

Annual Progress Report (APR)



2019 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 2019

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Executive Summary: Air Quality in Our Area

Air Quality in Dundee

Dundee City Council (DCC) has an Air Quality Management Area (AQMA) covering the whole city, as a result of exceedances of the Air Quality Objectives (AQOs) for nitrogen dioxide (NO₂)(annual mean and hourly mean) and particulate matter (PM₁₀)(annual mean). The main source contributing to these exceedances is road traffic, however the increasing popularity of wood burning stoves and other biomass sources has the potential to increase local background concentrations.

Dundee City Council currently monitor for NO₂, PM₁₀ and PM_{2.5}, the latest results and trends are discussed in Chapter 3. The majority of monitoring locations are showing an improving trend in pollutant concentrations, however potential for exceedances of the AQOs exist at the following locations:

- the city centre bus corridor;
- the inner ring road;
- adjacent to the trunk road network; and
- main arterial routes.

Dundee City Council produced its Air Quality Action Plan in 2011 and has a Corporate Air Quality Steering Group which co-ordinates actions to improve air quality in the city. The group contains representatives from various council services including: corporate policy; fleet management; planning; transportation and environmental health. The group also includes representatives from other major employers, including Dundee University and NHS Tayside. The Scottish Environment Protection Agency consult with the council on new industrial process applications and provide an annual update on existing processes in the city. DCC will liaise with Transport Scotland as part of the National Low Emission Framework (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.

Actions to Improve Air Quality

Dundee City Council has taken forward a number of measures during the current reporting year of 2018 in pursuit of improving local air quality. Key completed measures are:

- In 2018 there was a 12% increase in membership (140 rising to 157) of the Dundee ECO Stars fleet recognition scheme for Heavy Duty Vehicles, with vehicle numbers rising to 6495 by 31 December 2018.
- Over 17% of Dundee's taxis are now fully electric (there was a 4% increase in electric taxis in 2018).
- The Drive Dundee Electric campaign has continued its successful engagement with current and potential EV owners (both in public and business). It has helped raise awareness about EVs and incentives by hosting, talking or exhibiting at events (Clean Air Day, Dundee Food & Flower Festival, EV Festive Parade) in Dundee as well as promoting the new charging hubs present at Lochee, Princes Street, and Broughty Ferry. It has also built an online social media presence (@DundeeElectric has now over 1100 followers on Twitter) and created and distributed PR material.
- Dundee City Council supported and participated in the 'Clean Air Day' on June 21. Members from the health protection team of NHS Tayside supported Dundee City Council on the day at the event, held on the Nethergate, to help promote travel alternatives that are beneficial to air quality and health.

Dundee City Council

- Dundee continues to lead the way in electric vehicle uptake, with 122 charging posts (providing 237 charging points) present in the Dundee City Council area. Of these, 38 charging posts (providing 74 charging points) are located at Dundee City Council depots. There are 62 charging posts (providing 84 charging points) at public on-street charging locations which include the new charging hubs that opened in 2018 at Lochee, Princes Street, and Queen Street Broughty Ferry.
- A Sustrans Cycling Strategy Officer was embedded at Dundee City Council from October 2018 to help the council implement actions contained in Dundee's 2016 Cycling Strategy and support the delivery of cycling infrastructure projects.
- In conjunction with Leisure and Culture Dundee, a School Active Travel Active Delivery Programme (walking / scooting / cycling) was developed, and is due to commence in Spring 2019. The project objectives are to provide more Dundee pupils with opportunities to experience active travel and provide support to the Bikeability Programme.
- Dundee City Council continued to help promote public transport as an attractive and affordable alternative to private car use. In 2018 Dundee City Council teamed up again with local bus operators to offer a 20p fare promotion (Holiday Hop) to children travelling with adults during the Easter, summer, and October school holiday periods. This initiative has seen a huge increase in the number of children travelling by bus during the holiday periods compared to before the promotion was introduced.
- The Air Quality and Land Use Supplementary Guidance document was reviewed in 2018 and was adopted in early 2019 in conjunction with the new 2019 Dundee Local Development Plan.
- In addition, both of the main bus companies have improved their fleet. Investment by Xplore Dundee in late 2018 saw the introduction of 14 double decker EURO VI buses on the Service 22 corridor running from Craigowl to Ninewells via the city centre (Seagate). Xplore Dundee have also used Transport Scotland BEAR fund to retrofit cleaner EURO VI engines to five (previously) EURO V buses. In August 2018, Stagecoach East Scotland launched a fleet of 15 new EURO VI buses on the Taylink 99 service operating between St Andrews and Dundee.

“Go Safe to School Campaign Launches
Go Safe Dundee is intended to encourage pupils to take healthy and sustainable transport options – whether that is walking, cycling, by bus or by ‘park and stride’



Local Priorities and Challenges

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

- A continued expansion of the infrastructure to support uptake of ULEV, with the opening of further electric vehicle charging infrastructure in Dundee's three main multistorey car parks; Green Market, Olympia and Bell Street. Each hub will see the installation of 10 posts with two connectors and will trial "master and slave" configurations. Each hub will also integrate solar energy and battery storage.
- Drive Dundee Electric will continue to help raise awareness and encourage uptake of low emission vehicles. DDE will be in attendance at the EV Roadshow hosted by Home Energy Scotland at the Dundee Science Centre in March 2019, while a 'Fully Charged' show event has been booked for June 2019 at 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.
- Continuation of the 20p Holiday Hop promotion through the Easter, summer and October school holidays in 2019.
- Continued support for Active Travel related projects including the delivery of the School Active Travel Active Delivery programme and the embedding of the Sustrans Cycling Strategy Officer within the Council.
- Additional support to the proposed E-bike public bike hire scheme expected to be launched in 2019 at locations in parts of the city with higher levels of pollution and health inequality.
- Continued active participation with the Cleaner Air for Scotland (CAFS) Governance Group and assist as necessary with the review of the CAFS strategy being undertaken in 2019.
- Further progression with the development of the Dundee Low Emission Zone in line with guidance provided in the National Low Emission Framework, and continued participation in all tiers of governance set up to deliver the low emission zones in Scotland.
- Completion of the update to the Paramics Traffic Model for Dundee, which will be used in conjunction with the National Modelling Framework Air Quality City Model as necessary for the development of the Dundee Low Emission Zone.
- Take forward the other proposed Local Air Quality Management tasks highlighted in **Section 6.3**.

*“Celebrating Clean Air Day
with NHS Tayside, Electric
Bike (Scotland) and The
Bike Station”*



How to Get Involved

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

This includes advice on how we can all help to improve air quality in Dundee, such as: using public transport; car-sharing & car clubs; no-idling; electric vehicles; cycling; walking; and **not** burning wood or having a garden bonfire.

Table of Contents

Executive Summary: Air Quality in Our Area	i
Air Quality in Dundee	i
Actions to Improve Air Quality	i
Local Priorities and Challenges	iii
How to Get Involved	iv
1. Local Air Quality Management	1
2. Actions to Improve Air Quality	2
2.1 Air Quality Management Areas	2
2.2 Progress and Impact of Measures to address Air Quality in Dundee City Council	2
2.3 Cleaner Air for Scotland	29
2.3.1 Transport Action – “Avoiding travel – T1”	29
2.3.2 Climate Change Action – “Effective co-ordination of climate change and air quality policies to deliver co-benefits – CC2”	29
2.3.3 Commentary on further actions	29
3. Air Quality Monitoring Data and Comparison with Air Quality Objectives	31
3.1 Summary of Monitoring Undertaken	31
3.1.1 Automatic Monitoring Sites	31
3.1.2 Non-Automatic Monitoring Sites	31
3.2 Individual pollutants	33
3.2.1 Nitrogen Dioxide (NO ₂)	33
3.2.2 Particulate Matter (PM ₁₀)	35
3.2.3 Particulate Matter (PM _{2.5})	37
3.2.4 Sulphur Dioxide (SO ₂)	38
3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene	38
4. New Local Developments	39
4.1 Road Traffic Sources	39
4.2 Other Transport Sources	41
4.3 Industrial Sources	42
▪ New or Proposed Installations for which an Air Quality Assessment has been Carried Out	42
▪ Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced	43
▪ New or Significantly Changed Installations with No Previous Air Quality Assessment	43
▪ Major Fuel (Petrol) Storage Depots	44

▪ Petrol Stations	44
▪ Poultry Farms	44
4.4 Commercial and Domestic Sources	44
4.5 New Developments with Fugitive or Uncontrolled Sources	45
5. Planning Applications	47
6. Conclusions and Proposed Actions	48
6.1 Conclusions from New Monitoring Data	48
6.2 Conclusions relating to New Local Developments	49
6.3 Proposed Actions	49
Appendix A: Monitoring Results	51
Appendix B: Full Monthly Diffusion Tube Results for 2017	81
Appendix C: Supporting Technical Information / Air Quality Monitoring	
Data QA/QC	86
Glossary of Terms	121
References	123

List of Tables

Table 1.1 – Summary of Air Quality Objectives in Scotland	1
Table 2.1 – Declared Air Quality Management Areas	2
Table 2.2 Progress on Measures to Improve Air Quality	5
Table 3.2 Estimated PM _{2.5} Annual Mean Concentrations 2015 to 2018	37
Table A.1 Details of Automatic Monitoring Sites	51
Table A.2 Details of Non-Automatic Monitoring Sites	54
Table A.3 – Annual Mean NO ₂ Monitoring Results	62
Table A.4 – 1-Hour Mean NO ₂ Monitoring Results	70
Table A.5 – Annual Mean PM ₁₀ Monitoring Results	72
Table A.6 – 24-Hour Mean PM ₁₀ Monitoring Results	76
Table A.7 – Annual Mean PM _{2.5} Monitoring Results	80
Table B.1 – NO ₂ Monthly Diffusion Tube Results for 2018	81
Table C.1 Bias Factors from 2018 Co-location Studies and National Bias Adjustment Spreadsheet (Version 03/19_final)	88
Table C.2 Manual Approximate Orthogonal Regression Calculation 2018	89
Table C.3 Period Adjustment Calculation Seagate (101) (DT 50) Jan – Jun 2018	90
Table C.4 Period Adjustment Calculation West Marketgait/ Ward Road) (DT 231) Aug – Dec 2018	90
Table C.6 Road Traffic Reduction Sites – Annual Average Daily Traffic	110
Table C.7 Road Traffic Reduction Sites – Percentage Growth	111

List of Figures

Figure 4.1 Central Waterfront Site Map	41
Figure A.1 Automatic Monitoring Sites 2018	53
Figure A.2a NO ₂ Diffusion Tube Locations (City Centre)	59
Figure A.2b NO ₂ Diffusion Tube Locations (East)	60
Figure A.2c NO ₂ Diffusion Tube Locations (West)	61
Figure A.3a Trends in NO ₂ at Automatic monitors	68

Figure A.3b	Trend Analysis at Long-term NO ₂ Monitoring Locations.....	69
Figure A.4	Trend in 99.8 th percentile of hourly mean NO ₂ concentrations at Lochee Road ..	71
Figure A.5a	Trends in Annual Mean PM ₁₀ concentrations at Automatic monitors	73
Figure A5.b	Trends in Annual Mean PM ₁₀ concentrations at Automatic monitors	74
Figure A5.c	Trend analysis of PM ₁₀ annual means at long term monitoring sites.....	75
Figure A.6a	Frequency of Exceedances of PM ₁₀ 24 hour Mean Objective (50µg/m ³ , 7 allowed) 2008-2018.....	77
Figure A6.b	Trends in 98.08 th percentile PM ₁₀ concentrations at Automatic monitors.....	78
Figure A6.c	Trends in 98.08 th percentile PM ₁₀ concentrations at Automatic monitors	79
Figure C.1	NO ₂ Monitoring Locations in Union Street and Whitehall Street.....	91
Figure C.2	Overview of NO ₂ Concentrations in Union St and Nethergate (east of Marketgait)	91
Figure C.3	Overview of NO ₂ Concentrations in Whitehall St and Crichton St.	92
Figure C.4	NO ₂ Monitoring Locations in Seagate.....	93
Figure C.5	Overview of NO ₂ Concentrations in Seagate.	93
Figure C.6	NO ₂ Diffusion Tube Locations in Nethergate	94
Figure C.7	Overview of NO ₂ Diffusion Tube Concentrations in Nethergate.	94
Figure C.8	NO ₂ Diffusion Tube Locations in Victoria Road / Meadowside.....	95
Figure C.9	Overview of NO ₂ Diffusion Tube Concentrations in Victoria Road / Meadowside	95
Figure C.10	NO ₂ Diffusion Tube Locations in Albert Street / Dura Street.....	96
Figure C.11	Overview of NO ₂ Diffusion Tube Concentrations in Albert Street / Dura Street.	96
Figure C.12	NO ₂ Monitoring Locations in Lochee Road	97
Figure C.13	Overview of NO ₂ Concentrations in Lochee Road.....	97
Figure C.14	NO ₂ Diffusion Tube Locations in Logie Street	98
Figure C.15	Overview of NO ₂ Diffusion Tube Concentrations in Logie St.	98
Figure C.16	NO ₂ Diffusion Tube Locations in Albert St. / Arbroath Road.....	99
Figure C.17	Overview of NO ₂ Diffusion Tube Concentrations in Albert St. / Arbroath Road	99
Figure C.18	NO ₂ Diffusion Tube Locations on/near the Kingsway	100
Figure C.19	Overview of NO ₂ Diffusion Tube Concentrations on/near the Kingsway....	100
Figure C.20	Other NO ₂ Diffusion Tube Locations on Bus Corridor	101
Figure C.21	Overview of Other NO ₂ Diffusion Tube Concentrations on Bus Corridor ...	101
Figure C.22	NO ₂ Diffusion Tube Locations on Inner Ring Road	102
Figure C.23a	Overview of NO ₂ Diffusion Tube Concentrations on Inner Ring Road (West & North Marketgait	102
Figure C.23b	Overview of NO ₂ Diffusion Tube Concentrations on Inner Ring Road (East & South Marketgait.....	103
Figure C.24	NO ₂ Diffusion Tube Location at Stannergate Roundabout	104
Figure C.25	Overview of NO ₂ Diffusion Tube Concentration at Stannergate Roundabout	104
Figure C.26	NO ₂ Diffusion Tube Location at Strathmore Avenue	105
Figure C.27	Overview of NO ₂ Diffusion Tube Concentration at Strathmore Avenue	105
Figure C.28	Urban Background NO ₂ Monitoring Locations.....	106
Figure C.29	Overview of NO ₂ Concentrations at Urban Background Locations.....	106
Figure C.30	Ranked Annual Mean NO ₂ Concentrations at 50 Long-term Sites in 2009, 2011 and 2018	107
Figure C.31	Road Network and Traffic Count Locations for NMF City Model for Dundee	109
Figure C.32	Proposed Substantial Variation to PPC Permit PPC/A/1151594 in port and location of nearby real-time monitors.....	120

1. Local Air Quality Management

This report provides an overview of air quality in Dundee during 2018. 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		Date to be achieved by
	Concentration	Measured as	
Nitrogen dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m ³	Annual mean	31.12.2005
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 µg/m ³	Annual mean	31.12.2010
Particulate Matter (PM _{2.5})	10 µg/m ³	Annual mean	31.12.2020
Sulphur dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
Benzene	3.25 µg/m ³	Running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m ³	Running annual mean	31.12.2003
Carbon Monoxide	10.0 mg/m ³	Running 8-Hour mean	31.12.2003
Lead	0.25 µg/m ³	Annual Mean	31.12.2008

2. Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMA) 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 AQMA declared by Dundee City Council can be found in **Table 2.1**. Further information relating to declared or revoked AQMA, 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	<ul style="list-style-type: none"> • NO₂ annual mean • PM₁₀ annual mean • NO₂ 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	<p>Air Quality Action Plan for Nitrogen Dioxide (NO₂) and Fine Particulate Matter (PM₁₀)-January 2011</p> <p>https://www.dundeecc.gov.uk/sites/default/files/publications/Dundee%20CC%20FinalAQAP_Jan11.pdf</p>

2.2 Progress and Impact 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 2018 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 the AQMA. Key completed measures are:

- In 2018 there was a 12% increase in membership (140 rising to 157) of the Dundee ECO Stars fleet recognition scheme for Heavy Duty Vehicles, with vehicle numbers rising to 6495 by 31 December 2018.
- Over 17% of Dundee's taxis are now fully electric (there was a 4% increase in electric taxis in 2018).
- The Drive Dundee Electric campaign has continued its successful engagement with current and potential EV owners (both in public and business). It has helped raise awareness about EVs and incentives by hosting, talking or exhibiting at events (Clean Air Day, Dundee Food & Flower Festival, EV Festive Parade) in Dundee as well as promoting the new charging hubs present at Lochee, Princes Street, and Broughty

Ferry. It has also built an online social media presence (@DundeeElectric has now over 1100 followers on Twitter) and created and distributed PR material.

- Dundee City Council supported and participated in the 'Clean Air Day' on June 21. Members from the health protection team of NHS Tayside supported Dundee City Council on the day at the event, held on the Nethergate, to help promote travel alternatives that are beneficial to air quality and health.
- Dundee continues to lead the way in electric vehicle uptake, with 122 charging posts (providing 237 charging points) present in the Dundee City Council area. Of these, 38 charging posts (providing 74 charging points) are located at Dundee City Council depots. There are 62 charging posts (providing 84 charging points) at public on-street charging locations which include the new charging hubs that opened in 2018 at Lochee, Princes Street, and Queen Street Broughty Ferry.
- A Sustrans Cycling Strategy Officer was embedded at Dundee City Council from October 2018 to help the council implement actions contained in Dundee's 2016 Cycling Strategy and support the delivery of cycling infrastructure projects.
- In conjunction with Leisure and Culture Dundee, a School Active Travel Active Delivery Programme (walking / scooting / cycling) was developed, and is due to commence in Spring 2019. The project objectives are to provide more Dundee pupils with opportunities to experience active travel and provide support to the Bikeability Programme.
- Dundee City Council continued to help promote public transport as an attractive and affordable alternative to private car use. In 2018 Dundee City Council teamed up again with local bus operators to offer a 20p fare promotion (Holiday Hop) to children travelling with adults during the Easter, summer, and October school holiday periods. This initiative has seen a huge increase in the number of children travelling by bus during the holiday periods compared to before the promotion was introduced.
- The Air Quality and Land Use Supplementary Guidance document was reviewed and was due to be adopted early in 2019 in conjunction with the new 2019 Dundee Local Development Plan.
- In addition, both of the main bus companies have improved their fleet. Investment by Xplore Dundee in late 2018 saw the introduction of 14 double decker EURO VI buses on the Service 22 corridor running from Craigowl to Ninewells via the city centre (Seagate). Xplore Dundee have also used Transport Scotland BEAR fund to retrofit cleaner EURO VI engines to five (previously) EURO V buses. In August 2018, Stagecoach East Scotland launched a fleet of 15 new EURO VI buses on the Taylink 99 service operating between St Andrews and Dundee.

Progress on the following measures has been slower than expected due to:

- Revision of Council Travel Plan in line with requirements of the Cleaner Air for Scotland – in 2017/18 the council applied for Air Quality Action Plan Support Funding to revise and update the Travel Plan. Unfortunately this project was not completed as expected. Agreement from the Scottish Government to carry forward funding to undertake this project in 2019/20 has been obtained.
- The 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 (see **Section 2.3.2**). Dundee City Council became a signatory to the EU Covenant of Mayors (CoM) and Civic Leaders signed the 'Adhesion Form' on 19th March 2018. Through the Dundee Partnership, the city is now developing a 'Sustainable Energy and Climate Action Plan' (SECAP) for Dundee

that will aim to reduce area wide emissions and deliver multiple social, economic and environmental benefits. It is anticipated that the SECAP will be published in 2019.

- Funding to pay for both ECO Stars schemes for the 2018/19 financial year was obtained from the Scottish Government. In 2018 a new national Framework Agreement became available which is to be used to engage TRL Ltd to administer ECO Stars schemes. As of 31 December 2018, Dundee City Council had not yet been able to commence with this Agreement and as such for the period of 1 April to 31 December 2018 TRL were not actively approaching new companies, or working with existing members in Dundee. The Scottish Government was approached and agreed to carry forward allocated funding to 2019/20 to cover the cost of the scheme once the Agreement has commenced. It is anticipated that this will occur early in 2019.

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

- A continued expansion of the infrastructure to support uptake of ULEV, with the opening of further electric vehicle charging infrastructure in Dundee's three main multistorey car parks; Green Market, Olympia and Bell Street. Each hub will see the installation of 10 posts with two connectors and will trial "master and slave" configurations. Each hub will also integrate solar energy and battery storage.
- Drive Dundee Electric will continue to help raise awareness and encourage uptake of low emission vehicles. DDE will be in attendance at the EV Roadshow hosted by Home Energy Scotland at the Dundee Science Centre in March 2019, while a 'Fully Charged' show event has been booked for June 2019 at 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.
- Continuation of the 20p Holiday Hop promotion through the Easter, summer and October school holidays in 2019.
- Continued support for Active Travel related projects including the delivery of the School Active Travel Active Delivery programme and the embedding of the Sustrans Cycling Strategy Officer within the Council.
- Additional support to the proposed E-bike public bike hire scheme expected to be launched in 2019 at locations in parts of the city with higher levels of pollution and health inequality.
- Continued active participation with the Cleaner Air for Scotland (CAFS) Governance Group and assist as necessary with the review of the CAFS strategy being undertaken in 2019.
- Further progression with the development of the Dundee Low Emission Zone in line with guidance provided in the National Low Emission Framework, and continued participation in all tiers of governance set up to deliver the low emission zones in Scotland.
- Completion of the update to the Paramics Traffic Model for Dundee, which will be used in conjunction with the National Modelling Framework Air Quality City Model as necessary for the development of the Dundee Low Emission Zone.

Table 2.2 Progress on Measures to Improve Air Quality

KEY TO TABLE

Potential Air Quality Benefits

Small	0 - 0.5 µg/m ³
Medium	0.5 - 1.0 µg/m ³
High	greater than 1.0 µg/m ³
n/a	not applicable

Action Plan Measure Priority Level	
High	
Medium	
Low	

Timescale (Years from 2011)	
Short	1 - 2
Medium	3 - 5
Long	6 +

2019 updates (on progress in 2018) in purple.

(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>)

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 relating to emission reductions
1	Measure M1: Existing Road Infrastructure Improvements	Transport, planning and infrastructure	► City Centre Improvements - Union St.	DDC City Development Department (Transportation Division)			Implementation of improvements	High	<p>Union Street Road Infrastructure improvements 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>The National Modelling Framework (NMF) and subsequent National Low Emission Framework (NLEF) process will include this area during the appraisal process for determining appropriate designs for the development of the Dundee Low Emission Zone (LEZ) due to be introduced by 2020</p>	<p>Completed 2011</p> <p>2020</p>	<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>In 2018 there was a slight increase in NO2 and PM10 concentrations at the Whitehall St continuous monitor and there was also a slight increase in NO2 concentrations at many locations in this area.</p>
1 Cont		Transport planning and infrastructure	► NW Arterial Route Improvement - Lochee Rd					Not Estimated	<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>The NMF and subsequent NLEF process will include this area during the appraisal process for determining appropriate designs for the development of the Dundee LEZ due to be introduced by 2020.</p>	<p>Completed 2012</p> <p>2020</p>	<p>The automatic monitor in Lochee Road recorded annual mean NO2 concentrations above the AQO in 2018, but this was below that recorded in 2006 when the AQMA was first declared. The average long-term trend of annual mean NO2 at all monitoring locations in Lochee Road is slightly downwards. The PM10 annual concentration also decreased in 2018 and met the AQO.</p>

Dundee City Council

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 relating to emission reductions
1 Cont		Transport planning and infrastructure	►Arterial Route Improvements - Stannergate					Not estimated	<p>Consultants engaged in 2013 to carry out traffic micro-simulation modelling and air dispersion modelling.</p> <p>Final draft of the AD Modelling was received in April 2016, with the summary of findings presented in the 2016 Annual Progress Report.</p> <p>The NMF and subsequent NLEF process will include this area during the appraisal process for determining appropriate designs for the development of the Dundee LEZ due to be introduced by 2020.</p>	<p>Completed 2016</p> <p>2020</p>	<p>2018 NO2 annual average concentrations on the A92 between Broughty Ferry Road and Greendykes Road met the AQO objective however slight increases were observed at diffusion tubes located on the south side of the trunk road.</p> <p>In 2018 the annual mean and daily mean objectives for PM10 were again met at the Stannergate Osiris.</p>
1 Cont		Transport planning and infrastructure	►City Centre Improvements - Meadowside			2013 +		Not Estimated	<p>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 changes were completed in Feb/March 2016.</p> <p>The NMF and subsequent NLEF process will include this area during the appraisal process for determining appropriate designs for the development of the Dundee LEZ due to be introduced by 2020.</p>	<p>Completed 2016</p> <p>2020</p>	<p>The monitoring results since 2015 demonstrate that the air quality improvements attributable to this infrastructure change have been maintained.</p> <p>Slight increases and decreases in the annual average NO2 were observed at diffusion tubes located around the Hilltown / Victoria Road junction in 2018.</p> <p>A slight increase in annual PM10 was observed in 2018, possibly due to work being carried out in an adjacent multistorey carpark.</p>
1 Cont	Transport planning and infrastructure	►City Centre Upgrade 13 traffic signals with fibre optic connections			Funding contribution Awarded in 2016/17 Reallocated	2017/18		Not estimated	<p>A Fibre network is to be 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)</p> <p>The Fibre optic network project progressed during 2018 and is now due for completion in Spring 2019.</p>		

Dundee City Council

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1 Cont		Transport planning and infrastructure	► City Centre Improvements – Seagate / St. Andrews Street			2014/15		Not estimated	<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 NMF and subsequent NLEF process will include this area during the appraisal process for determining appropriate designs for the development of the Dundee LEZ due to be introduced by 2020.</p>	Completed 2017 2020	NO2 concentrations in the Seagate area exceeded the annual mean objective in 2018. PM10 concentrations remained below the annual mean objective.
1 Cont		Transport planning and infrastructure	City Centre Improvements – Crichton Street/ Whitehall Street /Nethergate		2016/17	2017/18		Not estimated	<p>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. The information from this project will help inform the NMF / NLEF assessment process being undertaken by Dundee City Council.</p> <p>The NMF and subsequent NLEF process will include this area during the appraisal process for determining appropriate designs for the development of the Dundee LEZ due to be introduced by 2020.</p>	Completed 2017 2020	
2	Measure M2: DCC will enhance the Urban Traffic Management and Control (UTMC) system to reduce congestion	Traffic management	<p>► Real-time traffic monitoring.</p> <p>► Improved control regime to smooth out peak traffic.</p>	DCC City Development Department (Transportation Division)	Implementation of UTMC improvements and carry out annual review to measure % reduction in congestion in line with target	2013+	<p>► 10% reduction in congestion (journey times) in targeted areas during peak times before and after implementation of measure.</p> <p>► Annual review of impact</p>	Small	<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>The introduction of MOTES was not pursued due to limited effect.</p> <p>Bluetooth journey time monitoring is now undertaken on all major arterial routes leading in to the city centre area.</p>	Completed 2013 2018	

Dundee City Council

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2 Cont						2014+			TACTRAN funding provided in 2014/15 to expand Bluetooth Traffic Speed Monitoring System to include the Lochee Road. This was completed by 31 st March 2015. In 2016 the system was expanded along the eastern corridor on the A92 coming in from Arbroath and Broughty Ferry. Ongoing discussions re maintenance costs with Transport Scotland and IBI. Bluetooth journey time monitoring is now undertaken on all major arterial routes leading in to the city centre area.	Completed 2016 2018	
2 Cont					Paramics/ AIRE modelling of key junctions –Kingsway / Forfar Rd & Lochee Rd corridor to test improvement options	2013		Not estimated	Consultants were engaged in 2013 to carry out traffic micro-simulation modelling and air dispersion modelling. Final Modelling outputs were received in April 2016. A more detailed summary of the options is contained in Appendix C of the 2016 Annual Progress Report. These options included: Kingsway / Forfar Road Options studied included A90 Bypass and improvements to signal timings, the bypass being the most beneficial scenario. Lochee Road Corridor options studied – closure of Cleghorn Street/Lochee Road junction and improvements to bus fleets. Study also found signal timings along the corridor to be optimised. Improvements to the bus fleets was the most beneficial of the options tested. The NMF and subsequent NLEF process will include this area during the appraisal process for determining appropriate designs for the development of the Dundee LEZ due to be introduced by 2020.	Completed 2016 2020	
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)			► Increase % of people who walk and cycle to work in Dundee. ► Identify funding for education	Small	In 2018 the Scottish Household Survey shows an increased number of people commuting by bike (up to 6.8%) in Dundee.	Ongoing	A reduction in transport / unnecessary journeys is predicted however this may be difficult to measure.

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3		Promoting travel alternatives			Behavioural Change Primary School programme to promote sustainable travel options in all primary schools in Dundee. Carried into 2018/19 to progress classroom workshop	2013+			The proposed classroom workshops to be carried out by graduates in 2018 did not progress due to being unable to retain the graduates to do so. Walk once a week (WOW) programme was not pursued by individual schools in 2018.	Ongoing	
3		Promoting travel alternatives			3 "Doctor Bike" Safety Events planned for the City Square Funding to provide match funding for i-bike initiative sought in FY for 2015/16 to 2018/19	2013/14 2015/16			Dr Bike events held regularly in the City Centre through 2018, including on Clean Air Day on 21 June 2018. The I-Bike programme was discontinued in summer 2018 and proposals were taken forward to establish an in-house (LACD) delivery model due to commence in Spring 2019.	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)		2011+	► Identification of new corridors that directly benefit air quality	Medium	Opportunities investigated as part of Air Quality Low Emission Charter. Study commissioned in summer 2017 to review stance allocation in Dundee City centre with a particular focus on improving air quality. See Appendix C.5 of the 2018 Annual Progress Report for a summary of this report. DCC is represented (along with the other major city local authorities) on the CAFS Governance Group and have worked with the Scottish Government, SEPA and partner organisations in development of the NMF and NLEF to bring forward options for further air quality improvements. An update on progress of CAFS is contained in Section 2.3 of this main report.	Medium Term 2017 ongoing	
		Vehicle Fleet efficiency					► Average age, Euro class, fuel, type			2012+	

Dundee City Council

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4 Cont	Measure M4, cont.	Vehicle Fleet efficiency	► Fleet Renewal – Emissions Improvements	DCC City Development Department (Transportation Division)		2011+	► Fleet age, Euro class, fuel type	Medium	DCC support the review of Bus Service Operators Grant (BSOG) payments and the Bus Emissions Abatement Retrofit Programme (BEAR) funding for retrofitting. Investment by Xplore Dundee in late 2018 saw the introduction of 14 double decker EURO VI buses on the Service 22 corridor running from Craigowl to Ninewells via the city centre (Seagate). Xplore Dundee have also used Transport Scotland BEAR fund to retrofit cleaner EURO VI engines to five (previously) EURO V buses. In August 2018, Stagecoach East Scotland launched a fleet of 15 new EURO VI buses on the Taylink 99 service operating between St Andrews and Dundee.	2013+	
		Vehicle Fleet efficiency					► Lobby Scottish Government for fuel duty rebates for low carbon fleet		Not formally pursued further in 2018		
4 Cont		Vehicle Fleet efficiency			National Express Dundee will introduce 9 Diesel Electric Hybrid buses into their fleet in April / May 2013 as per Green Bus Fund 2 bid success	2013			In 2013 High profile launch event for the nine Hybrid Buses introduced by National Express Dundee – coupled with promotional work with local schools Completed	2013	New cleaner emission vehicles are now successfully in operation
		Vehicle Fleet efficiency			ECO Stars Dundee Fleet Management Recognition Scheme introduced	2013/14			See Measure 6		
	Measure M4, cont.	Traffic Management Vehicle Fleet Efficiency	► Tackling Idling Bus Emissions	DCC City Development Department (Transportation Division)		2011+	► Traffic Regulation Conditions within the city centre. ► 'No-idling' signs on bus routes. ► Driver Training/Awareness Raising	Small	Opportunities were investigated as part of Air Quality Low Emission Charter (Reported in AQAP 2012, Appendix 2). National Express Dundee and Stagecoach have invested in in-vehicle monitoring systems and vehicles with auto-shutoff technology	2012+	

Dundee City Council

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4 Cont	Measure M4, cont.	Promoting low emission transport *	► Low Emission Zones (LEZ) for buses	DCC City Development Department (Transportation Division)		2013	► Investigate the Traffic Regulation Conditions for LEZ in City Centre. ► Route choice for clean buses see Park & Ride facilities	High	Opportunities being investigated as part of Air Quality Low Emission Charter. (Reported in AQAP 2012, Appendix 2) No longer necessary to pursue Traffic Regulations Conditions for LEZ in the city centre further as the Transport (Scotland) Bill introduced to Scottish Parliament in June 2018 contains provisions that will enable local authorities to introduce and enforce LEZ's. see Measure 5 re Park and Ride Facilities	Med Term, 2015-2016+	
		Promoting low emission transport			Bus Emission Modelling being undertaken to test likely improvements associated with various scenarios including possible LEZ for buses by 2017	2013/14			Model of main City Centre Bus Corridor set up to model the impact of the following low emission Scenarios: S1 – 2017 All Buses Euro V S2 – 2017 All Buses Euro VI S3 – 2017 All Buses & HGVs Euro V S4 – 2017 All Buses & HGVs Euro VI Modelling Report of the above was completed in July 2015. A summary of findings available in Appendix C of 2016 Air Quality Annual Progress Report. The NMF and subsequent NLEF process will include this area during the appraisal process for determining appropriate designs for the development of the Dundee LEZ due to be introduced by 2020.	Completed 2020+	
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)			► Report on identification and prioritisation of P&R facilities ► Implementation of scheme ► Passenger numbers	Medium	The Tay Cities Deal was announced in 2018 and did not include Park & Ride facilities. Park and Ride (or Park & Choose to include options other than bus transportation) may be included within a review of strategic transport projects by Transport Scotland.		

