1.0	31.1	26.4
159	Seagate (Romon) Average	340487	730446	48.2	43.9	33.2	21.6	16.2	19.8	21.1	31.4	31.4	35.2	36.6	35.5	31.2	100.0	1.0	31.2	26.5
55	Soapwork Lane	340099	730650	46.6	40.0	M	M	M	18.3	15.3	21.1	27.0	33.2	34.0	35.8	30.1	75.0	1.0	30.1	25.6
218	South Marketgait (Lampost 18)	340291	729979	32.4	23.9	M	M	M	19.5	11.7	24.5	21.3	28.1	26.3	30.1	24.2	75.0	1.0	24.2	20.6

Site Id. (DT)	Location	x	y	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.85)
235	South Marketgait/Nethergate	340106	729972	29.0	23.8	M	M	M	14.6	9.5	17.2	18.4	23.1	22.3	26.8	20.5	75.0	1.0	20.5	17.4
151	South Road (1 Denbank)	335188	731528	40.5	35.5	M	M	M	M	M	25.4	28.9	37.8	32.4	31.5	33.1	58.3	0.825	27.3	23.2
162	St Andrews St/Seagate(116)	340532	730548	42.7	36.7	M	M	M	17.6	17.6	24.8	25.7	32.3	35.7	34.8	29.8	75.0	1.0	29.8	25.3
59	Strathmore Ave (353)	339609	731871	37.7	35.0	M	M	M	M	M	32.1	27.7	32.7	35.7	34.5	33.6	58.3	0.825	27.7	23.6
219	Thomson Avenue (Street Sign)	340542	730194	38.9	32.8	M	M	M	16.7	15.9	23.5	24.1	29.4	29.1	29.5	26.7	75.0	1.0	26.7	22.7
229	Thomson Avenue/S.Crichton St	340421	730078	37.5	28.3	M	M	M	13.7	14.8	18.3	24.8	30.7	31.2	30.2	25.5	75.0	1.0	25.5	21.7
60	Trades Lane (31)	340575	730500	30.7	28.6	M	M	M	13.5	10.2	17.2	19.5	22.8	24.3	27.4	21.6	75.0	1.0	21.6	18.3
93	Victoria Rd (10)	340230	730673	38.9	34.3	M	M	M	18.9	15.0	25.5	25.7	34.2	32.3	38.3	29.2	75.0	1.0	29.2	24.8
184	Victoria Rd (104)/William St)	340697	730950	34.4	26.0	M	M	M	M	M	24.0	25.2	28.4	29.8	33.7	28.8	58.3	0.825	23.7	20.2
191	Victoria Rd (4 India Buildings)	340213	730633	37.7	28.6	M	M	M	17.1	11.7	23.2	22.7	29.8	30.8	30.5	25.8	75.0	1.0	25.8	21.9
68	Victoria Rd (60)	340375	730779	40.0	34.9	M	M	M	20.7	17.6	28.9	31.4	37.7	34.4	38.2	31.5	75.0	1.0	31.5	26.8
70	Victoria Rd/Hilltown	340274	730714	63.0	63.4	M	M	20.2	22.2	32.2	37.5	48.1	52.7	53.7	54.1	44.7	83.3	1.0	44.7	38.0
243	Victoria St (Eagle Mill)	340836	731026	27.4	23.7	M	M	M	M	M	13.8	18.5	23.8	25.9	28.5	23.1	58.3	0.825	19.0	16.2
71	Victoria St / Albert St	341071	731072	31.8	27.8	M	M	M	18.1	12.7	22.1	24.5	30.4	30.2	33.5	25.7	75.0	1.0	25.7	21.8
205	West Marketgait/ Old Mill (23)	339773	730436	69.5	55.6	M	M	20.0	21.0	25.2	34.6	44.0	55.0	50.1	49.7	42.5	83.3	1.0	42.5	36.1
231	West Marketgait/ Ward Road	339834	730314	49.1	42.5	M	M	14.3	16.5	16.6	22.6	26.6	33.1	32.4	35.1	28.9	83.3	1.0	28.9	24.5
183	West Marketgait/Guthrie St	339805	730338	59.8	53.9	M	M	M	21.3	24.6	32.1	38.7	40.9	44.6	43.9	40.0	75.0	1.0	40.0	34.0
72	Westport (2)	339842	730122	47.9	45.5	M	M	M	M	M	14.4	19.3	21.1	25.6	24.5	28.3	58.3	0.825	23.4	19.9
73	Whitehall Cr (4)	340376	730109	44.5	29.7	M	M	M	13.9	18.9	23.7	26.3	30.8	28.5	33.3	27.7	75.0	1.0	27.7	23.6
161	Whitehall Cr/Union St (50)	340305	730051	31.0	26.3	M	M	M	11.3	11.7	17.2	18.0	21.0	18.5	23.8	19.9	75.0	1.0	19.9	16.9
76	Whitehall St (1)	340265	730153	57.5	47.4	M	M	M	17.1	27.2	35.6	36.2	35.0	41.8	38.6	37.4	75.0	1.0	37.4	31.8
81	Whitehall St (12)	340293	730142	42.1	36.8	M	M	M	17.3	21.7	38.2	30.4	37.1	35.5	36.4	32.8	75.0	1.0	32.8	27.9
77	Whitehall St (15)	340322	730098	44.7	39.0	M	M	M	14.3	16.6	24.7	24.8	M	30.1	32.6	28.4	66.7	0.949	26.9	22.9
74	Whitehall St (40)	340330	730106	42.2	38.9	M	M	M	15.4	19.9	31.4	29.8	M	33.1	36.1	30.9	66.7	0.949	29.3	24.9
75	Whitehall St (5)	340289	730128	50.4	44.1	M	M	M	14.1	20.2	28.4	28.4	32.8	37.9	37.5	32.6	75.0	1.0	32.6	27.7

Site Id. (DT)	Location	x	y	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.85)
	Whitehall St (Romon 1)			43.8	36.0	30.5	15.4	12.5	14.8	21.1	31.5	29.5	32.6	31.8	34.3	27.8	100.0	1.0	27.8	23.6
	Whitehall St (Romon 2)			43.2	38.8	31.7	15.0	12.4	14.6	21.4	31.8	28.7	32.9	34.3	32.6	28.1	100.0	1.0	28.1	23.9
	Whitehall St (Romon 3)			42.1	38.2	29.5	14.7	12.0	14.4	21.7	33.0	29.3	33.7	32.2	34.3	27.9	100.0	1.0	27.9	23.7
160	Whitehall St (Romon) Average	340278	730156	43.0	37.7	30.6	15.0	12.3	14.6	21.4	32.4	29.2	33.1	32.8	33.7	28.0	100.0	1.0	28.0	23.8
82	Woodside Ave	340776	732307	16.2	12.9	M	M	5.5	6.5	4.1	7.6	9.8	11.5	17.1	15.8	10.7	83.3	1.0	10.7	9.1

Notes

- (1) Exceedences of the NO₂ annual mean objective are shown in **bold**. (Borderline values are coloured **orange**).
- (2) NO₂ annual means greater than 60µg/m³ are shown in **bold & underlined**, indicating a potential exceedence of the NO₂ 1-hr mean objective
- (3) Sites shaded green were monitoring locations installed in 2020.
- (4) M' means that the diffusion tube was either missing or else interference meant that the results were considered invalid.

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

New or Changed Sources Identified Within Dundee City Council During 2020

Dundee City Council has not identified any new sources relating to air quality within the reporting year of 2020.

Additional Air Quality Works Undertaken by Dundee City Council During 2020

Dundee City Council has not completed any additional works within the reporting year of 2020.

QA/QC of Diffusion Tube Monitoring

Monitoring of NO₂ concentrations using passive diffusion tubes (PDT) is widely used throughout the UK. Provided that care is taken with the storage, handling and analysis of the tubes, and an appropriate “bias-adjustment” factor is applied, the overall uncertainty of the annual mean is expected to be about +/-20%. The key issues to be considered are the performance of the laboratory, the precision of the diffusion tubes, and the application of a suitable bias adjustment factor. These issues are considered in turn below.

Laboratory Performance

The diffusion tubes used by Dundee City Council are supplied by Gradko and analysed by Tayside Scientific Services utilising the 20% Triethanolamine (TEA) in water preparation method. Diffusion tubes are exposed for 4 to 5 weeks in accordance with the recommended dates supplied by Defra. The method for preparing and analysing tubes has remained unchanged since 2001. Two diffusion tubes from each monthly batch are used as blanks. These tubes are not exposed but are taken round during the monthly deployment and collection and stored in the refrigerator during the exposure period. They are analysed along with the appropriate batch of exposed tubes. The purpose of the blanks is to determine whether contamination occurred during the preparation or deployment.

Defra and the Devolved Administrations advise that diffusion tubes used for Local Air Quality Management should be obtained from laboratories that have demonstrated satisfactory performance in the AIR Proficiency Testing (PT) scheme. Laboratory performance in AIR PT is also assessed, by the National Physical Laboratory (NPL), alongside laboratory data from the monthly NPL Field Intercomparison Exercise carried out at Marylebone Road, central London.

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 combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme. AIR NO₂ PT forms an integral part of the UK NO₂ Network’s QA/QC, and is a useful tool in assessing the analytical performance of those laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). With consent from the participating laboratories, LGC Standards provides summary proficiency testing data to the LAQM Helpdesk for hosting on the webpages at <http://laqm.defra.gov.uk/diffusion-tubes/ga-qc-framework.html> . This information is updated on a quarterly basis following completion of each AIR PT round.

Tayside Scientific Services has demonstrated satisfactory performance in the latest report.⁸

All diffusion tube changeovers apart from April 2020 were in accordance with the diffusion tube calendar. The April changeovers were on the 2nd and 30th of April instead of the 1st and 29th of April. This was to limit trips during lockdown and to coincide with Partisol filter changeovers. These dates were within the 48hours either side allowed in the diffusion tube calendar.

Diffusion Tube Annualisation

Annualisation was required for many non-automatic monitoring sites, as a consequence of the lockdown measures associated with the global pandemic in 2020. The sites requiring annualisation are detailed in **Table C.a to C.2f**. Annualisation is required for any site with data capture less than 75% but greater than 25%. The methodology outlined in Box 7.9 of LAQM.TG(16) was used.

Diffusion Tube Bias Adjustment Factors

Dundee City Council have applied a local bias adjustment factor of 0.85 to the 2020 monitoring data. A summary of bias adjustment factors used by Dundee City Council over the past five years is presented in **Table C.1a**.

Table C.1a Bias Adjustment Factors

Year	Local or National	If National, Version of National Spreadsheet	PDT Bias Adjustment Factor
2020	Local	-	0.85
2019	Local	-	0.85
2018	Local	-	0.84
2017	Local	-	0.81
2016	Local	-	0.83

⁸ <https://laqm.defra.gov.uk/assets/laqmno2performancedatauptooctober2020v1.pdf>

Suitable Bias Adjustment Factor

The discussion and calculation of a suitable bias adjustment factor is detailed below:

The diffusion tubes are supplied by Gradko and analysed by Tayside Scientific Services utilising the 20% Triethanolamine (TEA) in water preparation method. The bias adjustment factor available on the LAQM Support Website⁹ for Tayside Scientific Services is **0.75** (Spreadsheet version 03/21_final). This is based the kerbside National inter-comparison site at Marylebone Road (0.75).

Factor from Local Co-location Studies

Dundee City Council co-locates three nitrogen dioxide diffusion tubes with each of the roadside automatic nitrogen dioxide analysers. Co-location studies were carried out at 4 automatic monitoring locations in 2020. The factor for each study is shown in **Table C.2a** along with the factor for the national inter-comparison site at Marylebone Road in London. A minimum of 9 months is required to make a valid bias calculation. Only 3 of the Dundee City Council co-location studies met the criteria in 2020. The QA/QC procedures for all the Dundee City Council automatic analysers used in the bias-calculation is equivalent to the Automatic Urban and Rural Network (AURN), which is run by the national government. Tayside Scientific Services have demonstrated satisfactory performance for the analysis of diffusion tubes over the quarterly AIR-PT/WASP rounds up to October 2020. The automatic analyser period means are calculated from mid-day on tube changeover days.

Table C.1b Bias Factors from 2020 Co-location Studies and National Bias Adjustment Spreadsheet (Version 03/21_final)

Site Name	Site Type ¹	Length of Study (months)	PDT ² Mean Conc. (Dm) (µg/m ³)	Analyser Mean Conc. (Cm) (µg/m ³)	% DC ³	Bias (B)	Tube Precision & average CV ⁴	Bias Adjustment Factor (A) (Cm/Dm)	Adjusted Tube Mean (µg/m ³)
Lochee Road	R	12	38	31	100	22% (17% - 27%)	G (4%)	0.82 (0.79 - 0.86)	31 (30 - 33)
Seagate	R	12	31	28	100	10% (6% - 13%)	G (2%)	0.91 (0.88 - 0.94)	28 (27 - 29)
Whitehall Street	R	11	29	24	100	22% (16% - 28%)	G (2%)	0.82 (0.78 - 0.86)	24 (23 - 25)
Marylebone Road Intercomparison	K	12	57	43	n/a	34.2%	G	0.75	

1 - R= Roadside, K= Kerbside

2 - PDT = Passive Diffusion Tube for NO₂

3 - %DC = Percentage Data Capture on the automatic analyser for the periods used

4 - Tube precision is determined as follows: **G** = Good precision - coefficient of variation (CV) of diffusion tube replicates is considered G when the CV of eight or more periods is less than 20%, and the average CV of all monitoring periods is less than 10%; **P** = Poor precision - CV of four or more periods >20% and/or average CV >10%; **S** = Single tube, therefore not applicable; **na** = not available.

Discussion of Choice of Factor to Use

The majority of nitrogen dioxide diffusion tubes operated by Dundee City Council are located at roadside or kerbside locations. In view of this it is normally considered appropriate to use an overall factor derived from roadside and kerbside sites. A manual approximate orthogonal regression

⁹ <http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

calculation using Bias B figures (obtained from the precision and accuracy spreadsheets¹⁰) was carried out for the local roadside sites separately and incorporating the national inter-comparison kerbside site at Marylebone Road. The calculation was carried out in accordance with the guidance available on the Defra website prepared by Air Quality Consultants¹¹ (AQC) (see **Table C.2b**). The factor obtained using only local roadside sites was **0.85**, and **0.82** when the kerbside site at Marylebone Road was included. The **0.85** bias correction factor represents a more conservative approach and has been used to bias correct the diffusion tube data presented in this report.

Table C.1c Manual Approximate Orthogonal Regression Calculation 2020

Co-location Sites 2020	Site Type ¹	Bias Factor A	Bias B
Lochee Road	R	0.82	22%
Seagate	R	0.91	10%
Whitehall St	R	0.82	22%
Mean Local		0.85	18.0%

Manual orthogonal regression Calculation as para 2.4 AQC doc ²		
Express as a factor	Add 1	Inverse
0.18	1.18	0.85

National: Marylebone Road Intercomparison	K	0.75	34.2%
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Combined Local & National: Mean Combined		0.83	22.1%
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0.221	1.221	0.82
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Notes:

1 - R= Roadside, K= Kerbside

2 - Paragraph 2.4 of AQC's report states, "For most purposes, a reasonable approximation of our method can be derived by averaging the bias values, expressed as a factor, i.e. -16% is -0.16. Next add 1 to this value, e.g. -0.16 + 1.00 equals 0.84 in this example, then take the inverse to give the bias adjustment factor 1/0.84 = 1.19. (This will not be exactly the same as the correction factor calculated using orthogonal regression, but will be reasonably close). IT IS IMPORTANT NOT TO AVERAGE THE ADJUSTMENT FACTORS."

NO₂ Fall-off with Distance from the Road

Fall-off-with-distance calculations were required for five non-automatic monitoring sites, where the annual mean concentrations were greater than 36µg/m³ and the monitoring site is not located at a point of relevant exposure. Details of the sites, and the methodology used are included in **Table 3.1** in **Section 3.1.3**. The measurements used in the calculation are contained in **Table A2**.

¹⁰ <http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html>

¹¹ <http://laqm.defra.gov.uk/documents/NO2-Diffusion-Tube-Collocation-Methodology.pdf>

QA/QC of Automatic Monitoring

All automatic analysers (excluding Osiris units) are audited twice yearly by an external consultant, Ricardo. The gas analysers do not have on-site gases and are manually calibrated every 3 weeks by Ricardo using National Physical Laboratory (NPL) traceable gas.

Dundee City Council secured funding from the Scottish Executive to commission Ricardo to assist with data management and ratification procedures. Dundee joined the 'Calibration Club' run by Ricardo at the end of 2006. Ricardo have ratified all the real-time monitoring data reported on the Scottish Air Quality Website from 2006 onwards under contract from the Scottish Government.

<http://www.scottishairquality.scot/latest/summary?view=la>

All instruments (excluding Osiris units) are serviced and calibrated every 6 months by the equipment supplier. Osiris units undergo quarterly flow checks and filter changes as well as annual service and calibration by the manufacturer (Turnkey Instruments).