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6	Measure M6: DCC will introduce measures to reduce emissions from Heavy Goods Vehicles	Freight and delivery management	►Perth & Dundee Retail Freight Consolidation Centre	DCC City Development Department Transportation Division)& TACTRAN		2011+	►Implementation of scheme ► Vehicle fleet in the AQMA ►Study for the alternate system of retail freight	Small	Opportunities being investigated as part of Air Quality Low Emission Charter (See AQAP2012 Appendix 2) The production of a freight consolidation plan and provision of a small scale freight consolidation centre has not been progressed.	Long term	
6 Cont	Measure M6 cont.	Freight and delivery management	►Freight Quality Partnership (FQP)	DCC City Development Department Transportation Division)& TACTRAN			►Implementation of partnership ► Changes in hourly profile of HGVs in AQMA	Small	Dundee is included as part of TACTRAN's Regional Freight Quality Partnership The production of a freight consolidation plan and provision of a small scale freight consolidation centre has not been progressed.	Long term	
6 cont.		Freight and delivery management			A freight routing planning tool will be launched by TACTRAN which should encourage HGVs to follow appropriate routes	Jan-13			The TACTRAN Freight Planning Tool was established in 2013.		
		Freight and delivery management			Dundee is participating in a pan European project (ENCLOSE) investigating city logistics with carbon and emission reduction as important factors under investigation	2013			The Dundee Sustainable Urban Logistics Plan (SULP) was developed to give legacy post ENCLOSE project in terms of energy efficient and 'green' city logistics. The Plan was approved by the City Development Committee on 27/10/2014.	completed	

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 relating to emission reductions
6 Cont		Vehicle Fleet Efficiency			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.	2013			Dundee ECO Stars Fleet Recognition Scheme was successfully launched on the 13th December 2013 with 12 inaugural members. This is a fleet accreditation system that acknowledges greener fleets. The Corporate Air Quality Steering Group intends to seek funding for future years. Dundee City Council received funding from the Scottish Government's Air Quality Support Funding for 2018/19 to allow us to continue the scheme for larger commercial vehicles and a separate scheme for Taxis and Private Hire Vehicles. In 2018 a new national Framework Agreement became available to assist Scottish local authorities in appointing TRL Ltd to deliver ECO Stars Schemes however this process had not been finalised by the end of 2018. It is hoped that scheme delivery will commence in Dundee during early 2019. By the end of 2018 there were 157 members (6495 vehicles) in the commercial scheme and 17 (515 vehicles) in the scheme for Taxi & Private Hire Vehicles.	Ongoing	A number of participating members are now demonstrating working towards operating cleaner /greener fleets.
		Promoting Low Emission Transport			Match funding for feasibility study for Ultra Low Emission Vehicles (ULEV) / Zero Emission Vehicles (ZEV) deliveries in 2015/16 FY				A Freight Consolidation business plan was prepared and although there were initial discussions with a potential operator to develop a small scale freight consolidation centre in the city, this has not been progressed.		

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 relating to emission reductions
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 Corporate Fleet Manager ► DCC Environment Department			► Approval of Strategy (Asset Management Plan) ► Average age fleet and Euro category, fuel type	Small	► See also Measure 14 The Fleet Section continue to replace older vehicles with newer less polluting vehicles. In 2018, 3 new EURO VI minibuses were introduced in January and 4 new refuse collection vehicles arrived in February. A new grant has been provisionally agreed with Transport Scotland to fund a further 56 electric vehicles. The trial of an electric refuse collection vehicle went well and discussions are ongoing with the manufacturer. Trials of electric hedge trimmers, strimmers, leaf blowers etc commenced in 2018.	2014+	
		Promoting Low Emission Transport			The development of an Asset Management Plan which will incorporate environmental issues as part of the replacement criteria	2013/14			An asset management plan has been created providing details of the ongoing replacement plan. Due to financial restrictions and vehicle variations the replacement programme will be done on a cost and condition basis. The emphasis of the plan will continue to be the replacement of the oldest and most polluting vehicles.	ongoing	
		Promoting Low Emission Transport			Initial discussions for 2013/14 vehicle/plant replacement programme has identified improved emissions as a high priority	2013/14			See Measure 7 above		
	Vehicle Fleet Efficiency				Participation in ECO Stars Dundee-Fleet Management Recognition Scheme	2013			DCC Fleet Achieved 4-Star Rating in ECO Stars Recognition Scheme as recognition for reducing the environmental impact of the Council's Fleet.	Ongoing	

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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	►DCC Support Services ►DCC City Development Department ►Tayside Police			►Traffic Regulation Conditions for 'No Idling' of taxis ►Explore the potential of introducing Licensing Conditions for minimum taxi Euro category for certain classes of vehicles ►Provide 'No Idling' street signage ►Monitoring for idling in place	Medium	The ECO Stars fleet recognition scheme for taxis/private hire vehicles maintained its membership at 17 (517 vehicles) by the 31st December 2018. The Lochee charging hub officially opened in April 2018, the Princes Street hub opened in August 2018, while the Broughty Ferry hub opened in December 2018. Over 17% of Dundee's taxis are now fully electric (there was a 4% increase in electric taxis in 2018).	Ongoing+	Objective to remove poor emission vehicles from service
8		Transport Management			As part of Air Quality Low Emission Charter, continue to investigate opportunities for: Traffic Regulation Conditions for 'No Idling' of taxis;	2013/2014+			No further action in regards to the investigation of a traffic regulation condition for no idling for taxis is proposed		
8		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	
		Traffic Management			Provide 'No Idling' street signage; Monitoring for idling.				Not progressed as not included in 2018/19 funding application.		
		Promoting low emission transport			DCC also looking at collaborative work with taxi operators in developing an Electric Vehicle trial for taxis in Dundee				Over 17% of Dundee's taxis are now fully electric (there was a 4% increase in electric taxis in 2018).		

Dundee City Council

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8		Vehicle Fleet Efficiency			Expansion of ECOSTARS to include taxi / private hire operators	2014/15			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. By the end of 2018 there were 17 (515 vehicles) in the scheme for Taxi & Private Hire Vehicles.		
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	► VOSA ► Tayside Police ► DCC Environment Department.			► Approval/non-approval of RET scheme ► Traffic Regulation Conditions if necessary.	Small	Project on hold until funding identified. No progress as no funding obtained to do so in 2018.		
		Traffic Management			To seek funding to undertake feasibility study of introduction of RET	2015/16+			Project on hold No progress as no funding obtained to do so in 2018/19.		
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.			► Adoption of Local Development Plan ► Adoption of Air Quality SPG	Small	Supplementary Guidance now fully adopted and available on the Dundee City Council website.	2015 +	

Dundee City Council

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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.		2011+	►Implementation of co-ordination strategy ►Reciprocal attendance of air quality and climate change working groups/steering committees	Small	The Sustainability & Climate Change Manager sits on the Corporate Air Quality Steering Group to ensure synergy between AQ and CC policy. In addition, as required by the Clean Air for Scotland Strategy, AQ implications have been included in the city-wide Sustainable Energy & Climate Action Plan (in development) and associated 'Strategic Environmental Assessment' Environmental Report	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	►DCC City Development Department. (Transport Division)			► Number of TACTRAN policies and proposals implemented	n/a	DCC continue to support TACTRAN and focus on implementation of Regional Transport Strategy Ongoing. Ongoing support of TACTRAN, with TACTRAN included in the Dundee LEZ Delivery Group. Funding also applied for and obtained to help incorporate LEZ into the Regional Transport Model – this will be progressed in 2019 with model due to be completed in late 2019.	On-going 2019+	
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	DCC City Development Department (Transportation Division)			►List of any promotion campaigns planned / implemented ►Number / proportion of cleaner vehicles within fleets or clean fuels infrastructure in each financial year ►Number of electric charging points installed	Small	See also measures 7 and 14 Dundee continues to lead the way in electric vehicle uptake, with 122 charging posts (providing 237 charging points) present in the Dundee City Council area. Of these, 38 charging posts (providing 74 charging points) are located at Dundee City Council depots. There are 62 charging posts (providing 84 charging points) at public on-street charging locations which include the new charging hubs that opened in 2018 at Lochee, Princes Street, and Queen Street Broughty Ferry.. The Drive Dundee Electric campaign has continued with its successful engagement with current and potential EV owners (both in public and business). It has helped raise awareness about EVs and incentives by hosting, talking or exhibiting at events (Clean Air Day, Dundee Food & Flower Festival, EV Festive Parade in Dundee as well as promoting the new charging hubs present at Lochee, Princes Street, and Broughty Ferry), building an online social media presence (@DundeeElectric has now over 1100 followers on Twitter) and creating and distributing PR material.	2012+ on-going	

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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	► DCC Corporate Fleet Manager		2011+	Number / proportion of new/improved vehicles within fleets in each financial year	Small	See also Measure 7 The replacement programme continues with the spend for 2018/19 set to be in the region of £1.4 million, this is to include a number of new RCVs, minibuses and ride on mowers. A programme of downsizing vans continues with the introduction of 5 smaller less polluting tippers. DCC has recently received a Grant Award from Switched on Towns & Cities for £2.5 million which includes replacing approximately 100 vehicles across all the cities partners with electric vehicles.	2014+	
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. ► Investigate fleet activities in relation to pollution hotspots e.g. waste management fleet routes	► DCC Corporate Fleet Manager ► DCC Environment Department		2011+	► Implementation of smarter driver programme ► Preparation / Implementation of Fleet management plan ► 10% reduction by 2013 for staff business travel and Corporate Fleet	Small	See Also Measures 7,13,14 There are now a number of vehicles fitted with GIS route optimisation software to try and remove excess mileage.	2014+	
15					Analysis of the information from the telematics system in relation to idling time etc.	2014+			Ongoing as above		

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16	Measure M16: DCC will promote options for better travel planning amongst Dundee City Council employees	Promoting Travel Alternatives	<ul style="list-style-type: none"> ► 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)	Funding being sought in 2017/18 to review Corporate Travel Plan and update it in line with CAFS actions	2011+	<ul style="list-style-type: none"> ► Implementation of DCC Travel Plan & review of progress with targets ► 10% reduction by 2013 in staff business travel ► % DCC employees walking/cycling to work 	Small	<p>See also Measure 3, 17 & 22</p> <p>In 2017/18 DCC applied to the Scottish Govt (SG) for funding through the Air Quality Action Plan Support Funding to revise and update the Staff Travel Plan. Following the granting of these funds, consideration was given to bring in external consultants to deliver the work. However, as the council employed a number of graduate staff, the SG was approached and agreed to carry forward the funding into 2018/19 to retain a graduate to undertake this task. However due to graduates not being retained this was not progressed in 2018. Agreement to carry forward funding into 2019 was obtained.</p>	2015+ 2019	
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	<ul style="list-style-type: none"> ► Continue to investigate and develop the use of various incentive schemes ► Develop cycling strategies ► DCC to investigate use of annual survey on how/what modes of transport employees use to travel to work 	DCC City Development (Transportation Division)		2011+	<ul style="list-style-type: none"> ► % DCC employees walking/cycling to work ► Incorporate cycling measures within DCC Travel Plan in line with the new DCC Cycling Strategy to be developed 	Small	<p>See also Measures 3, 16 & 22</p> <p>Ongoing promotion of cycling through the provision of the Tax Free Bikes scheme in partnership with Cyclescheme and the monthly cycling breakfast offered to those who cycle in to the city centre. Both regular and electric bicycles are available for use by staff members.</p>	2014+	

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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	DCC City Development (Property Division)			►10% reduction by 2013	Small	The Climate Change Board continues to implement the Council's Carbon Management Plan and current energy management projects. However, while there are a number of initiatives that when fully implemented should realise reductions in our CO ₂ emission, the current performance is not consistently improving. The agreed procedural arrangements to enable the Council to comply with the new mandatory UK-wide Carbon Reduction Commitment - Energy Efficiency Scheme have been implemented. The Council's recorded Total Footprint Emissions for property in 2017/18 27,165 tonnes of CO ₂ 2018/19 data not available until July 2019 Fleet transport baseline figure of 5,976 tonnes (reported 2007 estimate) has further reduced from 3,623 tonnes in 2017/18 to 3422 tonnes in 2018/19.	On-going	
					New annual aspirational reduction target of 5% until 2020	2013+					
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/advice note and annually review content	►DCC Housing Department ►Solar Cities		2011+	►List of any promotion campaigns planned/implemented	Small	The implementation of the Non Domestic Energy Efficiency (NDEES) Basket 1 projects continued through 2018. The NDEES Basket 2 projects are to go to Committee in April 2019. The RPCS Energy Centre is under construction and due to go live in August 2019.	ongoing	

Dundee City Council

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 relating to emission reductions
20	Measure M20: DCC will provide the public with relevant air quality information.	Public Information	<ul style="list-style-type: none"> ► Investigating the potential for uptake of an air pollution information system, such as Air Alert ► Improvements to AQ website information ► Make up to date air quality information available to the public through Councils digital website 	<ul style="list-style-type: none"> ► DCC Environment Department ► DCC City Development (Transportation Division) 			<ul style="list-style-type: none"> ► Investigate funding sources ► Implement Air Alert or similar service ► Improved rating of website in peer review ► Make AQ information available through Council's website ► Real Time Travel Information 	Small	<p>Links to the real time data for the continuous automated monitoring sites in Dundee on the Scottish Air Quality website are available through the air quality pages on the Dundee City Council website.</p> <p>The proposed improvements to the smoke control area maps on the DCC website were not progressed however an overall map of smoke control areas was added to aid those seeking information.</p> <p>The 2018 Annual Progress Report was added to the list of air quality reports able to be downloaded from the DCC website.</p> <p>The peer review of air quality websites in the United Kingdom was not undertaken in 2018.</p>	2012+	
20		Public Information			► Complete improvements to AQ website	2013/15			Improvements ongoing (see above)		
		Public Information			► Develop Database to enable DCC staff to better manage large volume of AQ data and make it more readily available to stakeholders	2013/15			See measure 30.		

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 relating to emission reductions
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	<ul style="list-style-type: none"> ► DCC to ensure all relevant commercial planning applications have travel plan conditions applied in accordance with current best practice. ► DCC to produce Travel Plan Strategy which: ► Details procedure for tracking & possible requirement for enforcement of planning conditions requiring travel plans. ► Details procedure for Travel Plan Information storage at DCC 	<ul style="list-style-type: none"> ► DCC City Development Department, (Planning Division, Transportation Division) ► DCC Education Department 			<ul style="list-style-type: none"> ► Develop Business Case for Travel Co-ordinator & identify potential funding streams. ► Number of new travel plans (need to show in terms of walking cycling - % of journeys saved). ► Identify & report on any Air Quality related Travel Plan targets from travel plan strategy and any relevant Travel Planning Team targets. ► Promotion of Travel Plan initiatives e.g. Sustrans' Travel Smart ► Implement & regularly review Travel Plan Strategy 	Small	In 2017 the Travel Behaviour Change Schools Programme was put on hold. However, the Scottish Govt has agreed to any funding underspend from 2017/18 being carried forward into 2018/19 to retain a graduate trainee to undertake the classroom workshops and review the Council's Corporate Travel Plan as outlined in Measure 16. However the school workshops and travel plan update were not progressed in 2018 due to the graduates not being retained as proposed.	2014+	

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 relating to emission reductions
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	<ul style="list-style-type: none"> ► Identify walking & cycling schemes (such as Park & Cycle). ► Identify walking & cycling promotional opportunities around Dundee City 	DCC City Development (Transportation Division)		2011+	<ul style="list-style-type: none"> ► Number of walking and/or cycling initiatives in operation. ► Establish the use of cycle monitoring counts at key points on cycle routes 	Small	See also Measures 3,16 & 17 A Sustrans Cycling Strategy Officer was embedded with Dundee City Council from October 2018 to help the Council implement actions contained in Dundee's 2016 Cycling Strategy and support the delivery of cycling infrastructure projects.	2014+	
					Preliminary Works to achieve off-road cycle route around the Port of Dundee	2013/14			Permission to commence on Nynas land to undertake preliminary works to achieve off-road route around Port of Dundee Work on upgraded cycle path / lighting etc through the Dock commenced Oct 2018 and was due to be completed early 2019.	2019	
					Provide Pedestrian Bridge over the railway at Riverside Drive / Seabraes	2013/14			Transportation Division & City Engineers completed works at Riverside Drive / Seabraes Pedestrian Bridge, including pedestrian crossing improvements on Riverside Drive.	Completed	
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	<ul style="list-style-type: none"> ► Promote schemes such as the SQUID card including Dundee and surrounding towns. ► Introduce smart and integrated ticketing 	► DCC City Development (Transportation Division)		2011+	<ul style="list-style-type: none"> ► % uptake schemes ► Passenger numbers 	Small	Continued close partnership working with bus operators to deliver an improved bus service and user experience – Passenger Focus Scotland survey records highest levels of bus user satisfaction in Scotland are in Dundee. Dundee City Council continued to help promote public transport as an attractive and affordable alternative to private car use. In 2018 Dundee City Council teamed up again with local bus operators to offer a 20p fare promotion (Holiday Hop) to children travelling with adults during the Easter, summer, and October school holiday periods. This initiative has seen a huge increase in the number of children travelling by bus during the holiday periods compared to before the promotion was introduced.	ongoing	
		Transport planning and infrastructure			NEC SMART Ticketing to Go Live 2014	2014			Completed	July 2014	

Dundee City Council

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 relating to emission reductions
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)			► Implementation of Annual Energy Efficiency Action Plan. ► Report reductions in energy use	Small	The Council completed the installation of 46 energy conservation measures across 8 properties. This was completed utilising an Energy Performance Contract where the appointed contractor has guaranteed the annual energy savings of at least £222,600 resulting in CO2 savings of 1,000 tonnes. The contract cost was £1.7 million giving a simple payback of around 7.6 years.	ongoing	
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 Department (Environmental Protection Division) 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) ► Percentage of the total planning applications responded to with air quality conditions/ assessments	Small	Officers from the Pollution Team within Community Safety & Protection check weekly planning lists and provide comments to the Planning Officers on all applications which may adversely impact on local air quality. 54 planning applications were responded to for the 2018 calendar year.	n/a	Suggestions on best practice and mitigation measures advised accordingly.
					See Measure 10 regarding the introduction of Supplementary Planning Guidance						

Dundee City Council

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 relating to emission reductions
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	Small	For period up to 31st December 2018, officers investigated a total of 27 relevant complaints of which 88% had been resolved and three were still being investigated.	N/A	
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 ► % resolved	Small	During 2018 officers investigated 15 complaints of smoke from commercial waste burning and 23 complaints of smoke from domestic waste burning (bonfires) under Environmental Protection and Clean Air legislation. 92% of these complaints have been resolved, with three still being investigated.	N/A	
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		2011+	► % uptake composting bins	Small	DCC continues to promote composting as a means of sustainable management of garden waste within the City & plan to reissue home composting advice leaflets to all residents during the 2019 growing season as part of wider plans to revise the green waste collection system. During this time we are also exploring the possibility of obtaining external funding to provide home composting bins to residents in the City.	Ongoing	

Dundee City Council

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 relating to emission reductions
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.			<ul style="list-style-type: none"> ► Number of monitoring sites ► Identification of sites in new hotspots ► Monitoring data via DCC website 	N/A	<p>Dundee City Council currently has one background automated continuous monitoring site (Mains Loan), and automated continuous monitors located at Broughty Ferry Road, Meadowside, Logie Street, Lochee Road, Seagate, Whitehall St, Albert Street, Myrekirk Terrace and Stannergate.</p> <p>In 2018 there were 89 NO₂ diffusion tube sites across the city. These are located adjacent to busy roads and junctions, and also locations identified for collecting background levels.</p> <p>The location of new relevant exposure next to pollution sources (e.g. busy roads) and dispersion modelling results inform the need for new monitoring locations and hence the potential identification of new hotspots, which are detailed in Section 4 of the APR.</p> <p>In March 2018, the existing PM₁₀ monitor at the Lochee Rd automated site was replaced with a new monitor capable of monitoring both PM₁₀ and PM_{2.5}. Funding to support the replacement of the existing PM₁₀ monitors at Seagate, Meadowside and Whitehall Street with PM_{10/2.5} monitors was secured via the Scottish Government LAQM funding grant for 2018/19. Replacement of these monitors is due to be completed by the end of the 2018/19 financial year.</p> <p>Historical air quality monitoring data for the 2006 - 2015 period is available on the DCC website. Links to real time data for Dundee's continuous automated monitors presented on the Scottish Air Quality website are on the DCC website. The 2018 Air Quality Annual Progress Report was added to the list of air quality reports able to be viewed or download from the DCC website.</p>	N/A	

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 relating to emission reductions
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	<ul style="list-style-type: none"> ►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 NO₂ diffusion tubes regularly deployed around the City Council area. 	► DCC Environment Department/ Tayside Scientific Services			<ul style="list-style-type: none"> ► QA/QC measures adopted ► Auditing reports 	N/A	<p>External consultants undertake calibrations and filter changing of the continuous monitoring equipment in the air quality monitoring stations.</p> <p>Filter changes for the Osiris meters (indicative PM₁₀ meters) are undertaken on a quarterly basis and each receive an annual calibration. Six monthly audits of continuous monitoring stations and equipment are undertaken by external consultants and auditing reports obtained.</p> <p>The Public Analyst used participates in the AIR NO₂ Proficiency Testing (AIR NO₂ PT) Scheme and field inter-comparison study for the NO₂ diffusion tubes.</p> <p>The NOx analyser at the Mains Loan background automated continuous monitoring site became affiliated with the DEFRA AURN (automatic urban and rural network) monitoring group in 2017 and now is subject to an alternative auditing procedure.</p> <p>All of the above feeds in to the quality control and data ratification process.</p>	N/A	
					Develop Database to enable DCC staff to better manage large volume of AQ data and make it more readily available to stakeholders	2013/15			The database is now available for use.	completed	

Dundee City Council

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 relating to emission reductions
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	N/A	► See Measure 29 Six new NO ₂ diffusion tube monitoring locations commenced in 2018, including Commercial Street, Dudhope Crescent Road, Grays Lane, Riverside Esplanade, Thomson Avenue, and West Marketgait. The new locations replaced locations where monitoring was stopped due to compliance with the annual air quality objective.	N/A	See Section 6.3 and Table A.3 of main report for monitoring results for the new tube locations in 2018.
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			► Classified traffic counts undertaken	N/A	There were no traffic counts undertaken for air quality purposes up to 31 December 2018. The SEPA Air Quality City Model being created through the National Modelling Framework using the traffic count data collected in 2017 is still in progress and will undergo further refinement for use during 2019. Funding was secured via the 2018/19 Air Quality Action Plan grant scheme to update the existing Paramics Traffic model for Dundee. This will include further road traffic counts being undertaken during its development. The tender process to appoint the consultants was undertaken October / November 2018 with the consultants then appointed in December 2018. The traffic counts are proposed for May 2019 with the new Paramics traffic model to be built by summer 2019. This model is necessary to work alongside the SEPA AQ City Model to guide the design of the low emission zone due to introduced in Dundee by 2020.	Ongoing	

2.3 Cleaner Air for Scotland

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

2.3.1 Transport Action – “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 produced a 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 and to incentivise the use of public transport and walking and cycling and car sharing. In addition, a Travel Policy exists containing a Business Travel hierarchy considering both staff business travel within and outwith Dundee.

The existing Travel Plan now requires to be brought up to date to inform employees of the travel opportunities that exist other than the use of the car, and to ensure that it is compatible with the CAFS strategy. Funding has been secured to undertake a review of this Plan and to update this as necessary by the end of the 2019/20 financial year.

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

Dundee City Council's Sustainability & Climate Change Manager sits on the Corporate Air Quality Steering Group to ensure synergy between air quality and climate change policy. During 2018 Dundee City Council became a signatory to the global Covenant of Mayors (CoM) and through the Dundee Partnership progressed the development of a 'Sustainable Energy and Climate Action Plan' (SECAP) for Dundee. The development of the SECAP was stimulated by a workshop held in August 2018 attended by over fifty representatives from twenty different public, private and community organisations whose ideas and knowledge were gathered and used to help co-design the content of the SECAP. Over 100 ideas were identified, many resulting as actions listed under themes of Energy, Mobility, Waste and Resilience in the draft SECAP titled, 'Dundee 2030 – Our Sustainable Future', due to be consulted on then published in 2019.

Within the Mobility theme, references are made to the six main objectives within CAFS with relationships between the SECAP and air quality considered. Proposed actions include the introduction of the Dundee Low Emission Zone, expansion of the number of electric vehicle charging hubs, ECO Stars, the Dundee Cycling Strategy, and development of active travel hubs.

2.3.3 Commentary on further actions

In parallel to continuing with the implementation of the AQAP measures, Dundee City Council, along with the other three major city authorities, is represented on the CAFS Governance Group. DCC is committed to working with the Scottish Government and its partner organisations to deliver CAFS' aim of improving Scotland's air quality to be the best in Europe.

During 2018 the development of the National Modelling Framework (NMF) and National Low Emission Framework (NLEF) were progressed by SEPA and Transport Scotland with DCC assisting with their development as necessary. The detailed NMF AQ City Model for Dundee progressed further with data used from the 2017 traffic counts being supplemented by fleet and bus route information provided by local bus operators. Outputs from the NMF model will be the main focus of the appraisal process contained in the NLEF document published by the Scottish Government in January 2019. The model will be used to guide development of the Dundee Low Emission Zone and the identification of any other transport focussed interventions to be used to bring further improvements to air quality in the city.

3. Air Quality Monitoring Data and Comparison with Air Quality Objectives

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Section 3 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 2018. **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 2018 (March 23rd) the particulate analyser (BAM) at the roadside site in Lochee Road was replaced with a new analyser (Palas Fidas 200), which is capable of monitoring both PM₁₀ and PM_{2.5}.

National monitoring results are available at <http://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.1**.

3.1.2 Non-Automatic Monitoring Sites

Dundee City Council undertook non-automatic (passive) monitoring of NO₂ at 89 sites during 2018. **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 Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in **Appendix C.1**. Five (5) new diffusion tube sites were added to the network at the start of 2018 at the following locations where new residential properties had been introduced, proposed or identified close to busy roads:

- Commercial Street (84) (DT 226)
- Dudhope Crescent Road (40) (DT 227)
- Gray's Lane (3) (DT 225)
- Riverside Esplanade / S. Crichton St. (DT 228)
- Thomson Avenue/S.Crichton St. (DT 229)

During 2018, the diffusion tube site at **Seagate (DT101)** became inaccessible owing to building works. As a result, a new site was added to the network during and the PDT was redeployed at the following location:

- West Marketgait / West Road (DT 231)

The new site is located on the east side of West Marketgait by the junction with Ward Road where a new flatted development is proposed.

The diffusion tube results for the entire network were reviewed in December 2018 (when only 10 months data was available) in order to identify those monitoring locations where: concentrations were well below the AQO; showing a decreasing trend; no longer needed for model verification; or, were unnecessary for long term trend analysis. The following 7 tube locations were discontinued at the end of 2018:

- Commercial Street (84) (DT 226)- well below the AQO

- Gray's Lane (3) (DT 225) - well below the AQO
- Muirton Road (2) (DT 222) – well below the AQO
- Pitkerro Road (42) (DT 207) – well below the AQO
- King St (3) (DT 216) – well below the AQO
- Dock St (12) (DT 192) – well below the AQO
- Meadowside (28) (DT 182) – decreasing trend below 36 µg/m³

The above seven diffusion tubes were redeployed (along with one new tube) at the beginning of 2019 in areas where new residential developments are planned or preliminary results from SEPA's NMF Dundee City AQ Model (see **Section 4.1**) identified possible exceedances close to busy roads and junctions in Dundee.

- Clepington Road (164) (DT 232)
- Dock St / Trades Lane (DT 233)
- Lower Princes Street (DT 237)
- Meadowside Halls (DT 238)
- Princes Street (185) (DT 239)
- Seagate (36-40) (DT 236)
- South Marketgait / Nethergate (DT 235)
- St Andrews St (26) (DT 56)

The annual concentrations from the new diffusion tubes deployed in 2019 will be reported in the Annual Progress Report 2020.

3.2 Individual pollutants

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

3.2.1 Nitrogen Dioxide (NO₂)

Table A.3 in **Appendix A** compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

For diffusion tubes, the full 2018 dataset of monthly mean values is provided in **Appendix B**. Locations marked in green were new in 2018.

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 21.0 µg/m³ (from DT 185) for city centre sites, and 17.9 µg/m³, (the average of concentrations from five urban background locations (DT 7, DT 223, 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 2018

Site ID	Location	2018 Bias Adjusted NO ₂ Annual Mean (µg/m ³)	2018 Predicted annual mean NO ₂ concentration at Receptor (µg/m ³)
DT 31	Lochee Rd (140) Traffic Lts	48.8	48.0
DT 205	West Marketgait/Old Mill (23)	47.0	46.9
DT 37	Logie St (114)	48.2	46.3
DT 70	Victoria Rd/Hilltown	49.2	43.3
DT 190	Seagate (97)	41.7	41.7
DT 217	Seagate (99)	41.3	41.3
DT 156	Dock St (57)	46.4	41.2
CM 5	Seagate Romon	45.9	40.6
DT 149	Meadowside (Romon) Average	40.4	39.6
DT 30	Lochee Rd (138)	48.4	39.3
DT 158	Lochee Rd (Romon) Average	43.1	38.1
DT 50	Seagate (101)	38.3	37.9
DT 224	Seagate (112)	37.6	37.6
DT 49	Rankine St (2)	38.5	37.6
CM 4	Lochee Rd Romon	43.4	37.5
DT 183	West Marketgait / Guthrie St	41.4	37.1
DT 160	Whitehall St (Romon) Average	38.3	36.5
DT 159	Seagate(Romon) Average	40.0	36.5

The highest NO₂ annual mean concentrations predicted at relevant receptors were on the North West arterial route (Lochee Road Corridor); the West Marketgait, which is part of the inner ring road; the main bus corridor; and, part of the trunk road network close to the city centre (i.e. Dock Street 57). There are no specific measures within the AQAP currently targeting the inner ring road or trunk roads however these areas will be included in air quality city model and scenario testing as a part of the NLEF process. 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 the urban background site at Mains Loan which shows a slight worsening trend. An analysis of apparent trends in the 74 monitoring locations with at least 5 years data is shown in **Figure A.3b**. Concentrations at the majority of sites (68) show an improving trend or have remained stable. The greatest improvements have been 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 Whitehall Street), and at the urban background site at Mains Loan.

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**. In addition **Figure C.30** compares the ranked annual mean NO₂ concentrations measured at fifty long-term monitoring sites for 2009, 2011 (the year of the action plan), and 2018. This shows an overall reduction in the highest monitored concentration and in the number of long-term sites which exceed the objective.

Table A.4 in **Appendix A** compares the ratified continuous monitored NO₂ hourly mean concentrations for the past 5 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 2018. No exceedances of the hourly mean objective were indicated by the diffusion tube annual mean concentrations in 2018 as none exceeded 60µg/m³. The Lochee Road automatic monitor had six occasions when the concentration was over 200µg/m³. Analysis showed these were all in the winter months, during peak traffic times. The pattern of these occurrences are similar to those in previous years.

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 there for the past 5 years. **Figure A.4** shows the long-term trend in the 99.8th percentile concentration of hourly means at Lochee Road. The trend line has been drawn using an Excel simple regression statistical program. Diffusion tube monitoring and dispersion modelling show that the automatic monitor is not sited in the most polluted location. Until there is an established downward trend the AQMA for the hourly mean objective will remain.

3.2.2 Particulate Matter (PM₁₀)

Table A.5 in **Appendix A** compares the ratified and adjusted monitored PM₁₀ annual mean concentrations for the past 5 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 5 years with the air quality objective of 50µg/m³, not to be exceeded more than 7 times per year.

One exceedance of the PM₁₀ annual mean objective (18µg/m³) was predicted at the Logie Street (Osiris) during 2018, this is 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. The second largest decreasing trend has been in Meadowside where action plan measures to increase the separation distance between the active carriageway and receptors may have contributed to the decrease in concentrations.

The PM₁₀ daily mean objective (50µg/m³, not to be exceeded more than 7 times per year) was exceeded at the Logie Street (Osiris) during 2018. Resurfacing of the road adjacent to the monitor during July 2018 contributed to the objective being breached.



Dry, still and misty conditions along with easterly and south-easterly air masses, bringing pollutants from the rest of the UK and continental Europe are thought to have contributed to the other exceedances. Easterly winds and misty conditions have also been present during many of the other recorded exceedances of the daily mean in Dundee.

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.

The majority of automatic monitoring sites with at least 5 years data capture show an improving trend. The trend in concentrations at Mains Loan background site remains relatively stable with small increasing trends evident at Myrekirk Terrace, and Seagate. 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.

3.2.3 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. Dundee City Council were successful in obtaining funding from the Scottish Government to establish a further three PM_{2.5} monitors in the city, (Whitehall Street, Seagate and Meadowside), which were installed in March 2019.

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 2018

Year	2015	2016	2017	2018
<i>Scottish Annual Mean Objective</i>	10	10	10	10
Whitehall St (BAM)		10.6	10.3	11.0
Seagate (BAM)	10.2	9.6	11.1	10.9
Meadowside (BAM)	11.3	11.5	10.3	10.7
Logie St (Osiris)	10.9	9.7	10.2	13.2
Myrekirk Tce (Osiris)	12.9	10.9	8.4	9.5
Albert St (Osiris)	13.3	10.8	10.0	12.3
Stannergate (Osiris)	18.8	14.6	9.8	8.3

Potential exceedances were estimated at the following locations in 2018:

- Albert Street;
- Logie Street (Osiris);
- Meadowside (BAM);
- Seagate (BAM); and,
- Whitehall Street (BAM).

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). No guidance is currently available on how to predict forward PM_{2.5} monitoring concentrations to 2020. However, further evidence is required to determine whether the estimates at these locations are representative of local PM_{2.5} before deciding whether an AQMA is required.

The three new PM_{2.5} monitors installed in 2019 (Whitehall Street, Seagate and Meadowside), will help support the decision of whether to declare an AQMA, or not.

3.2.4 Sulphur Dioxide (SO₂)

Dundee City Council does not currently monitor SO₂.

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

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

4. New Local Developments

4.1 Road Traffic Sources

As part of the Cleaner Air for Scotland Strategy (2015) discussed in **Section 2.3**, the Scottish Government, Scottish Environmental Protection Agency (SEPA) and Transport Scotland are developing a city air quality model of Dundee's road traffic emissions as part of the National Modelling Framework (NMF). The NMF will include an air quality assessment tool, guidance documents, data requirements, best practice and 'web-based interactive data products' aimed at providing a standardised approach to modelling air quality at regional and local level. It is expected that the local NMF model will 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 September 2017 in Dundee as shown in **Figure C.30**, which will provide a new baseline for review and assessment. The results of the local NMF model are expected to be available later in 2019. These traffic counts will be updated in 2019 as part of the wider traffic survey to development of a city-wide traffic model, this will potentially be used to test some of the low-emission zone options.

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 2018, 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;
- Roads with significantly changed traffic flows; 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 a 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 2018. 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)¹, 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)(**Fig 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 to be studied by the NMF for Dundee, and PM₁₀ will be considered as part of this 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. The local authority intends to 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.

Annual road count data (as AADT) from the council's long term Road Traffic Reduction Act (RTRA) Sites from 2005-2017 are presented in **Table C.6**. **Table C.7** shows the percentage growth at each of the sites since 2005; none have experienced a significant increase (>10%) in traffic flows over this time. Consequently updated assessments of NO₂ and PM₁₀ are not required for those RTRA Sites where there is relevant exposure. No updated information for 2018 was available at the time of writing. Updated information will be incorporated into future reports when available. Generally findings at these sites have been considered indicative of traffic growth for local roads in the city.

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. Planning applications were approved in 2017 for the 7 storey mixed use developments including new residential exposure at Site 2 (17/00337/FULM²) and Site 6 (17/00113/FULM³) 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

¹ http://idoxwam.dundeeccity.gov.uk/idoxpa-web/files/2F64D6E6C1FBD1605B559D04E3C9BB02/pdf/18_00988_FULL-09_-_AIR_QUALITY_ASSESSMENT-907467.pdf

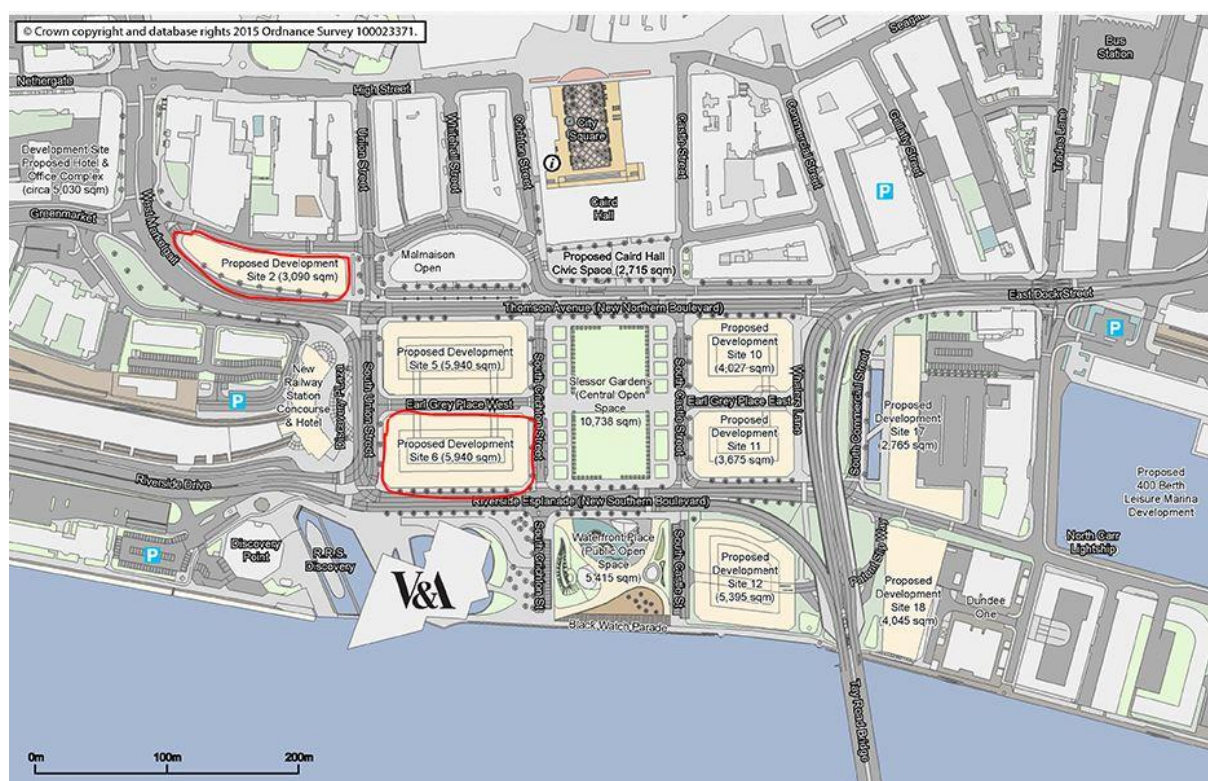
² http://idoxwam.dundeeccity.gov.uk/idoxpa-web/files/51E78CF29BF1FA7B11FA4846A09E8068/pdf/17_00337_FULM--807610.pdf

³ http://idoxwam.dundeeccity.gov.uk/idoxpa-web/files/FE1C82D9CF9E655FE288ACED2CC262BD/pdf/17_00113_FULM--780127.pdf

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.⁴ 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 2018 (32.4µg/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 2018 (29.1µg/m³).

Figure 4.1 Central Waterfront Site Map



4.2 Other Transport Sources

None of the following transport sources have been identified as new since the Annual Progress Report 2018:

- 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.

⁴ http://idoxwam.dundee.gov.uk/idoxpa-web/files/3C595B6A9A40C075C7F512D927F9B0C9/pdf/17_00113_FULM-AIR_QUALITY_ASSESSMENT_-_DUNDEE_WATERFRONT-902402.pdf

4.3 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 are regulated by the Scottish Environmental Protection Agency (SEPA) is provided in **Appendix C.4**. This Appendix also includes a screening assessment of all the SEPA regulated processes and contains updated information provided by SEPA.

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

SEPA were consulted regarding any changes that meet the above criteria at SEPA regulated sites. The consultation responses are summarised in **Appendix C.4**. In addition, the council were consulted on one proposed installation which was accompanied with an air quality assessment.

Dundee Energy from Waste CHP facility – PPC/A/1158864

The review and assessment of the above application, for a new energy from waste facility to replace the existing plant, was reported in APR2018. However the application was withdrawn and the council were subsequently consulted on a substantial variation to the existing site permit instead (**PPC/A/1003157**). This variation still included the construction of the replacement facility. Examination of the documentation and subsequent discussions with SEPA established that:

- there were no changes to the air quality assessment submitted for the new facility;
- the proposed stack height remained unchanged;
- the two plants will not incinerate waste at the same time during commissioning; and,
- the old plant would be decommissioned once the new plant is operational.

Therefore, it was considered that the dispersion modelling results reviewed previously, would not change and so the substantial variation should not lead to a breach of any of the air quality objectives at existing relevant receptors.

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

SEPA were also consulted regarding any changes that meet the above criteria at SEPA regulated sites. The consultation responses are summarised in **Appendix C.4**, and no existing installations with substantially increased emissions or new relevant exposure were identified.

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

SEPA were consulted regarding any changes that meet the above criteria at SEPA regulated sites. The consultation responses are summarised in **Appendix C.4**. The council was consulted on a substantial variation to the permit below which did not have an air quality assessment.

PPC/A/1151594 Augean North Sea Services, Riverside Works, Princess Alexandra Wharf, Stannergate Road, Dundee, DD1 3LU
Disposal or Recovery of Hazardous Waste with a capacity exceeding 10 tonnes per day, Chapter 5.3 Part A (b) (ii), (iii), (iv), (vi), (x)

The consultation for the above variation was received by the Community Safety & Protection division of the council towards the end of 2018. The variation extends the licensed area to several locations across the port to increase the capability of the area for oil and gas decommissioning. The local SEPA office, have advised that the facility is essentially a waste management facility with no issues for LAQM pollutants but with the potential for fugitive particulate emission associated with breaking, crushing, cutting and decontamination operations (see **Figure C.32**)

The regulated activities described with the potential to generate fugitive emissions are in areas B, D and H. SEPA advised that the processes in area D would all be within a building and any dust generated would be contained. The boundary of area H is greater than 200m from relevant receptors so it is unlikely that the PM objectives would be at risk of being breached. The area B boundary is approximately 190m from relevant receptors. It is not yet known where the cutting and crushing operations will be positioned but they are likely to be more than 200m away from receptors.

Furthermore, the application acknowledged that the crushing and screening of aggregates have the potential to generate dust during operations and during the stockpiling of processed material, and consequently proposed the following dust emission controls:

- Use of modern plant and equipment with enclosed screens and belts where appropriate

- Baffles and spray bars fitted to the processing equipment where appropriate
- Dampening down of stockpiles and road areas to prevent dust arising from windy conditions and traffic movements
- Processing will not take place during windy conditions that are likely to give rise to excessive dust movements
- Dust monitoring will be undertaken during the screening and crushing activities

Given the non-threshold nature of PM₁₀ and PM_{2.5}, SEPA were asked to ensure that all reasonably practical measures to reduce these emissions are employed by the applicant including wheel-wash facilities and sheeting of dusty loads if trackout is a possibility.

The permit is currently on hold at the request of the applicant.

▪ **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.

▪ **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.

4.4 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:

- Biomass⁵ 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 (2018), 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 enquiries/complaints to the Council about domestic solid fuel burning, and planning applications for the installation of wood/solid fuel burning stoves are on the increase.

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 2018, however, the air quality assessment for the proposed energy centre for the Regional Performance Centre for Sport in Caird Park (reported previously in the APR2018) was received during 2018.

Regional Performance Centre for Sport Gas Fired CHP

The proposed Regional Performance Centre for Sport in Caird Park, along with its associated energy centre received planning permission in 2017 (16/00577/FULM). The energy centre includes ground source heat pumps, a gas-fired CHP, three conventional gas-fired boilers with the potential for a fourth to supply a district heating network for nearby housing. A planning condition was attached to the consent to ensure air dispersion modelling was carried out for the energy centre⁶. The air quality assessment considered the current proposed plant and possible future plant, and its findings predicted no exceedances of the AQO's at relevant locations.

4.5 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.

Since the last APR (2018), sources of fugitive or uncontrolled particulate matter, are proposed within the port area, associated with oil and gas decommissioning activities, these are discussed in **Section 4.3**. The activities will 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 APR2018. 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 in 2017/18 and are now estimated to be below both the annual mean and daily

⁵ 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.

⁶ http://idoxwam.dundeecc.gov.uk/idoxpa-web/files/04ABD40C8248B0D162FB02690D3AE59B/pdf/16_00577_FULM--791980.pdf

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. Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

Potential exceedances of the NO₂ annual mean objective (40µg/m³) were predicted at the following receptor locations, within the AQMA:

- Dock Street;
- Lochee Road;
- Logie Street;
- Seagate;
- Victoria Road; and
- West Marketgait.

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 improvements 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 Whitehall Street), and at the urban background site at Mains Loan.

No exceedances of the NO₂ hourly mean objective were identified by automatic monitors or indicated by diffusion tubes in 2018. Lochee Road is the only area of the city where the hourly AQO has been exceeded previously. Although exceedances of the hourly mean continue to be recorded here, for the past 5 years the objective has been achieved (18 exceedances are allowed). Until there is an established downward trend the AQMA for the hourly mean AQO should remain.

One exceedance of the PM₁₀ annual mean objective (18µg/m³) was predicted at the Logie Street (Osiris) during 2018, this is within the current AQMA.

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. The second largest decreasing trend has been in Meadowside where action plan measures to increase the separation distance between the active carriageway and receptors may have contributed to the decrease in concentrations.

The PM₁₀ daily mean objective (50µg/m³, not to be exceeded more than 7 times per year) was also exceeded at the Logie Street (Osiris) during 2018. Resurfacing of the road adjacent to the monitor during July 2018 contributed to the objective being breached.

The majority of automatic monitoring sites with at least 5 years data capture show an improving trend. The trend in concentrations at Mains Loan background site remains relatively stable with small increasing trends evident at Myrekirk Terrace, and Seagate. 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 2018. 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). Potential exceedances were estimated at the following locations:

- Albert Street;
- Logie Street (Osiris);
- Meadowside (BAM);
- Seagate (BAM); and,
- Whitehall Street (BAM).

Dundee City Council were successful in obtaining funding from the Scottish Government to establish a further three PM_{2.5} monitors in the city, at Whitehall Street, Seagate and Meadowside. These were installed in March 2019, data from these analysers will help support the decision on whether or not an AQMA is required for this pollutant.

6.2 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**. The comprehensive traffic data collected as part of this process will provide a new baseline for review and assessment. An air quality assessment is awaited for a proposed mixed use development (including residential and other receptors) within the Central Waterfront Area. This will be reviewed in subsequent reports when available. There were no new 'other transport' sources identified in 2018.

No new industrial sources were identified in 2018. The council was consulted on two substantial variations to existing industrial sources (Part A processes), as discussed in **Section 4.3**: the proposed Energy from Waste plant to replace the existing council facility to the east of the city; and, a waste management facility within the port area. The variation to the proposed Energy from Waste plant did not alter the conclusions of the previous assessment, i.e. that the impacts would be insignificant at all relevant receptors and would not lead to a breach of any of the air quality objectives. The variation to the waste management facility in the port has the potential for fugitive emissions of particulates but the regulated activities are likely to be located at distances greater than 200m from receptors, hence no screening assessments were required under LAQM guidance. Control measures are proposed for the dust generating activities, which will be regulated by SEPA. No other existing industrial sources had substantially increased emissions, have been altered significantly, or had new relevant exposure introduced nearby.

Commercial and domestic sources were reviewed in **Section 4.4**. The air quality assessment for the energy centre for the proposed Regional Centre for Sport was reviewed in 2018. No exceedances of the relevant air quality objectives were predicted.

There is the potential for an increase in uncontrolled fugitive particulate matter as a consequence of additional movements of heavy vehicles over unmade ground within the licensed area discussed in **Section 4.3** (see also **Figure C.31**) 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.

6.3 Proposed Actions

The 2018 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 2018 identified a new area of exceedance outside of the known hotspots, although the monitored concentration at the new tube installed to the north of the North Marketgait, (DT 227 Dudhope Crescent

Road) was close to exceeding the annual mean objective ($39.3 \mu\text{g}/\text{m}^3$). The following actions are proposed following the review and assessment of monitoring data and new developments:

- Review the data from the new analysers capable of monitoring PM_{10} and $\text{PM}_{2.5}$ in Meadowside, Seagate and Whitehall Street;
- Continue monitoring of fugitive PM_{10} sources around the port area;
- Review the air quality assessment awaited for the mixed use development in the Central Waterfront Area;
- Report on any new or significantly changed SEPA prescribed process;
- Provide update on the progress of the NMF model for Dundee;
- Report on the new diffusion tubes installed in 2019. Eight diffusion tubes were installed in areas where new residential developments are planned or have been identified close to busy roads and junctions in Dundee;
 - Clepington Road (164) (DT 232)
 - Dock St / Trades Lane (DT 233)
 - Lower Princes Street (DT 237)
 - Meadowside Halls (DT 238)
 - Princes Street (185) (DT 239)
 - Seagate (36-40) (DT 236)
 - South Marketgait / Nethergate (DT 235)
 - St Andrews St (26) (DT 56)
- Monitor planning applications for new pollution sources, relevant exposure and creation of 'street canyons';
- 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;
- Consider whether specific action plan measures are possible to target the identified exceedance areas on the West Marketgait (part of the inner ring road);
- Implement the action plan measures being taken forward in 2019/20; and,
- Submit the next Annual Air Quality Progress Report in 2020.

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
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)	1.0 (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	1.10	1.70
					PM ₁₀		Beta Attenuation (BAM)			2.06
CM 2	Union Street Rollalong ⁽³⁾	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
CM 14	Meadowside Romon	Roadside	340243	730653	NO ₂	Y	Chemiluminescent ^d	0.42	1.60	2.26
					PM ₁₀		Beta Attenuation (BAM)		1.63	2.17

Dundee City Council

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 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
- (3) CM2 Union Street – was discontinued in January 2016

Figure A.1 Automatic Monitoring Sites 2018

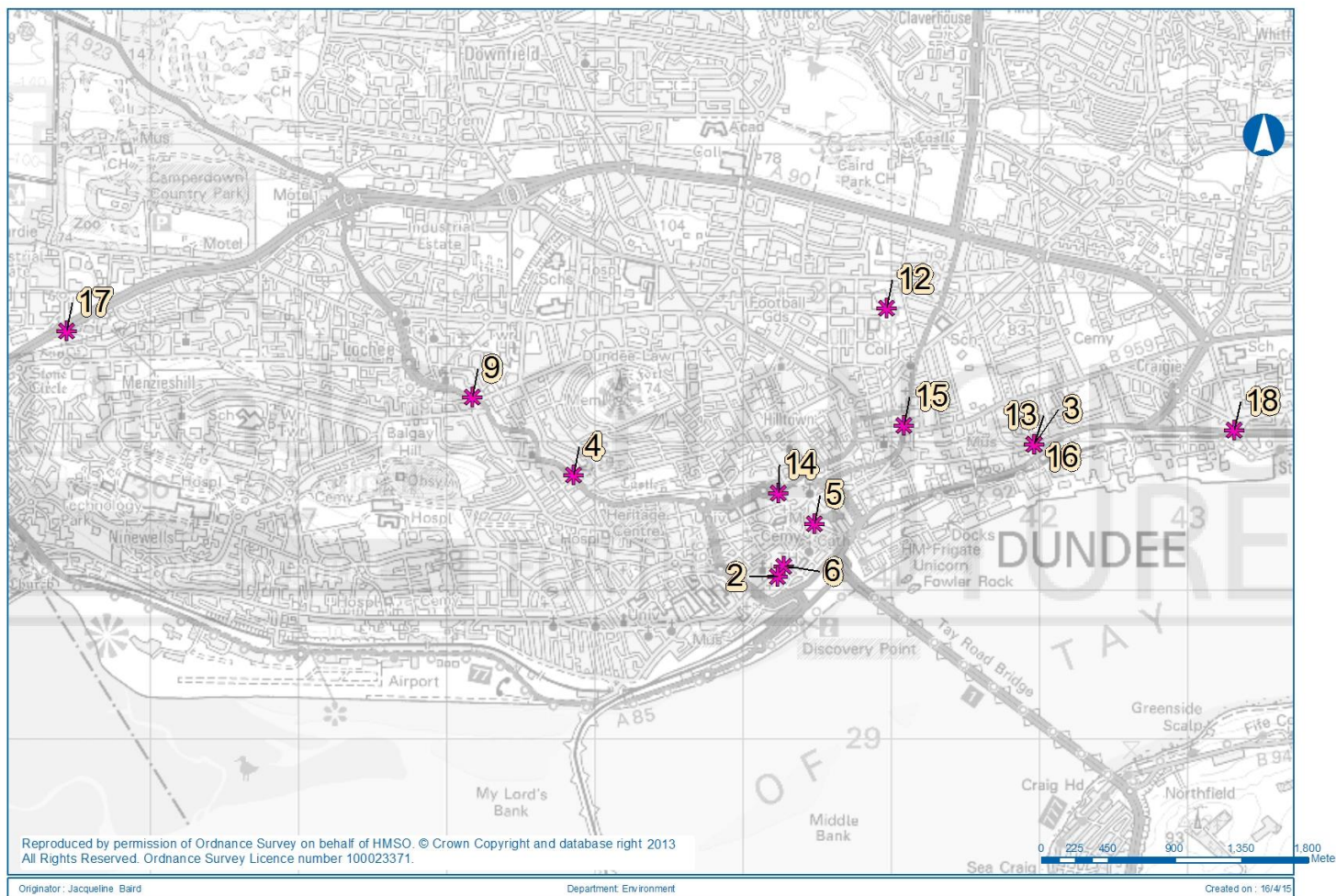


Table A.2 Details of Non-Automatic Monitoring Sites

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 187	Albert St (81)	K	341113	731265	NO ₂	Y	PDT	2.95	0.47	N
DT 5	Arbroath Rd (13)	K	341111	731070	NO ₂	Y	PDT	2.52	0.73	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 145	Broughty Ferry Rd (Greendykes)	R	342662	731112	NO ₂	Y	PDT	7.72	4.10	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 11	Broughty Ferry Rd (141)	R	343322	731073	NO ₂	Y	PDT	1.98	1.32	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	5.3	11.2	N
DT 13	Cleington Rd/ Forfar Rd	K	341385	732121	NO ₂	Y	PDT	8.28	0.78	N
DT 226	Commercial St (84)	R	340343	730399	NO ₂	Y	PDT	0.0	5.86	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 192	Dock St (12)	R	340389	730079	NO ₂	Y	PDT	4.00	2.49	N
DT 85	Dock St (21)	R	340524	730216	NO ₂	Y	PDT	0.34	5.13	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 156	Dock St (57)	R	340656	730343	NO ₂	Y	PDT	3.25	2.53	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
DT 214	East Dock Street (26)	R	340725	730417	NO ₂	Y	PDT	0.2	3.7	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 225	Gray's Lane (3)	R	338086	731355	NO ₂	Y	PDT	-0.29	3.92	N
DT 216	King Street (3)	K	340493	730659	NO ₂	Y	PDT	2.89	0.77	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 177	Kingsway / Strathmartine Rd (279)	R	339179	732896	NO ₂	Y	PDT	3.63	3.14	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 182	Meadowside (28)	K	340298	730550	NO ₂	Y	PDT	2.95	0.80	N
DT 149	Meadowside (Romon) Average	R	340243	730653	NO ₂	Y	PDT	0.33	1.85	Y
DT 222	Muirton Rd (2)	R	338165	731296	NO ₂	Y	PDT	0.14	1.4	N
DT 42	Muirton Rd (6)	R	338156	731294	NO ₂	Y	PDT	0.30	1.11	N

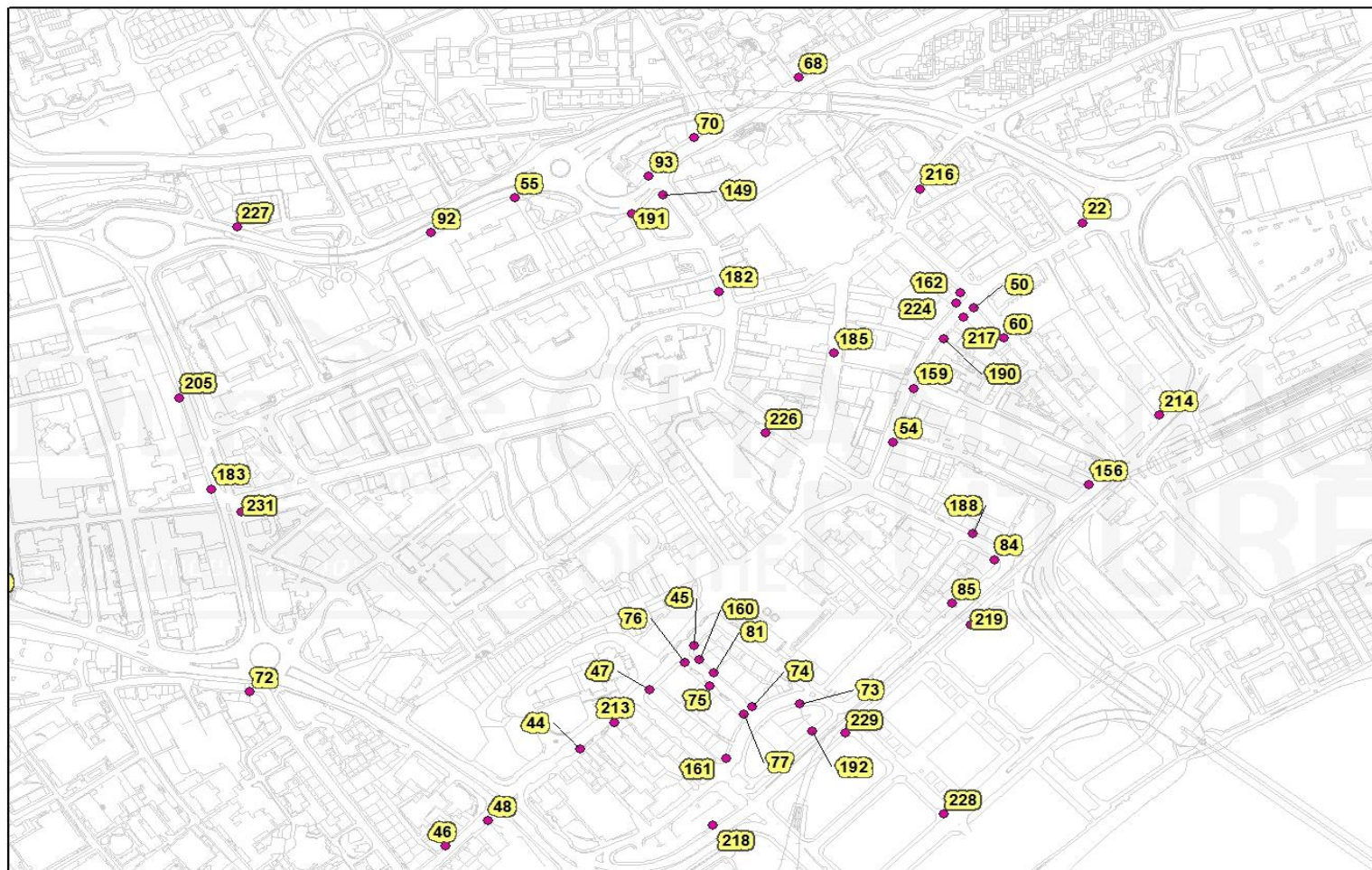
Site ID	Site Name	Site Type (1)	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ? (Y/N)	Monitoring Technique	Distance to Relevant Exposure ? (m) (2)	Distance to Kerb of Nearest Road (m) (3)	Tube collocated with a Continuous Analyser ?
DT 185	Murraygate (46)	UB	340409	730484	NO ₂	Y	PDT	n/a	n/a	N
DT 189	Myrekirk Rd (29)	R	335420	731726	NO ₂	Y	PDT	5.17	2.00	N
DT 45	Nethergate (6)	R	340274	730171	NO ₂	Y	PDT	2.51	1.25	N
DT 47	Nethergate (40)	R	340230	730124	NO ₂	Y	PDT	2.72	1.26	N
DT 44	Nethergate (88)	K	340163	730061	NO ₂	Y	PDT	5.00	0.86	N
DT 213	Nethergate (64)	R	340196	730089	NO ₂	Y	PDT	2.4	4.15	N
DT 48	Nethergate(132) / Marketgait	R	340074	729984	NO ₂	Y	PDT	3.60	1.33	N
DT 46	Nethergate (95)	K	340033	729957	NO ₂	Y	PDT	1.84	0.86	N
DT 207	Pitkerro Road (42)	R	341924	732235	NO ₂	Y	PDT	5.99	2.94	N
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 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 50	Seagate (101)	R	340545	730532	NO ₂	Y	PDT	0.19	1.94	N
DT 224	Seagate (112)	R	340528	730537	NO ₂	Y	PDT	0	2.64	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 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 56	St Andrews St (26)	K	340516	730584	NO ₂	Y	PDT	1.77	0.71	N
DT 59	Strathmore Avenue (353)	K	339609	731871	NO ₂	Y	PDT	1.45	0.67	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 219	Thomson Avenue (Street Sign)	R	340542	730194	NO ₂	Y	PDT	1.8	2.2	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 93	Victoria Rd (10b)	K	340230	730673	NO ₂	Y	PDT	2.70	0.30	N
DT 184	Victoria Rd (104) / William St	R	340697	730950	NO ₂	Y	PDT	1.50	1.36	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 71	Victoria St/Albert St	K	341071	731072	NO ₂	Y	PDT	1.70	0.75	N
DT 205	West Marketgait/ Old Mill (23)	R	339773	730436	NO ₂	Y	PDT	0.05	2.80	N
DT 183	West Marketgait / Guthrie St	R	339805	730338	NO ₂	Y	PDT	2.02	1.16	N
DT 72	Westport (2)	R	339842	730122	NO ₂	Y	PDT	2.50	0.46	N
DT 231	West Marketgait/ Ward Road	R	339834	730314	NO ₂	Y	PDT	0.0	2.70	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:

- (1) R=Roadside, K=Kerbside, UB=Urban Background, 'Kerb' is taken as being the edge of the carriageway with flowing traffic
- (2) 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 representative of a residential area).
- (3) n/a if not applicable (e.g.at background).
- (4) New sites are highlighted in green

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



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

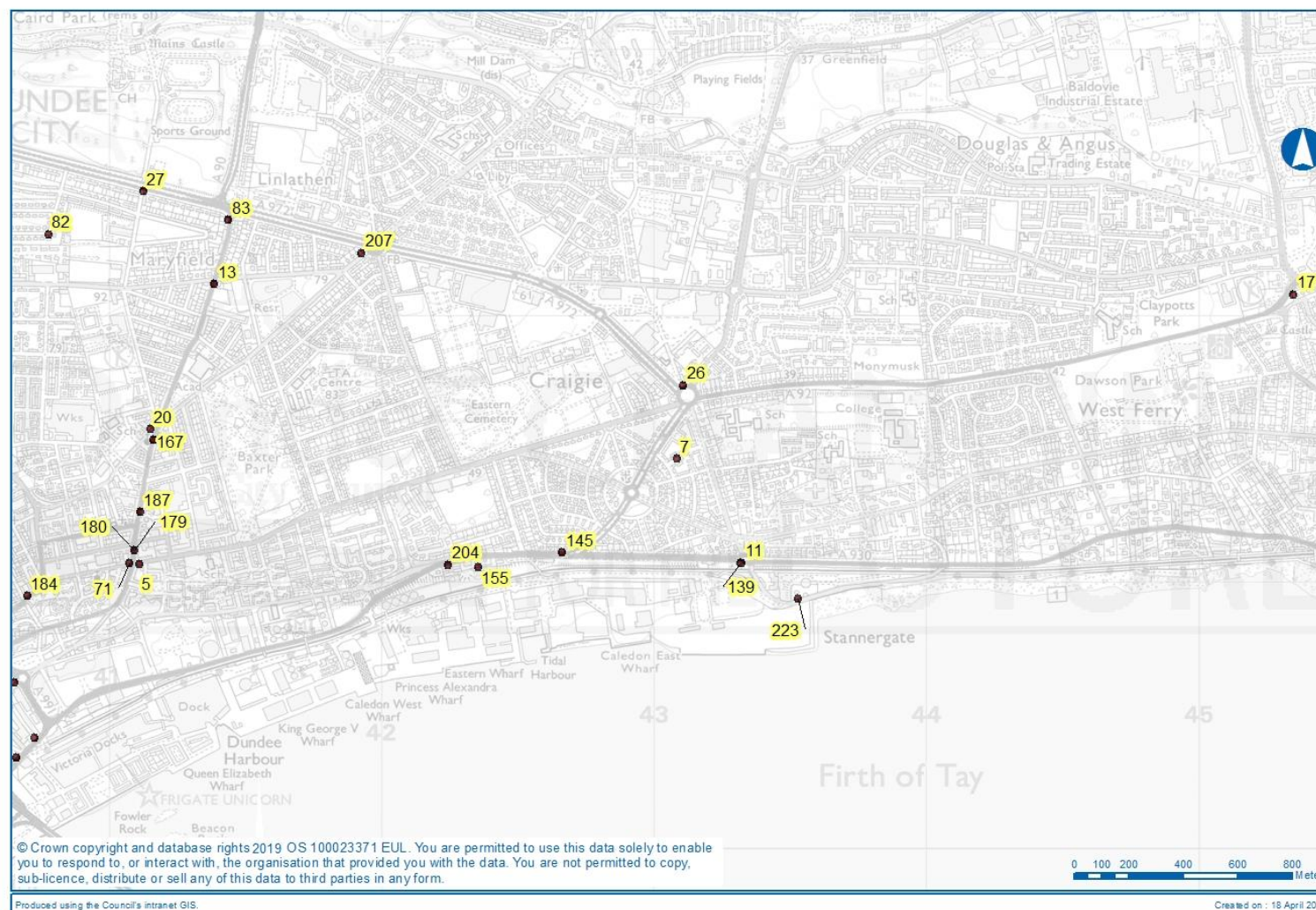


Figure A.2c NO₂ Diffusion Tube Locations (West)

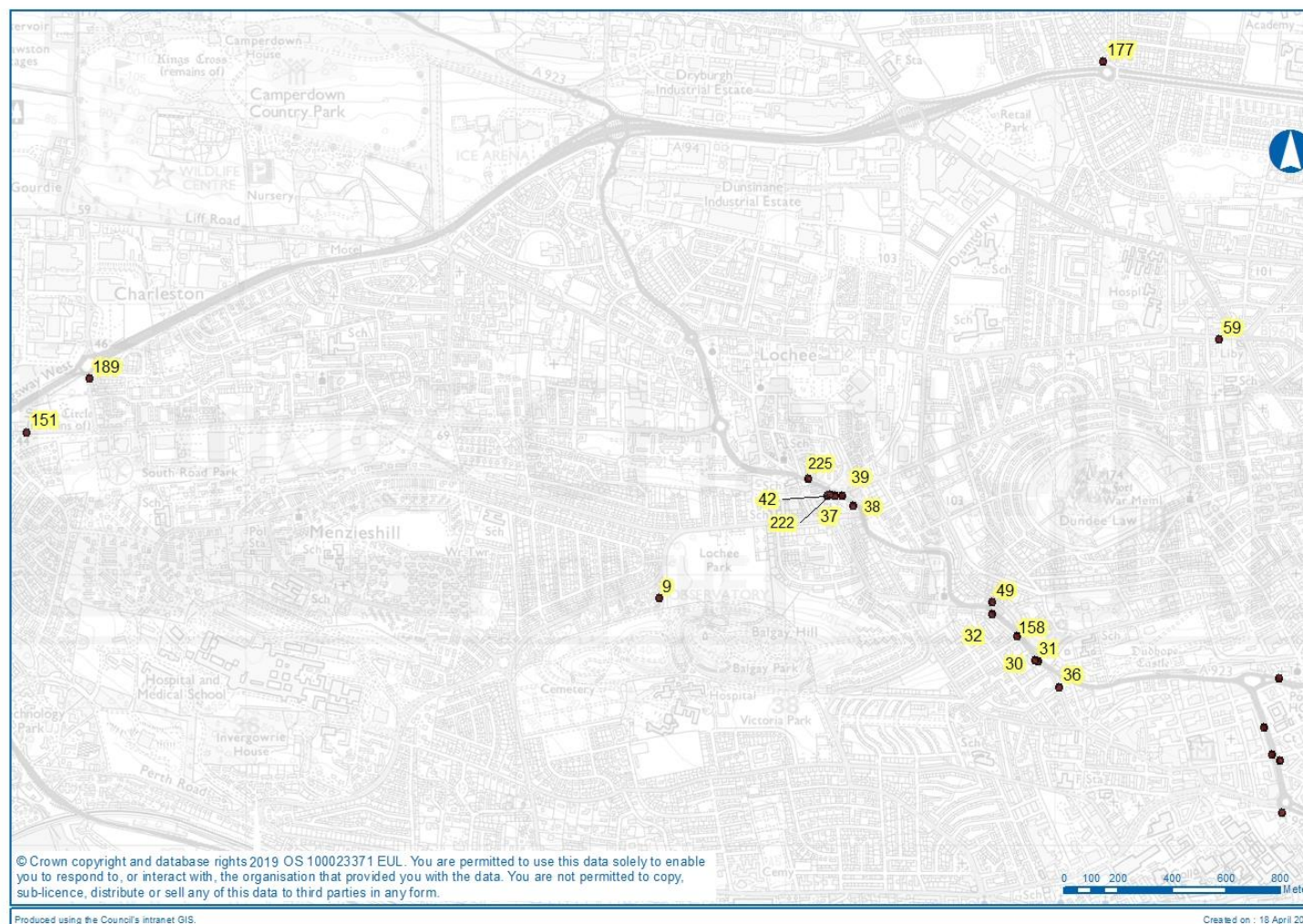


Table A.3 – Annual Mean NO₂ Monitoring Results

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2014	2015	2016	2017	2018
DT 92	Abertay 2	R	PDT	100.0	39.7	36.3	38.5	35.9	37.9
DT 179	Albert St (15) (Facade)	R	PDT	100.0	36.5	33.4	33.7	31.5	33.2
DT 180	Albert St (15) (Rdside)	K	PDT	100.0	38.0	35.5	35.5	33.0	35.1
DT 167	Albert St (191)	K	PDT	100.0	35.0	31.2	33.5	30.1	32.5
DT 187	Albert St (81)	K	PDT	100.0	31.1	30.3	31.3	27.9	29.7
DT 5	Arbroath Rd (13)	K	PDT	100.0	35.7	34.4	36.5	33.7	35.0
DT 168	Arbroath Rd (27)	R	PDT		32.4	29.5			
DT 147	Arbroath Rd (38)	K	PDT		34.3	33.7	35.0	34.3	
DT 212	Arbroath Rd (89)	R	PDT				29.4		
DT 7	Balgavies Place	UB	PDT	100.0	15.5	15.0	16.3	16.7	15.2
DT 9	Birnam Place	UB	PDT	100.0	9.6	8.7	9.5	9.9	9.3
DT 140	Broughty Ferry Rd (L/P 66)	R	PDT		30.6	32.0	33.1	33.5	
DT 164	Broughty Ferry Rd - Lower	UB	PDT		14.9	14.9	14.9	18.6	
DT 204	Broughty Ferry Rd (129)	R	PDT	100.0		38.3	36.0	38.2	40.1
DT 139	Broughty Ferry Rd (141 Downpipe)	R	PDT	100.0	31.1	32.3	33.3	34.0	31.1
DT 11	Broughty Ferry Rd (141)	R	PDT	100.0	36.5	35.4	40.4	40.0	36.4
DT 142	Broughty Ferry Rd (141) (St.Sign)	R	PDT		29.5	27.6			
DT 145	Broughty Ferry Rd (Greendykes)	R	PDT	100.0	34.3	31.8	35.0	34.1	33.6
DT 166	Broughty Ferry Rd LP 59(2)	R	PDT		24.0	21.1			
CM 3	Broughty Ferry Road	UI	Automatic	98.8			12.7	19.7	23.3
DT 223	Broughty Ferry Road Lower (Cyclesign)	UB	PDT	83.3				24.4	20.2
DT 186	Carolina Court 30 mph sign	R	PDT		25.0				