The Partisol is a semi-automatic reference equivalent PM₁₀ analyser. It contains 16 'Emfab' filters, each is exposed for 24 hours allowing for 2 weeks continuous operation (usually with two blanks). The filters are supplied by the equipment manufacturer and conditioned and weighed before and after the sampling period by Tayside Scientific Services using in-house procedures.

The Fidas 200 is a nephelometer, which is calibrated using a HEPA filter and 'CalDust' by Ricardo (Local Site Operator) every 3 weeks for the first 6 months following installation, thereafter it is calibrated during the twice-yearly service and audits

PM₁₀ and PM_{2.5} Monitoring Adjustment

Dundee utilise several methods for monitoring particulate matter (PM₁₀) within the city. TEOM and Osiris monitors have heated inlets. These tend to drive off volatile organic particulate matter and in consequence the measured concentrations tend be lower than those measured by gravimetric reference standard monitors. The Partisol is a reference equivalent method and had been used historically to determine a local correction factor for the TEOMs, which were designated as non-equivalent in 2006. TEOM PM₁₀ data presented in this report have been corrected using the Volatile Correction Methodology (VCM) since 2008.

DCC have five Osiris analysers which have been in their current locations since at least 2012. These are also non-equivalent but their measurements are considered indicative of particulate concentrations. Dundee commenced a yearly study in 2005 to compare the PM₁₀ data measured using an Osiris analyser with that from a TEOM. This study determined that the Osiris generally exaggerates peak values compared to the TEOM. Annually, post service, all 5 Osiris monitors are co-located in-house and their data is compared with that of the designated "master" to derive, if necessary, individual adjustment factors. The factors used to adjust the 2019 data can be made available on request. The "master" Osiris unit has been co-located with the Partisol at the urban industrial site at Broughty Ferry Road since September 2012, thus allowing the Osiris results presented in this report to be gravimetrically corrected prior to reporting. The gravimetric factor applied to 2020 data was **1.366**. This methodology although reasonable for annual mean data, has a tendency to over-estimate the number of daily mean exceedances. Consequently, these results should be treated with some caution.

For comparison with the NAQS objectives annual mean concentrations are calculated from an hourly time base. PM₁₀ data from the Fidas does not require to be adjusted, determined by the UK

Equivalence Testing Programme¹². For comparison with the NAQS objectives annual mean concentrations are calculated from an hourly time base. The PM_{2.5} data is adjusted for slope by the following factor (1/1.06).

Automatic Monitoring Annualisation

Annualisation was required for three automatic monitoring sites in 2020, a summary of the sites is presented in **Table C.g to C2i**. Annualisation is required for any site with data capture less than 75% but greater than 25%.

NO₂ Fall-off with Distance from the Road

No automatic NO₂ monitoring locations within Dundee City Council were above 36µg/m³ during 2020, therefore distance correction is not required.

¹² <http://laqm.defra.gov.uk/laqm-faqs/faq104.html>

Table C.2a – Period Adjustment Calculation for Jan & Feb, August to Dec (concentrations presented in $\mu\text{g}/\text{m}^3$)

Urban Background Locations	Data Capture %	Annual Mean, A_m ($\mu\text{g}/\text{m}^3$)	Period Mean, P_m ($\mu\text{g}/\text{m}^3$)	Ratio, A_m/P_m	Average Ratio, R_a
DT 7 Balgavies PI	75.0	14.87	19.02	0.782	0.825
DT 155 Carolina Court Lp6	75.0	18.46	22.27	0.829	
DT 185 Murraygate (46)	83.3	16.78	19.43	0.864	
DT 82 Woodside Ave	83.3	10.70	12.99	0.824	
Sites to be annualised					
DT 167 Albert St (191)	58.3	24.5	29.7		
DT 9 Birnam PI		7.7	9.3		
DT 13 Clepington Rd/ Forfar Rd		25.5	30.9		
DT 20 Dura St (100)		29.1	35.2		
DT 83 Forfar Rd (104)		33.5	40.6		
DT 177 Kingsway/Strathmartine Rd (N)		27.2	33.0		
DT 237 Lower Princess St		25.0	30.3		
DT 189 Myrekirk Rd (29)		25.1	30.5		
DT 151 South Road (1 Denbank)		27.3	33.1		
DT 59 Strathmore Ave (353)		27.7	33.6		
DT 184 Victoria Rd (104)/William St)		23.7	28.8		
DT 243 Victoria St (Eagle Mill)		19.0	23.1		
DT 72 Westport (2)		23.4	28.3		

Table C.2b Period Adjustment Calculation for Jan & Feb, May, Sep, Nov & Dec (concentrations presented in $\mu\text{g}/\text{m}^3$)

Urban Background Locations	Data Capture %	Annual Mean, A_m ($\mu\text{g}/\text{m}^3$)	Period Mean, P_m ($\mu\text{g}/\text{m}^3$)	Ratio, A_m/P_m	Average Ratio, R_a
DT 7 Balgavies PI	75.0	14.87	18.90	0.787	0.828
DT 155 Carolina Court Lp6	75.0	18.46	22.20	0.831	
DT 185 Murraygate (46)	83.3	16.78	19.47	0.862	
DT 82 Woodside Ave	83.3	10.70	12.88	0.831	
Site to be annualised					
DT 223 B/ Ferry Rd Lower (Cyclesign)	50.0	22.5	27.1		

Table C.2c Period Adjustment Calculation for Jan & Feb, Jul to Sep, Nov & Dec (concentrations presented in $\mu\text{g}/\text{m}^3$)

Urban Background Locations	Data Capture %	Annual Mean, A_m ($\mu\text{g}/\text{m}^3$)	Period Mean, P_m ($\mu\text{g}/\text{m}^3$)	Ratio, A_m/P_m	Average Ratio, R_a
DT 7 Balgavies PI	75.0	14.87	17.09	0.870	0.895
DT 155 Carolina Court Lp6	75.0	18.46	20.59	0.897	
DT 185 Murraygate (46)	83.3	16.78	18.33	0.916	
DT 82 Woodside Ave	83.3	10.70	11.93	0.897	
Sites to be annualised					
DT 145 B/Ferry Rd Greendykes	58.3	29.1	32.5		
DT 171 Claypotts / Arbroath Rd (502)		24.7	27.6		
DT 227 Dudhope Crescent Road (40)		34.0	38.0		
DT 26 Kingsway East Roundabout		32.5	36.3		

Table C.2d Period Adjustment Calculation for Jan & Feb, Jun & Jul, Sep to Dec (concentrations presented in $\mu\text{g}/\text{m}^3$)

Urban Background Locations	Data Capture %	Annual Mean, A_m ($\mu\text{g}/\text{m}^3$)	Period Mean, P_m ($\mu\text{g}/\text{m}^3$)	Ratio, A_m/P_m	Average Ratio, R_a
DT 7 Balgavies PI	75.0	14.87	16.93	0.878	0.905
DT 155 Carolina Court Lp6	75.0	18.46	20.41	0.904	
DT 185 Murraygate (46)	83.3	16.78	18.11	0.926	
DT 82 Woodside Ave	83.3	10.70	11.74	0.912	
Site to be annualised					
DT 46 Nethergate (95)	66.7	22.4	24.7		

Table C.2e Period Adjustment Calculation for Jan & Feb, Jun to Sep, Nov & Dec (concentrations presented in $\mu\text{g}/\text{m}^3$)

Urban Background Locations	Data Capture %	Annual Mean, A_m ($\mu\text{g}/\text{m}^3$)	Period Mean, P_m ($\mu\text{g}/\text{m}^3$)	Ratio, A_m/P_m	Average Ratio, R_a
DT 7 Balgavies PI	75.0	14.87	15.81	0.940	0.949
DT 155 Carolina Court Lp6	75.0	18.46	19.34	0.954	
DT 185 Murraygate (46)	83.3	16.78	17.69	0.949	
DT 82 Woodside Ave	83.3	10.70	11.25	0.951	
Sites to be annualised					
DT 204 B/Ferry Rd (129)	66.7	31.8	33.5		
DT 139 B/Ferry Rd (141) Downpipe		28.7	30.2		
DT 11 Broughty Ferry Rd (141)		31.5	33.2		
DT 77 Whitehall St (15)		26.9	28.4		
DT 74 Whitehall St (40)		29.3	30.9		

Table C.2f Period Adjustment Calculation for Jan, Jun - Sep, Nov & Dec

Urban Background Locations	Data Capture %	Annual Mean, A _m (µg/m ³)	Period Mean, P _m (µg/m ³)	Ratio, A _m /P _m	Average Ratio, R _a
DT 7 Balgavies PI	75.0	14.87	15.20	0.978	0.990
DT 155 Carolina Court Lp6	75.0	18.46	18.49	0.998	
DT 185 Murraygate (46)	83.3	16.78	16.60	1.011	
DT 82 Woodside Ave	83.3	10.70	11.01	0.971	
Site to be annualised					
DT 47 Nethergate (40)	58.3	25.9	26.1		

Table C.2g Period Adjustment Calculation for CM14, Meadowside NO₂ Annual Mean 2020 (concentrations presented in µg/m³)

Urban Background Locations	Data Capture %	Annual Mean, A _m (µg/m ³)	Period Mean, P _m (µg/m ³)	Ratio, A _m /P _m	Average Ratio, R _a
CM12, Dundee, Mains Loan	97.40	8.47	7.58	1.117	1.074
Edinburgh, St Leonards	88.02	13.69	13.49	1.015	
Aberdeen, Errol Place	94.46	13.45	12.32	1.092	
Site to be annualised					
CM 14, Meadowside - NO₂	31.96	25.6	23.81		

Table C.2h Period Adjustment Calculation for CM15, Albert St PM₁₀ Annual Mean 2020 (concentrations presented in µg/m³)

Urban Background Locations	Data Capture %	Annual Mean, A _m (µg/m ³)	Period Mean, P _m (µg/m ³)	Ratio, A _m /P _m	Average Ratio, R _a
CM12, Dundee, Mains Loan	99.73	6.99	7.15	0.977	0.984
Edinburgh, St Leonards	99.29	8.05	8.18	0.985	
Aberdeen, Errol Place	99.72	9.43	9.54	0.989	
Site to be annualised					
CM 15, Albert St - PM₁₀	70.36	13.9	14.14		

Table C.2i Period Adjustment Calculation for CM9, Logie St PM₁₀ Annual Mean 2020 (concentrations presented in µg/m³)

Urban Background Locations	Data Capture %	Annual Mean, A _m (µg/m ³)	Period Mean, P _m (µg/m ³)	Ratio, A _m /P _m	Average Ratio, R _a
CM12, Dundee, Mains Loan	99.73	6.99	7.22	0.968	0.975
Edinburgh, St Leonards	99.29	8.05	8.29	0.971	
Aberdeen, Errol Place	99.72	9.43	9.56	0.987	
Site to be annualised					
CM 9, Logie St - PM₁₀	71.85	14.0	14.31		

Appendix C.2 Overview of NO₂ Annual Mean Concentrations across the City
Union Street & Whitehall Street

Figure C.1 NO₂ Monitoring Locations in Union Street and Whitehall Street

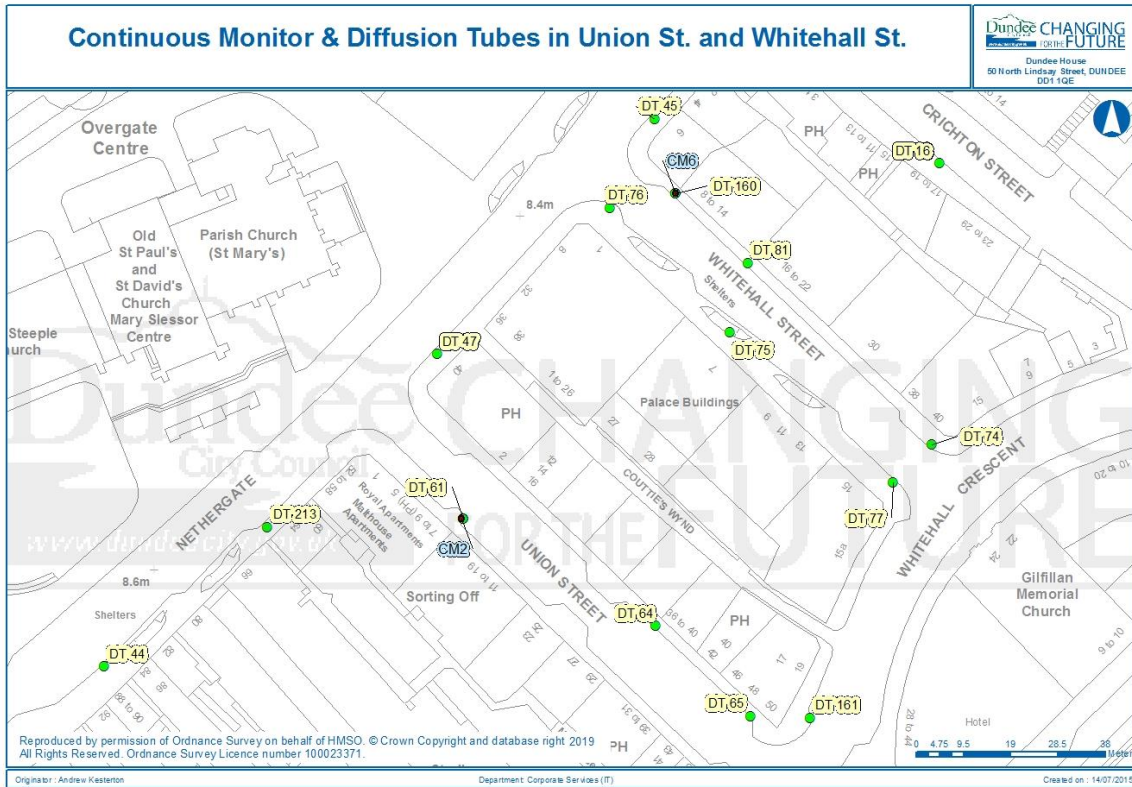


Figure C.2 Overview of NO₂ Concentrations in Union St and Nethergate (east of Marketgait)

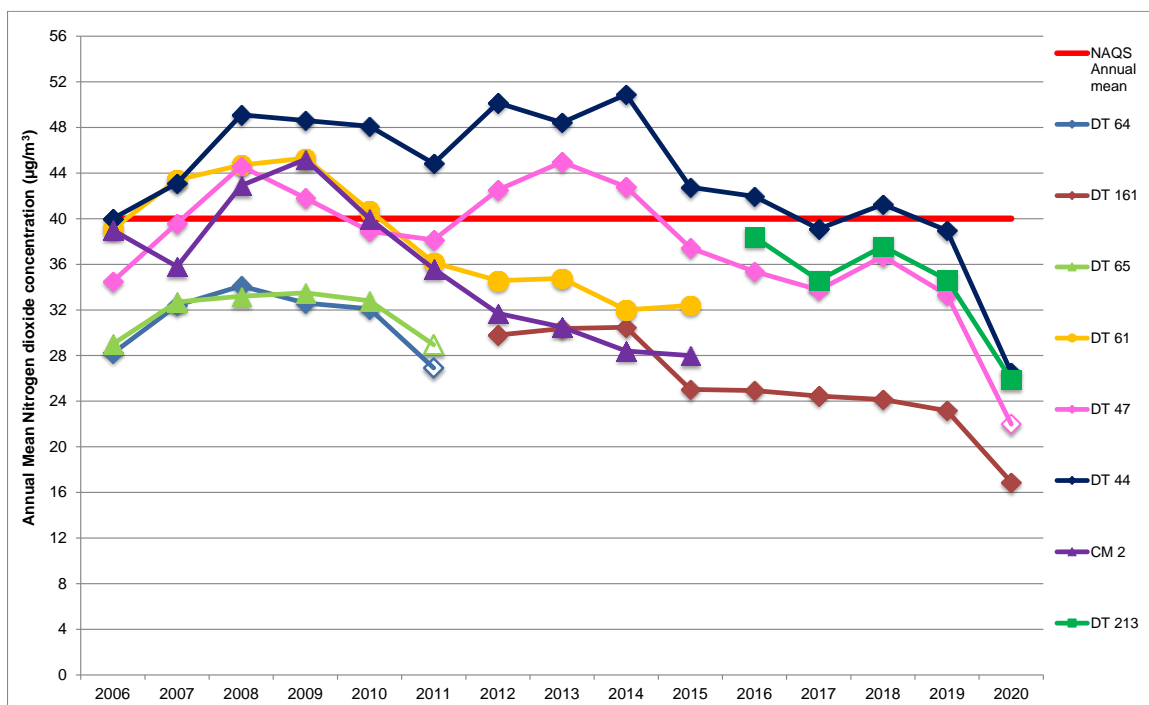
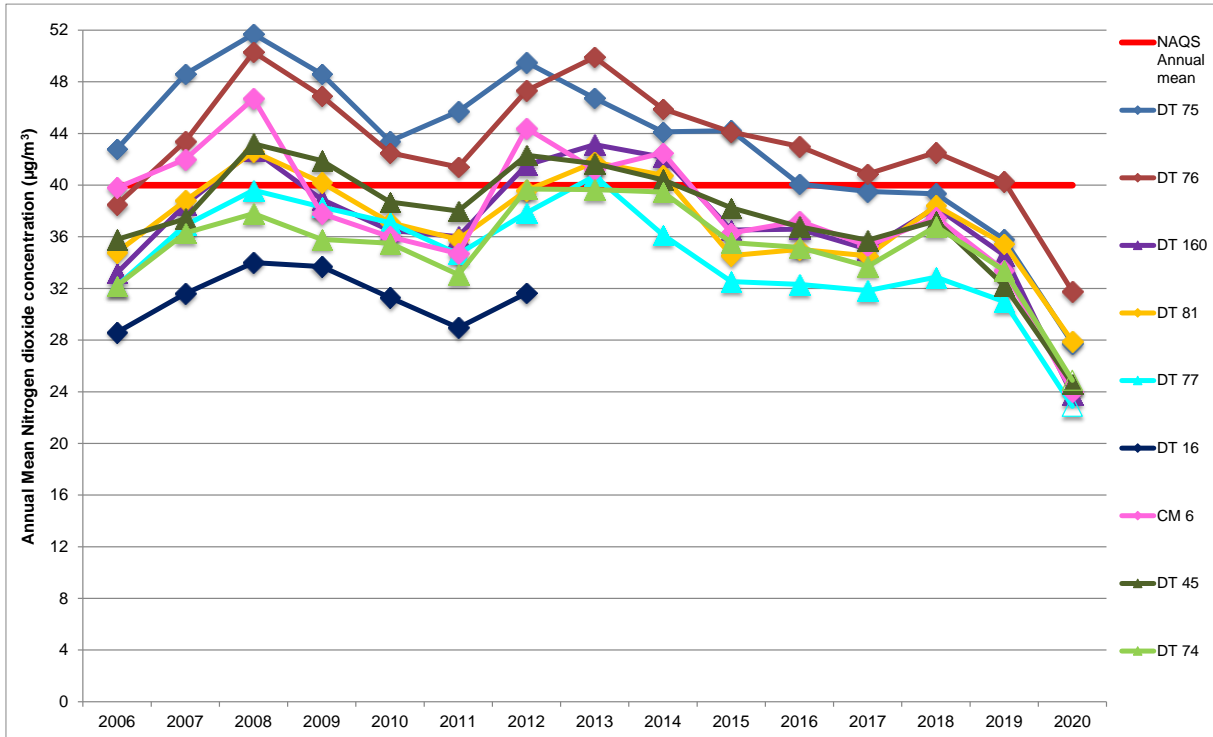


Figure C.3 Overview of NO₂ Concentrations in Whitehall St and Crichton St.



Seagate

Figure C.4 NO₂ Monitoring Locations in Seagate

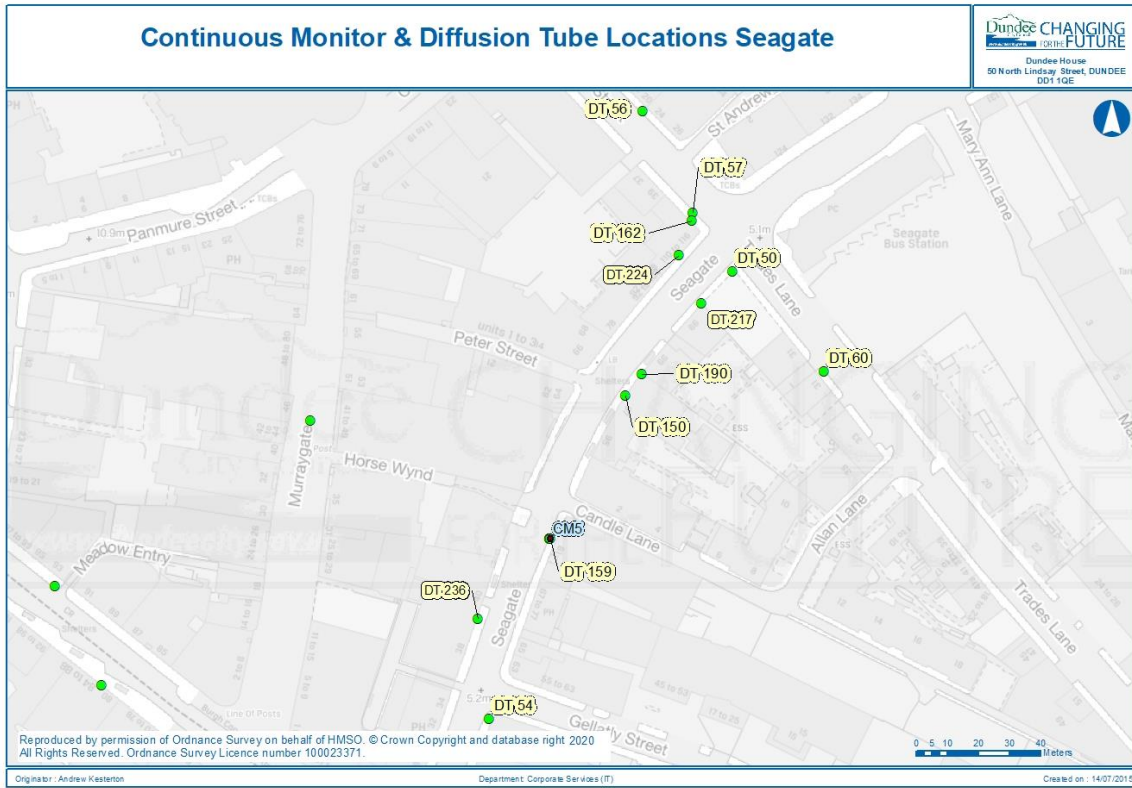
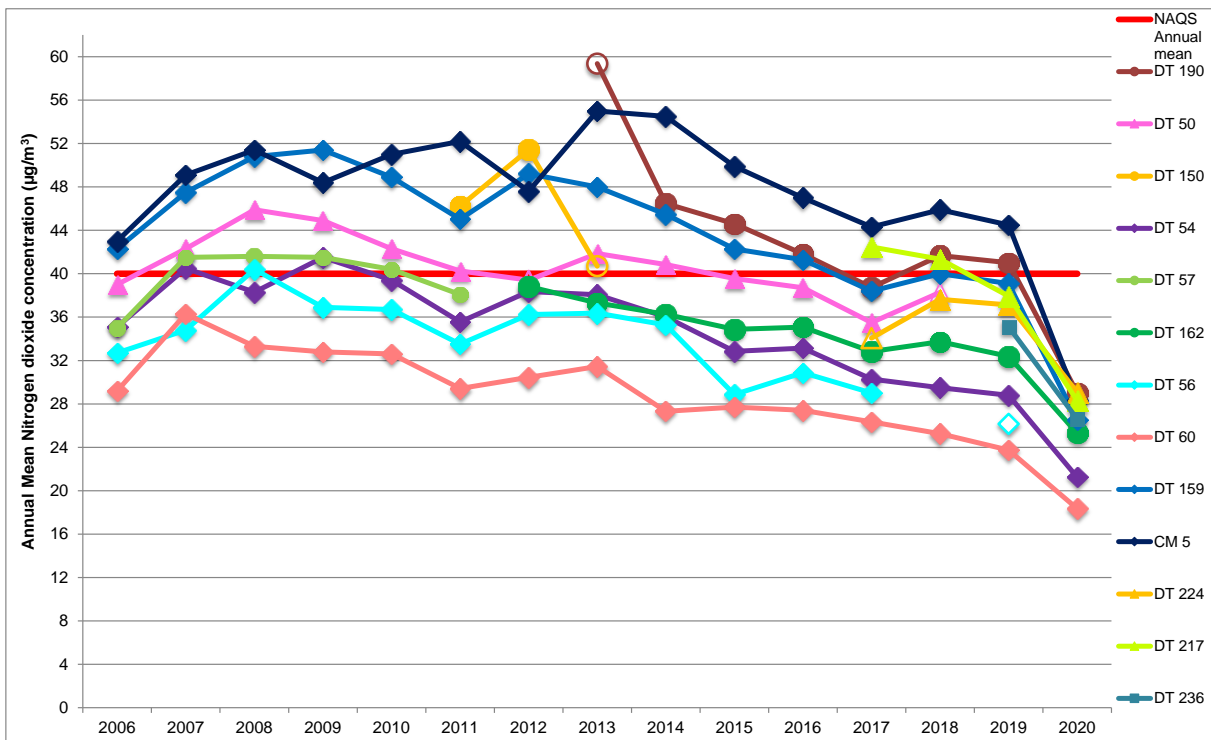


Figure C.5 Overview of NO₂ Concentrations in Seagate.



Nethergate

Figure C.6 NO₂ Diffusion Tube Locations in Nethergate

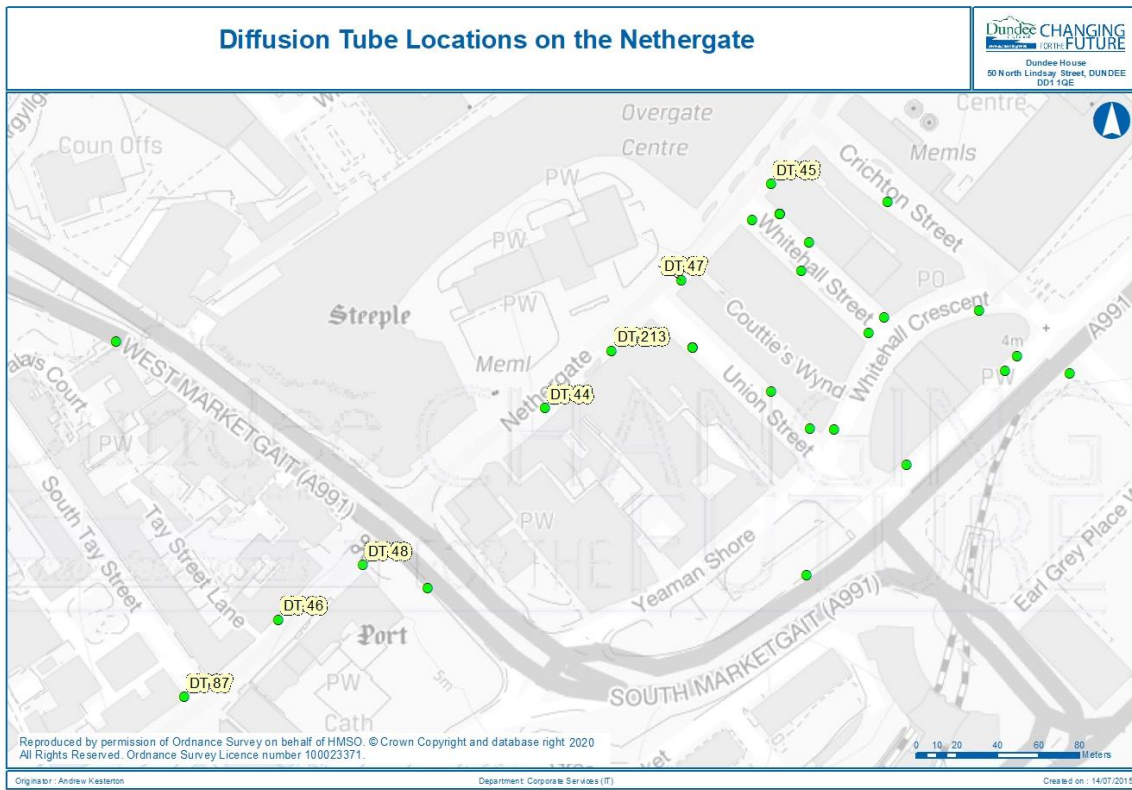
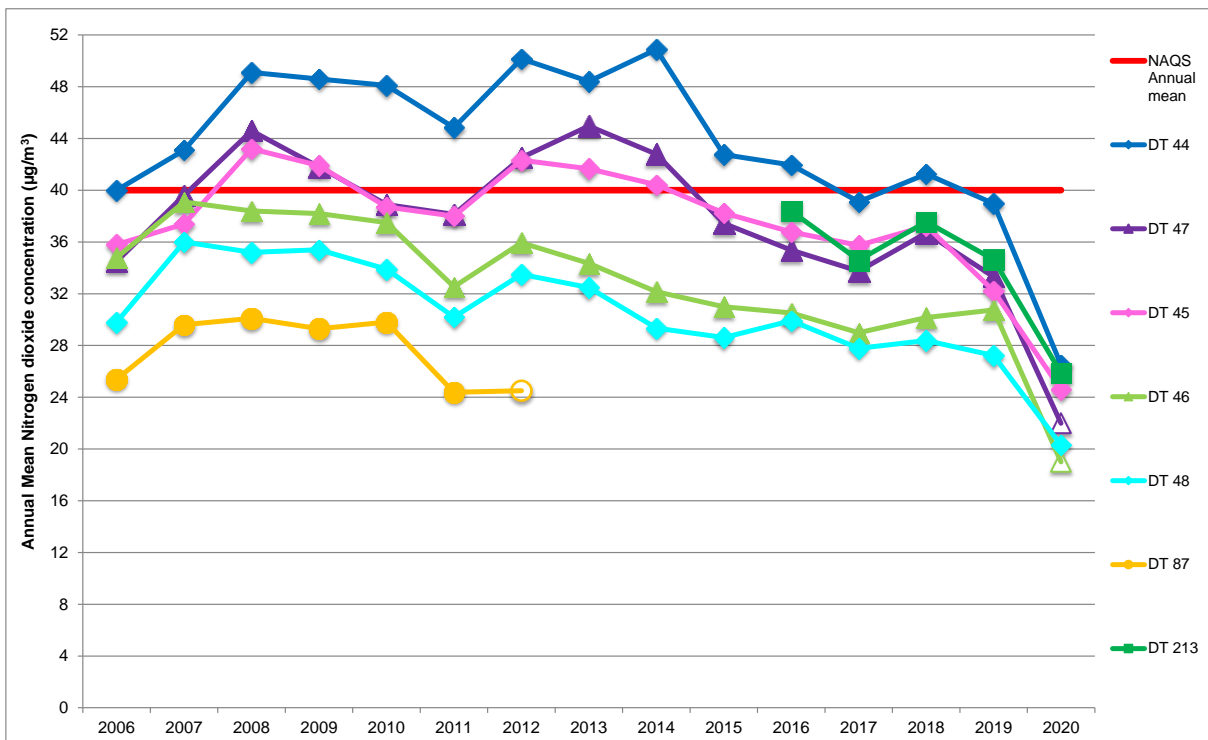


Figure C.7 Overview of NO₂ Diffusion Tube Concentrations in Nethergate.