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2014	2015	2016	2017	2018
DT 155	Carolina Court LP6	UB	PDT	100.0	19.4	18.6	19.1	20.4	19.7
DT 171	Claypotts / Arbroath Rd (502)	R	PDT	100.0			26.6	29.1	25.9
DT 210	Cleghorn Street (57)	R	PDT				27.1		
DT 13	Clelington Rd/ Forfar Rd	K	PDT	100.0	33.6	36.5	31.8	30.6	30.6
DT 226	Commercial St (84)	R	PDT	100.0					26.2
DT 188	Commercial St (9)	R	PDT	100.0	39.4	35.6	37.4	34.2	35.1
DT 84	Commercial St/Dock St (40)	R	PDT	100.0	35.9	36.4	34.8	34.3	33.1
DT 175	Coupar Angus Rd (38)	R	PDT		29.8				
DT 203	Coupar Angus Rd/Sinclair St	R	PDT			23.1			
DT 192	Dock St (12)	R	PDT	100.0	25.8	25.9	26.1	25.8	25.9
DT 85	Dock St (21)	R	PDT	100.0	38.2	37.4	37.6	36.7	33.7
DT 156	Dock St (57)	R	PDT	100.0	51.7	51.4	49.3	49.4	46.4
DT 206	Drumgeith Road (2)	R	PDT				18.4	19.6	
DT 227	Dudhope Crescent Road (40)	K	PDT	100.0					39.3
DT 20	Dura St (100)	K	PDT	100.0	34.4	34.9	37.5	33.5	33.2
DT 214	East Dock Street (26)	R	PDT	100.0			34.7	31.8	31.6
DT 22	Eastport Roundabout	R	PDT	100.0	32.9	30.7	31.7	30.0	31.1
DT 83	Forfar Rd (104)	K	PDT	100.0	44.8	45.1	46.3	40.6	41.0
DT 211	Forfar Rd (83a)	R	PDT				31.3		
DT 225	Grays Lane (3)	R	PDT	91.7					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			31.6	30.2		
DT 193	Horsewater Wynd	K	PDT		21.9				

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2014	2015	2016	2017	2018
DT 216	King Street (3)	K	PDT	91.7			30.9	28.5	32.8
DT 177	Kingsway / Strathmartine Rd (279)	R	PDT	100.0	36.8	36.2	34.8	32.0	33.7
DT 26	Kingsway East Roundabout	R	PDT	91.7	38.8	36.1	37.2	37.9	38.3
DT 27	Kingsway/ Mains Loan	R	PDT	91.7	32.0	29.3	31.5	27.6	28.4
DT 30	Lochee Rd (138)	K	PDT	100.0	49.6	49.6	48.9	47.3	48.4
DT 31	Lochee Rd (140) Traffic Lts	R	PDT	91.7	51.1	50.3	53.0	48.1	48.8
DT 32	Lochee Rd (184)	K	PDT	100.0	34.4	36.2	35.1	34.5	33.7
DT 158	Lochee Rd (Romon) Average	K	PDT	100.0	43.1	44.8	43.8	42.6	43.1
CM 4	Lochee Rd Romon	R	Automatic	93.3	45.8	47.8	44.6	43.6	43.4
DT 36	Lochee Rd/Polepark Rd	K	PDT	100.0	28.9	28.1	27.6	26.7	25.4
DT 37	Logie St (114)	R	PDT	100.0	51.7	51.0	53.8	47.9	48.2
DT 38	Logie St (98)	K	PDT	100.0	33.1	32.3	34.3	32.9	31.5
DT 39	Loons Rd (1)	R	PDT	100.0	39.1	35.6	38.6	35.6	35.5
CM 12	Mains Loan	UB	Automatic	91.0	12.4	10.3	11.4	12.1	12.3
DT 182	Meadowside (28)	K	PDT	100.0	34.7	37.1	35.9	34.8	35.0
DT 149	Meadowside (Romon) Average	R	PDT	100.0	43.7	41.2	41.0	39.3	40.4
CM 14	Meadowside Romon	R	Automatic	92.8	39.6	38.2	35.9	34.8	34.3
DT 42	Muirton Rd (6)	R	PDT	100.0	29.2	25.0	26.6	23.4	25.0
DT 222	Muirton Road (2)	R	PDT	100.0				24.3	26.1
DT 185	Murraygate (46)	UB	PDT	100.0	23.9	21.4	21.2	20.0	21.0
DT 189	Myrekirk Rd (29)	R	PDT	100.0	31.7	32.2	33.7	30.7	29.4
DT 181	Myrekirk Terrace (8)	R	PDT		27.6				
DT 47	Nethergate (40)	R	PDT	100.0	42.8	37.4	35.4	33.8	36.7
DT 45	Nethergate (6)	R	PDT	100.0	40.4	38.2	36.8	35.7	37.2

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2014	2015	2016	2017	2018
DT 213	Nethergate (64)	R	PDT	100.0			38.4	34.6	37.6
DT 44	Nethergate (88)	K	PDT	100.0	50.9	42.7	41.9	39.1	41.3
DT 46	Nethergate (95)	K	PDT	100.0	32.2	31.0	30.5	29.0	30.2
DT 48	Nethergate(132) / Marketgait	R	PDT	100.0	29.3	28.6	29.9	27.8	28.4
DT 91	Perth Rd (320)	K	PDT		35.1	34.0			
DT 207	Pitkerro Road (42)	R	PDT	100.0			32.6	32.5	33.0
DT 49	Rankine St (2)	R	PDT	91.7	38.1	40.2	36.5	39.3	38.5
DT 228	Riverside Esplanade/ S.Crichton St	R	PDT	100.0					29.1
CM 5	Seagate	R	Automatic	93.1	54.5	49.9	47.0	44.3	45.9
DT 50	Seagate (101)	R	PDT	50.0	40.8	39.6	38.7	35.5	38.3
DT 224	Seagate (112)	R	PDT	100.0				34.1	37.6
DT 54	Seagate (9)	R	PDT	100.0	36.0	32.8	33.2	30.3	29.5
DT 190	Seagate (97)	R	PDT	100.0	46.5	44.6	41.8	38.7	41.7
DT 217	Seagate (99)	R	PDT	83.3				42.5	41.3
DT 159	Seagate(Romon) Average	K	PDT	100.0	45.5	42.3	41.3	38.4	40.0
DT 55	Soapwork Lane	R	PDT	100.0	31.9	32.0	35.4	33.9	34.2
DT 218	South Marketgait (Lampost 18)	R	PDT	100.0				30.0	32.4
DT 151	South Rd (1 Denbank)	R	PDT	100.0	33.2	32.5	33.4	33.6	32.5
DT 56	St Andrews St (26)	K	PDT		35.3	28.9	30.9	29.0	
DT 162	St Andrews St PB (façade)	R	PDT	100.0	36.3	34.9	35.1	32.8	33.7
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	100.0	38.8	35.9	39.4	33.2	32.4
DT 219	Thomson Avenue (Street Sign)	R	PDT	100.0				31.1	31.6

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2014	2015	2016	2017	2018
DT 229	Thomson Avenue/ S. Crichton St	K	PDT	100.0					28.9
DT 60	Trades Lane (31)	K	PDT	100.0	27.3	27.7	27.4	26.3	25.3
DT 61	Union St (Rollalong) Average	R	PDT		32.0	32.4			
CM 2	Union St Rollalong	R	Automatic		28.4	28.0			
DT 184	Victoria Rd (104) / William St	R	PDT	100.0	30.7	27.3	29.7	27.4	28.4
DT 93	Victoria Rd (10b)	K	PDT	100.0	30.6	29.3	31.7	29.8	31.5
DT 191	Victoria Rd (4) - India Buildings	R	PDT	100.0	31.8	29.7	30.2	28.6	29.3
DT 68	Victoria Rd (60)	R	PDT	100.0	37.5	34.9	34.7	33.0	33.4
DT 70	Victoria Rd/Hilltown	R	PDT	100.0	51.5	54.1	50.8	51.5	49.2
DT 71	Victoria St/Albert St	K	PDT	100.0	30.0	27.6	30.9	28.0	28.0
DT 183	West Marketgait / Guthrie St	R	PDT	100.0	46.1	46.8	46.1	44.1	41.4
DT 231	West Marketgait/ Ward Road	R	PDT	41.7					31.2
DT 205	West Marketgait/Old Mill (23)	R	PDT	100.0		54.0	51.6	45.1	47.0
DT 72	Westport (2)	R	PDT	75.0	36.3	33.0	31.2	33.1	31.5
DT 73	Whitehall Cr (4)	K	PDT	100.0	36.3	35.6	33.7	33.2	32.3
DT 161	Whitehall Cr /Union St (50)	K	PDT	100.0	30.5	25.0	24.9	24.4	24.1
DT 76	Whitehall St (1)	K	PDT	100.0	45.9	44.1	43.0	40.9	42.5
DT 81	Whitehall St (12)	R	PDT	100.0	40.8	34.5	35.0	34.5	38.4
DT 77	Whitehall St (15)	K	PDT	100.0	36.1	32.5	32.3	31.8	32.9
DT 74	Whitehall St (40)	K	PDT	100.0	39.5	35.6	35.2	33.7	36.8
DT 75	Whitehall St (5)	R	PDT	100.0	44.1	44.2	40.1	39.5	39.3
DT 160	Whitehall St (Romon) Average	R	PDT	100.0	42.2	36.5	36.6	35.0	38.3
CM 6	Whitehall St Romon	R	Automatic	94.4	42.5	36.3	37.2	35.3	37.5
DT 82	Woodside Ave	UB	PDT	100.0	14.9	13.2	13.7	13.3	13.4

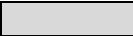
-
- Notes:** Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**. Borderline values are shown in orange.
 NO₂ annual means exceeding 60µg/m³, indicating a potential exceedence of the NO₂ 1-hour mean objective are shown in **bold and underlined**.
- (1) R=Roadside, K=Kerbside, 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 NO₂ at Automatic monitors

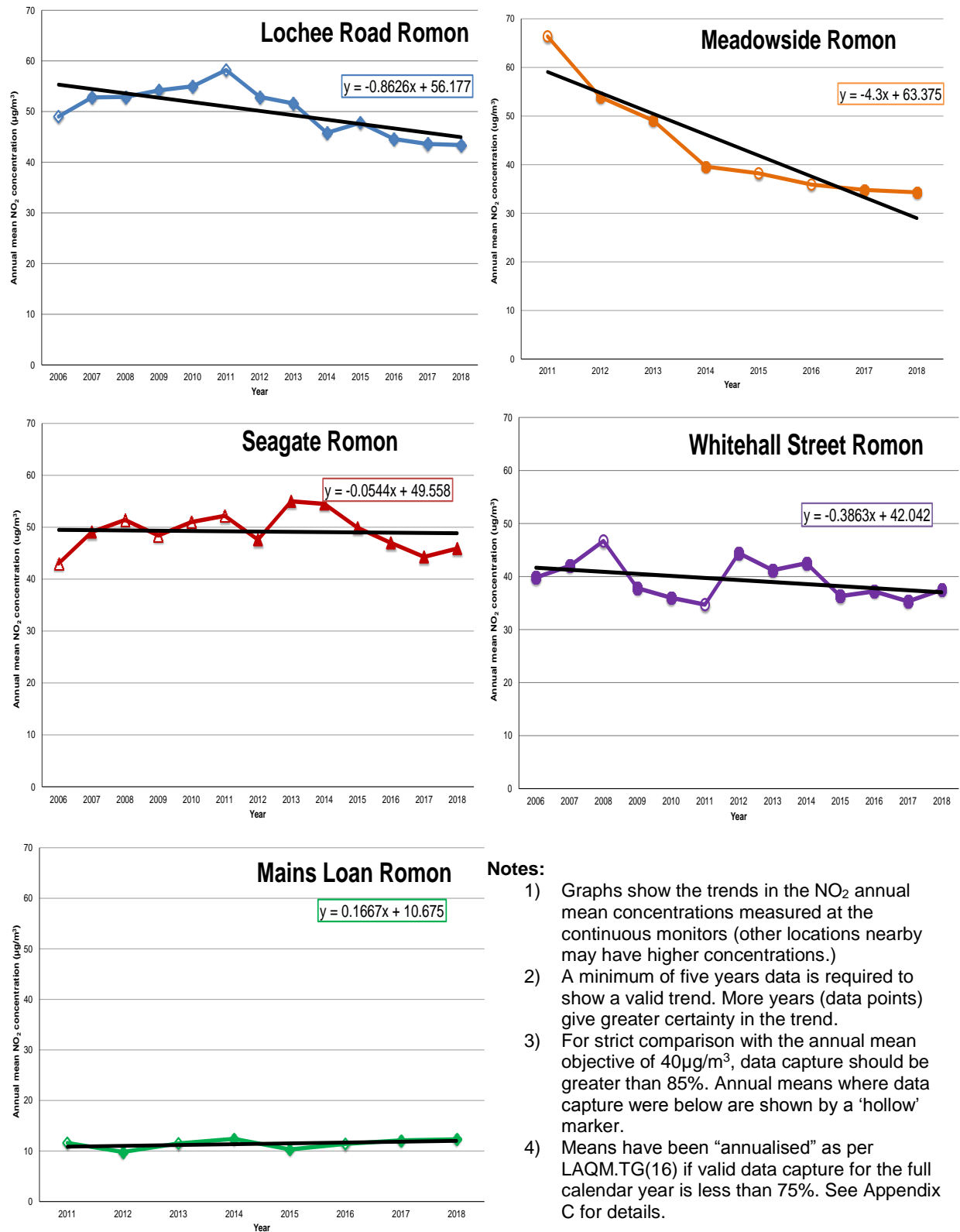


Figure A.3b Trend Analysis at Long-term NO₂ Monitoring Locations

Site Id.	Location	Site Type	No. of years for trend	Trend
CM 14	Meadowside	R	8	-4.30
DT 190	Seagate (97)	R	6	-3.27
DT 149	Meadowside (Romon) Average	R	8	-2.72
DT 188	Commercial St (9)	R	6	-1.53
DT 183	West Marketgait / Guthrie St	R	6	-1.51
DT 161	Whitehall Cr /Union St (50)	K	7	-1.23
DT 177	Kingsway / Strathmartine Rd (279)	R	6	-1.12
DT 185	Murraygate (46)	UB	6	-1.03
DT 92	Abertay 2	R	10	-0.94
DT 167	Albert St (191)	K	6	-0.92
DT 184	Victoria Rd (104) / William St	R	6	-0.92
DT 93	Victoria Rd (10b)	K	10	-0.92
DT 162	St Andrews St PB (façade)	R	7	-0.91
DT 179	Albert St (15) (Façade)	R	6	-0.90
CM 4	Lochee Road	R	13	-0.87
DT 180	Albert St (15) (Rdside)	K	6	-0.86
DT 189	Myrekirk Rd (29)	R	6	-0.81
DT 46	Nethergate (95)	K	13	-0.77
DT 54	Seagate (9)	R	13	-0.74
DT 191	Victoria Rd (4) - India Buildings	R	6	-0.74
DT 159	Seagate(Romon) Average	K	13	-0.71
DT 75	Whitehall St (5)	R	13	-0.68
DT 60	Trades Lane (31)	K	13	-0.66
DT 68	Victoria Rd (60)	R	13	-0.66
DT 72	Westport (2)	R	13	-0.60
DT 139	Broughty Ferry Rd (141 Downpipe)	R	8	-0.60
DT 71	Victoria St/Albert St	K	13	-0.60
DT 187	Albert St (81)	K	6	-0.55
DT 13	Cleington Rd/ Forfar Rd	K	13	-0.54
DT 48	Nethergate (132) / Marketgait	R	13	-0.54
DT 182	Meadowside (28)	K	6	-0.52
DT 5	Arbroath Rd (13)	K	13	-0.51
DT 84	Commercial St/Dock St (40)	R	13	-0.50
DT 27	Kingsway/ Mains Loan	R	13	-0.49
DT 20	Dura St (100)	K	13	-0.49
DT 50	Seagate (101)	R	13	-0.46
DT 39	Loons Rd (1)	R	13	-0.45

Site Id.	Location	Site Type	No. of years for trend	Trend
DT 30	Lochee Rd (138)	K	13	-0.45
DT 70	Victoria Rd/Hilltown	R	13	-0.43
DT 151	South Rd (1 Denbank)	R	8	-0.43
DT 158	Lochee Rd (Romon) Average	K	13	-0.42
DT 82	Woodside Ave	UB	13	-0.41
DT 36	Lochee Rd/Polepark Rd	K	13	-0.41
DT 155	Carolina Court LP8	UB	7	-0.40
CM 6	Whitehall Street	R	13	-0.39
DT 11	Broughty Ferry Rd (141)	R	13	-0.38
DT 83	Forfar Rd (104)	K	13	-0.37
DT 59	Strathmore Avenue (353)	K	13	-0.36
DT 77	Whitehall St (15)	K	13	-0.35
DT 37	Logie St (114)	R	13	-0.32
DT 42	Muirton Rd (6)	R	13	-0.31
DT 22	Eastport Roundabout	R	13	-0.30
DT 31	Lochee Rd (140) Traffic Lts	R	13	-0.30
DT 47	Nethergate (40)	R	13	-0.28
DT 44	Nethergate (88)	K	13	-0.27
DT 32	Lochee Rd (184)	K	13	-0.26
DT 26	Kingsway East Roundabout	R	13	-0.20
DT 81	Whitehall St (12)	R	13	-0.19
DT 7	Balgavies Place	UB	13	-0.18
DT 45	Nethergate (6)	R	13	-0.16
DT 158	Dock St (57)	R	8	-0.14
DT 9	Binnam Place	UB	13	-0.14
DT 145	Broughty Ferry Rd (Greendykes)	R	8	-0.13
DT 38	Logie St (98)	K	13	-0.12
DT 49	Rankine St (2)	R	13	-0.09
DT 85	Dock St (21)	R	13	-0.08
DT 76	Whitehall St (1)	K	13	-0.06
CM 5	Seagate	R	13	-0.05
DT 192	Dock St (12)	R	5	-0.01
DT 160	Whitehall St (Romon) Average	R	13	0.00
DT 55	Soapwork Lane	R	13	0.00
DT 74	Whitehall St (40)	K	13	0.10
CM 12	Mains Loan	UB	8	0.17
DT 73	Whitehall Cr (4)	K	13	0.55

- Note:**
- (1) Locations where the 2018 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

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ 1-Hour Means > 200µg/m ³ ⁽³⁾				
					2014	2015	2016	2017	2018
CM3	Broughty Ferry Rd	UI	Automatic	98.8	n/a	n/a	0	0	0
CM4	Lochee Rd Romon	R	Automatic	99.3	0	0	4	6	6
CM12	Mains Loan	UB	Automatic	91.0	0	0	0 (77.2)	1	0
CM14	Meadowside Romon	R	Automatic	92.8	0	0 (109.5)	0 (102.4)	0	0
CM5	Seagate	R	Automatic	93.1	0	0	0	0	0
CM2	Union St Rollalong	R	Automatic	n/a	0	0	n/a	n/a	n/a
CM6	Whitehall St Romon	R	Automatic	94.4	0	0	0	0	0

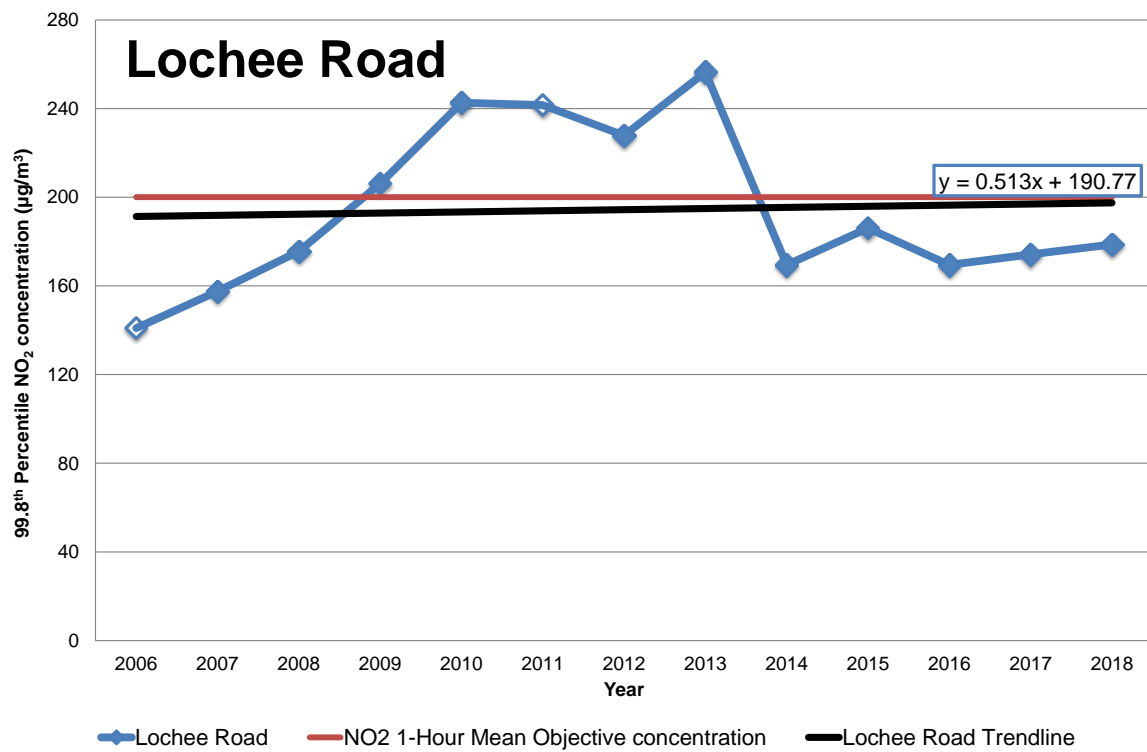
Notes: Exceedances of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

(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



Note: Hollow data points indicate those years when the valid data capture was less than 85%

Table A.5 – Annual Mean PM₁₀ Monitoring Results

Site ID	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2018 (%) ⁽²⁾	PM ₁₀ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2014	2015	2016	2017	2018
CM 2	Union St (TEOM/BAM)	R	Automatic	n/a	16.5	16.8	n/a	n/a	n/a
CM 6	Whitehall Street (BAM)	R	Automatic	87.0	n/a	n/a	15.1	14.7	15.7
CM 3	Broughty Ferry Rd (TEOM)	UI	Automatic	82.8	14.7	12.6	12.1	11.4	12.3*
CM 13	Broughty Ferry Rd (Partisol)	UI	Automatic	99.7	14.5	12.6	11.5	11.1	11.2
CM 16	Broughty Ferry Rd (Osiris)	UI	Automatic	82.0	14.6	12.1	11.5	11.1	11.3*
CM 12	Mains Loan (TEOM/Fidas)	UB	Automatic	99.2	12.9	11.9	10.0	9.5	9.1
CM 5	Seagate (BAM)	R	Automatic	89.8	17.7	14.5	13.7	15.8	15.6
CM 14	Meadowside (BAM)	R	Automatic	91.1	16.6	16.1	16.4	14.7	15.3
CM 4	Lochee Rd (BAM/Fidas)	R	Automatic	98.6	18.6	19.8	18.9	17.5	12.6
CM 9	Logie St (Osiris)	K	Automatic	87.9	16.1	15.5	13.8	14.5	18.9
CM 17	Myrekirk Tce (Osiris)	R	Automatic	87.1	18.3	18.4	15.6	12.0	13.5
CM 15	Albert St (Osiris)	K	Automatic	84.9	21.4	19.0	15.4	14.3	17.5*
CM 18	Stannergate (Osiris)	R	Automatic	81.6	26.7	26.9	20.8	14.0	11.9*

Notes: (1) Exceedances of the PM₁₀ annual mean objective of 18µg/m³ are shown in **bold** (borderline values are **orange**).
(2) R=Roadside, K=Kerbside, UB=Urban Background, UI=Urban Industrial
(3) 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%).
(4) 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

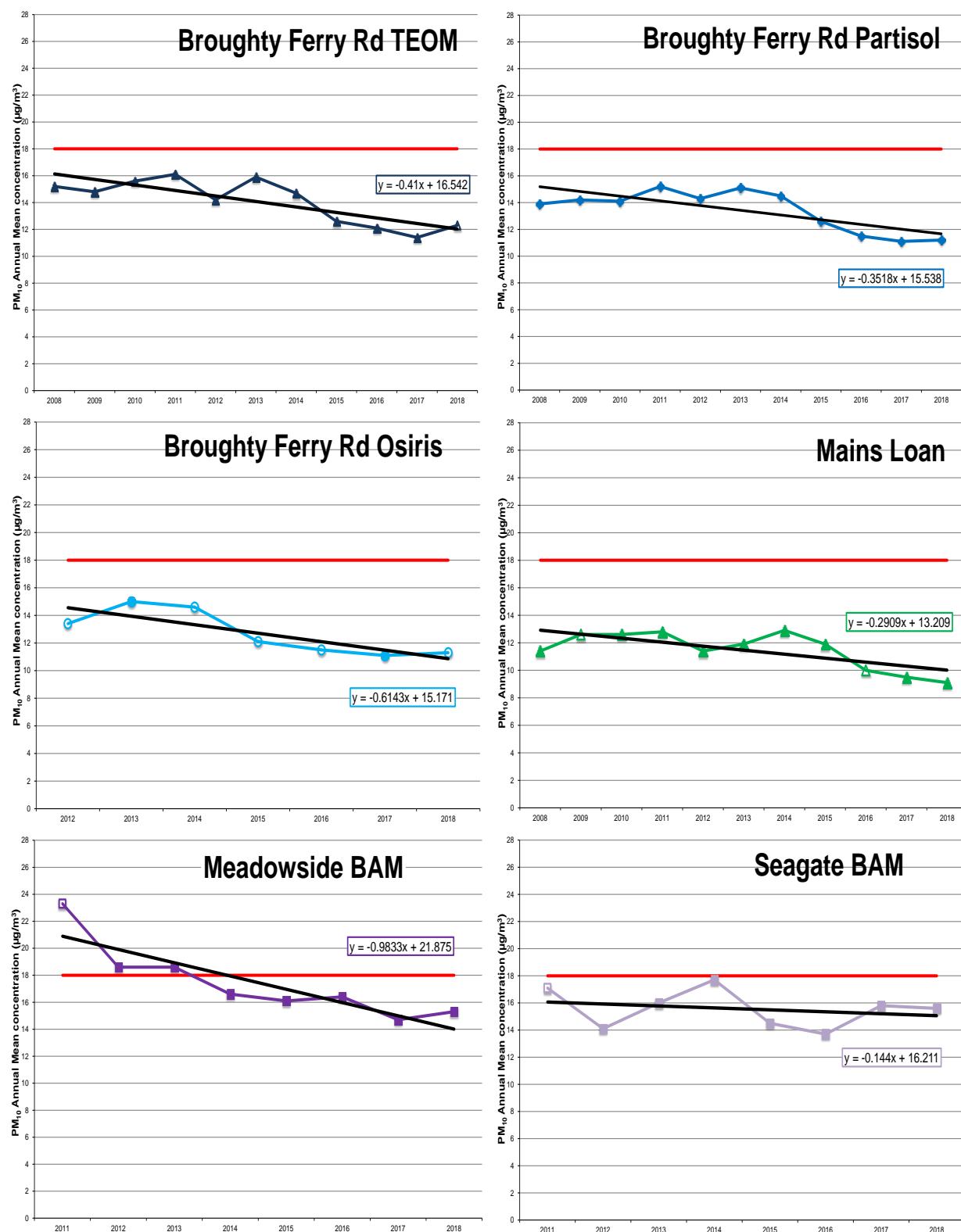
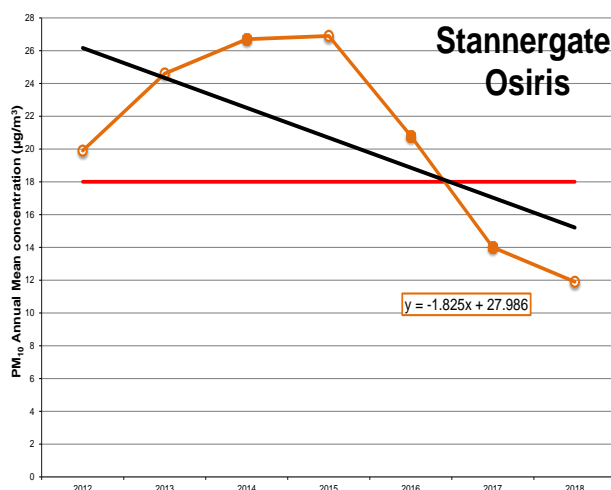
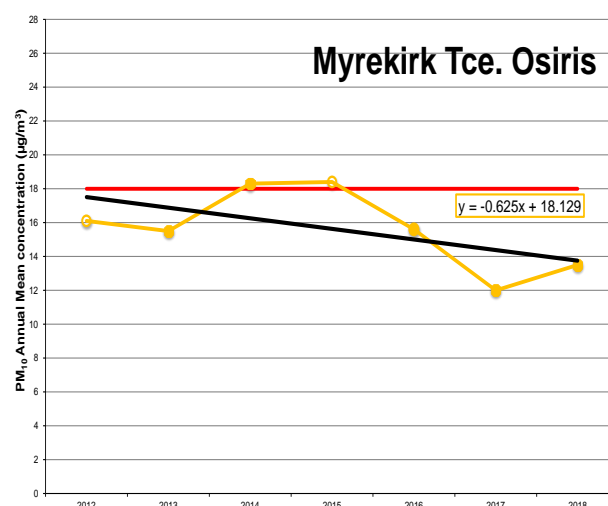
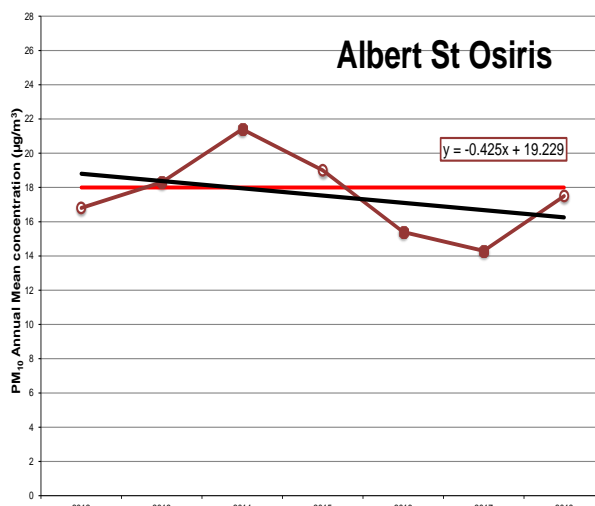
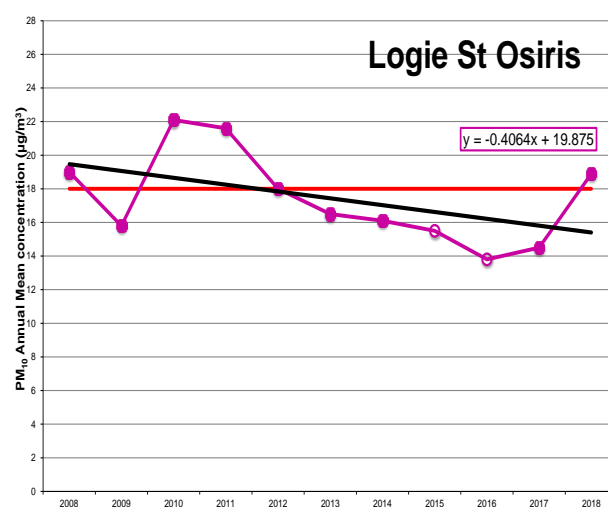
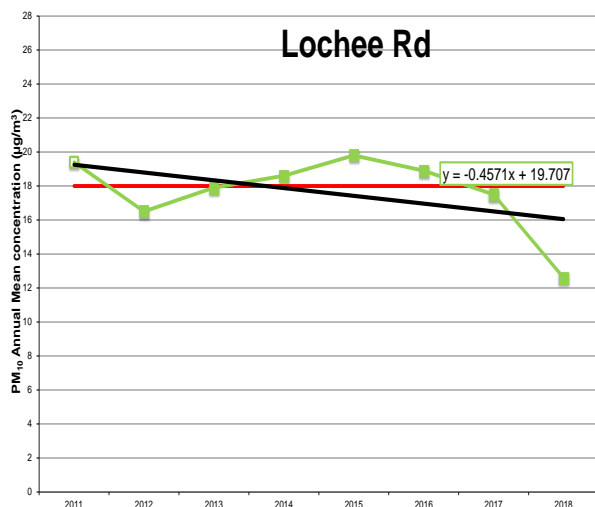