Victoria Road / Meadowside

Figure C.8 NO₂ Diffusion Tube Locations in Victoria Road / Meadowside

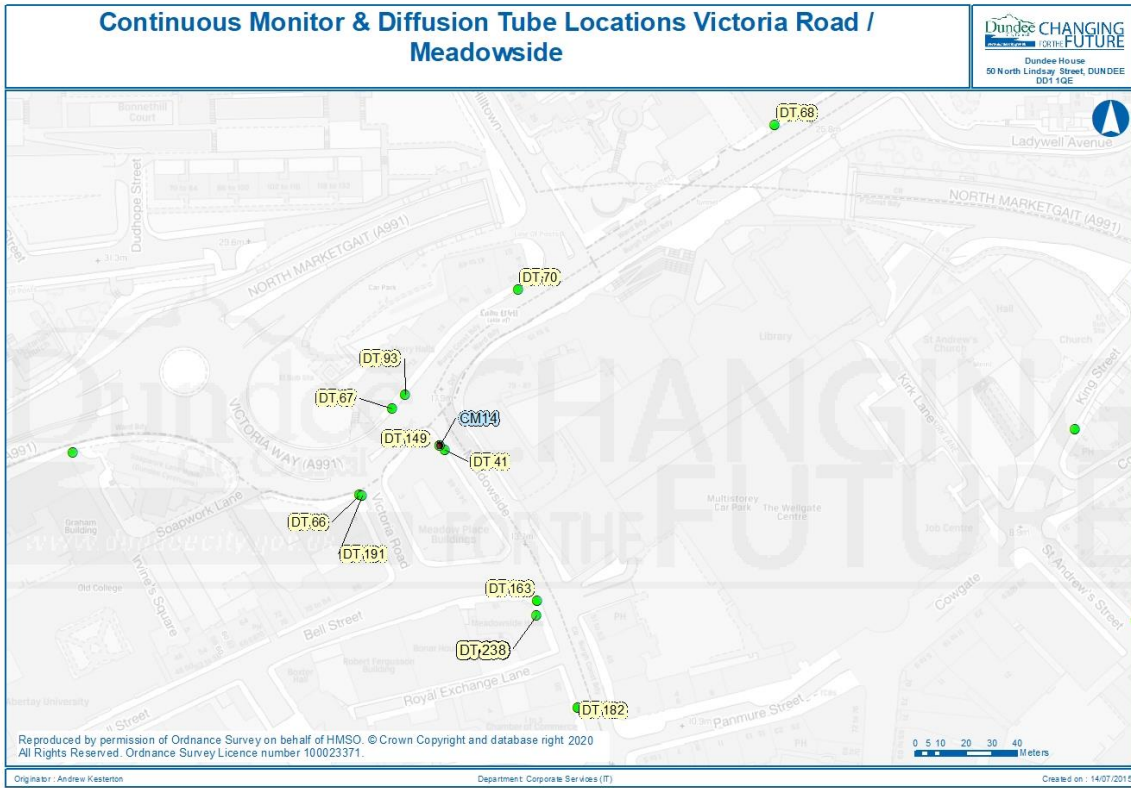
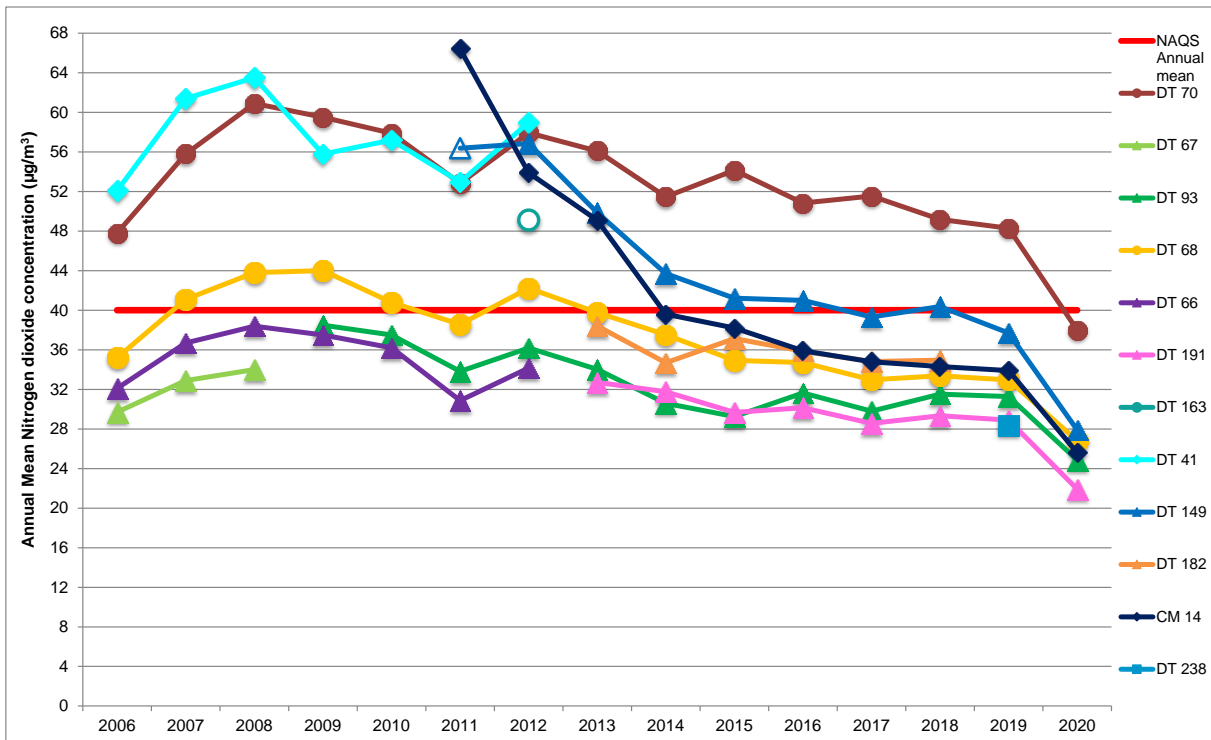


Figure C.9 Overview of NO₂ Diffusion Tube Concentrations in Victoria Road / Meadowside



Albert Street / Dura Street

Figure C.10 NO₂ Diffusion Tube Locations in Albert Street / Dura Street

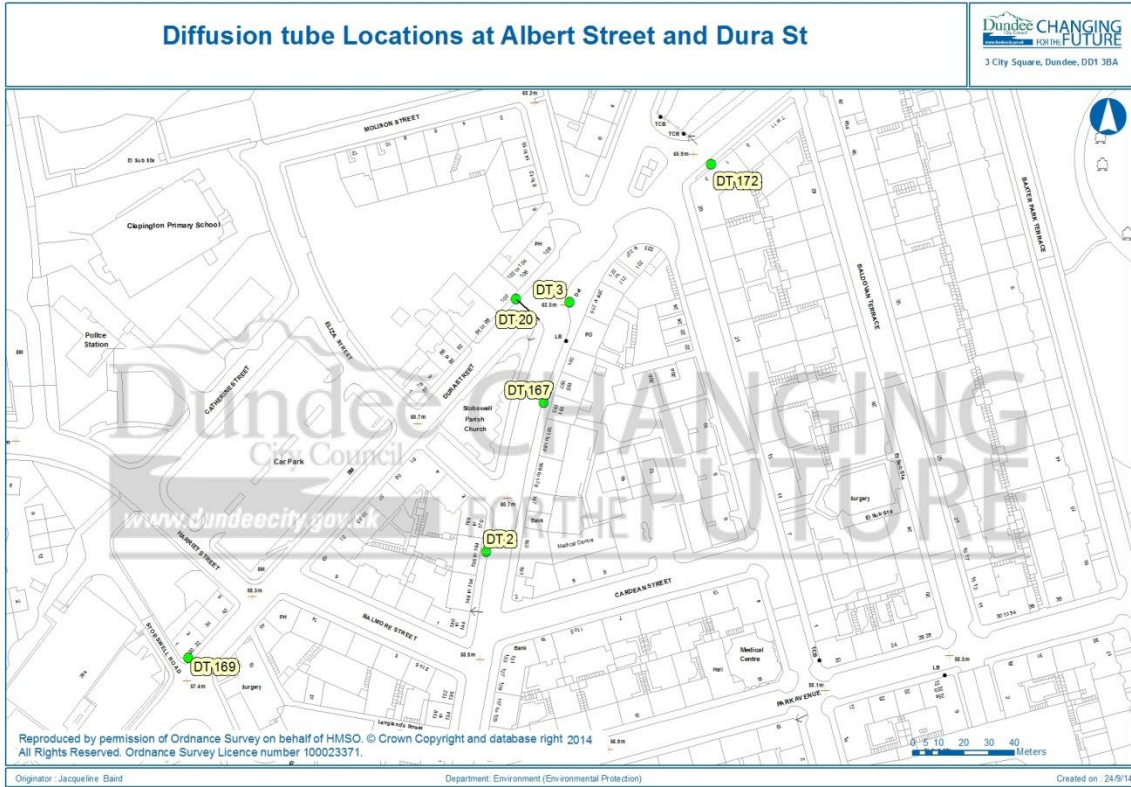
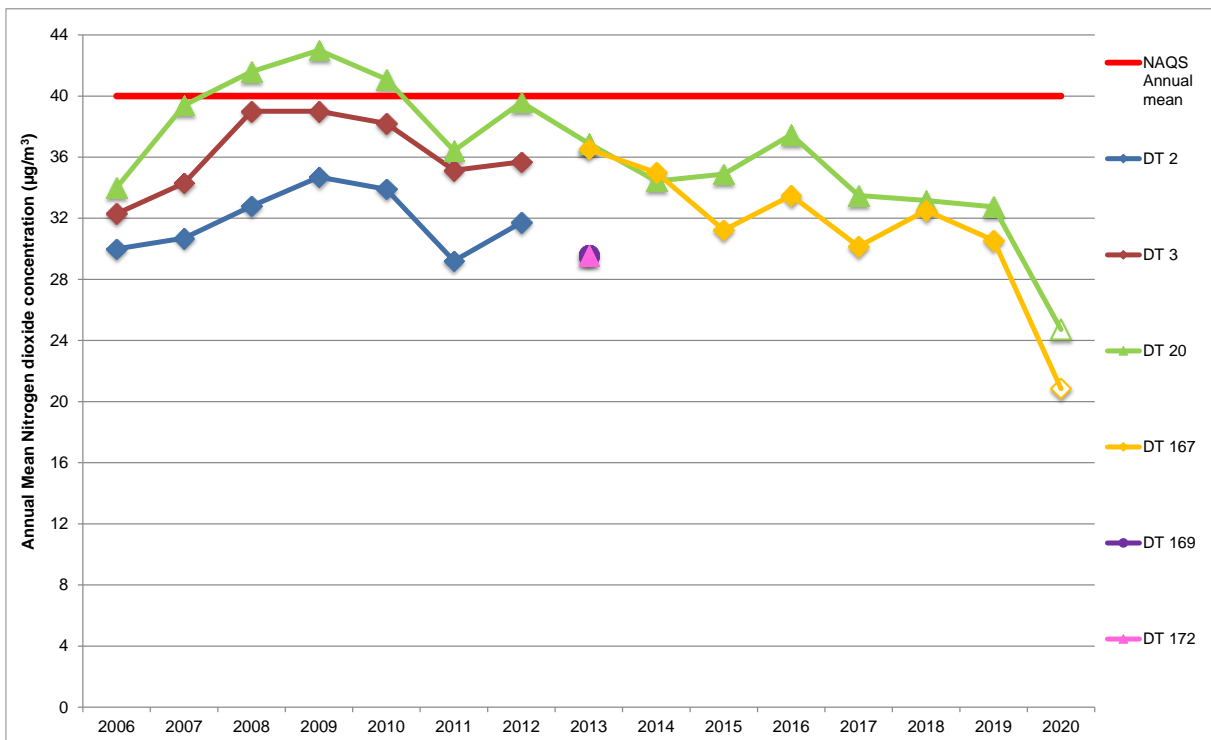


Figure C.11 Overview of NO₂ Diffusion Tube Concentrations in Albert Street / Dura Street.



Lochee Road

Figure C.12 NO₂ Monitoring Locations in Lochee Road

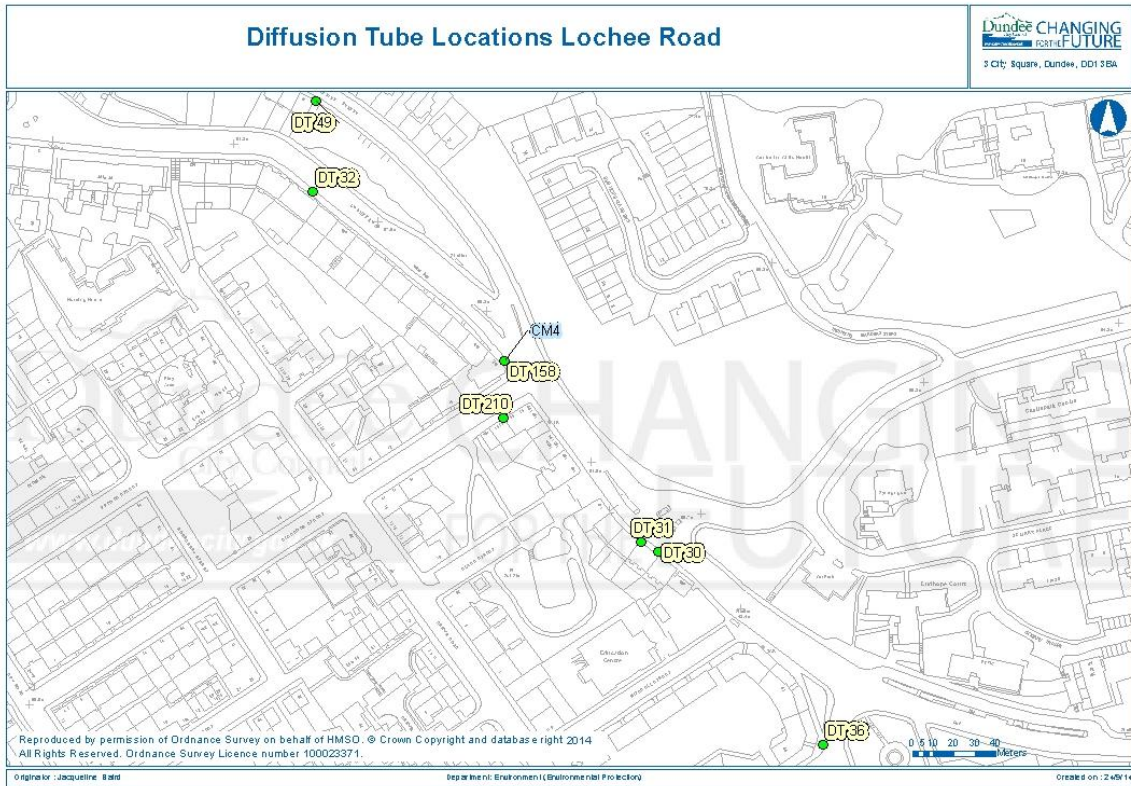
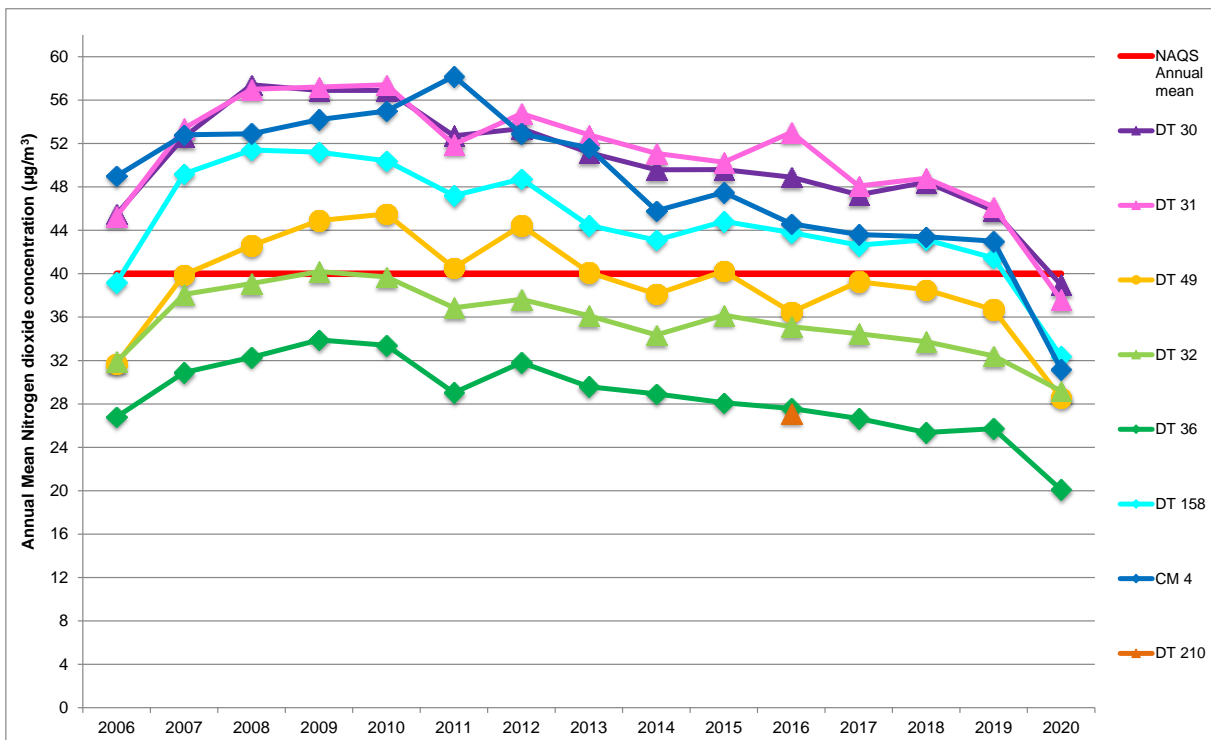