Figure A5.b Trends in Annual Mean PM₁₀ concentrations at Automatic monitors



Notes:

- 1) Graphs show the trends (shown as **black** lines) in the PM₁₀ annual mean concentrations measured by the continuous analysers.
- 2) A minimum of five years data is required to show a valid trend. More years (data points) generally 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 as the **red** line), valid data capture should be greater than 85%. Annual means where data capture were below are shown by "hollow" markers.
- 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⁾	No. of years for trend	Trend ⁽²⁾
CM 18	Stannergate (Osiris)	7	-1.825
CM 14	Meadowside (BAM)	8	-0.983
CM 17	Myrekirk Tce (Osiris)	7	-0.625
CM 16	Broughty Ferry Rd (Osiris)	7	-0.614
CM 4	Lochee Rd (BAM/Fidas)	8	-0.457
CM 15	Albert St (Osiris)	7	-0.425
CM 3	Broughty Ferry Rd (TEOM)	11	-0.410
CM 9	Logie St (Osiris)	11	-0.406
CM 13	Broughty Ferry Rd (Partisol)	11	-0.352
CM 12	Mains Loan (TEOM/Fidas)	11	-0.291
CM 5	Seagate (BAM)	8	-0.144

Notes: (1) Locations where the 2018 PM₁₀ annual mean is exceeded are shown in **bold**, borderline locations are orange

(2) 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

Site ID	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2018 (%) ⁽²⁾	PM ₁₀ 24-Hour Means > 50µg/m ³ ⁽³⁾				
					2014	2015	2016	2017	2018
CM 2	Union St (TEOM/BAM)	R	Automatic	n/a	2	7	n/a	n/a	n/a
CM 6	Whitehall Street (BAM)	R	Automatic	84.4	n/a	n/a	1	1	4 (39.8)
CM 3	Broughty Ferry Rd (TEOM)	UI	Automatic	84.7	1	2	0	0	0 (25.6)
CM 13	Broughty Ferry Rd (Partisol)	UI	Automatic	99.7	1	0	0	0	0
CM 16	Broughty Ferry Rd (Osiris)	UI	Automatic	81.6	3 (40.7)	2 (35.4)	1 (26.2)	0	1 (34.2)
CM 12	Mains Loan (TEOM/Fidas)	UB	Automatic	99.7	1	1	0 (27.5)	0	0
CM 5	Seagate (BAM)	R	Automatic	89.6	3	3	0	3	1
CM 14	Meadowside (BAM)	R	Automatic	90.4	2	4	3	1	4
CM 4	Lochee Rd (BAM/Fidas)	R	Automatic	98.6	1	5	2	4	1
CM 9	Logie St (Osiris)	K	Automatic	87.7	2	4 (39.2)	0 (28.6)	2	11
CM 17	Myrekirk Tce (Osiris)	R	Automatic	86.8	3	7 (54.2)	1	0	2
CM 15	Albert St (Osiris)	K	Automatic	84.4	14	8 (63.9)	2	3	5 (46.0)
CM 18	Stannergate (Osiris)	R	Automatic	81.1	16	15 (72.3)	4	2	0 (25.7)

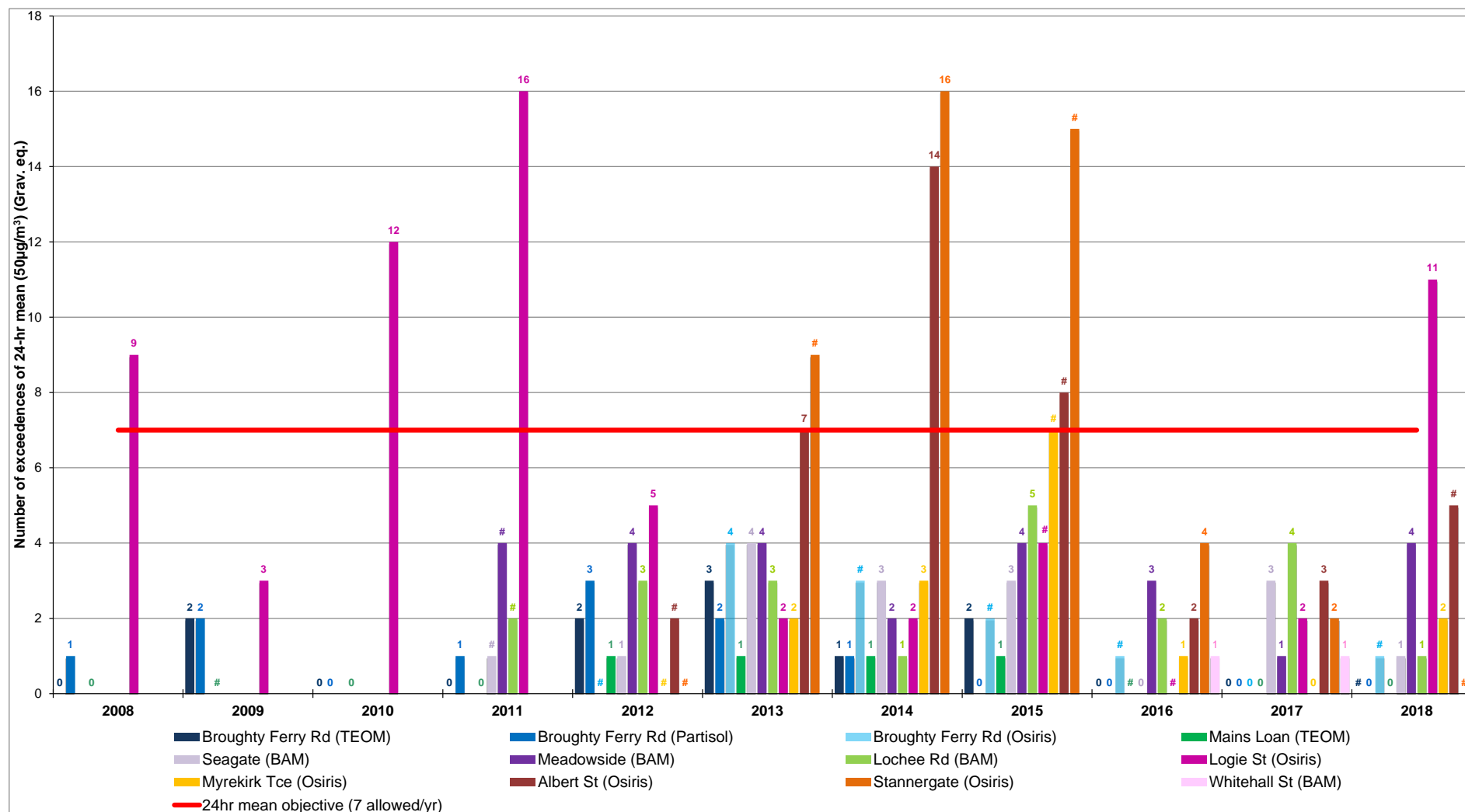
Notes: Exceedances of the PM₁₀ 24-hour mean objective (50µg/m³ not to be exceeded more than 7 times/year) are shown in **bold**.

(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 A.6a Frequency of Exceedances of PM₁₀ 24 hour Mean Objective (50µg/m³, 7 allowed) 2008-2018



Note: # denotes that the actual number of exceedances is unknown as the data capture was less than 85%

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

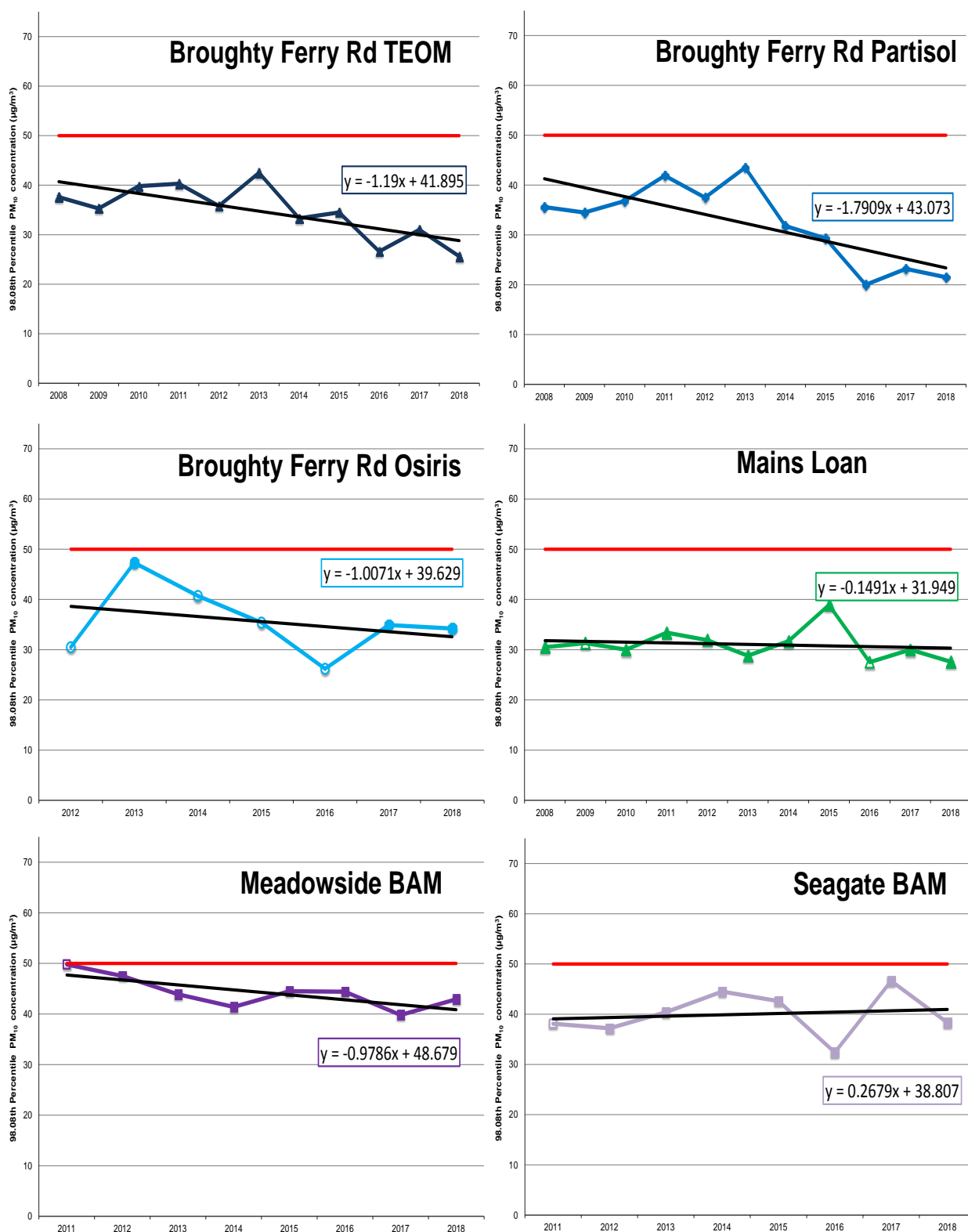


Figure A6.c Trends in 98.08th percentile PM₁₀ concentrations at Automatic monitors

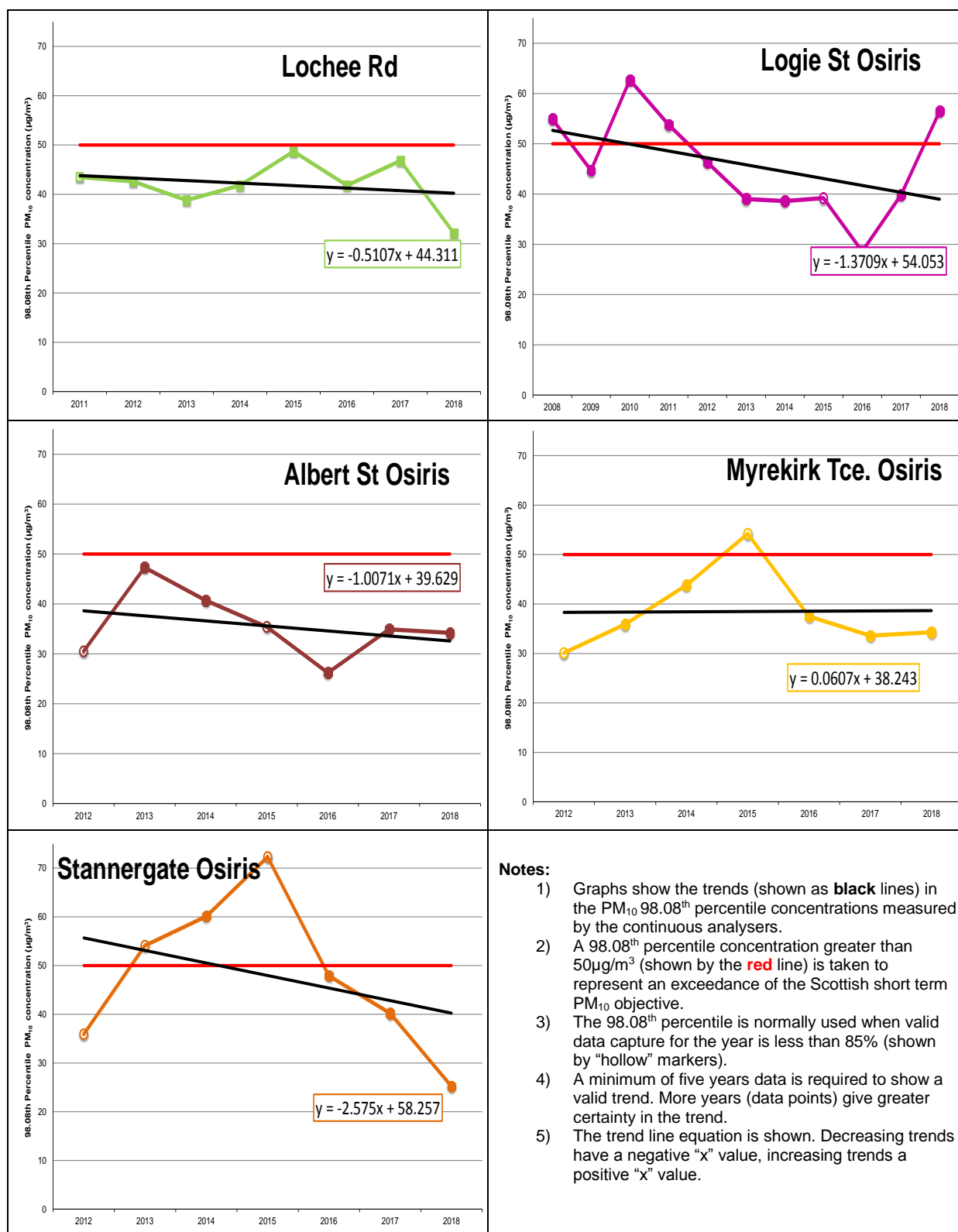


Table A.7 – Annual Mean PM_{2.5} Monitoring Results

Site ID	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2018 (%) ⁽²⁾	PM2.5 Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2014	2015	2016	2017	2018
CM 12	Mains Loan (Fidas)	UB	Automatic	99.5	n/a	n/a	n/a	n/a	5.5
CM 4	Lochee Rd (Fidas)	R	Automatic	77.4	n/a	n/a	n/a	n/a	5.7

Notes: Exceedances of the PM_{2.5} annual mean objective of 10µg/m³ are shown in **bold**.

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO₂ Monthly Diffusion Tube Results for 2018

Site Id. (DT)	Location	x	y	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.84)
92	Abertay 2	340019	730612	54.3	55.2	44.1	46.9	54.7	37.0	35.9	35.4	31.2	41.2	55.4	49.8	45.1	100.0	1.0	45.1	37.9
179	Albert St (15)(Façade)	341092	731121	46.2	47.3	43.8	44.2	49.8	30.2	35.1	31.2	26.8	37.8	38.3	43.9	39.6	100.0	1.0	39.6	33.2
180	Albert St (15)(Roadside)	341091	731121	48.6	50.7	39.4	41.8	51.0	37.7	36.0	33.1	27.4	39.7	48.6	46.8	41.7	100.0	1.0	41.7	35.1
187	Albert St (81)	341113	731265	43.7	44.2	31.9	36.9	37.6	28.8	29.9	29.1	23.9	32.1	43.2	43.1	35.4	100.0	1.0	35.4	29.7
167	Albert St (191)	341161	731535	47.4	48.0	43.3	44.8	46.5	28.3	30.2	29.3	20.4	34.0	51.0	41.2	38.7	100.0	1.0	38.7	32.5
5	Arbroath Rd (13)	341111	731070	58.3	51.7	36.5	38.5	41.4	29.3	34.3	40.8	34.6	43.9	48.2	42.5	41.7	100.0	1.0	41.7	35.0
7	Balgavies PI	343082	731465	32.6	24.8	15.4	16.0	13.4	7.7	9.9	14.3	14.0	18.9	22.6	27.4	18.1	100.0	1.0	18.1	15.2
9	Birnam PI	337531	730914	16.8	13.9	12.6	9.6	9.4	6.5	5.7	8.1	7.6	11.3	16.1	15.9	11.1	100.0	1.0	11.1	9.3
223	B/ Ferry Rd Lower (Cyclesign)	343530	730937	36.1	26.1	15.0	14.9	M	8.7	13.2	M	27.8	38.7	26.5	33.4	24.0	83.3	1.0	24.0	20.2
139	B/Ferry Rd (141) Downpipe	343317	731072	54.8	44.8	32.1	37.1	32.4	24.2	27.9	29.7	35.7	40.7	37.4	47.9	37.1	100.0	1.0	37.1	31.1
11	Broughty Ferry Rd (141)	343322	731073	58.8	48.8	39.0	42.8	36.9	32.4	37.2	42.4	43.4	50.7	40.2	47.0	43.3	100.0	1.0	43.3	36.4
145	B/Ferry Rd Greendykes	342662	731112	54.1	49.3	34.9	36.7	40.8	24.9	33.3	36.0	32.6	40.4	45.4	51.1	40.0	100.0	1.0	40.0	33.6
204	B/Ferry Rd (129)	342244	731066	67.3	54.4	46.9	49.3	48.4	39.2	41.7	37.5	31.8	45.2	56.8	54.8	47.8	100.0	1.0	47.8	40.1
155	Carolina Court Lp6	342353	731058	39.1	29.8	22.1	22.3	15.6	10.9	14.2	19.4	16.9	27.0	29.6	34.7	23.5	100.0	1.0	23.5	19.7
171	Claypotts / Arbroath Rd (502)	345347	732080	53.8	33.3	28.7	27.7	21.6	14.9	18.0	29.3	32.7	34.7	31.2	44.4	30.9	100.0	1.0	30.9	25.9
13	Cleington Rd/ Forfar Rd	341385	732121	50.5	48.2	34.7	36.8	28.8	20.1	24.6	31.3	29.0	42.8	43.8	46.2	36.4	100.0	1.0	36.4	30.6
188	Commercial St (9)	340544	730291	48.1	48.5	44.5	47.3	46.0	35.9	33.8	31.2	30.1	41.3	48.0	47.0	41.8	100.0	1.0	41.8	35.1
226	Commercial St (84)	340343	730399	42.7	37.7	31.4	32.4	31.0	20.4	23.9	25.3	25.2	33.2	34.6	36.8	31.2	100.0	1.0	31.2	26.2
84	Commercial St /Dock St (40)	340565	730263	51.9	45.6	38.6	43.6	37.2	29.1	29.1	34.0	34.8	42.2	41.3	45.5	39.4	100.0	1.0	39.4	33.1

Dundee City Council

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192	Dock St (12)	340389	730079	40.2	39.2	35.5	38.9	29.8	20.1	21.1	22.4	22.0	31.6	32.8	35.9	30.8	100.0	1.0	30.8	25.9
85	Dock St (21)	340524	730216	46.1	37.3	39.5	46.8	38.8	30.0	32.8	40.6	36.6	45.8	42.0	45.6	40.2	100.0	1.0	40.2	33.7
156	Dock St (57)	340656	730343	78.8	64.2	46.5	57.1	52.7	39.2	41.5	50.0	52.6	57.2	57.8	64.8	55.2	100.0	1.0	55.2	46.4
227	Dudhope Crescent Road (40)	339830	730619	64.7	57.2	38.1	43.5	43.1	28.6	35.9	40.7	43.0	52.3	53.6	60.4	46.8	100.0	1.0	46.8	39.3
20	Dura St (100)	341150	731576	53.7	48.3	35.4	39.6	38.1	28.4	30.6	32.9	33.6	41.0	44.8	47.3	39.5	100.0	1.0	39.5	33.2
214	East Dock St (26)	340725	730417	47.5	44.5	39.5	39.2	38.8	27.8	29.6	33.3	28.2	37.6	38.1	47.1	37.6	100.0	1.0	37.6	31.6
22	Eastport Roundabout	340651	730623	46.7	42.3	37.6	39.9	39.8	30.3	27.5	29.6	28.2	39.7	39.4	42.6	37.0	100.0	1.0	37.0	31.1
83	Forfar Rd (104)	341437	732360	65.4	53.3	41.0	49.3	48.0	35.7	38.2	46.6	47.2	52.1	52.3	56.8	48.8	100.0	1.0	48.8	41.0
225	Grays Lane (3)	338086	731355	35.0	34.3	21.6	19.9	24.5	M	13.0	18.4	18.0	25.7	31.6	38.6	25.5	91.7	1.0	25.5	21.4
216	King Street (3)	340493	730659	46.1	42.9	44.4	40.6	45.9	M	30.1	27.5	23.8	37.2	47.6	42.8	39.0	91.7	1.0	39.0	32.8
26	Kingsway East Roundabout	343107	731740	64.1	53.9	38.4	40.1	41.4	M	38.6	42.4	36.9	45.8	48.6	51.1	45.6	91.7	1.0	45.6	38.3
27	Kingsway/ Mains Loan	341124	732468	37.9	39.5	40.5	37.3	M	30.8	27.2	22.6	19.7	30.8	44.2	41.2	33.8	91.7	1.0	33.8	28.4
177	Kingsway/Strathmartine Rd (N)	339179	732896	59.1	51.5	33.0	34.0	38.8	27.8	32.8	36.2	34.9	40.4	41.0	51.5	40.1	100.0	1.0	40.1	33.7
30	Lochee Rd (138)	338936	730680	73.8	69.0	50.0	51.1	58.2	45.2	45.9	53.1	55.6	61.9	56.7	71.4	57.7	100.0	1.0	57.7	48.4
31	Lochee Rd (140)(Traffic Lts)	338927	730685	M	71.8	47.5	52.6	60.7	51.0	50.0	54.6	57.0	62.1	59.8	72.1	58.1	91.7	1.0	58.1	48.8
32	Lochee Rd (184)	338767	730856	59.8	51.6	34.4	32.9	38.2	29.0	26.0	35.1	35.2	44.7	41.3	53.7	40.2	100.0	1.0	40.2	33.7
	Lochee Rd (Romon 1)			69.4	63.3	43.6	46.7	49.4	38.5	37.7	45.4	46.2	56.5	45.0	64.2	50.5	100.0	1.0	50.5	42.4
	Lochee Rd (Romon 2)			65.2	64.5	48.0	45.9	47.9	37.4	37.0	46.5	48.2	57.3	51.9	66.4	51.4	100.0	1.0	51.4	43.1
	Lochee Rd (Romon 3)			68.1	64.7	47.6	48.1	49.0	38.5	33.9	46.9	48.0	57.7	55.6	68.3	52.2	100.0	1.0	52.2	43.8
158	Lochee Rd (Romon) Average	338861	730773	67.6	64.2	46.4	46.9	48.8	38.1	36.2	46.7	47.5	57.2	50.8	66.3	51.3	100.0	1.0	51.3	43.1
36	Lochee Rd/Polepark Rd	339016	730586	42.3	40.3	32.9	27.5	30.2	21.2	20.7	22.8	22.1	32.8	36.3	33.4	30.2	100.0	1.0	30.2	25.4
37	Logie St (114)	338184	731293	74.0	64.9	57.3	57.2	61.8	46.8	28.0	50.8	48.8	57.3	67.1	74.0	57.3	100.0	1.0	57.3	48.2
38	Logie St (98)	338252	731258	52.9	46.5	34.1	36.6	34.5	24.5	18.4	31.7	35.7	41.9	42.1	51.4	37.5	100.0	1.0	37.5	31.5

Dundee City Council

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39	Loons Rd (1)	338211	731293	51.0	52.7	42.8	46.6	47.7	33.9	20.3	32.9	32.5	43.3	51.0	52.8	42.3	100.0	1.0	42.3	35.5
182	Meadowside (28)	340298	730550	56.8	49.5	41.7	40.4	39.2	26.0	30.1	36.2	41.5	48.6	42.1	47.2	41.6	100.0	1.0	41.6	35.0
	Meadowside (Romon 1)			55.3	56.9	47.2	51.0	50.5	38.5	37.3	42.9	44.3	51.6	50.5	51.8	48.2	100.0	1.0	48.2	40.4
	Meadowside (Romon 2)			59.9	58.8	49.1	48.4	50.5	38.1	36.8	42.2	44.4	51.3	50.7	52.6	48.6	100.0	1.0	48.6	40.8
	Meadowside (Romon 3)			56.7	57.4	49.6	47.7	50.6	33.0	36.7	41.4	41.8	50.9	49.4	54.4	47.5	100.0	1.0	47.5	39.9
149	Meadowside (Romon) Average	340243	730653	57.3	57.7	48.6	49.0	50.5	36.5	36.9	42.2	43.5	51.3	50.2	52.9	48.1	100.0	1.0	48.1	40.4
222	Muirton Rd (2)	338165	731296	34.4	39.3	33.5	31.1	41.0	25.7	18.7	23.4	18.5	28.3	38.3	40.9	31.1	100.0	1.0	31.1	26.1
42	Muirton Rd (6)	338156	731294	29.7	39.9	29.2	31.9	39.5	27.9	18.4	20.4	15.3	24.3	43.6	37.4	29.8	100.0	1.0	29.8	25.0
185	Murraygate (46)	340409	730484	34.6	31.7	28.1	24.9	25.0	18.1	17.0	18.7	16.9	25.5	29.4	30.3	25.0	100.0	1.0	25.0	21.0
189	Myrekirk Rd (29)	335420	731726	52.0	50.0	32.3	31.1	30.5	24.4	23.8	29.3	31.1	38.1	34.6	43.5	35.1	100.0	1.0	35.1	29.4
45	Nethergate (6)	340274	730171	54.0	47.2	44.6	47.1	48.6	34.2	35.6	41.2	38.8	46.3	47.4	46.9	44.3	100.0	1.0	44.3	37.2
47	Nethergate (40)	340230	730124	49.7	46.0	49.2	51.6	51.6	41.5	36.8	33.1	29.0	42.9	47.1	45.7	43.7	100.0	1.0	43.7	36.7
213	Nethergate (64)	340196	730089	53.8	54.9	47.6	48.3	50.4	32.1	37.7	39.4	34.6	46.7	45.3	45.8	44.7	100.0	1.0	44.7	37.6
44	Nethergate (88)	340163	730061	57.3	53.1	48.6	56.5	59.5	41.2	43.2	42.9	33.6	46.4	57.5	49.6	49.1	100.0	1.0	49.1	41.3
48	Nethergate (132)/Marketgait	340074	729984	42.0	42.8	36.9	37.4	31.2	21.4	24.1	27.9	26.9	36.6	41.8	36.4	33.8	100.0	1.0	33.8	28.4
46	Nethergate (95)	340033	729957	41.6	43.0	39.1	41.6	32.2	25.0	22.8	32.8	32.4	42.0	38.4	39.9	35.9	100.0	1.0	35.9	30.2
207	Pitkerro Road (42)	341924	732235	49.7	49.0	41.8	40.9	37.5	32.2	29.6	33.1	29.2	37.5	42.7	48.4	39.3	100.0	1.0	39.3	33.0
49	Rankine St (2)	338768	730900	68.3	55.8	36.1	38.7	40.0	30.6	34.5	M	39.7	47.8	48.1	64.8	45.9	91.7	1.0	45.9	38.5
228	Riverside Esplanade/S.Crichton St	340516	729991	46.3	42.4	43.0	36.3	34.8	26.3	25.9	29.0	24.2	31.0	40.1	36.3	34.6	100.0	1.0	34.6	29.1
54	Seagate (9)	340467	730388	46.9	40.9	35.4	40.0	38.3	27.6	26.7	27.1	25.5	36.6	38.2	38.2	35.1	100.0	1.0	35.1	29.5
190	Seagate (97)	340516	730499	56.7	54.3	46.6	55.4	59.4	46.6	44.1	42.9	38.3	48.2	51.6	51.2	49.6	100.0	1.0	49.6	41.7
217	Seagate (99)	340535	730522	61.1	59.0	47.5	52.7	61.9	46.6	M	39.4	34.3	45.4	M	44.3	49.2	83.3	1.0	49.2	41.3

Dundee City Council

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50	Seagate (101)	340545	730532	56.5	46.7	43.2	44.3	43.7	33.9	M						44.7	50.0	1.019	45.6	38.3
224	Seagate (112)	340528	730537	58.9	52.5	41.7	45.1	44.6	34.7	32.5	39.7	40.7	47.5	47.5	52.4	44.8	100.0	1.0	44.8	37.6
	Seagate (Romon 1)			57.7	50.8	52.1	56.7	57.6	41.1	40.4	38.6	39.2	48.3	50.6	49.8	48.6	100.0	1.0	48.6	40.8
	Seagate (Romon 2)			57.3	47.5	47.5	51.3	55.3	42.5	39.3	39.1	36.9	46.9	48.3	50.3	46.9	100.0	1.0	46.9	39.4
	Seagate (Romon 3)			56.3	49.9	49.4	50.0	56.5	42.6	39.8	39.5	38.9	46.0	50.3	49.5	47.4	100.0	1.0	47.4	39.8
159	Seagate (Romon) Average	340487	730446	57.1	49.4	49.7	52.7	56.5	42.1	39.8	39.3	38.3	46.5	49.7	49.9	47.6	100.0	1.0	47.6	40.0
55	Soapwork Lane	340099	730650	56.5	50.3	45.9	39.5	39.7	26.4	27.1	31.9	30.8	41.2	45.4	54.5	40.8	100.0	1.0	40.8	34.2
218	South Marketgait (Lampost 18)	340291	729979	44.5	49.7	48.8	41.6	43.6	31.8	27.4	27.5	22.5	37.1	45.8	42.5	38.6	100.0	1.0	38.6	32.4
151	South Road (1 Denbank)	335188	731528	50.4	44.5	34.9	35.1	37.4	31.7	31.2	35.8	33.0	38.8	42.0	48.9	38.6	100.0	1.0	38.6	32.5
162	St Andrews St/Seagate(116)	340532	730548	41.2	45.8	43.4	38.3	45.9	32.2	33.2	35.6	34.0	42.9	44.2	45.1	40.2	100.0	1.0	40.2	33.7
59	Strathmore Ave (353)	339609	731871	50.7	46.2	40.0	37.0	45.8	33.9	31.1	31.1	25.7	34.0	43.3	44.7	38.6	100.0	1.0	38.6	32.4
219	Thomson Avenue (Street Sign)	340542	730194	46.1	39.8	42.0	38.4	36.0	25.0	29.0	34.2	31.7	41.0	44.6	43.9	37.6	100.0	1.0	37.6	31.6
229	Thomson Avenue/S.Crichton St	340421	730078	49.9	43.1	38.2	37.0	27.9	20.5	23.1	30.7	27.6	39.0	38.3	37.7	34.4	100.0	1.0	34.4	28.9
60	Trades Lane (31)	340575	730500	43.5	34.3	27.7	35.0	30.9	21.0	20.4	22.9	23.2	31.3	34.3	36.4	30.1	100.0	1.0	30.1	25.3
191	Victoria Rd (4 India Buildings)	340213	730633	46.7	42.0	41.3	35.9	34.1	25.1	23.5	26.4	24.1	36.1	39.8	44.0	34.9	100.0	1.0	34.9	29.3
93	Victoria Rd (10)	340230	730673	47.1	46.4	38.7	45.2	40.1	31.1	25.3	27.6	27.6	38.8	39.6	42.9	37.5	100.0	1.0	37.5	31.5
70	Victoria Rd/Hilltown	340274	730714	75.1	71.0	59.2	52.5	55.4	42.5	41.7	55.0	62.0	62.5	57.0	68.7	58.6	100.0	1.0	58.6	49.2
68	Victoria Rd (60)	340375	730779	50.5	45.8	41.9	45.0	42.6	32.6	31.2	29.4	31.0	41.5	41.3	44.1	39.7	100.0	1.0	39.7	33.4
184	Victoria Rd (104)/William St)	340697	730950	42.7	36.0	35.4	31.9	37.1	29.7	29.1	28.8	23.7	34.2	40.2	36.3	33.8	100.0	1.0	33.8	28.4
71	Victoria St / Albert St	341071	731072	41.9	41.2	30.6	34.9	34.2	25.3	23.7	26.8	24.6	35.3	40.0	42.1	33.4	100.0	1.0	33.4	28.0
72	Westport (2)	339842	730122	51.0	43.9	35.4	36.0	31.1	24.6	M	M	M	38.9	36.2	40.4	37.5	75.0	1.0	37.5	31.5
183	West Marketgait/Guthrie St	339805	730338	52.5	64.3	48.5	45.4	48.3	33.8	37.0	44.2	46.3	56.4	56.0	59.1	49.3	100.0	1.0	49.3	41.4
205	West Marketgait/ Old Mill (23)	339773	730436	71.5	74.2	62.6	49.0	47.9	34.7	45.5	47.4	54.5	53.8	60.4	69.9	56.0	100.0	1.0	56.0	47.0

Dundee City Council

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231	West Marketgait/ Ward Road	339834	730314								31.2	34.5	45.2	45.5	46.6	40.6	41.7	0.914	37.1	31.2
73	Whitehall Cr (4)	340376	730109	52.1	46.2	43.8	38.1	41.5	27.9	29.1	31.3	31.1	42.8	37.6	40.5	38.5	100.0	1.0	38.5	32.3
161	Whitehall Cr/Union St (50)	340305	730051	37.2	35.3	32.7	30.4	25.9	20.1	19.2	22.9	21.5	27.6	35.3	36.8	28.7	100.0	1.0	28.7	24.1
74	Whitehall St (40)	340330	730106	54.2	48.8	43.9	51.6	49.3	39.4	31.0	31.9	33.0	46.3	49.0	47.3	43.8	100.0	1.0	43.8	36.8
81	Whitehall St (12)	340293	730142	47.7	44.5	56.4	48.7	58.3	40.4	38.2	34.8	32.8	46.2	54.3	46.4	45.7	100.0	1.0	45.7	38.4
76	Whitehall St (1)	340265	730153	59.3	56.0	51.9	57.0	61.4	40.8	41.5	47.4	44.5	52.8	46.6	48.4	50.6	100.0	1.0	50.6	42.5
75	Whitehall St (5)	340289	730128	57.6	54.9	44.5	48.6	50.8	31.5	39.8	47.0	43.1	44.4	51.0	48.7	46.8	100.0	1.0	46.8	39.3
77	Whitehall St (15)	340322	730098	51.9	48.9	41.3	41.8	38.5	30.0	25.7	31.0	32.9	40.6	40.7	46.2	39.1	100.0	1.0	39.1	32.9
	Whitehall St (Romon 1)			50.6	50.9	50.6	51.4	55.0	44.9	33.9	38.2	33.6	42.8	45.9	42.0	45.0	100.0	1.0	45.0	37.8
	Whitehall St (Romon 2)			49.3	47.9	51.1	52.3	54.9	40.9	36.9	39.7	33.4	45.8	51.1	43.6	45.6	100.0	1.0	45.6	38.3
	Whitehall St (Romon 3)			51.7	49.2	54.7	52.8	57.2	44.1	37.6	37.5	34.2	40.1	51.3	43.6	46.2	100.0	1.0	46.2	38.8
160	Whitehall St (Romon) Average	340278	730156	50.5	49.3	52.1	52.2	55.7	43.3	36.1	38.5	33.7	42.9	49.4	43.1	45.6	100.0	1.0	45.6	38.3
82	Woodside Ave	340776	732307	25.0	21.0	16.2	14.2	12.1	9.2	7.5	11.0	10.1	17.2	23.0	25.4	16.0	100.0	1.0	16.0	13.4

Notes

- (1) Exceedances 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 exceedance of the NO₂ 1-hr mean obj'.
- (3) Sites shaded green were monitoring locations installed in 2018.
- (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

Appendix C.1 Air Quality Monitoring Data QA/QC

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.

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.

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.⁷

Tube Precision

For the purposes of Local Air Quality Management, tube precision is separated into two categories, "Good" or "Poor", as follows: tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%, and the average CV of all monitoring periods is less than 10%. Tubes are considered to have "poor" precision where the CV of four or more periods is greater than 20% and/or the average CV is greater than 10%.

A spreadsheet tool has been developed to calculate the overall precision of a particular co-location study or any sets of duplicate or triplicate results. The tube precision of each study calculated using this spreadsheet⁸ is summarised in **Table C.1**. The distinction between "good" and "poor" precision is an indicator of how well the same measurement can be reproduced. This precision reflects the laboratory's performance/consistency in preparing and analysing the tubes, as well as the subsequent handling of the tubes in the field. Any laboratory can show "poor" precision for a particular period/co-location study, if this is due to poor handling of the tubes in the field.

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 **0.80** (Spreadsheet version 03/19_final). This is based the kerbside National inter-comparison site at Marylebone Road (0.91) and a mixture of kerbside and roadside sites from Fife Council.

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 2018. The factor for each study is shown in **Table C.1** 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. All the Dundee City

⁷ <https://laqm.defra.gov.uk/assets/tubeprecision2019version0319finalfull.pdf>

⁸ <http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html>

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

Council co-location studies met the criteria in 2018. 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 December 2018. The automatic analyser period means are calculated from mid-day on tube changeover days.

Table C.1 Bias Factors from 2018 Co-location Studies and National Bias Adjustment Spreadsheet (Version 03/19_final)

Site Name	Site Type ¹	Length of Study (months)	PDT ² Mean Conc. (Dm) (µg/m ³)	Analysed Mean Conc. (Cm) (µg/m ³)	% DC ³	Bias (B)	Tube Precision & average CV ⁴	Bias Adjustment Factor (A) (Cm/Dm)
Lochee Road	R	12	51	44	99	17%	G (3%)	0.85
Meadowside	R	11	48	34	98	40%	G (3%)	0.72
Seagate	R	11	47	45	100	4%	G (2%)	0.96
Whitehall Street	R	12	46	37	95	22%	G (4%)	0.82
Marylebone Road Intercomparison	K	12	93	85	n/a	9.9%	G	0.91

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 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.2**). The factor obtained using only local roadside sites was **0.83**, and **0.84** when the kerbside site at Marylebone Road was included. The **0.84** bias correction factor represents a more conservative approach and has been used to bias correct the diffusion tube data presented in this report.

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>

Table C.2 Manual Approximate Orthogonal Regression Calculation 2018

Co-location Sites 2017	Site Type ¹	Bias Factor A	Bias B	Manual orthogonal regression Calculation as para 2.4 AQC doc ²			
Lochee Road	R	0.85	17%				
Meadowside	R	0.72	40%				
Seagate	R	0.96	4%				
Whitehall St	R	0.82	22%				
Mean Local		0.84	20.8%				
National: Marylebone Road Intercomparison	K	0.91	9.9%				
Combined Local & National: Mean Combined		0.85	18.6%		0.186	1.186	0.84

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."

PM 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 to 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 2018 data can be made available on request¹². 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 2018 data was **1.320**. This methodology although reasonable for annual mean data, has a tendency to

¹² T:\Pollution\Air Quality\Progress Reports\Progress Report 2018\PM10

over-estimate the number of daily mean exceedances. Consequently, these results should be treated with some caution.

In addition, DCC have four unheated Beta-Attenuation Monitors (BAM), which are gravimetric equivalent monitors. The PM₁₀ data from these have been corrected for slope by Ricardo using the factor (0.8333) determined by the UK Equivalence Testing Programme¹³. 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, but the PM_{2.5} data is adjusted for slope by the following factor (1/1.06).

Short-term to Long-term Data adjustment

Annualisation of data was required for two diffusion tubes with less than 75% data capture in 2018. The methodology outlined in Box 7.9 of LAQM.TG(16) was used. The urban background sites used are shown in the tables below along with the annualisation factors applied to the data. All of the reference equivalent real-time analysers had greater than 85% data capture in 2018 and the reported annual mean did not require to be annualised.

Table C.3 Period Adjustment Calculation Seagate (101) (DT 50) Jan – Jun 2018

Urban Background Locations	Annual Mean, A _m (µg/m ³)	Period Mean, P _m (µg/m ³)	Ratio, A _m /P _m	Average Ratio, R _a
Balgavies PI	18.08	18.32	0.987	1.019
Carolina Court Lp6	23.47	23.30	1.007	
Murraygate (46)	25.02	27.07	0.924	
Woodside Ave	15.99	16.28	0.982	
B/ Ferry Rd Lower (Cyclesign)	24.04	20.16	1.192	
Site to be annualised				
Seagate (101)	45.6	44.70		

Table C.4 Period Adjustment Calculation West Marketgait/ Ward Road) (DT 231) Aug – Dec 2018

Urban Background Locations	Annual Mean, A _m (µg/m ³)	Period Mean, P _m (µg/m ³)	Ratio, A _m /P _m	Average Ratio, R _a
Balgavies PI	18.08	19.44	0.930	0.914
Carolina Court Lp6	23.47	25.52	0.920	
Murraygate (46)	25.02	24.16	1.035	
Woodside Ave	15.99	17.34	0.922	
B/ Ferry Rd Lower (Cyclesign)	24.04	31.60	0.761	
Site to be annualised				
West Marketgait/ Ward Road	37.1	40.60		

Note: annualised mean shown in red is not bias corrected

¹³ <http://laqm.defra.gov.uk/laqm-faqs/faq104.html>

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**

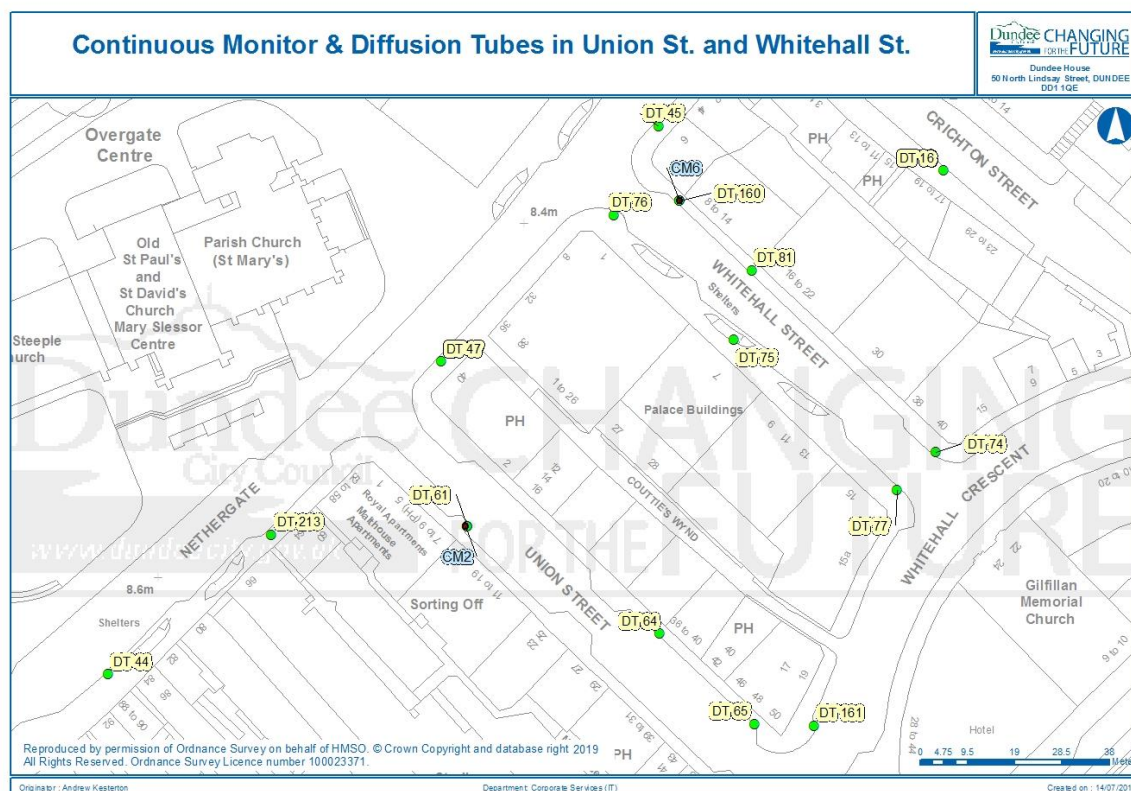


Figure C.2 Overview of NO₂ Concentrations in Union St and Nethergate (east of Marketgait)

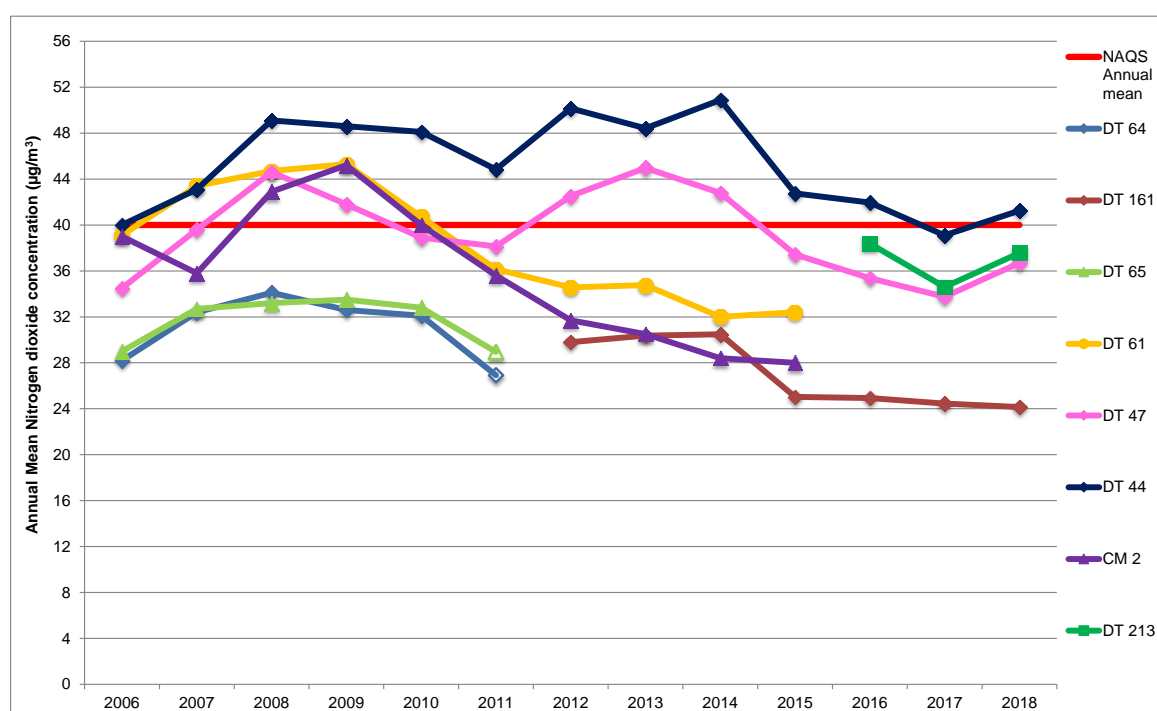
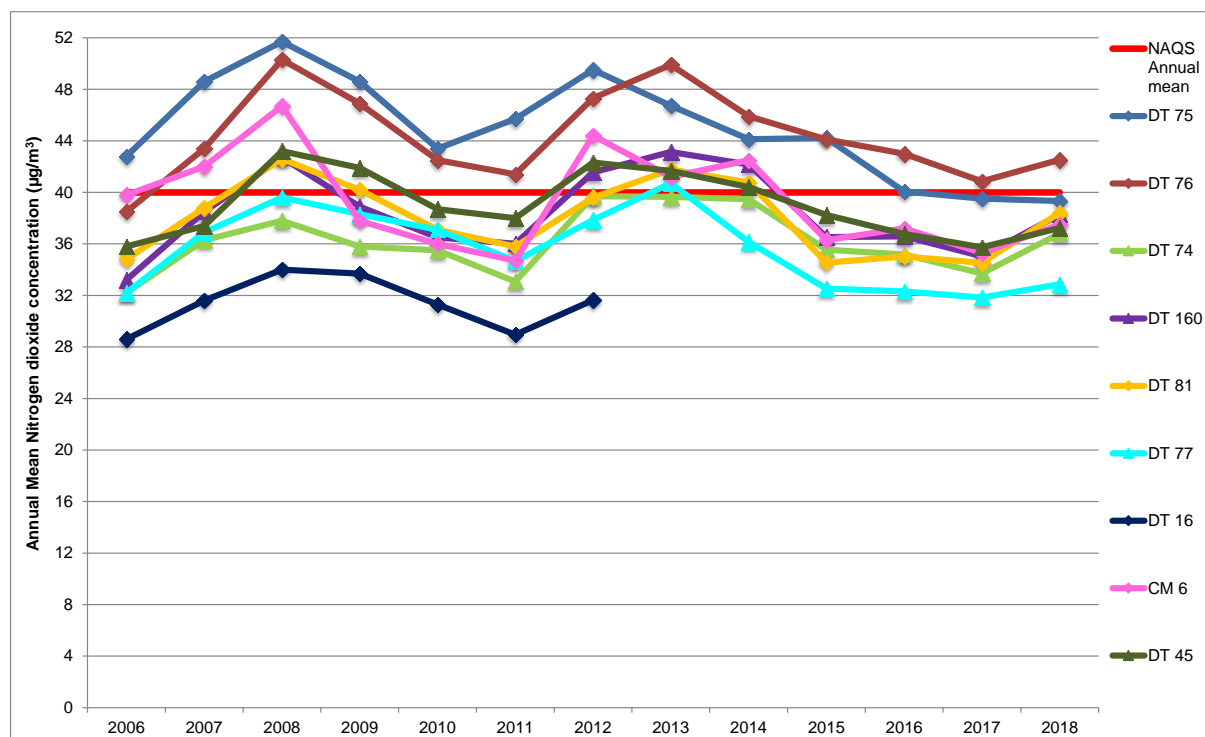


Figure C.3 Overview of NO₂ Concentrations in Whitehall St and Crichton St.



Seagate

Figure C.4 NO₂ Monitoring Locations in Seagate

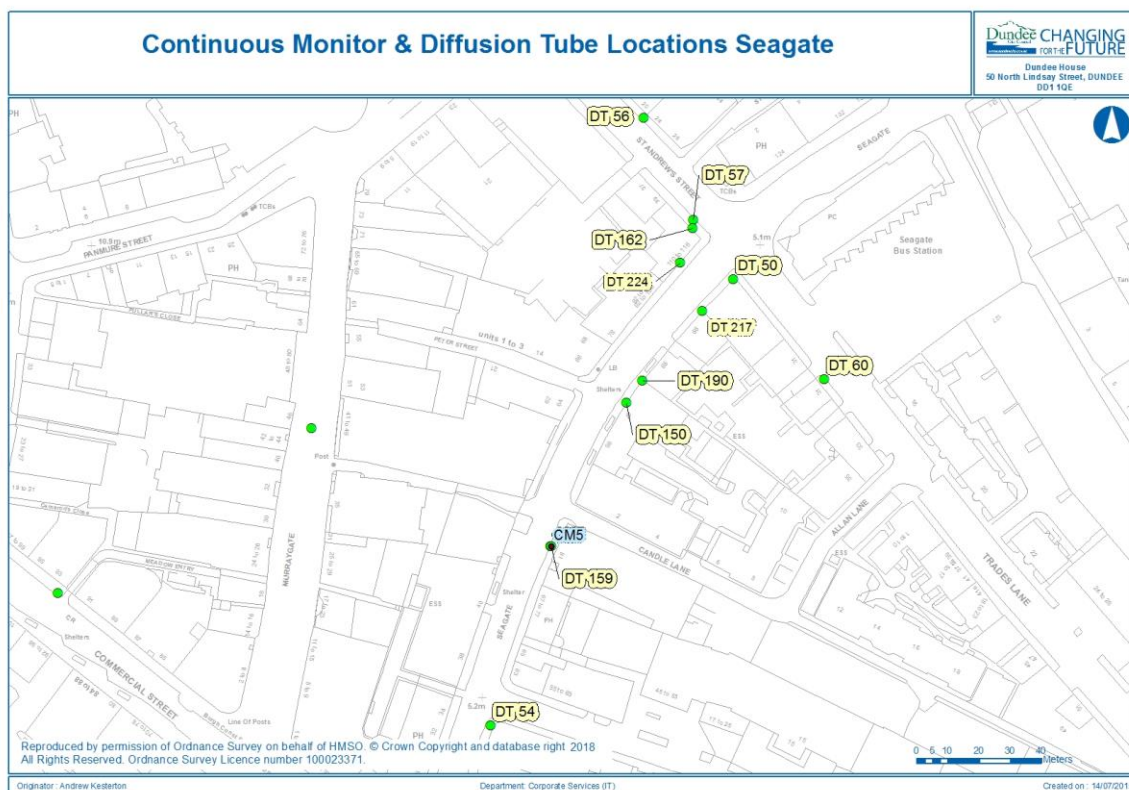
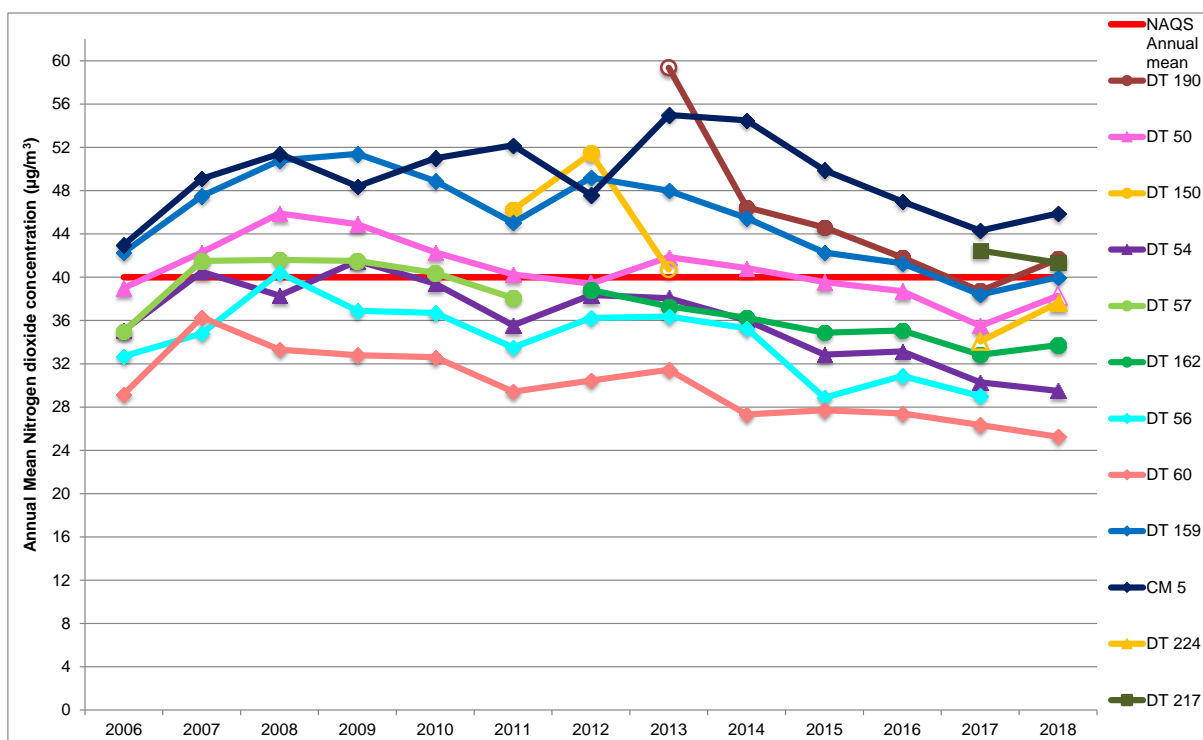


Figure C.5 Overview of NO₂ Concentrations in Seagate.



Nethergate

Figure C.6 NO₂ Diffusion Tube Locations in Nethergate

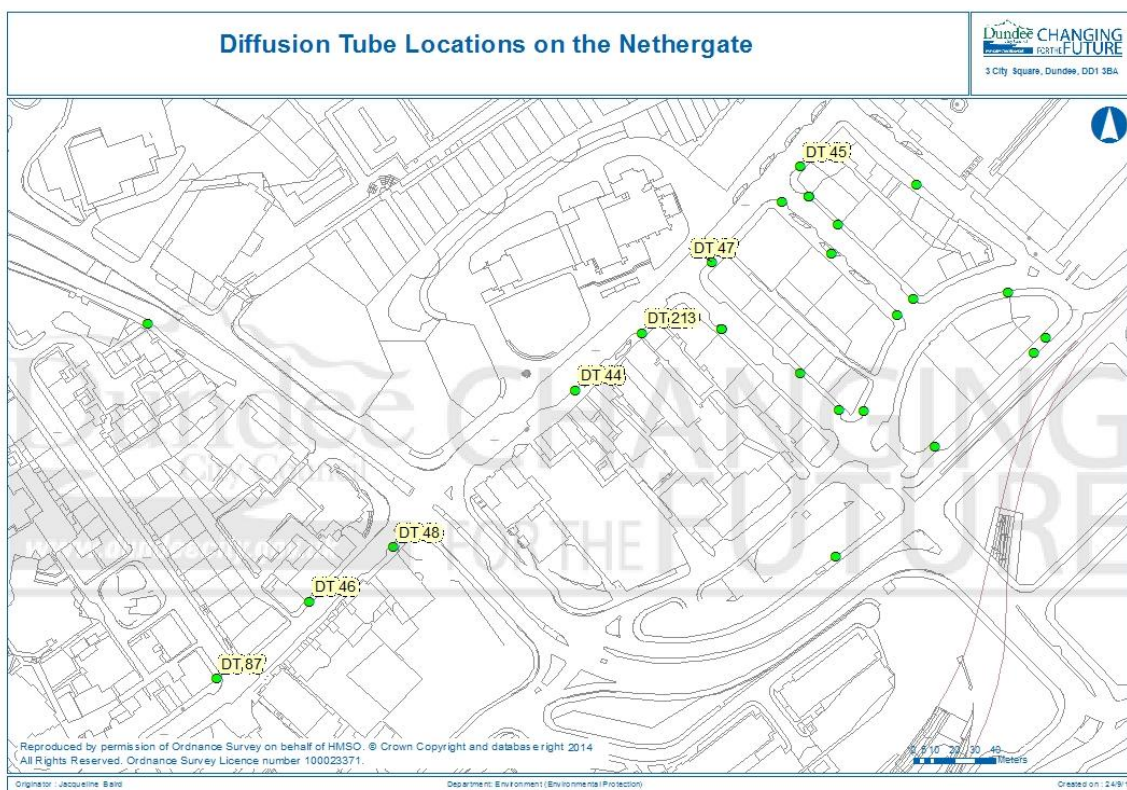
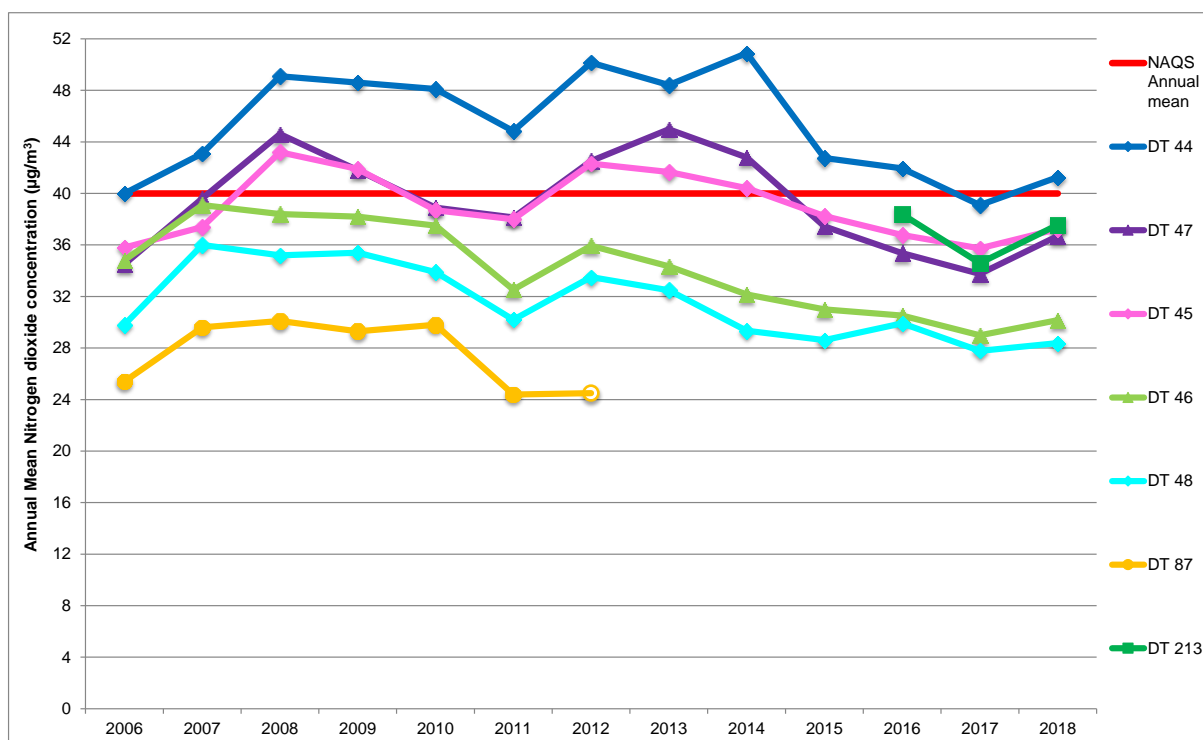


Figure C.7 Overview of NO₂ Diffusion Tube Concentrations in Nethergate.



Victoria Road / Meadowside

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

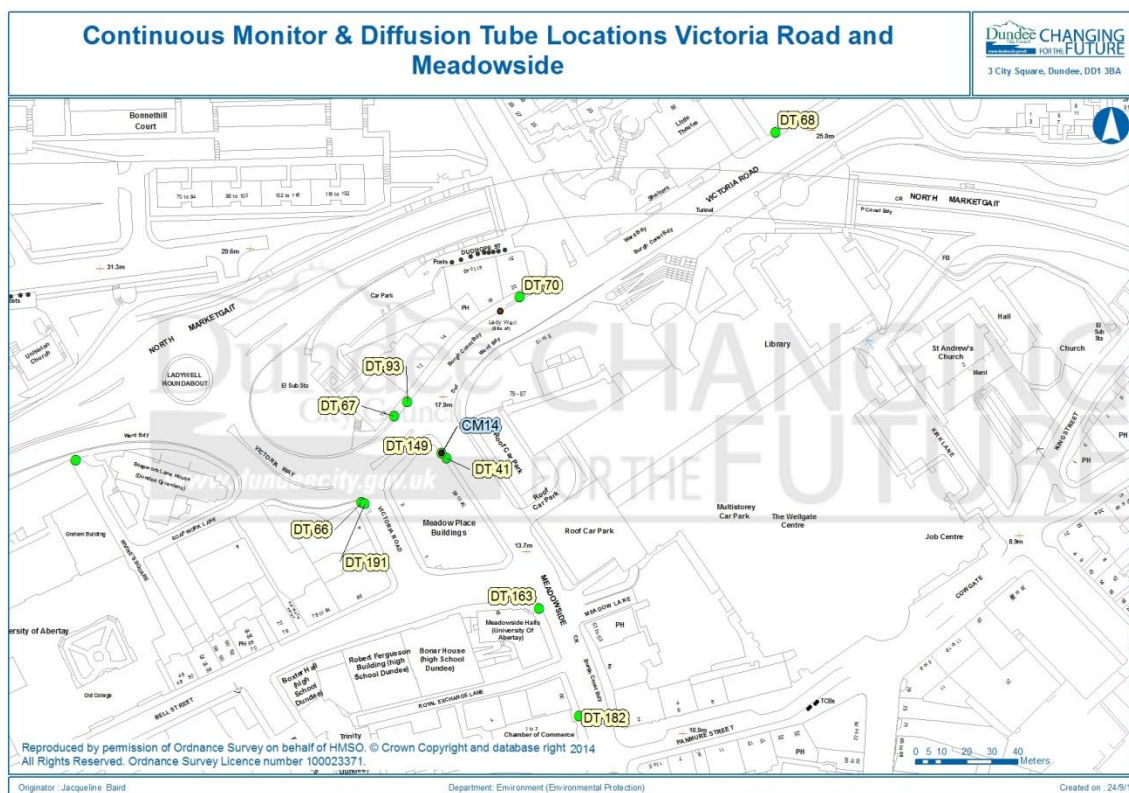
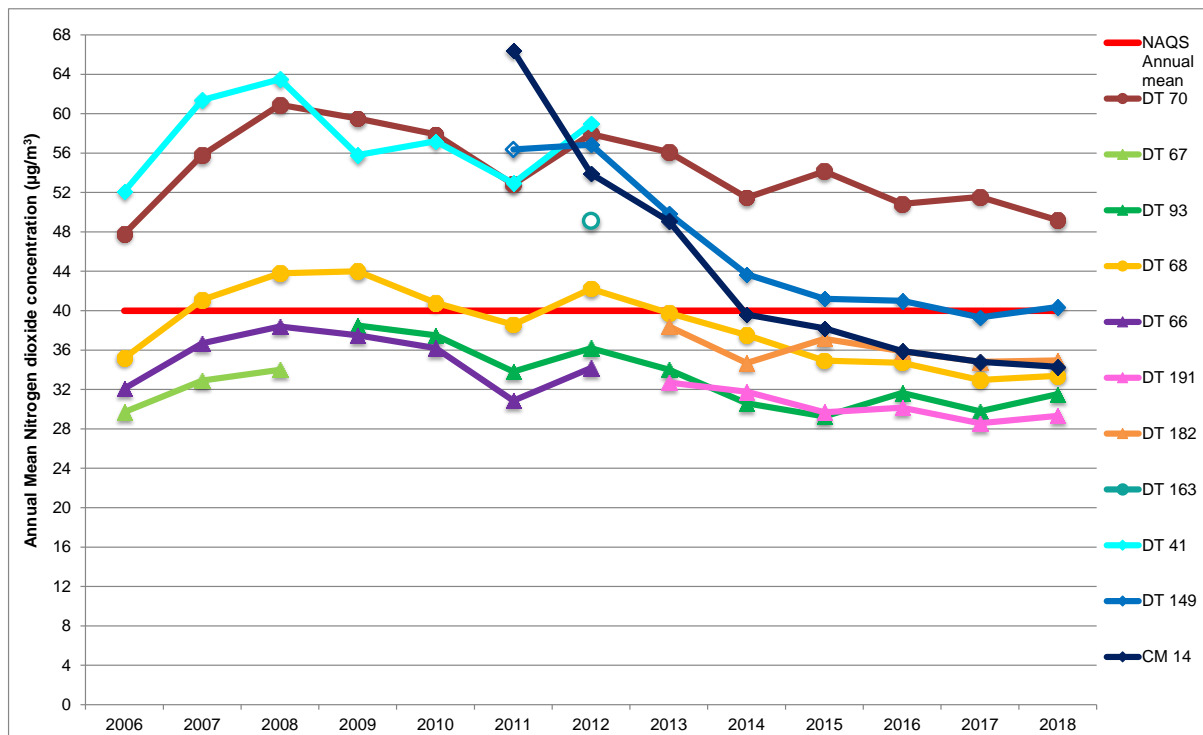


Figure C.9 Overview of NO₂ Diffusion Tube Concentrations in Victoria Road / Meadowside



Albert Street / Dura Street

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

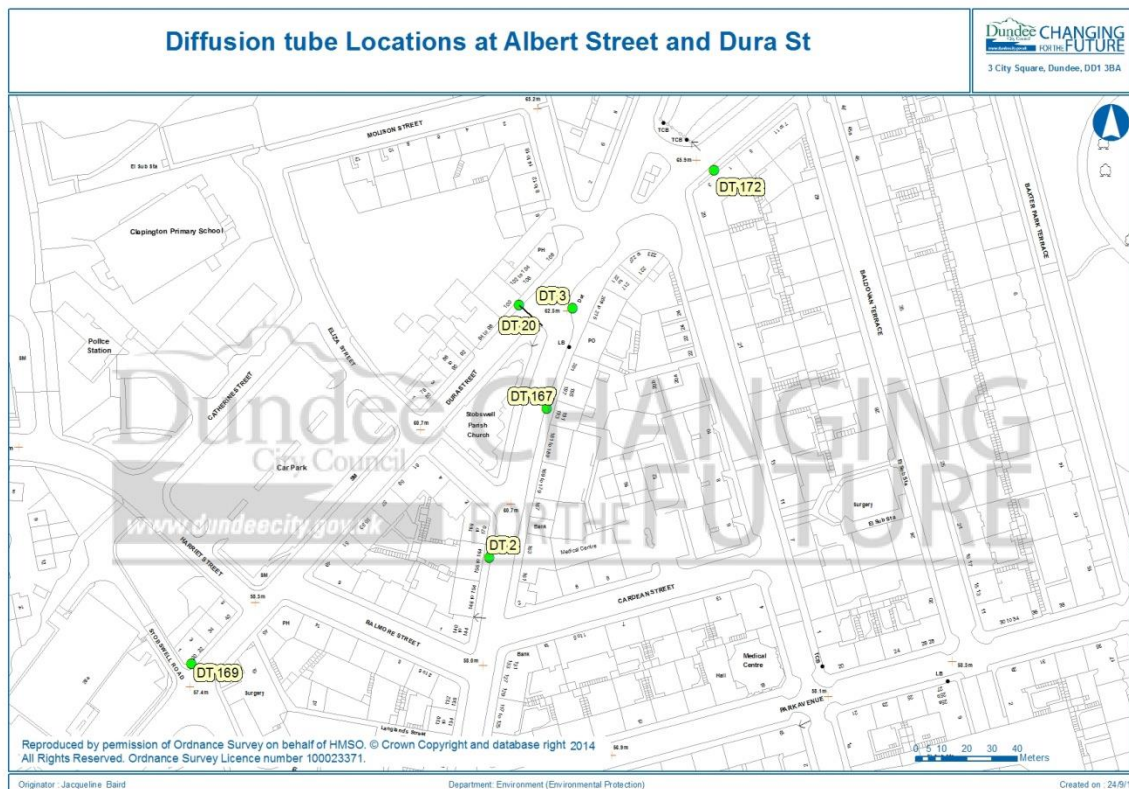
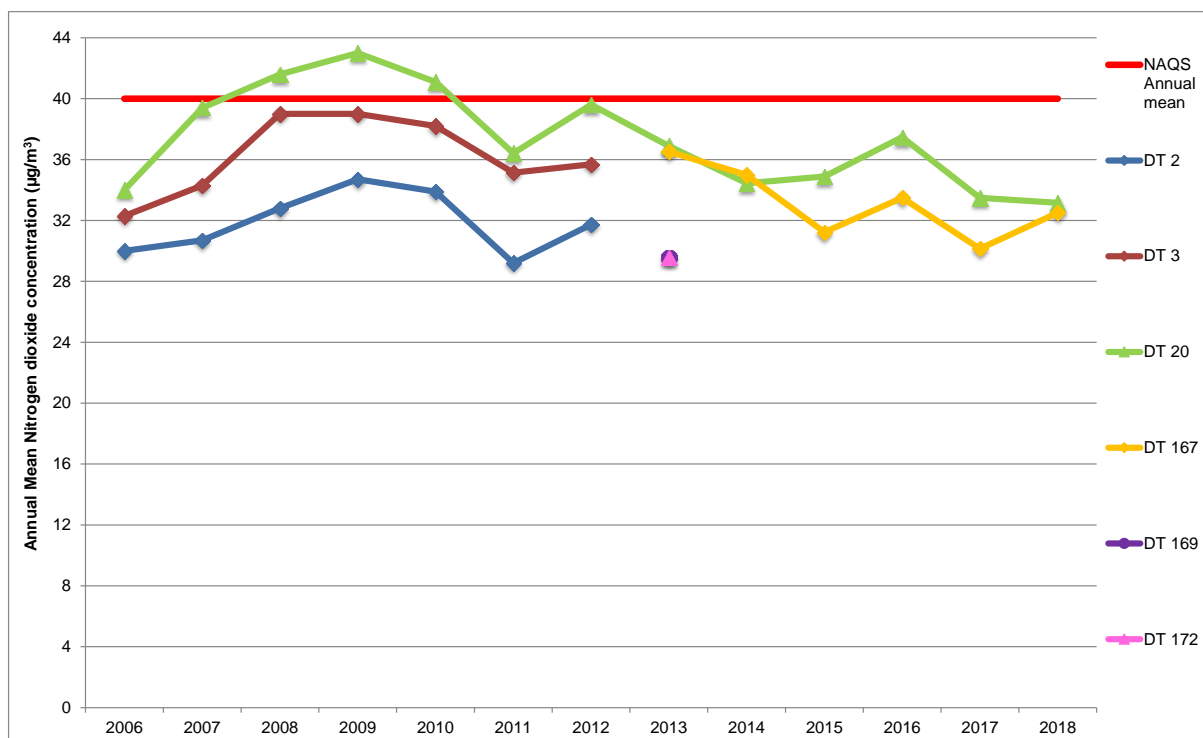


Figure C.11 Overview of NO₂ Diffusion Tube Concentrations in Albert Street / Dura Street.