Figure C.13 Overview of NO₂ Concentrations in Lochee Road



Logie Street

Figure C.14 NO₂ Diffusion Tube Locations in Logie Street

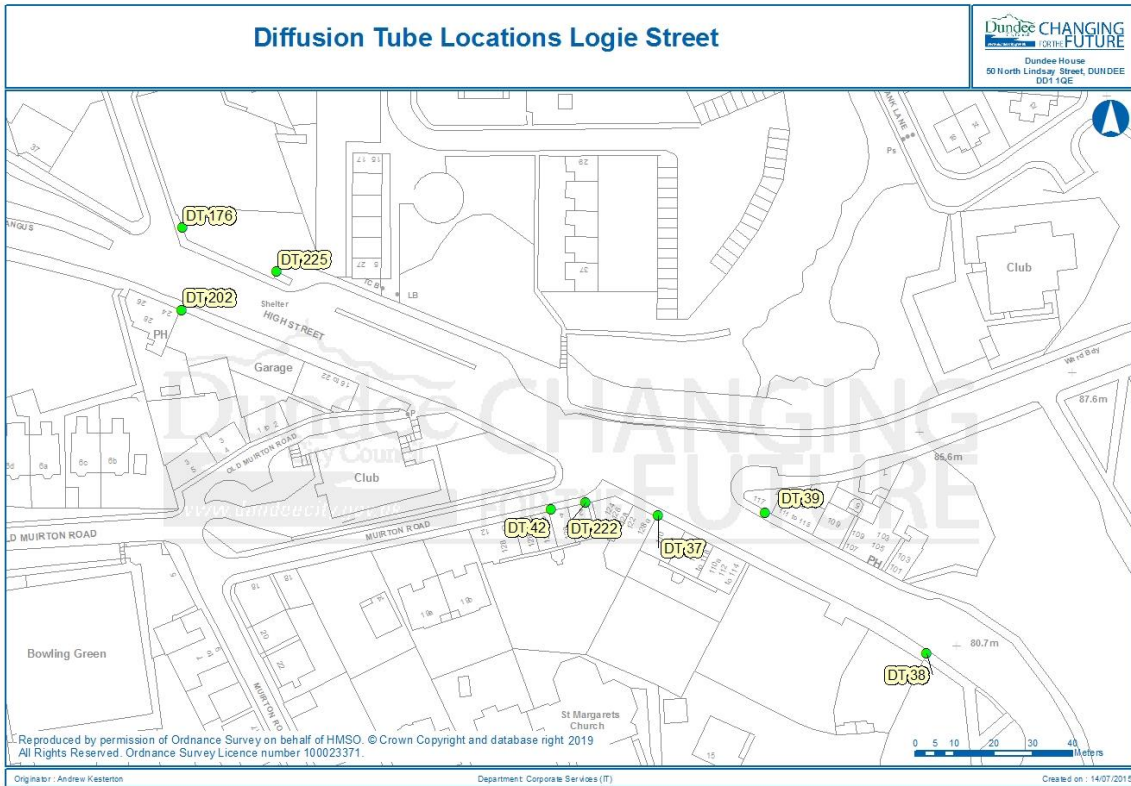
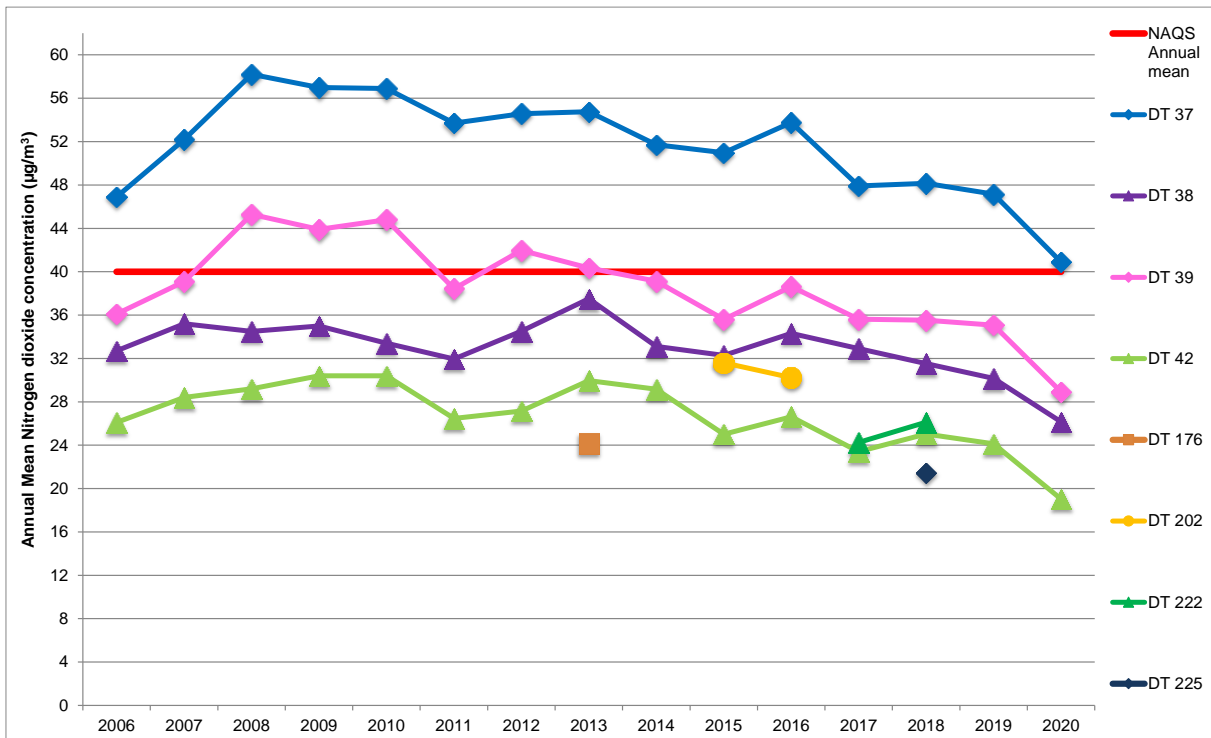


Figure C.15 Overview of NO₂ Diffusion Tube Concentrations in Logie St.



Albert Street / Arbroath Road

Figure C.16 NO₂ Diffusion Tube Locations in Albert St. / Arbroath Road

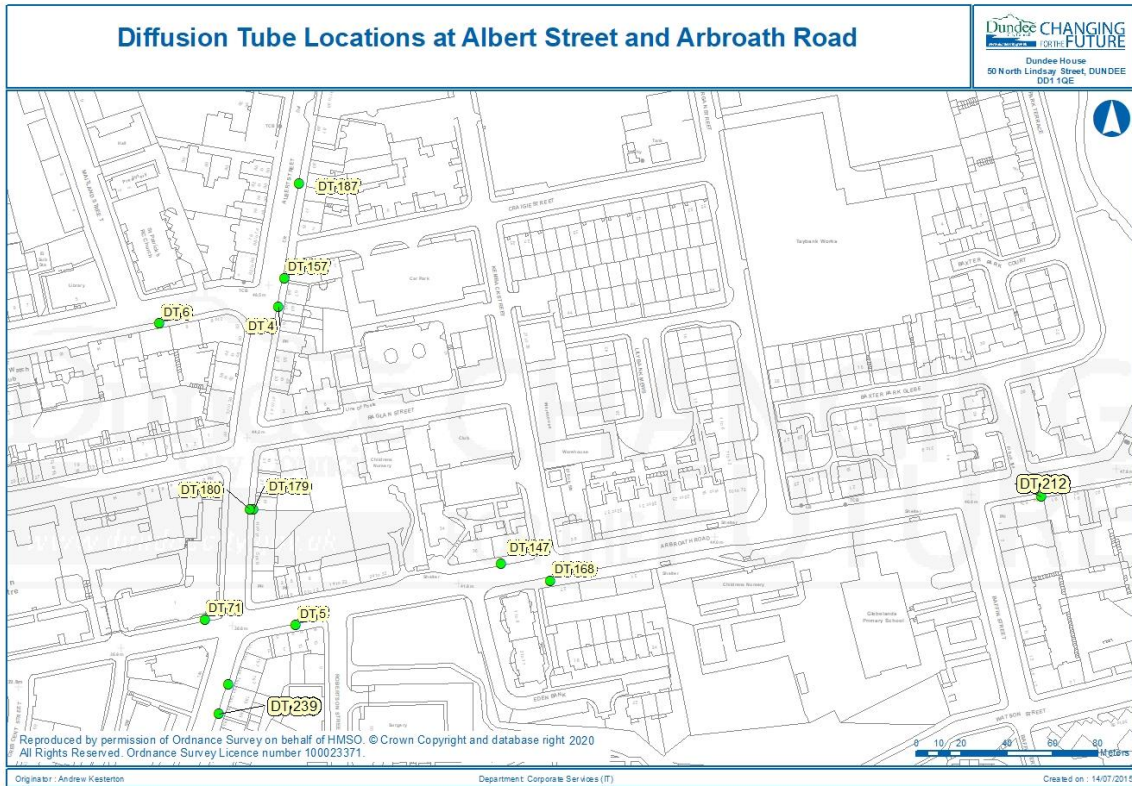
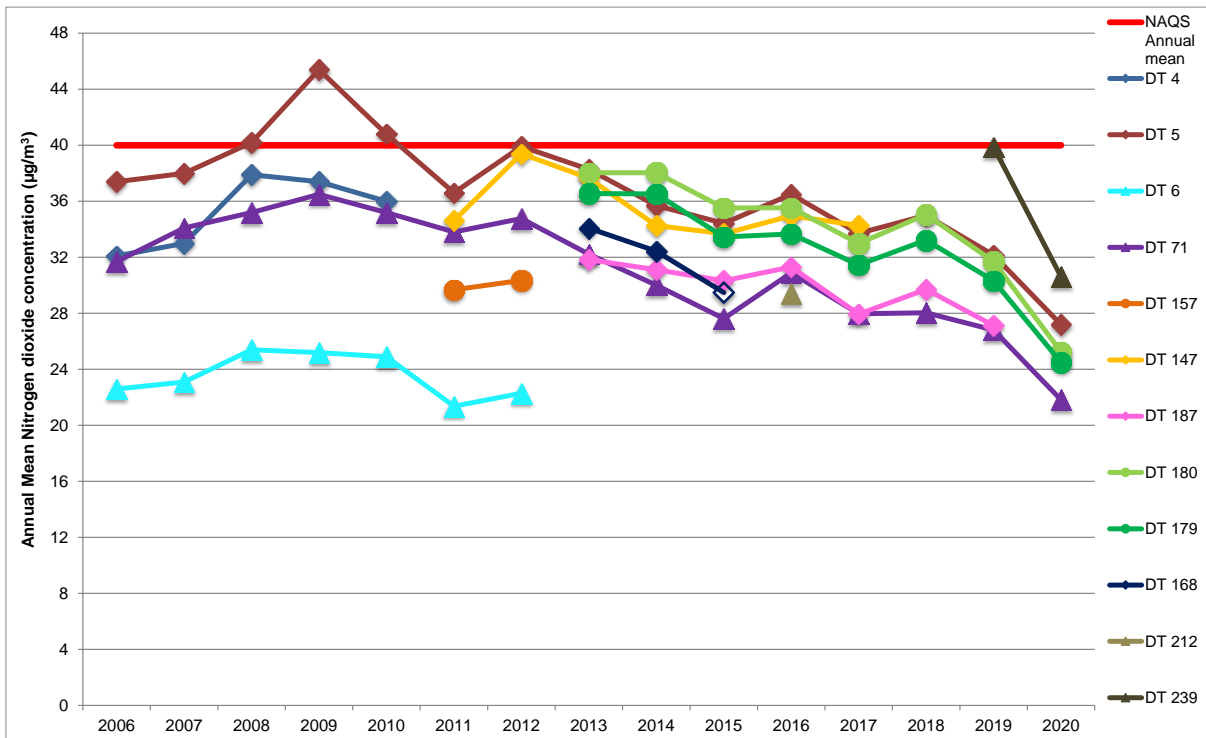


Figure C.17 Overview of NO₂ Diffusion Tube Concentrations in Albert St. / Arbroath Road



Kingsway / Forfar Road.

Figure C.18 NO₂ Diffusion Tube Locations on/near the Kingsway

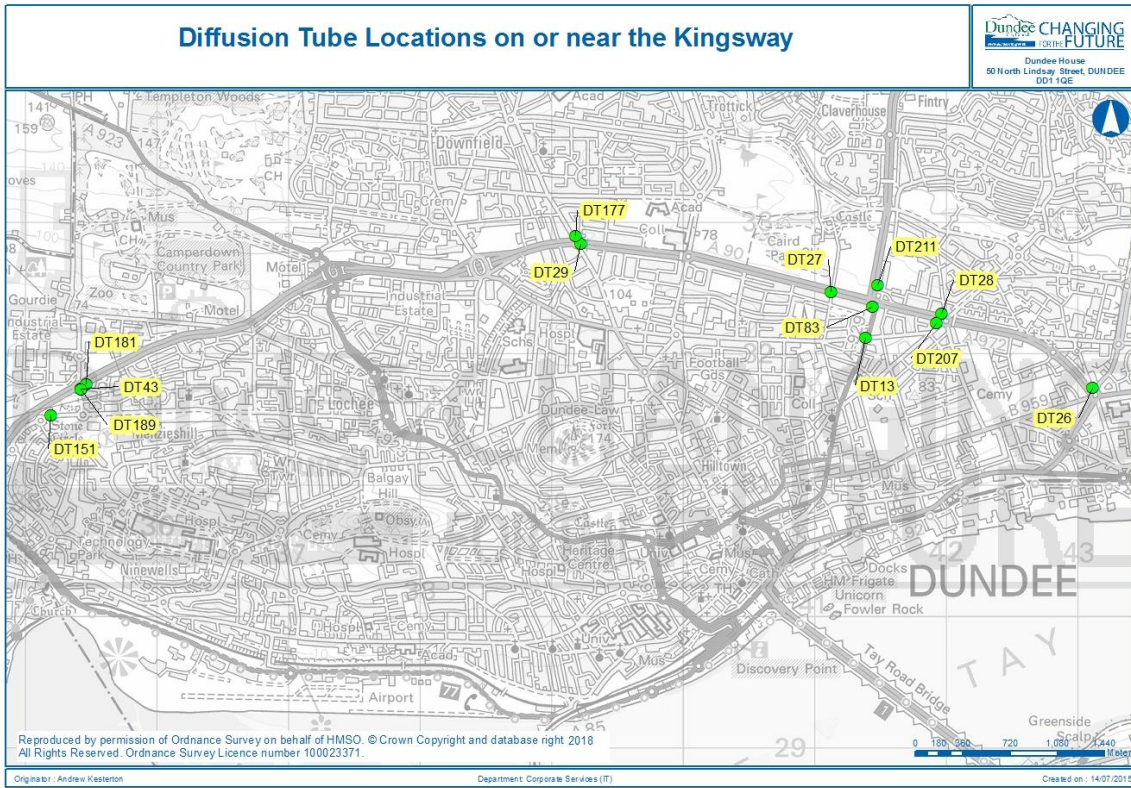
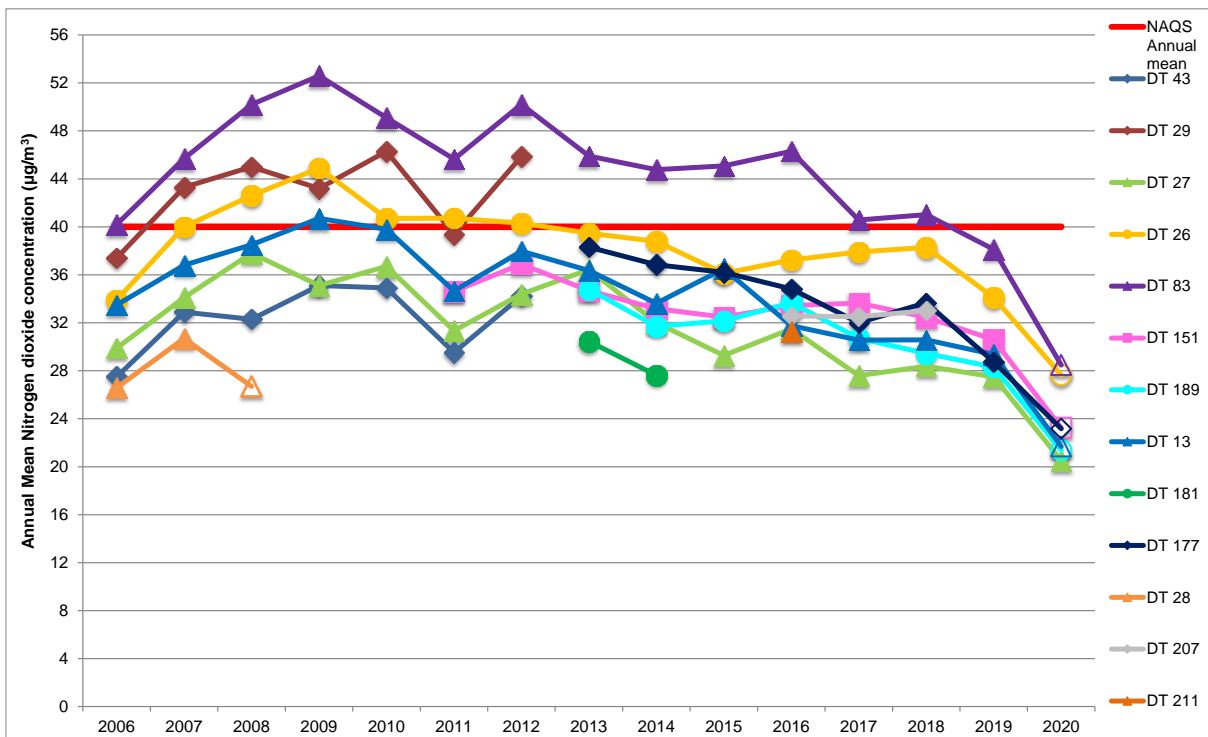


Figure C.19 Overview of NO₂ Diffusion Tube Concentrations on/near the Kingsway



Bus Corridor

Figure C.20 Other NO₂ Diffusion Tube Locations on Bus Corridor

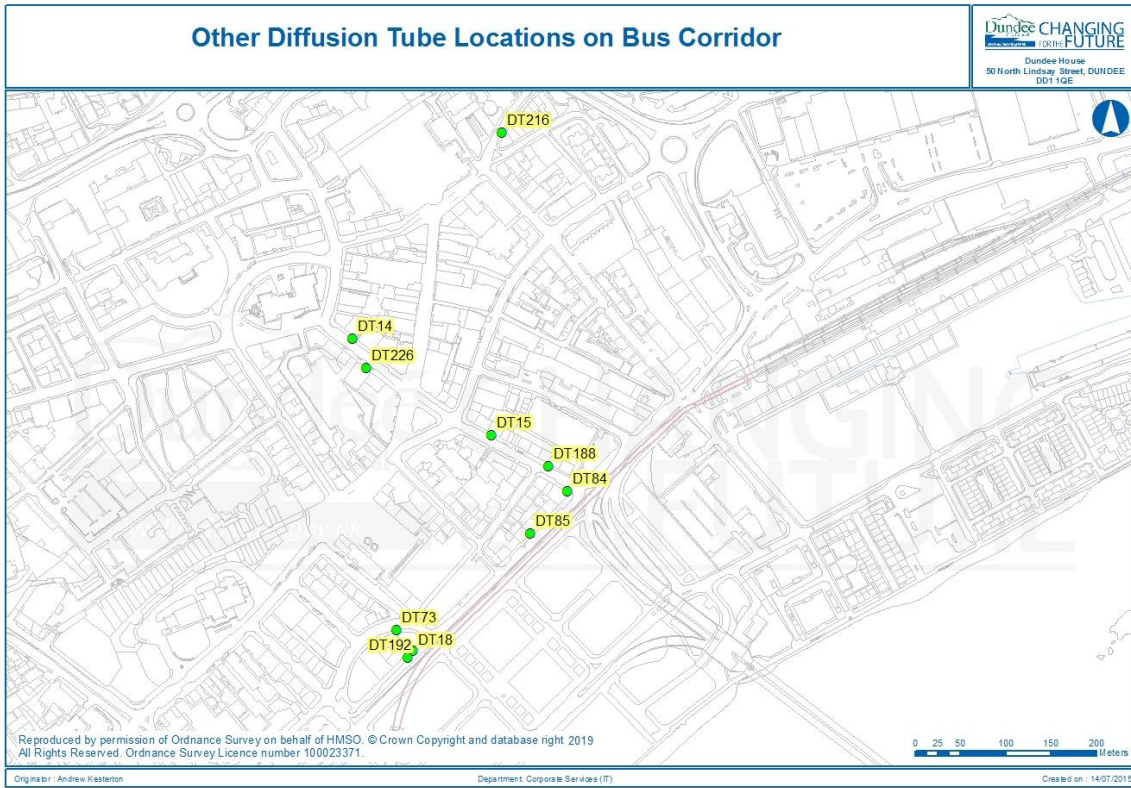
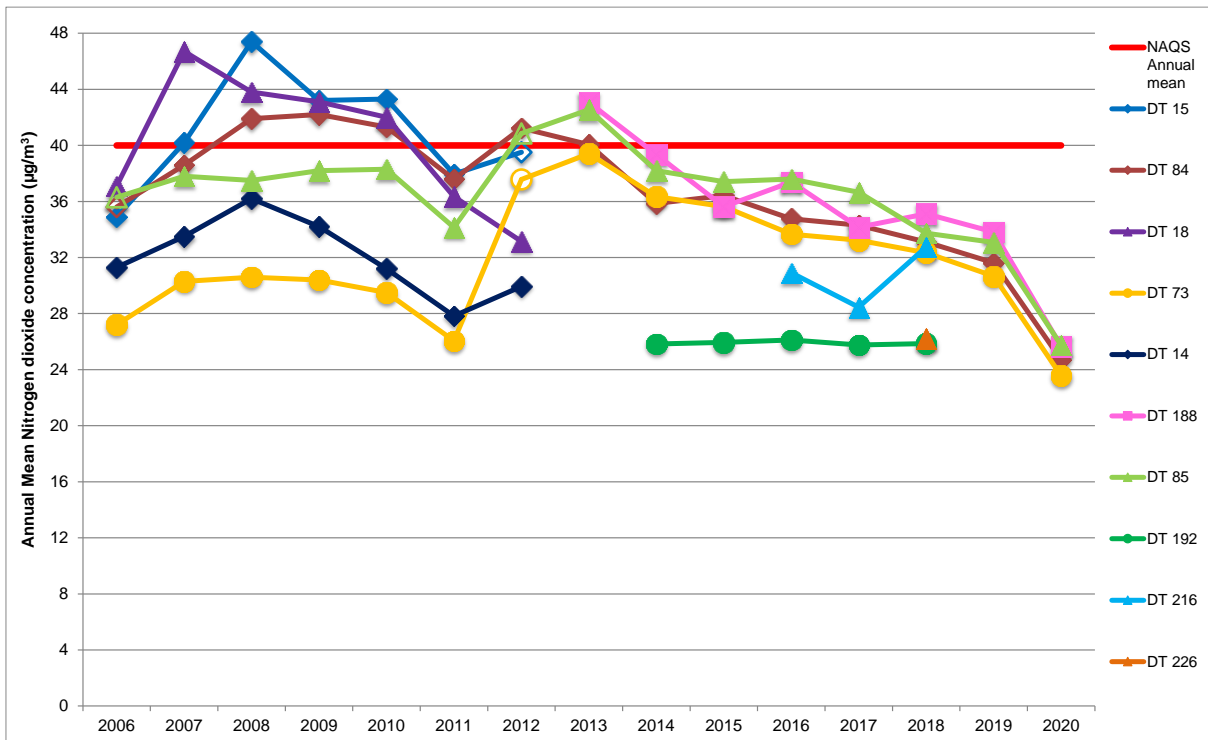


Figure C.21 Overview of Other NO₂ Diffusion Tube Concentrations on Bus Corridor



Inner Ring Road

Figure C.22 NO₂ Diffusion Tube Locations on Inner Ring Road

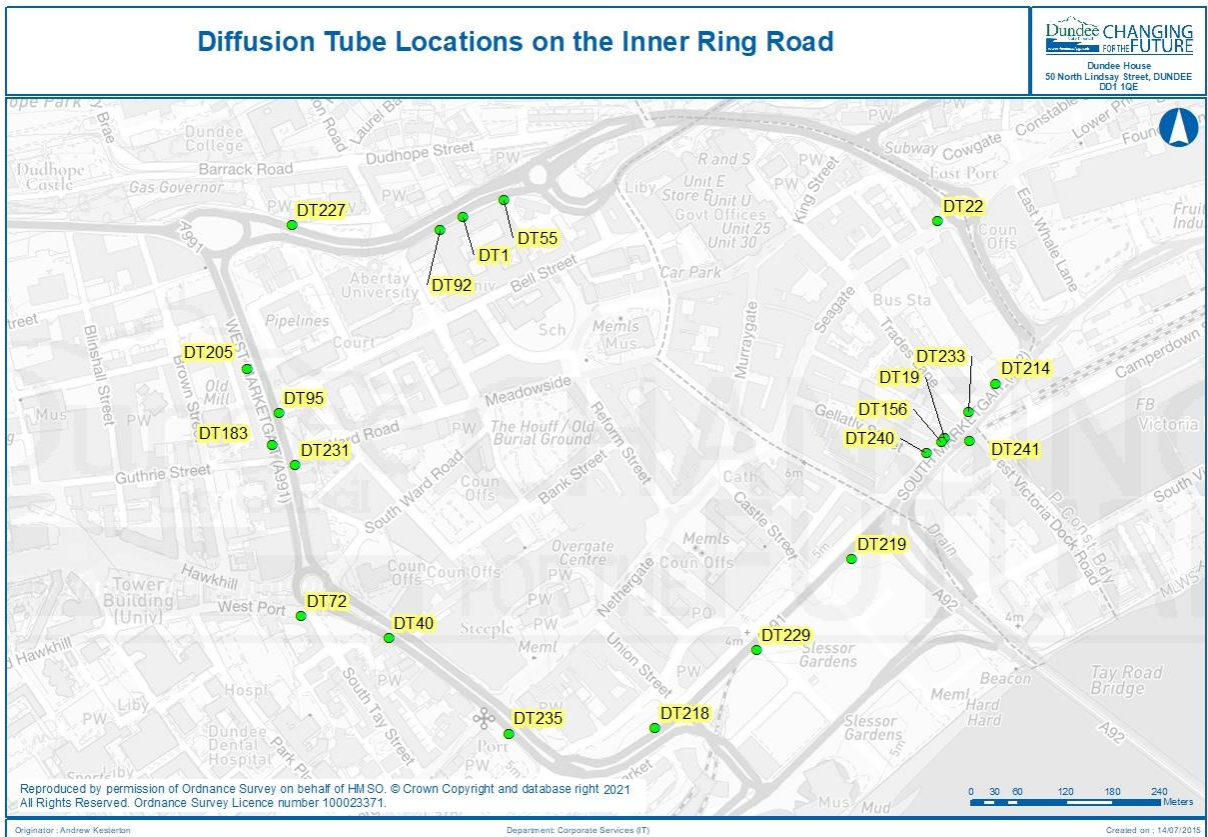


Figure C.23a Overview of NO₂ Diffusion Tube Concentrations on Inner Ring Road (West & North Marketgait)

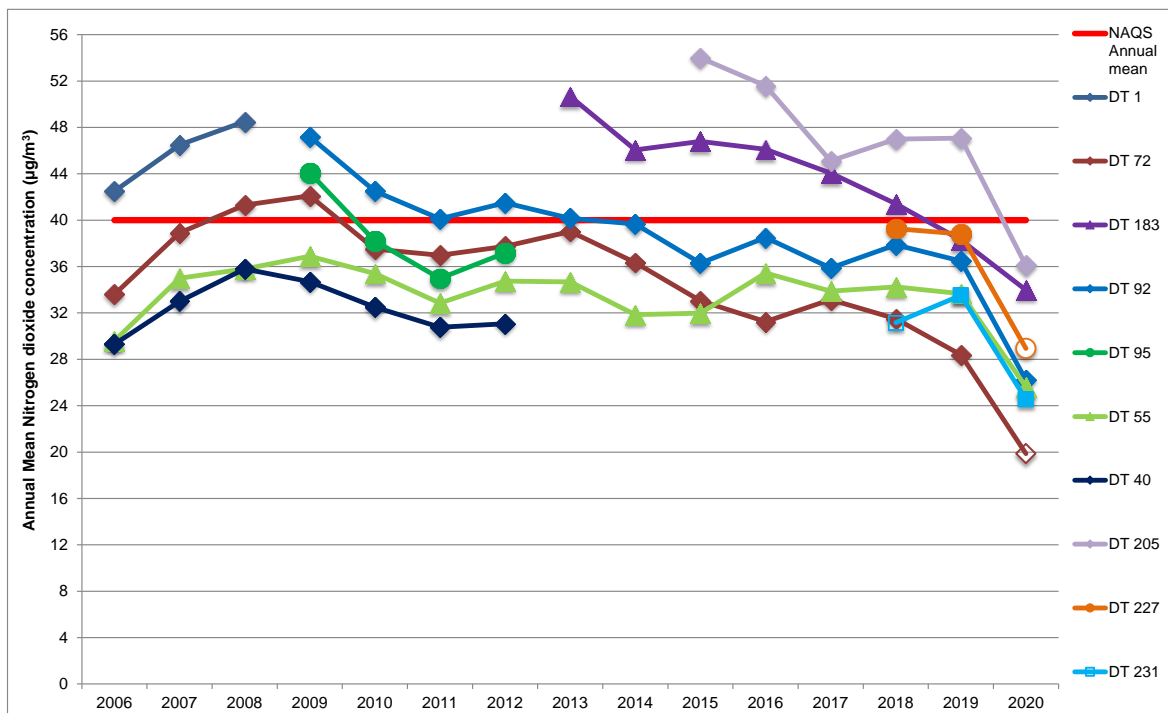
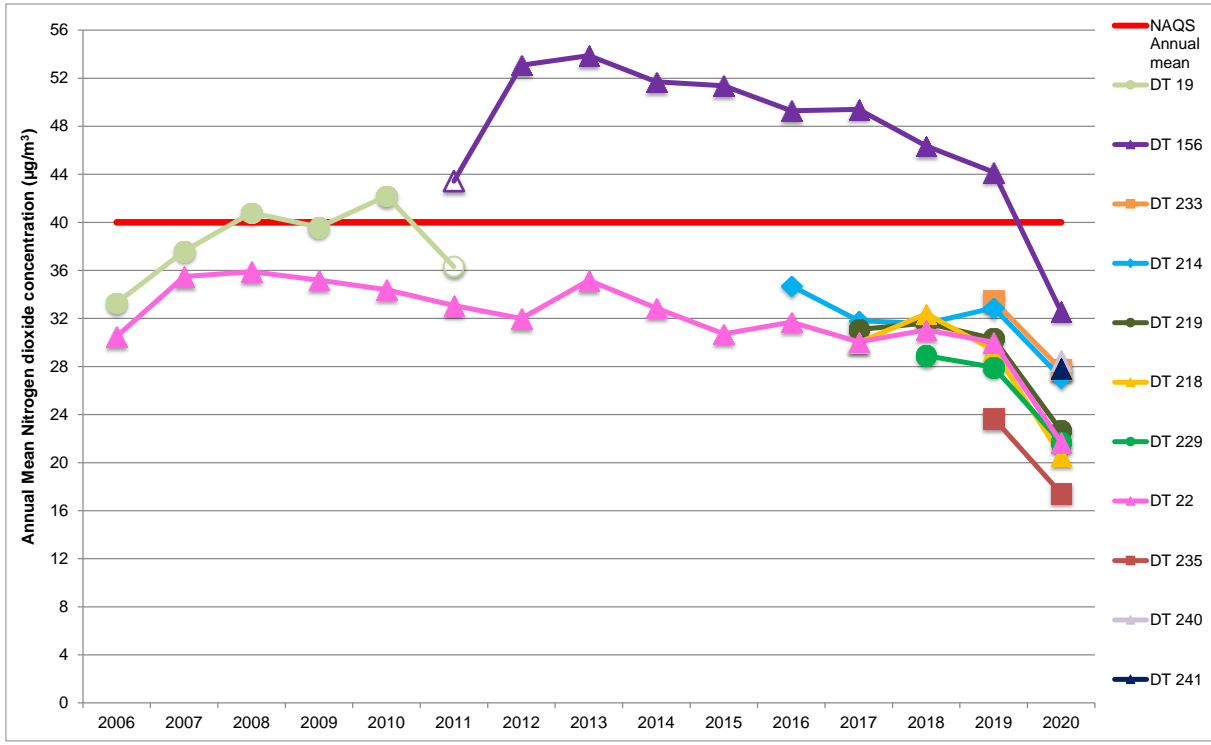


Figure C.23b Overview of NO₂ Diffusion Tube Concentrations on Inner Ring Road (East & South Marketgait)