Lochee Road

Figure C.12 NO₂ Monitoring Locations in Lochee Road

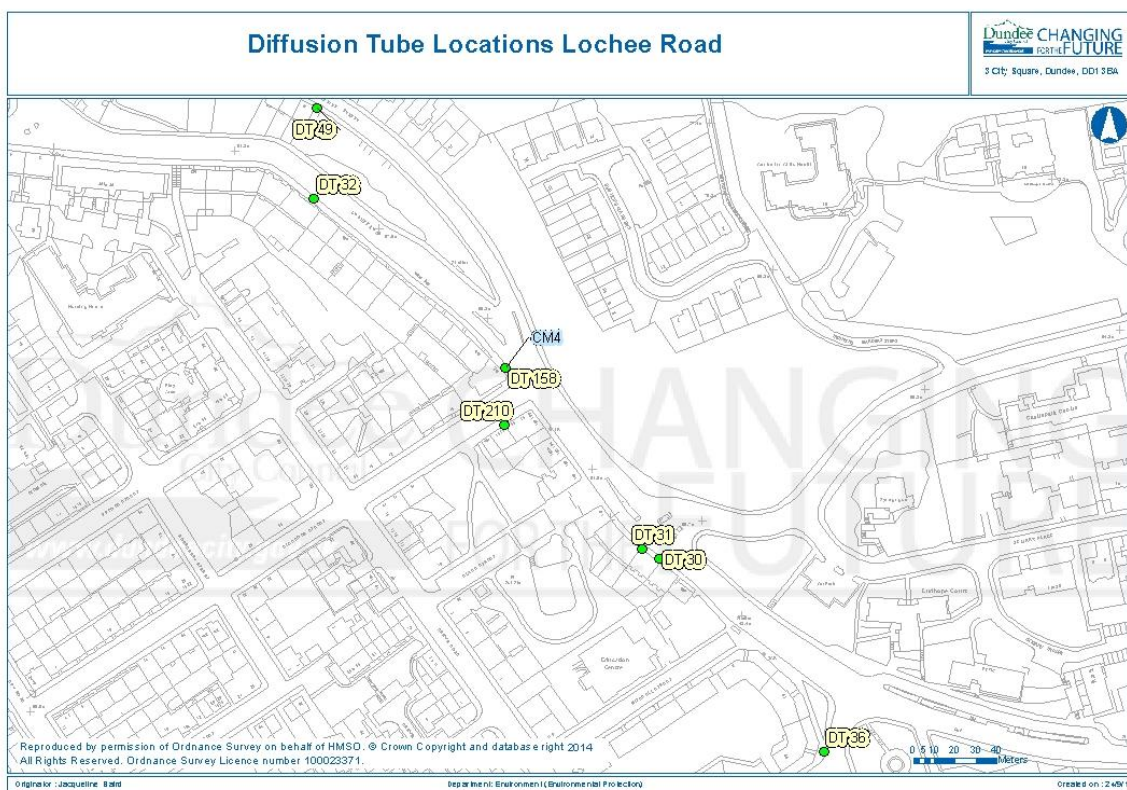
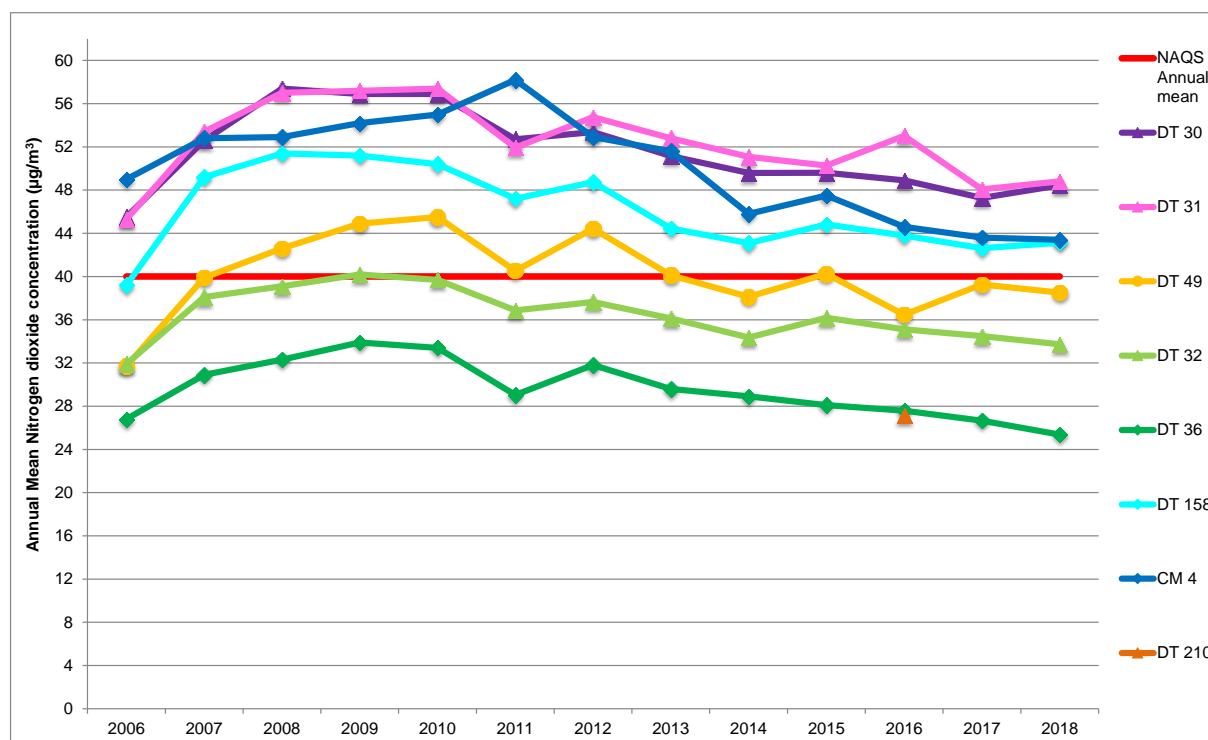


Figure C.13 Overview of NO₂ Concentrations in Lochee Road



Logie Street

Figure C.14 NO₂ Diffusion Tube Locations in Logie Street

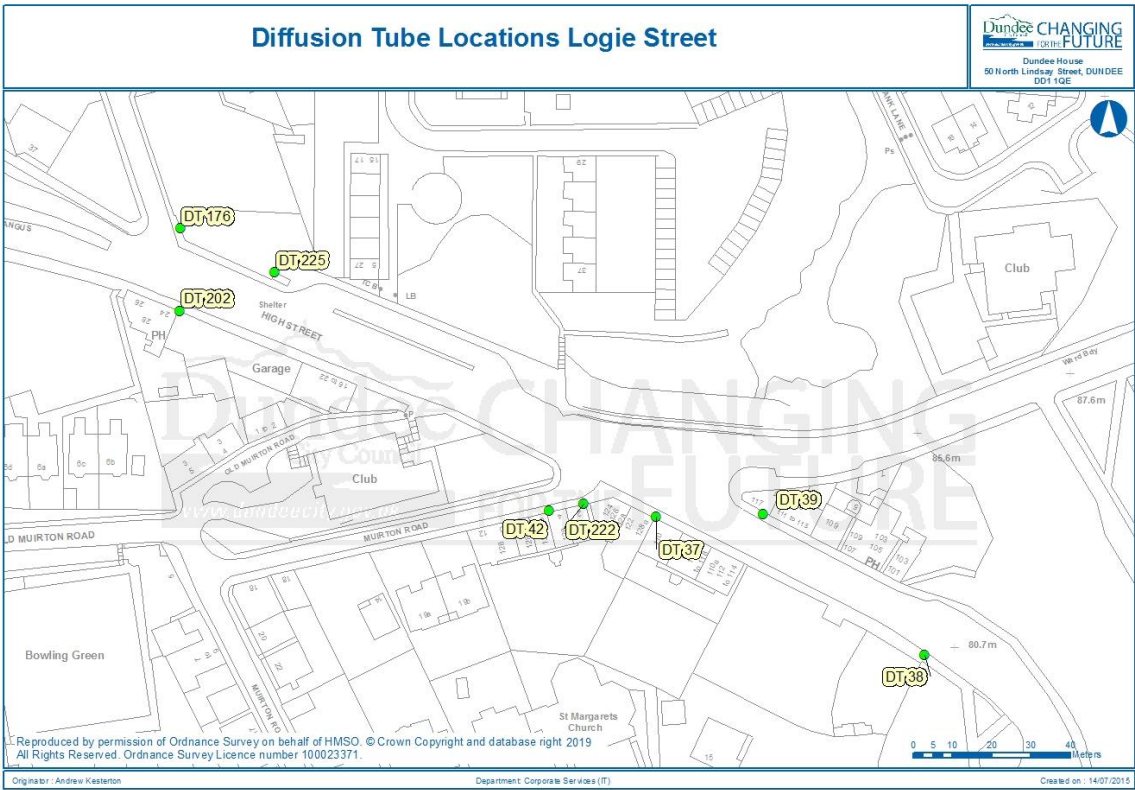
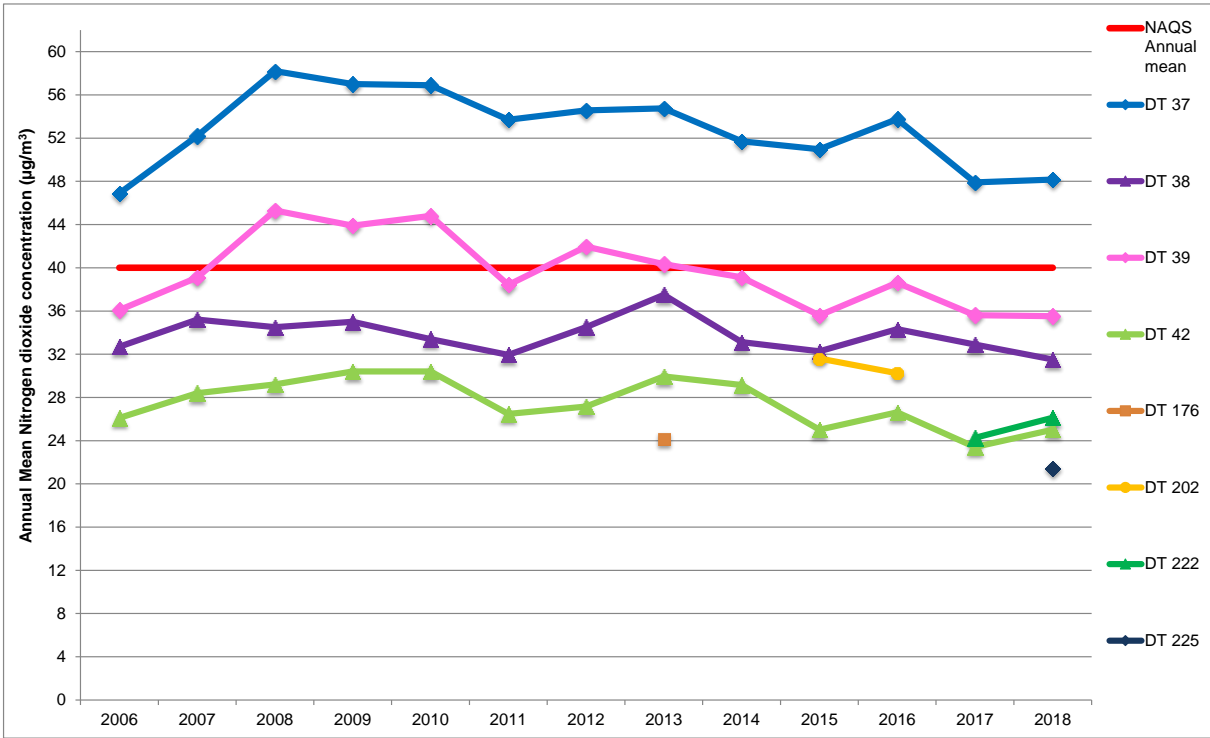


Figure C.15 Overview of NO₂ Diffusion Tube Concentrations in Logie St.



Albert Street / Arbroath Road

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

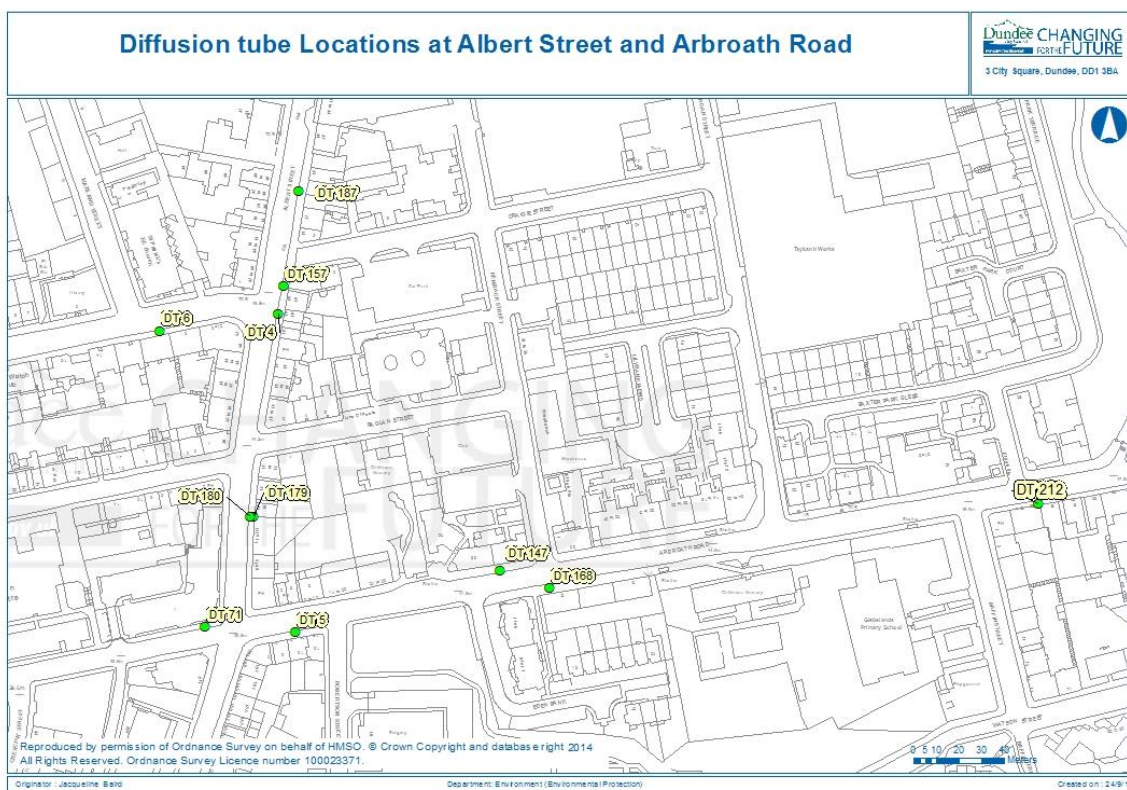
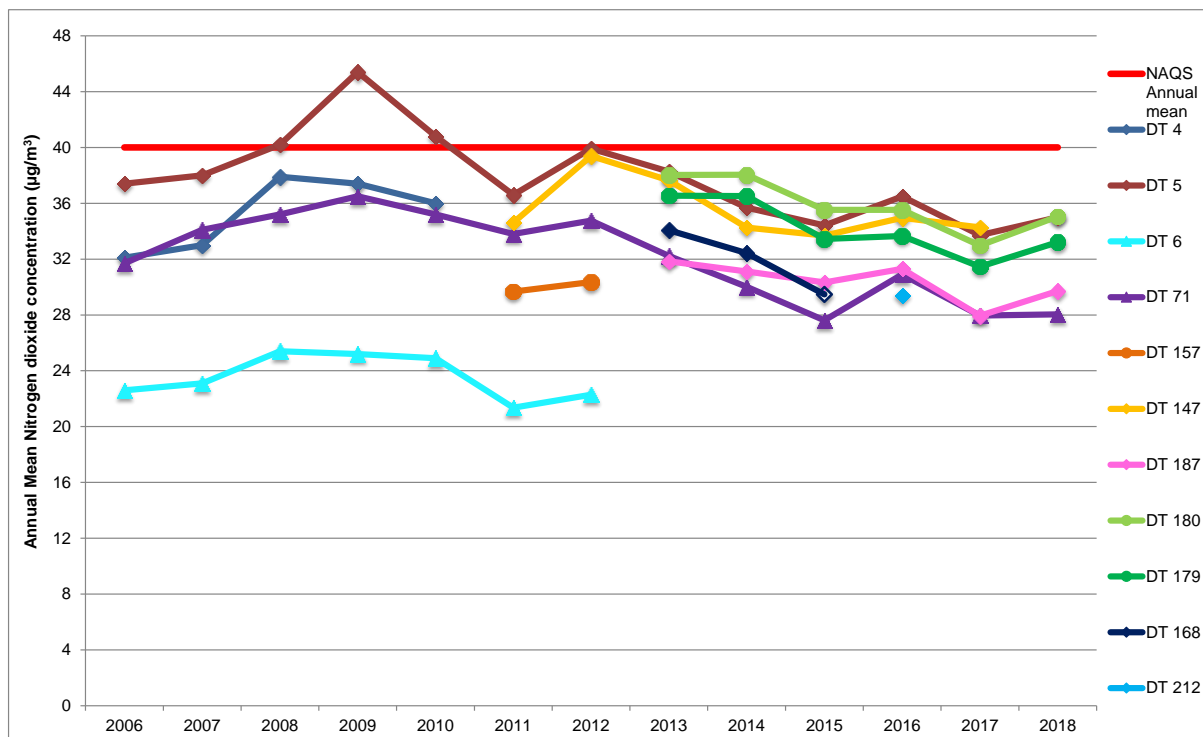


Figure C.17 Overview of NO₂ Diffusion Tube Concentrations in Albert St. / Arbroath Road



Kingsway / Forfar Road.

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

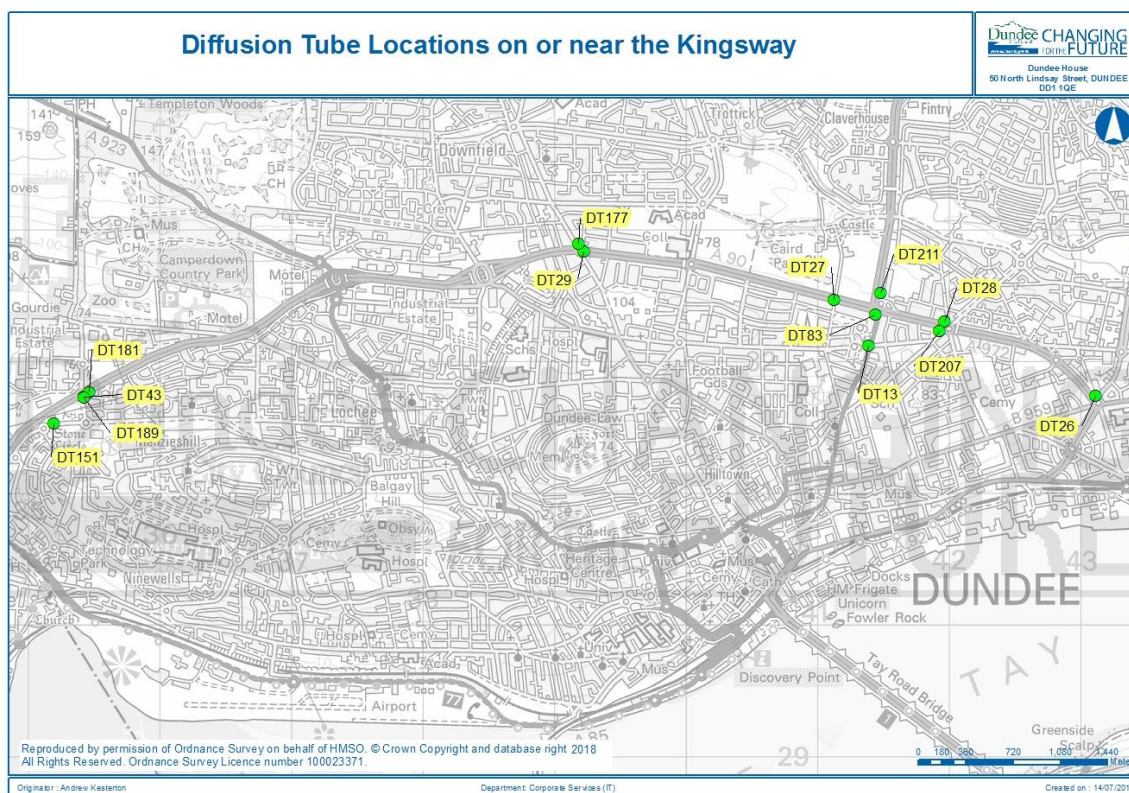
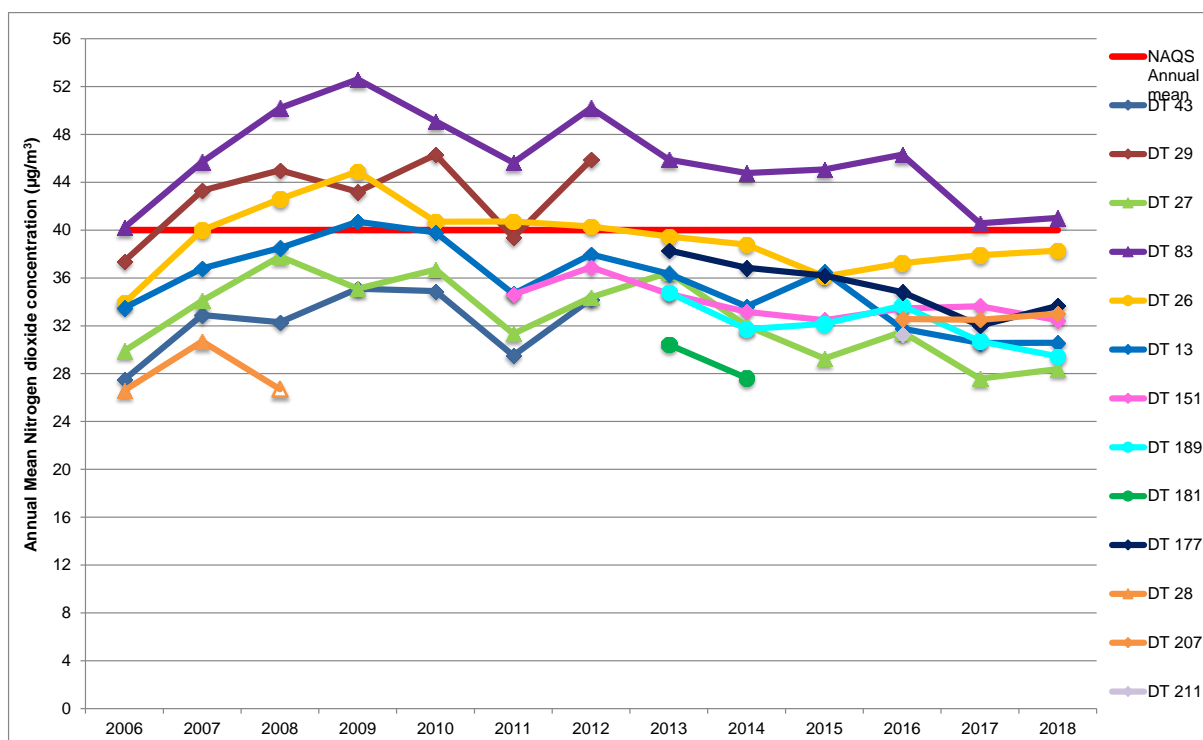


Figure C.19 Overview of NO₂ Diffusion Tube Concentrations on/near the Kingsway



Bus Corridor

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

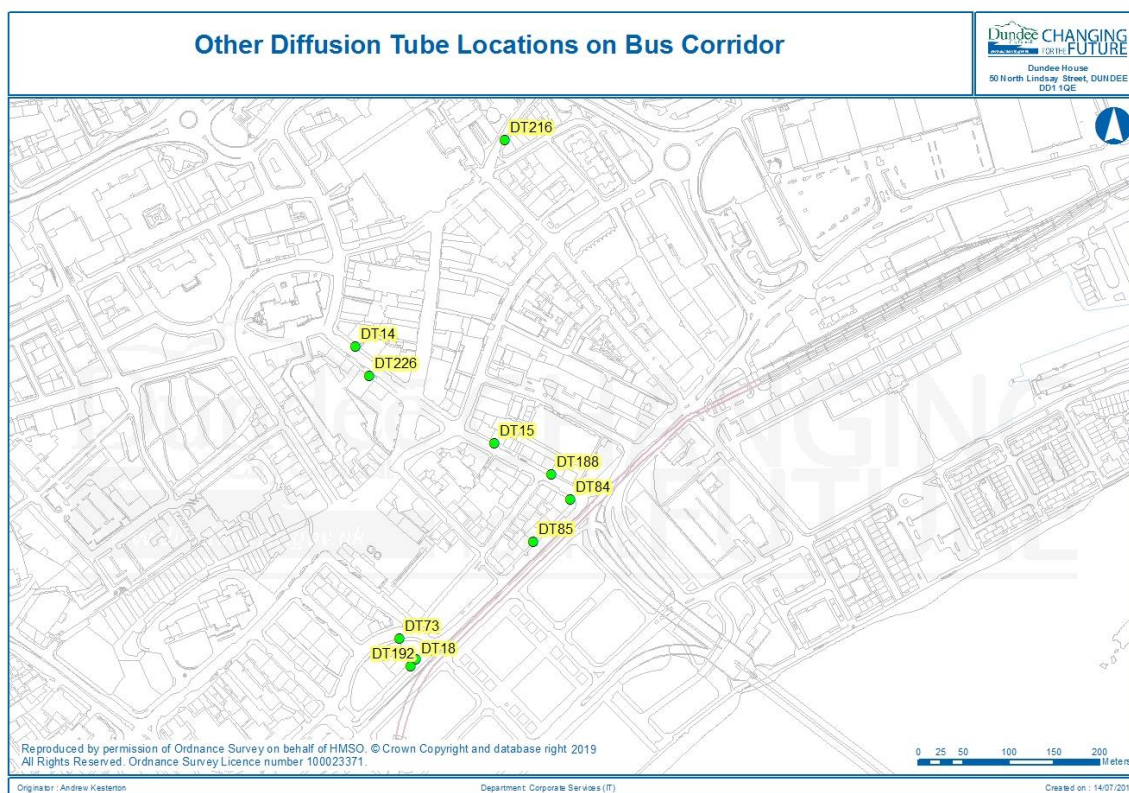
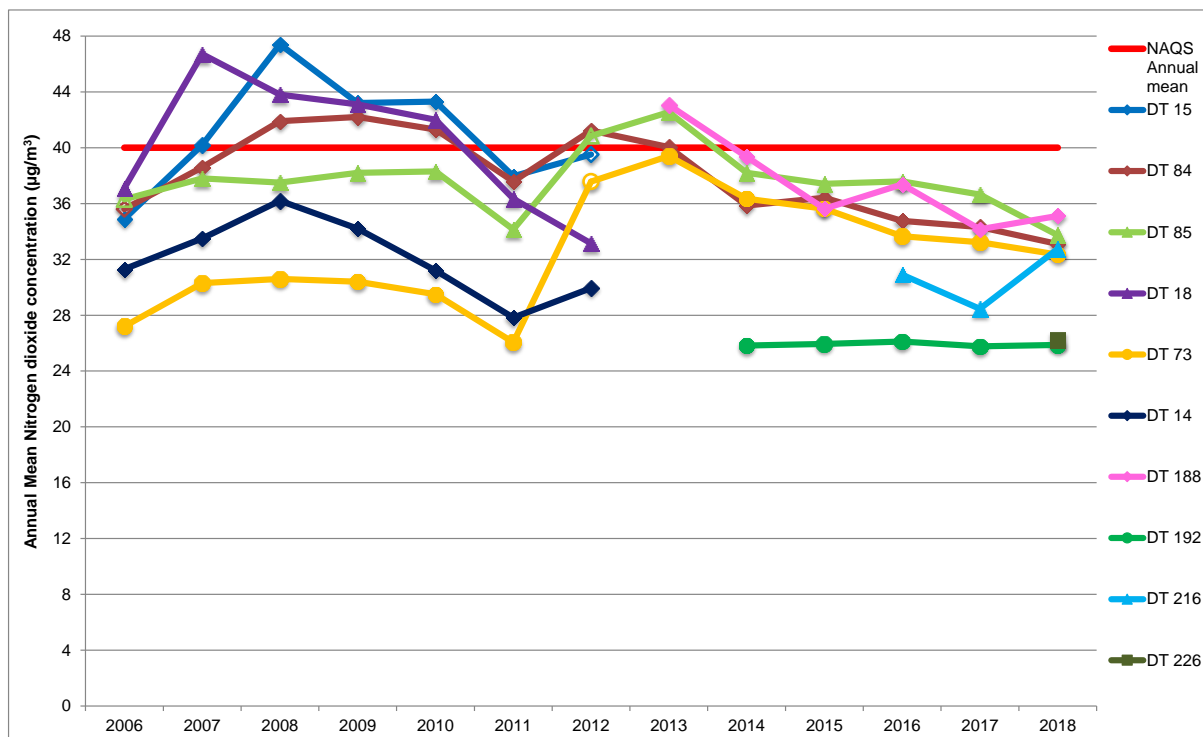