Stannergate Roundabout

Figure C.24 NO₂ Diffusion Tube Location at Stannergate Roundabout

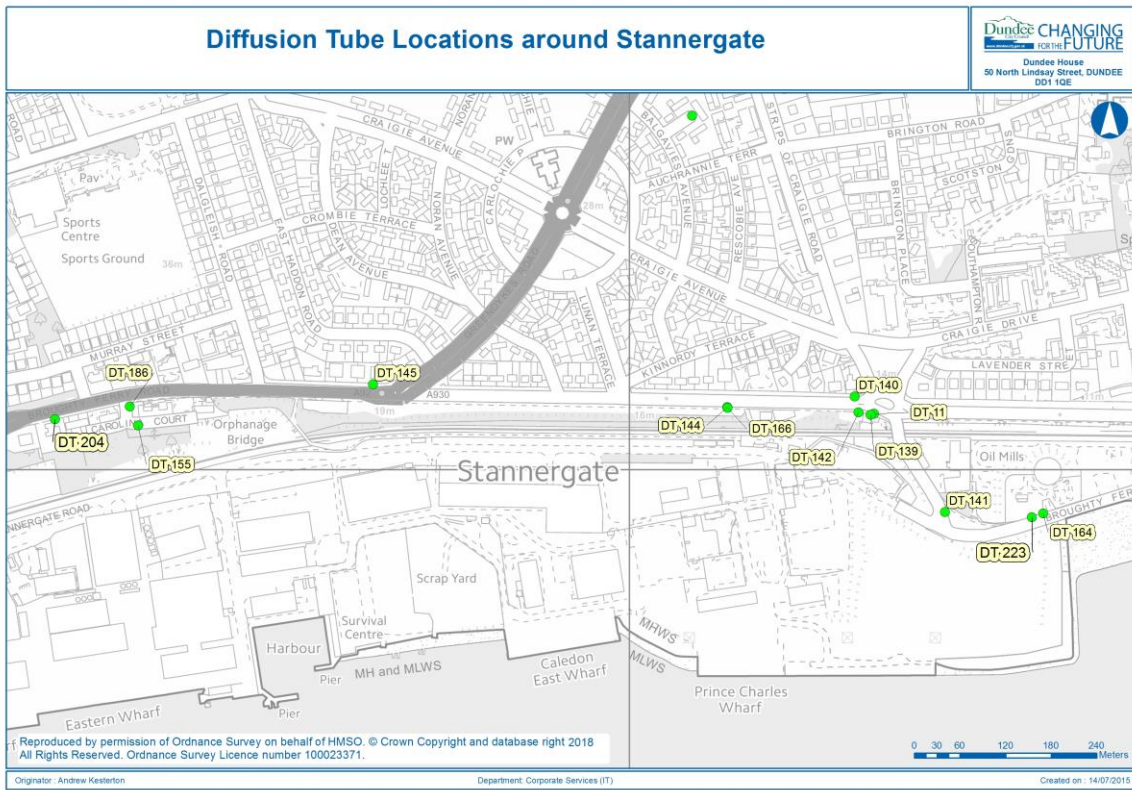
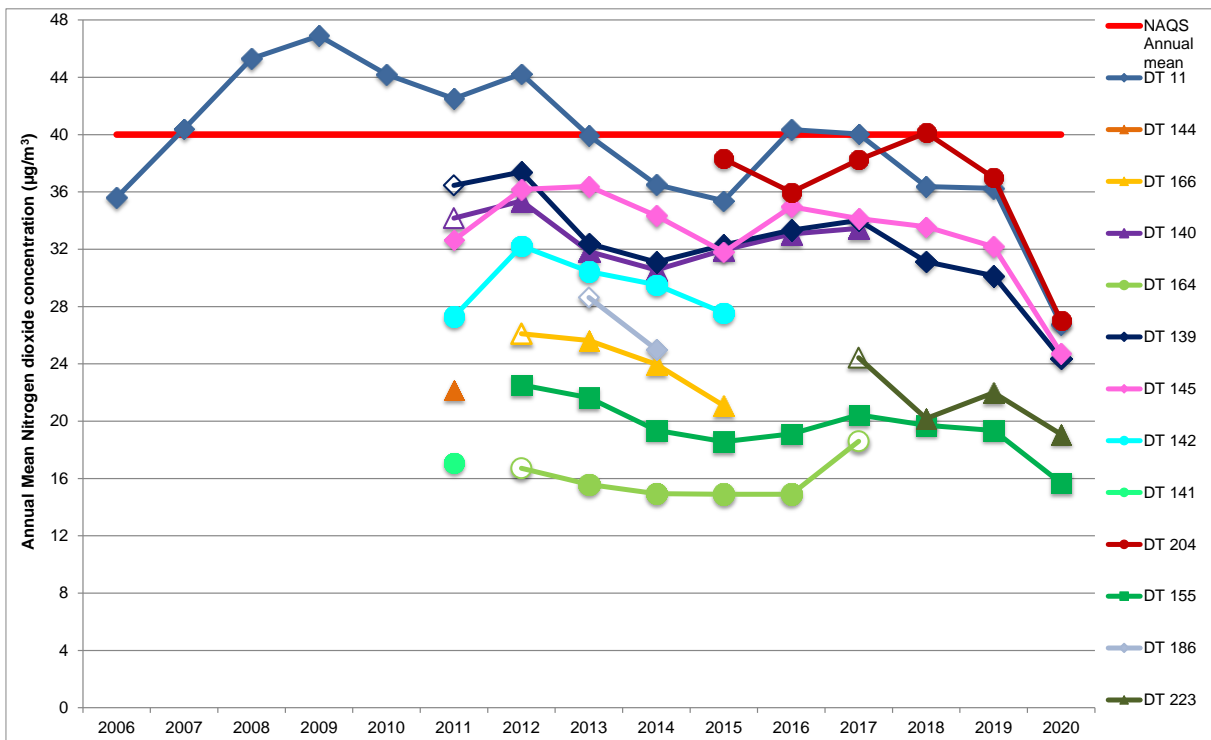


Figure C.25 Overview of NO₂ Diffusion Tube Concentration at Stannergate Roundabout



Strathmore Avenue

Figure C.26 NO₂ Diffusion Tube Location at Strathmore Avenue

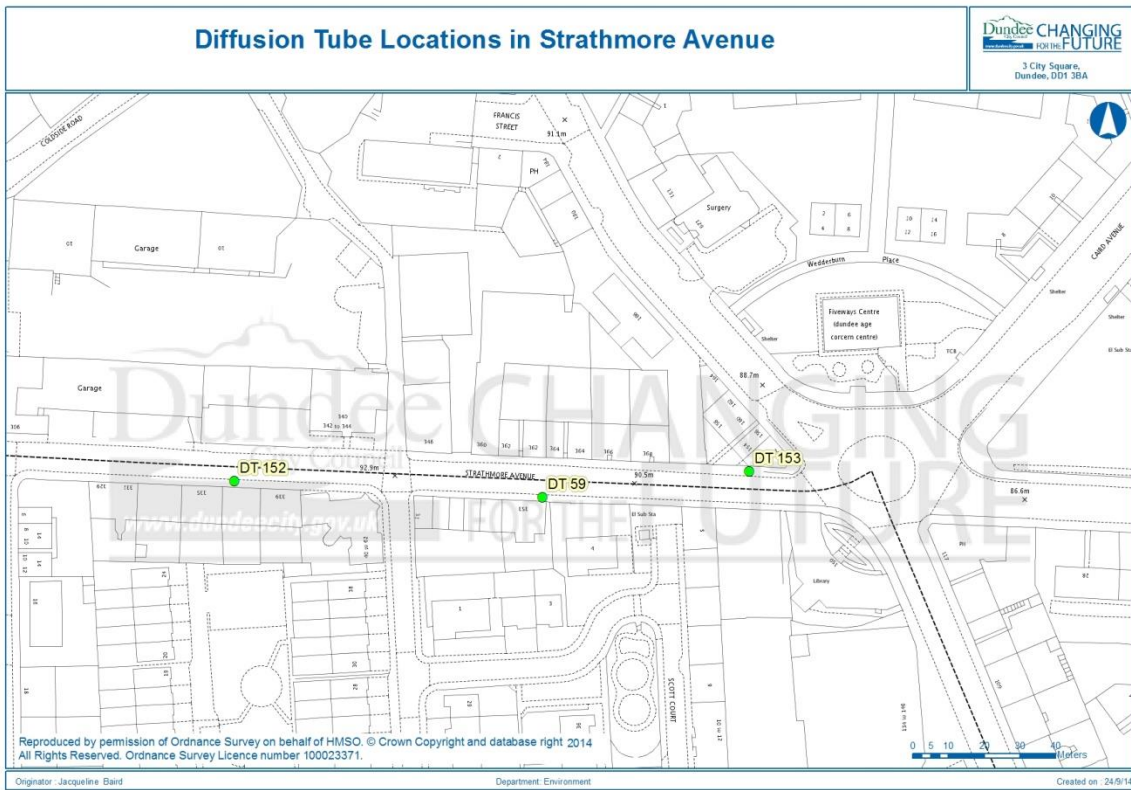


Figure C.27 Overview of NO₂ Diffusion Tube Concentration at Strathmore Avenue

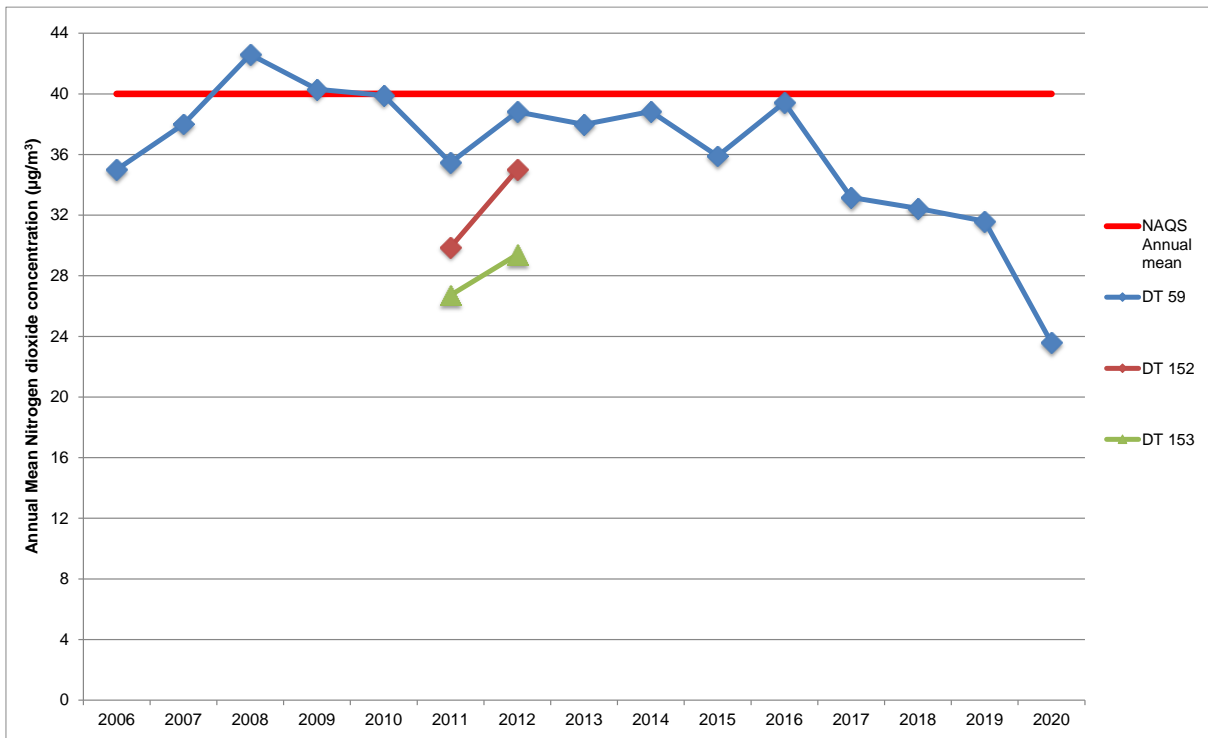


Figure C.28 Urban Background NO₂ Monitoring Locations

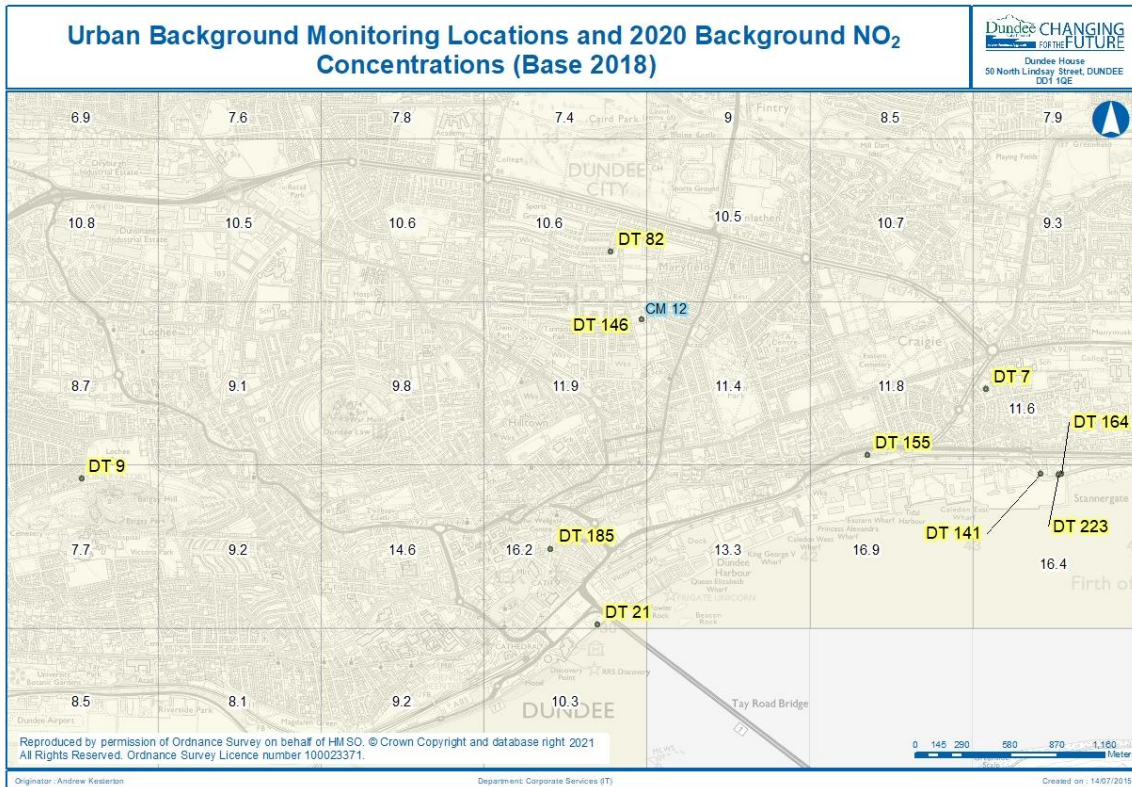
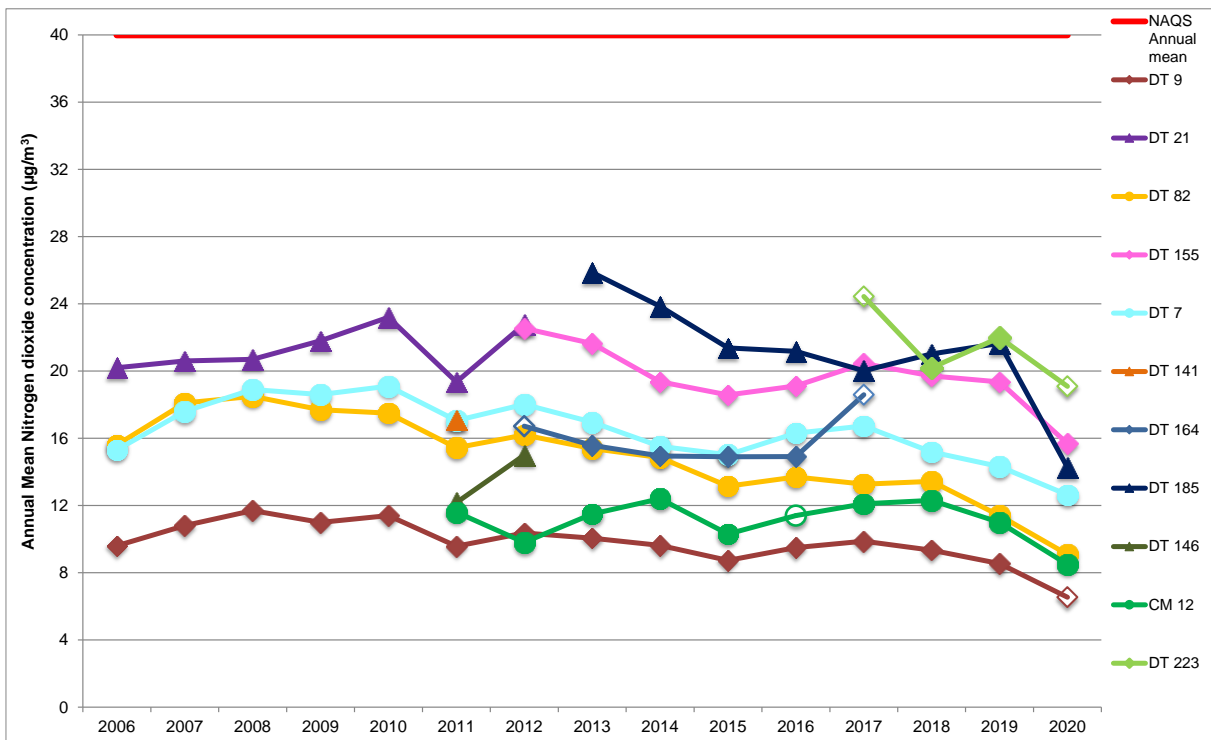


Figure C.29 Overview of NO₂ Concentrations at Urban Background Locations



Appendix C.3 Road Traffic Data

Table C.6 Road Traffic Reduction Sites – Annual Average Daily Traffic

RTRA count location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Bar Chart
Arbroath Rd (E of Kenilworth Ave)	13186	13335	14054	13153	13846	12869	13283	13697	13142	13174	13287	13642	13784	13526	13030	10194	
Blackness Rd (W of Marchfield)	6574	6675	6435	6195	6145	5938	5911	5844	5102	5509	5676	6487	5819	5810	5540	4115	
Broughty Ferry Rd (E of Dalglish Rd)	31956	31802	31535	30098	27640	27756	27315	24741	29322	30272	26809	28161	29190	29832			
Dens Rd (S of Hillbank Rd)	10852	10664	10672	11023	10833	10083	10062	10178	9744	9707	10315	10322	10756	10409	9961	7900	
Forfar Rd (N of Janefield Pl)	9278	9640	9880	8222	9224	9213	8861	9053	8768	9063	9209	8876	8991	9283	9055	6869	
Hilltown (N of Stirling St)	6024	5710	5895	5701	5753	5656	5416	5492	5608	4268	5782	5828	5491	4601	4392	4491	
Lochee Rd (N of Rankine St)	13477	13681	13438	13286	13296	12983	12684	11603	11285	11880	11821	11770	12453	12928	13135	9943	
Perth Rd (E of Windsor St)	8341	7434	7583	7531	7695	7352	7053	7184	7180	7214	7328	6650	7316	7912	7495	5101	
Pitkerro Rd (S of Baxter Park)	10107	9522	9975	9950	9789	9359	8623	8608	8827	8899	9085	9126	9584	8710	8774	7295	
Rankine St (N of Lochee Rd)	8098	7294	8069	7927	7605	7121	7115	6862	7188	6939	7118	7035	7043	7484	7282		
Riverside Dr (nr Airport)	18875	19056	18918	19045	17907	17654	17024	15900	16213	15932	15923	17343	17503	15791	17315	12794	
Rosebank St (N of Kinloch St)	4821	4867	4722	4623	4528	4603	4426	4489	4621	4587	4655	4615	4183	4015	4070	3326	
Tay Bridge	24475	24686	24748	25045	25406	25235	25484	24753	24770	24925	21762	25993	26631	26633	27250	18312	

Note: 1) Heights of the bars in the charts are relative to the range of values across all sites.
 2) The red and blue bars are the highest and lowest count, respectively, at that count location.

Table C.7 Road Traffic Reduction Sites – Percentage Growth

RTRA count location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Bar Chart
Arbroath Rd (E of Kenilworth Ave)	100	101	107	100	105	98	101	104	100	100	101	104	105	103	99	77	
Blackness Rd (W of Marchfield)	100	102	98	94	93	90	90	89	78	84	86	99	89	88	84	63	
Broughty Ferry Rd (E of Dalgleish Rd)	100	100	99	94	86	87	85	77	92	95	84	88	91	93			
Dens Rd (S of Hillbank Rd)	100	98	98	102	100	93	93	94	90	89	95	95	99	96	92	73	
Forfar Rd (N of Janefield Pl)	100	104	106	89	99	99	96	98	95	98	99	96	97	100	98	74	
Hilltown (N of Stirling St)	100	95	98	95	96	94	90	91	93	71	96	97	91	76	73	75	
Lochee Rd (N of Rankine St)	100	102	100	99	99	96	94	86	84	88	88	87	92	96	97	74	
Perth Rd (E of Windsor St)	100	89	91	90	92	88	85	86	86	86	88	80	88	95	90	61	
Pitkerro Rd (S of Baxter Park)	100	94	99	98	97	93	85	85	87	88	90	90	95	86	87	72	
Rankine St (N of Lochee Rd)	100	90	100	98	94	88	88	85	89	86	88	87	87	92	90		
Riverside Dr (nr Airport)	100	101	100	101	95	94	90	84	86	84	84	92	93	84	92	68	
Rosebank St (N of Kinloch St)	100	101	98	96	94	95	92	93	96	95	97	96	87	83	84	69	
Tay Bridge	100	101	101	102	104	103	104	101	101	102	89	106	109	109	111	75	

Note: 1) Heights of the bars in the charts are relative to the range for that location.

2) The red and blue bars are the highest and lowest percentage growth, respectively, for that site.

Appendix C.4 List of Industrial Processes

Process Name/Address	Process Type	PPC Sector	New source since APR 2019?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments (2019)
Rockwell Solutions, Wester Gourdie, Dundee	Chapter 6: Other Activities Surface treating with organic solvents - Also Chapter 7 SED	6.4.b	No	No	No	No	No	No	Variation in progress. Changes on site mean it's likely there has been a reduction of solvent emissions
MVV Environmental (Baldovie) Ltd Baldovie, Dundee	Chapter 5: Waste Management	Sector 5.1a and 5.1b under PPC 12	No	No	No	Yes, previously assessed	No	No	Substantial Variation for replacement plant issued in February 2019. Planning Application submitted late 2019 to continue use of old incinerator alongside the new one.
Nynas UK AB, East Camperdown Street, Dundee DD1 3LG	Chapter 1: Energy Industries	Section 1.2 Part A Paragraph (f) (i)	No	No	No	Yes, previously assessed	No	No	Site is now effectively a Part B process, but a formal surrender of the Part A has not yet been submitted. Site is now solely

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2019?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments (2019)
									burning natural gas, with a much reduced inventory of bitumen and oil products.
Nationwide Crash Repair Centres Ltd, Liff Road, Dundee	Chapter 6: Other Activities vehicle respraying	6.4.b	No	No	No	No	No	No	No Change
Hanson Aggregates Piper Street, Dundee	Chapter 3: Mineral Industries cement batchers	3.1.a.(ii)	No	No	No	No	No	No	Not operating.
Subsea Protection Systems	Chapter 3: Mineral Industries cement batching	3.1.b	No	No	No	Yes, previously assessed	No	No	Permit surrendered.
Discovery Filling Station	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Brochtay Filling Station	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Asda Stores Filling Station Kirkton	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Tesco Stores Ltd, Methven Street, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	Surrendered 2015
BP Kingsway West Filling Station	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change

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Process Name/Address	Process Type	PPC Sector	New source since APR 2019?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments (2019)
Shell Caird Park	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Shell UK Ltd, East Kingsway Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	Closed 2015
Asda Stores Ltd, Milton of Craigie, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Tesco Stores Ltd, Riverside Drive, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Tapedrive Ltd, Marketgait F/S, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Sainsburys Supermarket Ltd, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Jet Petrol Station, Forfar Road, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Dens Metals Ltd, West Pitkerro, Dundee	Chapter 2: Production and Processing of Metals	2.2.a	No	No	No	Yes, previously assessed	No	No	Surrendered 2015
Mctavish Ramsay Ltd, Barlow Ave, West Pitkerro	Chapter 6: Other Activities Timber Activity	6.6.(i)	No	No	No	No	No	No	Company in administration. Not operating
Johnsons, Asda Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	Surrendered 2015

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Process Name/Address	Process Type	PPC Sector	New source since APR 2019?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments (2019)
Breedon Aggregates Ltd, Longtown Street, Dundee	Chapter 3: Mineral Industries Cement Batching	3.1.a.(ii)	No	No	No	No, previously assessed	No	No	No Change
Aberdeen Valet Service Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	Site no longer operating.	Site no longer operating.	No	No	No	Surrendered 2015
Lochee Dry cleaning Centre Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	No Change
Ferry Laundrette Broughty Ferry	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	Not operating since fire in 2016, may become operational again
Stay-Press Dry Cleaning Centre, Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	Surrendered 2015
Care Clean, Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	No Change
Dignity Ltd, Dundee Crematorium, Dundee	Chapter 5: Waste Management	5.1c	No	No	No	No	No	No	No change
Laundry On Line, Annfield Road, Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	permit surrendered March 2016
Wm Morrison Supermarkets Plc, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	No	No	No	No Change

Process Name/Address	Process Type	PPC Sector	New source since APR 2019?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments (2019)
Wm Morrison Supermarkets plc, 1 Afton Way	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	No Change
Tesco Filling Station, South Road, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	No	No	No	No Change
Halley Stevensons (Dyers & Finishers) Limited, Baltic Works, Annfield Road, Dundee DD1 5JH	Chapter 6: Other Activities	Section 6.4 Part A Paragraph (a)	No	No	No	No	No	No	No Change
Discovery Flexibles, Kemback St Dundee	Chapter 6: Other Activities surface treatment using organic solvents also Chapter 7 SED coating flexible packaging	6.4.b	No	No	No	No	No	No	Replacement of one of the process lines with updated equipment. May mean slight change to emissions but not likely to be significant. Variation in progress.
J T Inglis, Riverside Works, Dundee	Chapter 6: Other Activities Textile Treatment	6.4.d	No	No	No	No	No	No	Site Closed 2016, surrender application ongoing

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Process Name/Address	Process Type	PPC Sector	New source since APR 2019?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments (2019)
Michelin Tyre Plant, Dundee	Chapter 6: Other Activities surface treatment of rubber with organic solvents also Chapter 7	6.4.b	No	No	No	Yes, previously assessed	No	No	Plant was still operating in 2019 but since has ceased operating
Michelin Tyre Plant, Dundee	Chapter 1: Energy Industries, Combustion	1.1.a	No	No	No	Yes, previously assessed	No	No	Plant was still operating in 2019 but since has ceased operating.
D C Thomson Printers, Dundee	Chapter 6: Other Activities printing process	6.4.b	No	No	No	No	No	No	Not operating but still permitted.
Day International Ltd, Balgray St, Dundee	Chapter 6: Other Activities surface treatment of rubber with organic solvents	6.4.b	No	No	No	Yes, previously assessed	No	No	Not operating at present.
RMC Readymix Ltd, Dundee	Chapter 3: Mineral Industries, Cement Batching	3.1.a.(ii)	No	No	No	No	No	No	No change
Brown & Tawse Steelstock Ltd, Fowler RD West Pitkerro - Dundee	Chapter 6: Other Activities, paint spraying	6.4.a	No	No	No	No	No	No	No Change
Armitages Pet Products Ltd, Broughty Ferry Road-Dundee	Chapter 6: Other Activities, Pet Food Manufacture	6.8.a	No	No	No	No	No	No	Permit surrender received December 2017

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Process Name/Address	Process Type	PPC Sector	New source since APR 2019?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments (2019)
Tesco Stores Ltd, Kingsway Retail Park Dundee	Chapter 1: Energy Industries, Petrol Station	1.2.c.(ii)	No	No	No	No	No	No	No Change
Joinery and Timber Creations (65) Ltd,	Chapter 6: Other Activities, Timber Process	6.6.(i)	No	No	No	No, previously assessed	No	No	Waste wood boiler- permitted but not operating.
Ethiebeaton Quarry	Chapter 3 Mineral Activities - cement batching process 3.1a(ii), roadstone coating 3.5e, crushing and grinding 3.5c	3.1a(ii), 3.5e, 3.5c	No	No	No	Yes, previously assessed	No	No	No change
Health Care Environmental Services, Nobel Road, Wester Gourdie Ind. Estate	Chapter 5 Waste Management Part A Treatment of Clinical waste	5.3a	No	No	No	No, previously assessed	No	No	Site still permitted but facility closed.
Petrol Filling Station, Asda, Myrekirk Road	Chapter 1: Energy Industries, Petrol Station	1.2.c.(ii)	No	No	No	Yes, but no relevant receptors	No	No	No change
ASKA Energy, 3B Edison Place, Dundee	Chapter 4. Chemical Industry, Part A, Producing organic chemicals (biodiesel)	Section 4, Part A, sub-section b	No	No	No	No (Emissions aren't LAQM pollutants)	No	No	Permit surrender received December 2017. Permit surrendered

Process Name/Address	Process Type	PPC Sector	New source since APR 2019?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments (2019)
Sherburn Cement, Shed 1, Eastern Wharf, Port of Dundee, DD1 3LZ	Chapter 3, Part B, section 3.1 (a)(i) Bulk Storage of Cement	PG 3/01(12)	No	No	No	Yes (possible fugitive emissions of particulates)	No	No	Site permitted 2016 and operating PPC/B/1142921 No change
Crown Timber King George V Wharf Road, Dundee Harbour, Dundee, DD1 3LU	Section 6.6 Part A Wood Products Preservation with Chemicals	Sector Guidance Note SG11 (draft status at issue)	No	No	No	No (No LAQM pollutants or fugitive emissions)	No	No	Existing process has come into the PPC regime (SEPA reference PPC/A/1132892) as part of the Industrial Emissions Directive. No change
Vericore Ltd, Kinnoull Road, Kingsway West, Dundee, DD2 3XR	Schedule 2 (PPC 2012) SED Part B Production of Veterinary Pharmaceuticals		No	No	No	Yes (possible fugitive emissions of particulates)	No	No	Site permitted 2016 and operating – PPC/B/1141206 No change

Process Name/Address	Process Type	PPC Sector	New source since APR 2019?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments (2019)
Augean North Sea Services, Riverside Works, Princess Alexandra Wharf, Stannergate Road, Dundee, DD1 3LU	Chapter 5.3 Part A (b) (ii), (iii), (iv), (vi), (x)		No	No	No	Yes (possible fugitive emissions of particulates)	No	No	Site permitted 2017– started operating May 2018 PPC/A/1151594 substantial variation received Dec 2018 has since been withdrawn at request of applicant
Scotscreed Limited, Fishdock Road, Stannergate, Dundee, DD1 3LU	Chapter 3; Section 3.1 Part B (a) (ii)		No	No	No	Yes (possible fugitive emissions of particulates)	No	No	Site permitted 2017 and operating PPC/B/1155960 No change
Dover Fueling Solutions, West Pitkerro Industrial Estate, 3, Baker Rd, Dundee DD5 3RT	Chapter 6; Section 6.4 Part B (a) coating and paint process		Yes*	No	No	Yes (possible fugitive emissions of particulates)	No	No	Existing process has come into PPC regime due to threshold change. Emissions contained. PPC/B/1180866 (2)

Notes: Yes* see Section 4.3
 ~ With reference to Annex 2 Appendix E TG.03
 Part A - Processes shaded purple
 (1) – see Section 4.3 –New or Proposed installations for which an Air Quality Assessment has been carried out
 (2) See Section 4.3 – New or Significantly changed installations with No previous Air Quality Assessment

Glossary of Terms

Abbreviation	Description
AADT	Annual Average Daily Traffic Flow
ADMS	An atmospheric air pollution dispersion model
AEA	AEA Energy & Environment
annualise	the means of estimating an annual mean from a shorter study period mean by comparison with full datasets from background AURN sites
AQ Archive	UK Air Quality Archive
APR	Air quality Annual Progress Report
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
AQO	Air Quality Objective
AQS	Air Quality Strategy
ATC	Automatic Traffic Count
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
Borderline	A concentration that is a potential exceedance (e.g. sites above 36µg/m ³ for NO ₂ or 16.2µg/m ³ for PM ₁₀ annual mean)
CAFS	Cleaner Air for Scotland Strategy
CHP	Combined Heat and Power
CO	Carbon Monoxide
DCC	Dundee City Council
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EC	European Community
EPA	The Environmental Protection Act 1990
EPAQS	Expert Panel on Air Quality Standards
EU	European Union
FDMS	Filter Dynamics Measurement System
GF	Ground floor
GIS	Geographical Information System
HDV	Heavy goods vehicles and buses
HFO	Heavy Fuel Oil
HGV	Heavy Goods Vehicle
HSL	Health & Safety Laboratory
IPC	Integrated Pollution Control
kerbside	0 to 1 metre from the kerb
LAQM	Local Air Quality Management
LAQM.TG(03)	Local Air Quality Management: Technical Guidance (2003)
LAQM.TG(09)	Local Air Quality Management: Technical Guidance (2009)
LAQM.TG(16)	Local Air Quality Management: Technical Guidance (2016) updated February 2018
LDP	Local Development Plan

LEZ	Low Emission Zone
Limit Value	An EU definition for a mandatory air quality standard of a pollutant listed in the air quality directives
MW	Mega Watts
mg/kg	Milligrams per Kilogram
mg/m ³	Milligrams per cubic metre
NAEI	National Atmospheric Emission Inventory
NAQS	National Air Quality Standard
NLEF	National Low Emission Framework (part of CAFS)
NMF	National Modelling Framework (part of CAFS)
NO	Nitric Oxide
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
ng/m ³	Nanograms per cubic metre
NPL	National Physical Laboratory
NRS	National Registers of Scotland
NRTF	National Road Traffic Forecast
OLEV	Office of Low Emission Vehicles
Osiris	the brand name given by Turnkey Instruments Ltd. to their particle measuring nephelometer
PDT	Passive Diffusion Tube
PHV	Private Hire Vehicles
P&T	Planning and Transportation
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
Pb	Lead
percentile	The percentage of results below a given value
ppb	Parts per billion
ppm	Parts per million
QA/QC	Quality Assurance and Quality Control
REAE	Ricardo Energy and Environment
receptor	In this study, the relevant location where air quality is assessed or predicted (for example, houses, hospitals and schools)
roadside	1 to 5 m from the kerb
SCA	Smoke Control Area
SED	Solvent Emissions Directive
SEPA	Scottish Environment Protection Agency
SO ₂	Sulphur Dioxide
SPG	Supplementary Planning Guidance
Street Canyon	A relatively narrow street with buildings on both sides, where the height of the buildings is generally greater than the width of the road
SULP	Sustainable Urban Logistics Plan
TEA	Triethanolamine
TEOM	Tapered Element Oscillating Microbalance
UKAS	United Kingdom Accreditation Service
ULEV	Ultra-Low Emission Vehicle
USA	Updating and Screening Assessment
µg/m ³	Micrograms per cubic metre
VCM	Volatile Correction Method
VOC	Volatile Organic Compound
vpd	Vehicles per day
WASP	Workplace Analysis Scheme for Proficiency

References

This report includes references where appropriate throughout the text as footnotes.