Figure C.21 Overview of Other NO₂ Diffusion Tube Concentrations on Bus Corridor



Inner Ring Road

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

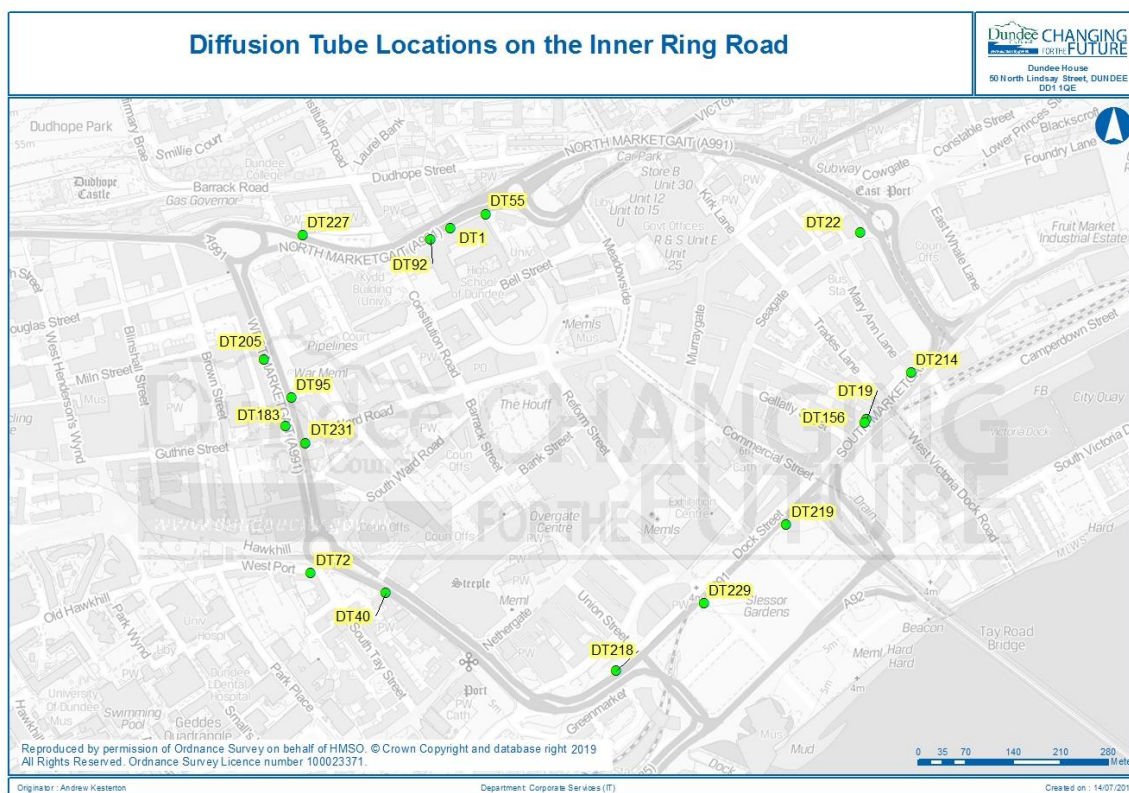


Figure C.23a Overview of NO₂ Diffusion Tube Concentrations on Inner Ring Road (West & North Marketgait)

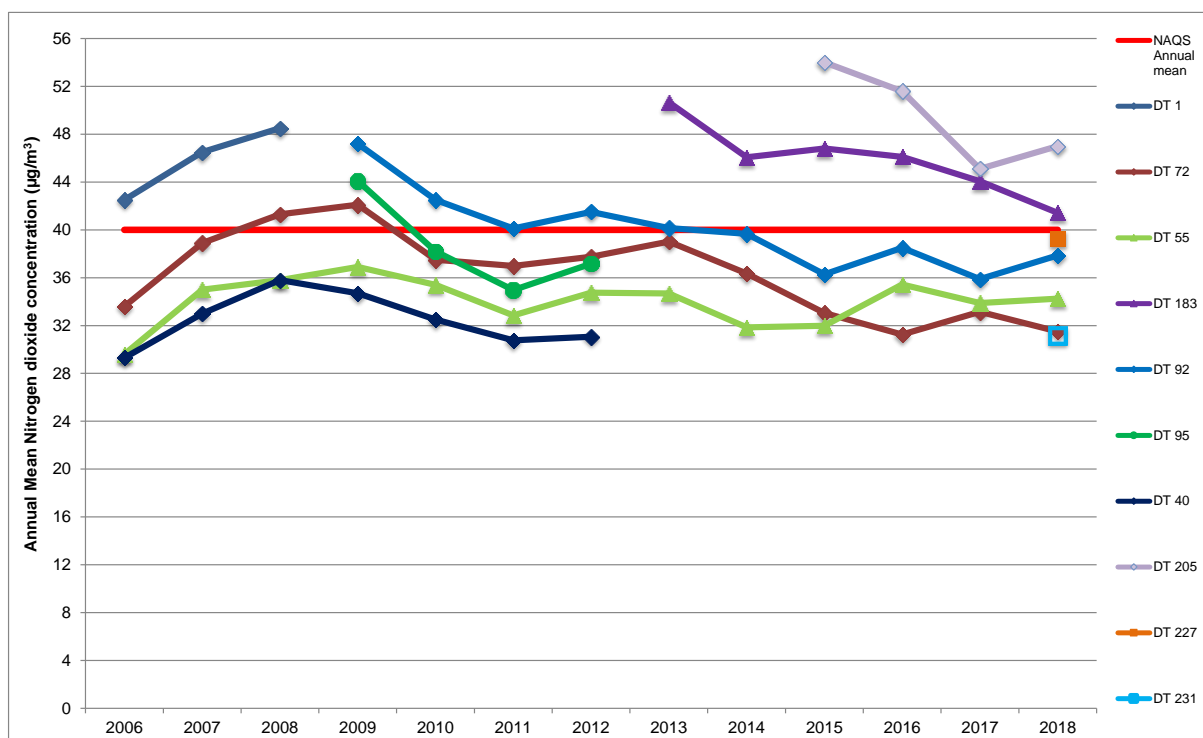
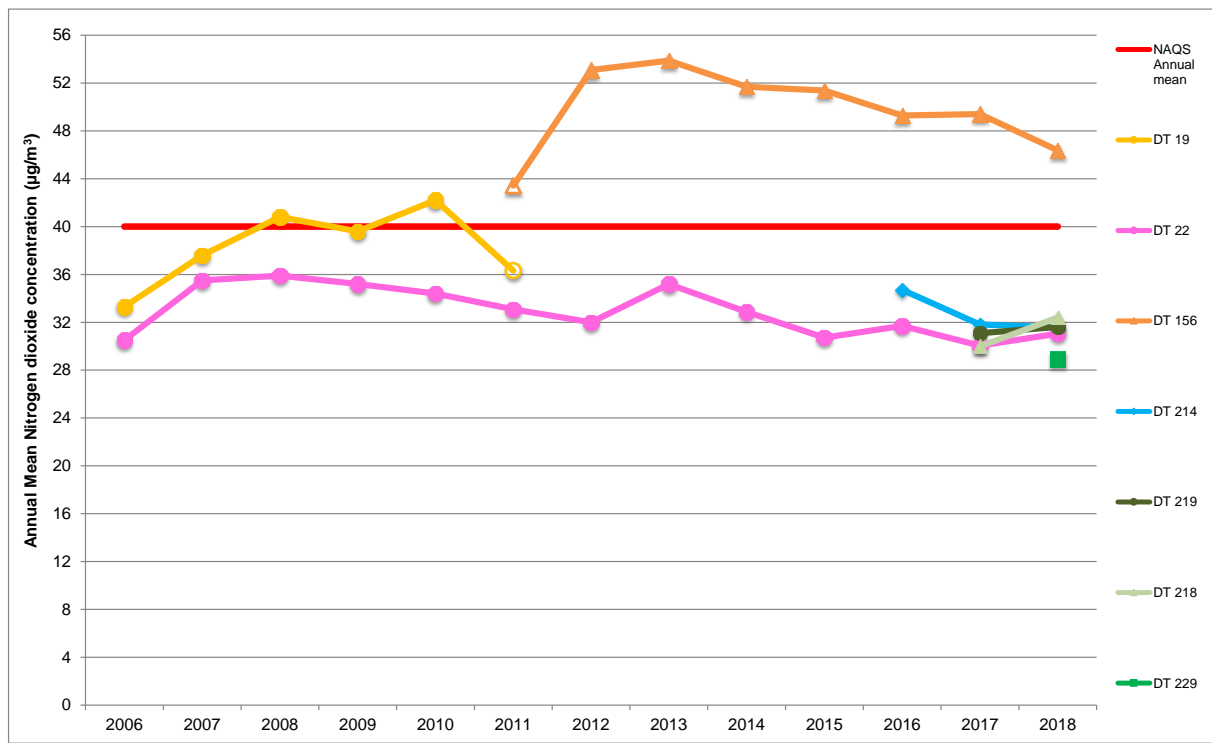


Figure C.23b Overview of NO₂ Diffusion Tube Concentrations on Inner Ring Road (East & South Marketgait)



Stannergate Roundabout

Figure C.24 NO₂ Diffusion Tube Location at Stannergate Roundabout

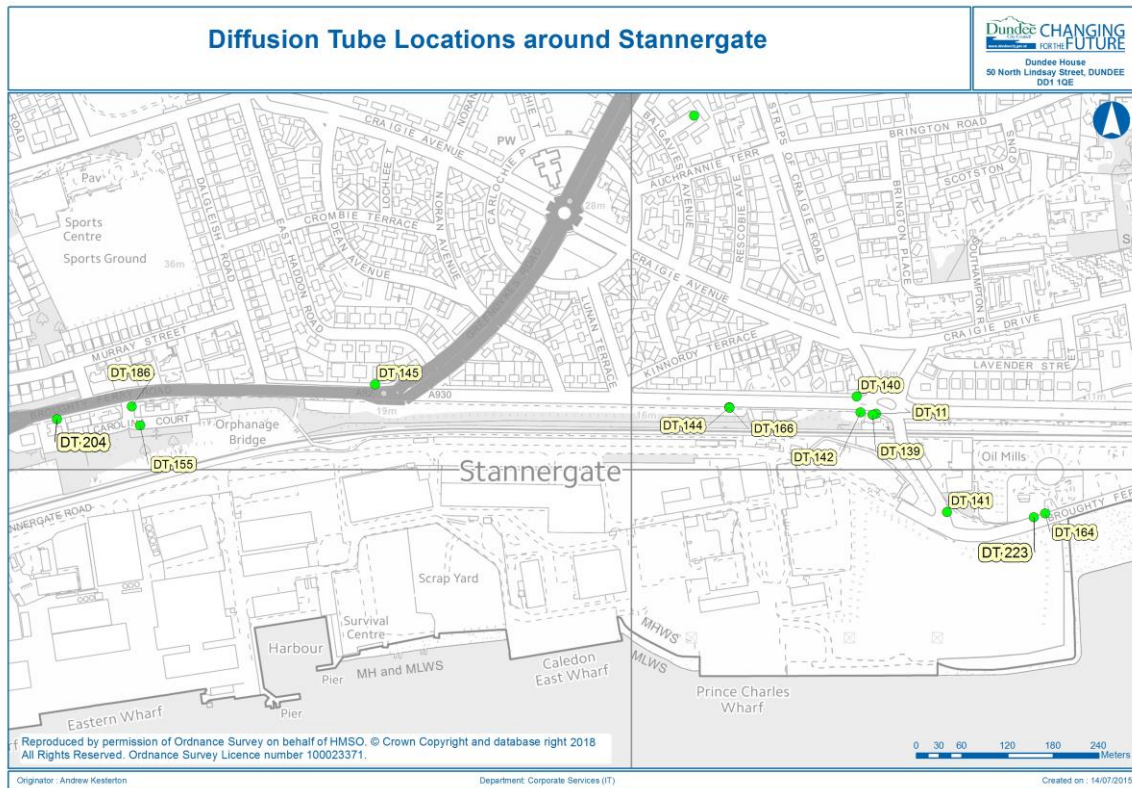
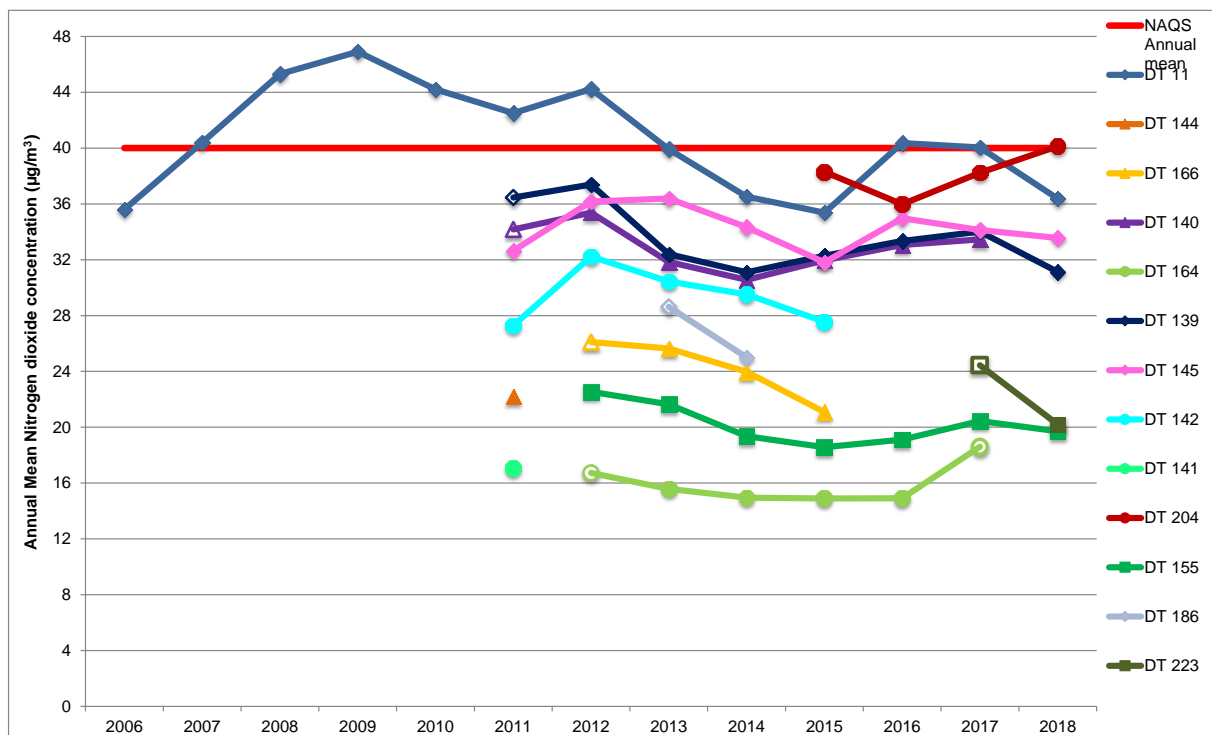


Figure C.25 Overview of NO₂ Diffusion Tube Concentration at Stannergate Roundabout



Strathmore Avenue

Figure C.26 NO₂ Diffusion Tube Location at Strathmore Avenue

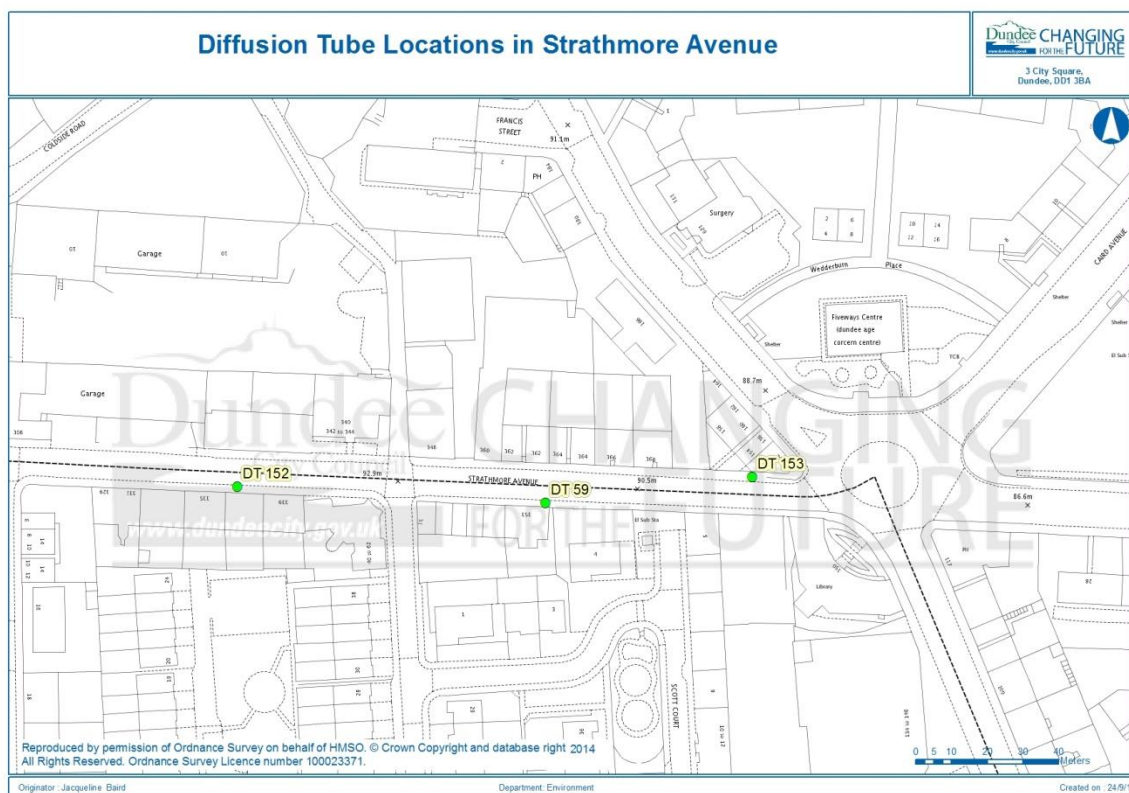


Figure C.27 Overview of NO₂ Diffusion Tube Concentration at Strathmore Avenue

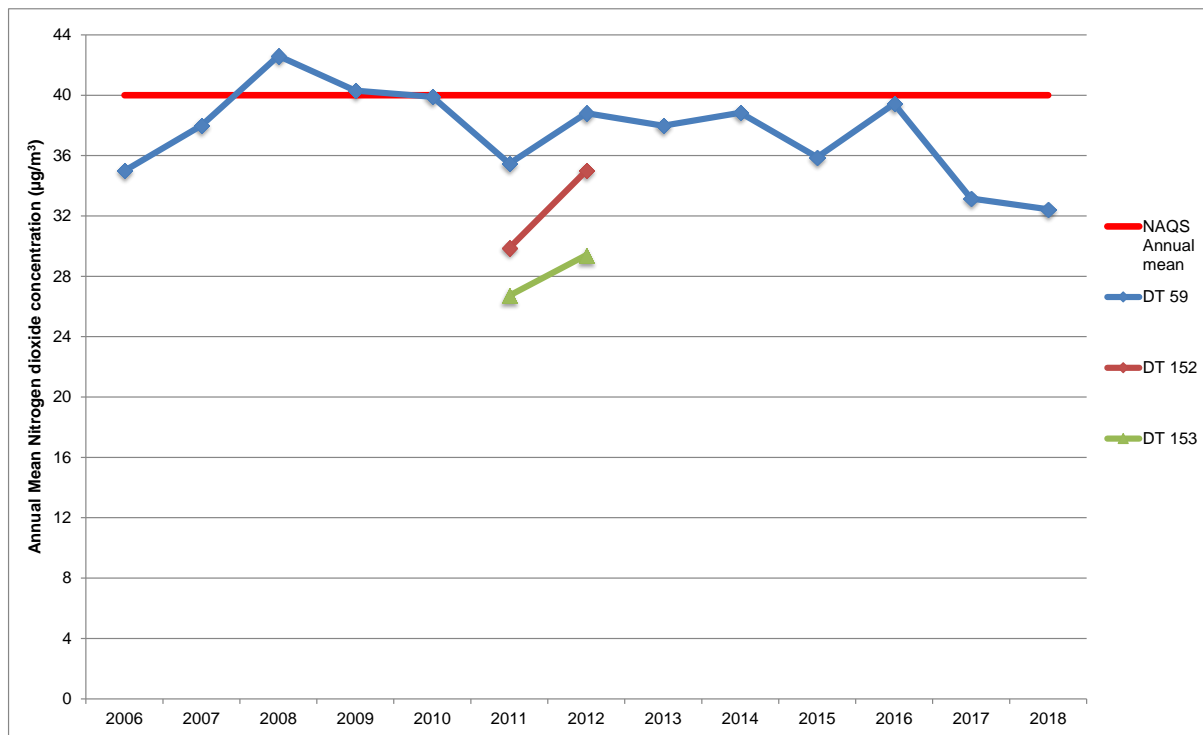


Figure C.28 Urban Background NO₂ Monitoring Locations

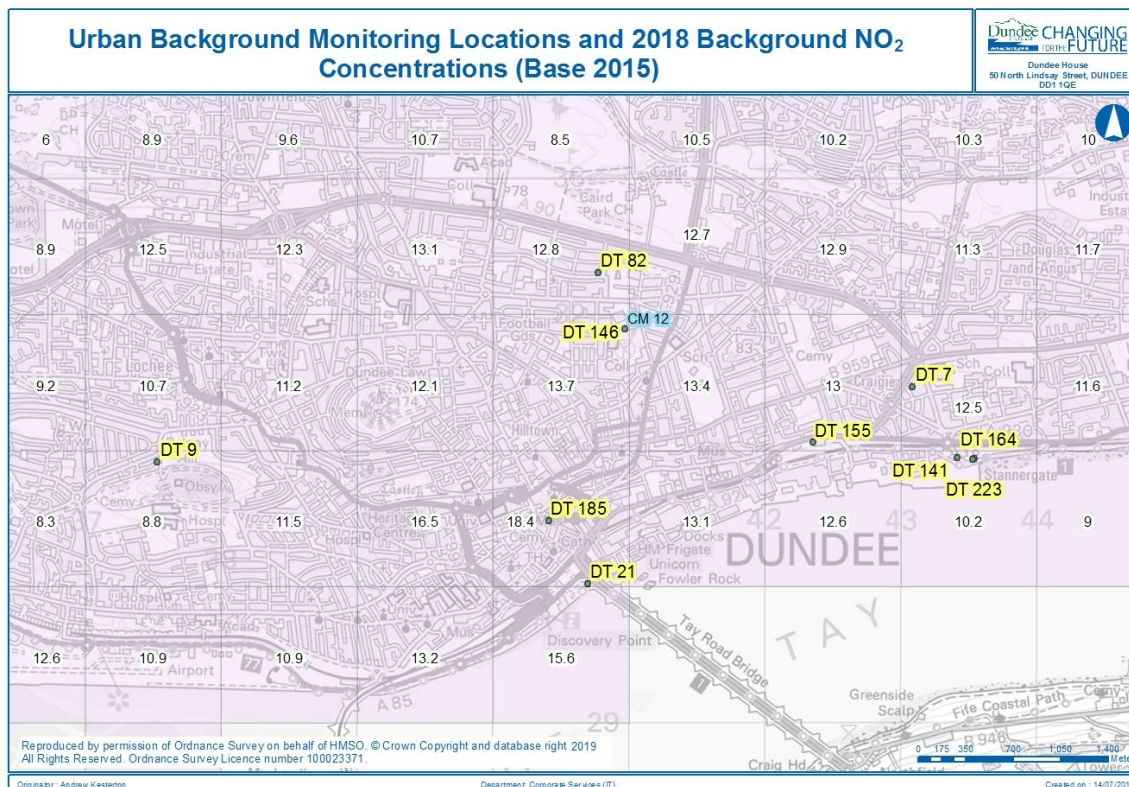


Figure C.29 Overview of NO₂ Concentrations at Urban Background Locations

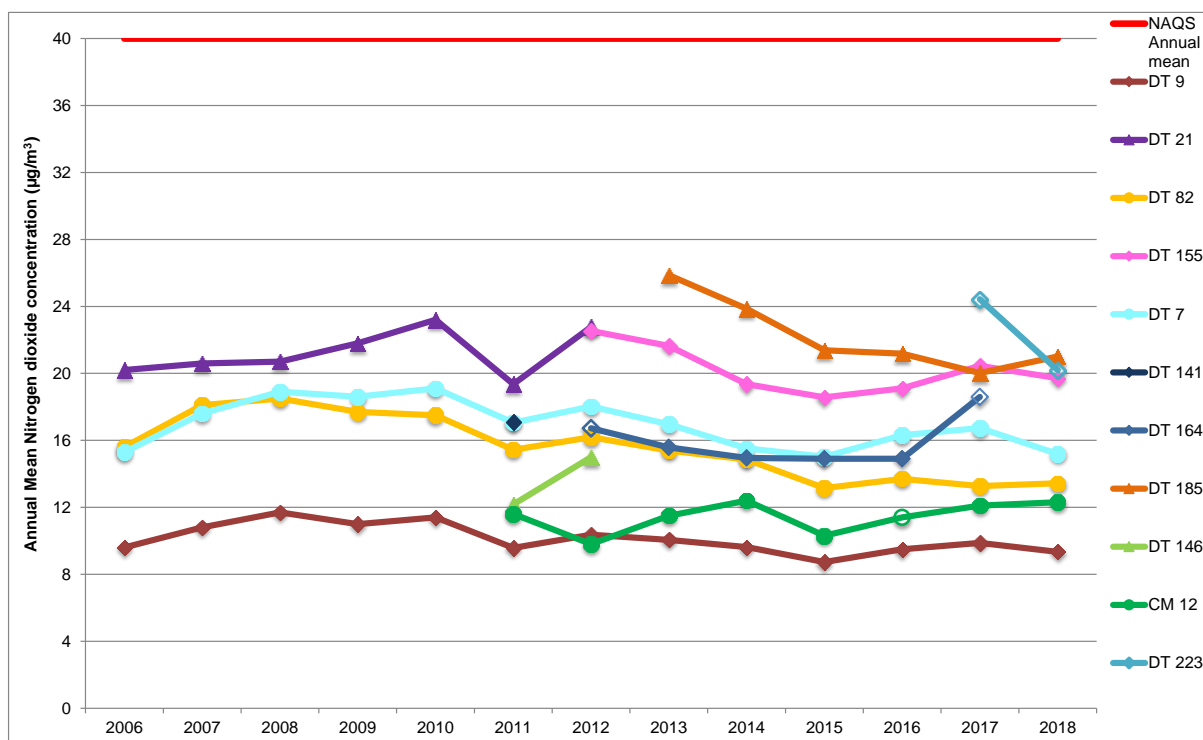
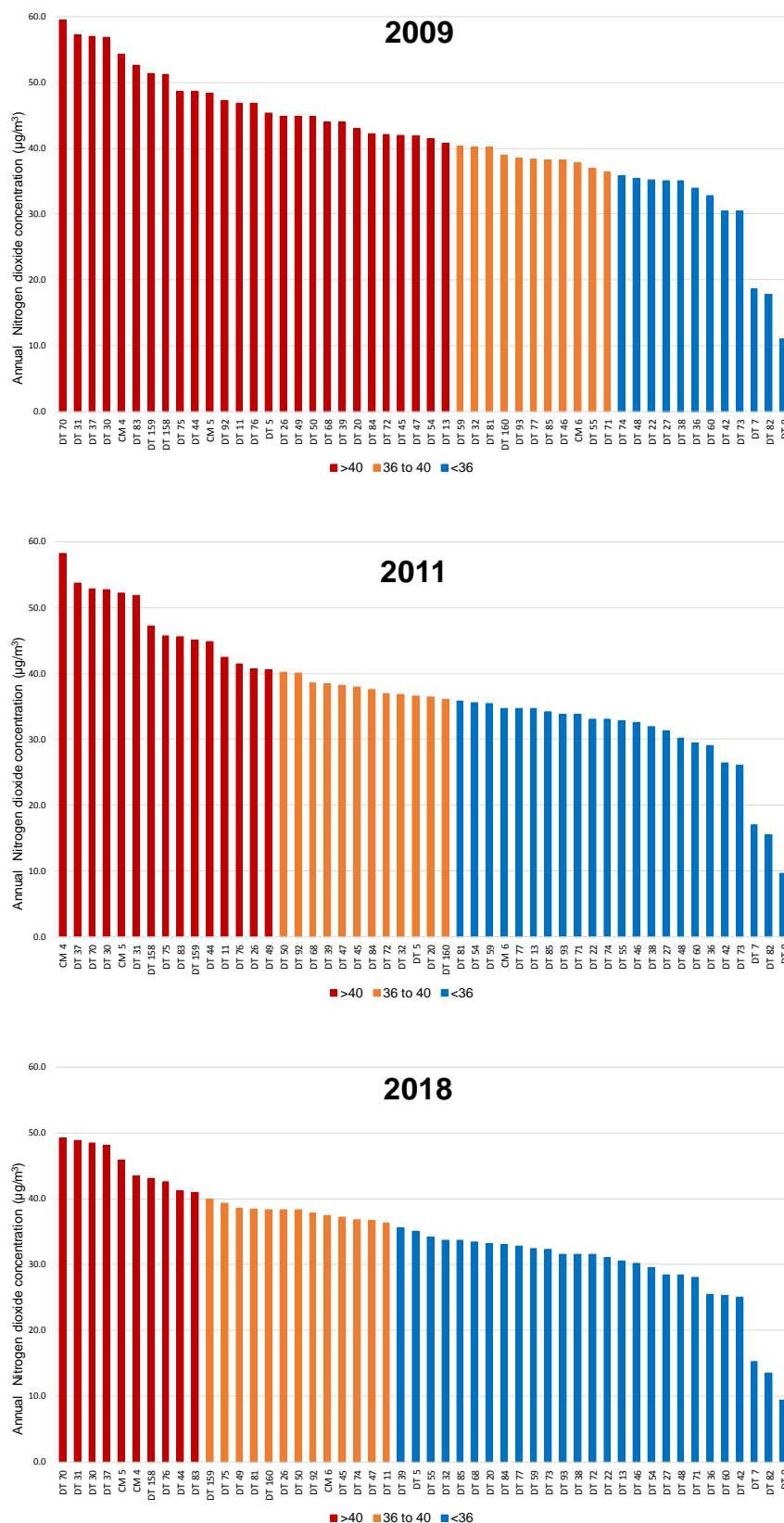
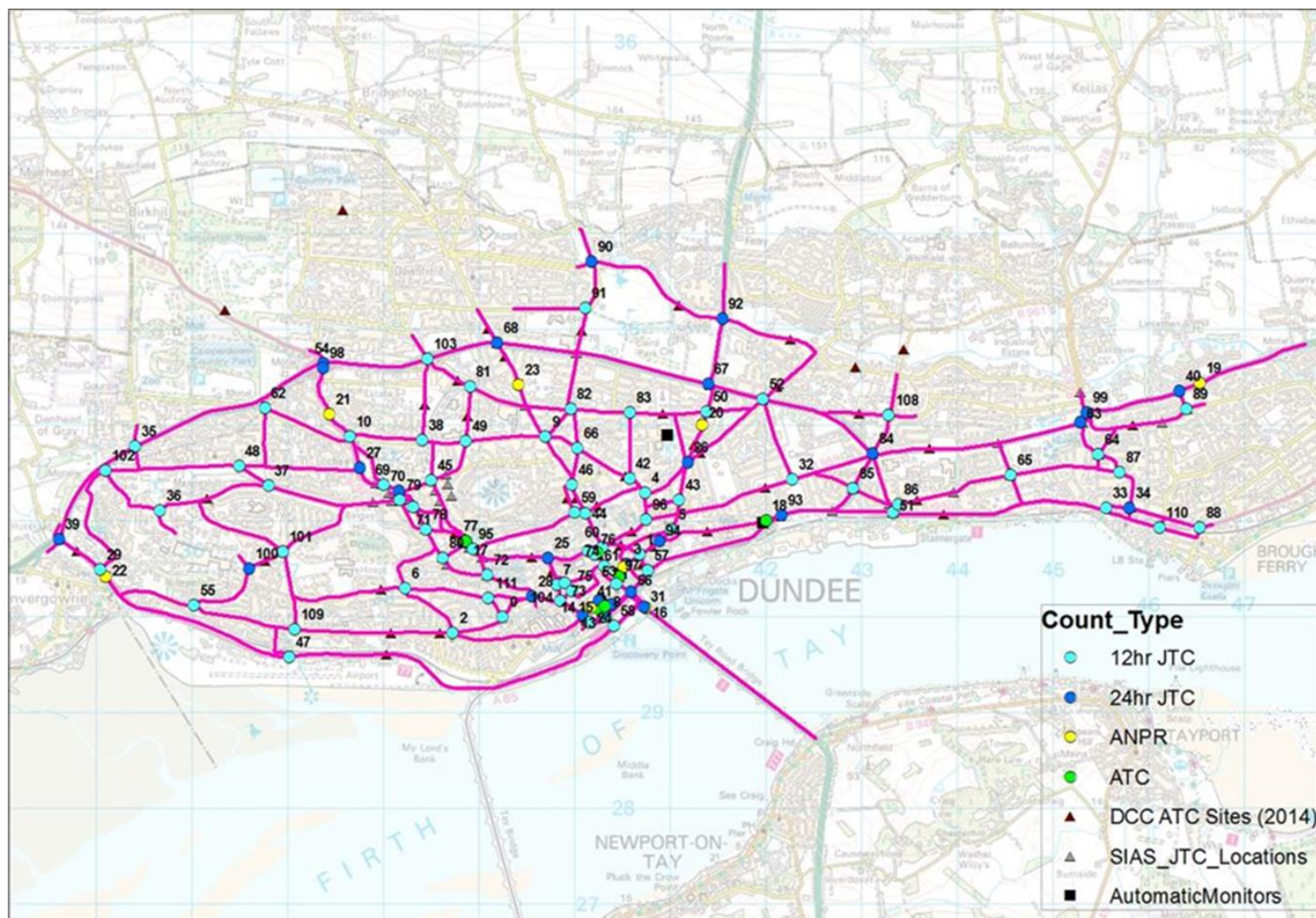


Figure C.30 **Ranked Annual Mean NO₂ Concentrations at 50 Long-term Sites in 2009, 2011 and 2018**



Appendix C.3 Road Traffic Data

Figure C.31 Road Network and Traffic Count Locations for NMF City Model for Dundee



Note: Picture provided by Mark Williams of Scottish Environment Protection Agency

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	Bar Chart
Arbroath Rd (E of Kenilworth Ave)	13186	13335	14054	13153	13846	12869	13283	13697	13142	13174	13287	13642	13784	
Blackness Rd (W of Marchfield)	6574	6675	6435	6195	6145	5938	5911	5844	5102	5509	5676	6487	5819	
Broughty Ferry Rd (E of Dalglish Rd)	31956	31802	31535	30098	27640	27756	27315	24741	29322	30272	26809	28161	29190	
Dens Rd (S of Hillbank Rd)	10852	10664	10672	11023	10833	10083	10062	10178	9744	9707	10315	10322	10756	
Forfar Rd (N of Janefield Pl)	9278	9640	9880	8222	9224	9213	8861	9053	8768	9063	9209	8876	8991	
Hilltown (N of Stirling St)	6024	5710	5895	5701	5753	5656	5416	5492	5608	4268	5782	5828	5491	
Lochee Rd (N of Rankine St)	13477	13681	13438	13286	13296	12983	12684	11603	11285	11880	11821	11770	12453	
Perth Rd (E of Windsor St)	8341	7434	7583	7531	7695	7352	7053	7184	7180	7214	7328	6650	7316	
Pitkerro Rd (S of Baxter Park)	10107	9522	9975	9950	9789	9359	8623	8608	8827	8899	9085	9126	9584	
Rankine St (N of Lochee Rd)	8098	7294	8069	7927	7605	7121	7115	6862	7188	6939	7118	7035	7043	
Riverside Dr (nr Airport)	18875	19056	18918	19045	17907	17654	17024	15900	16213	15932	15923	17343	17503	
Rosebank St (N of Kinloch St)	4821	4867	4722	4623	4528	4603	4426	4489	4621	4587	4655	4615	4183	
Tay Bridge	24475	24686	24748	25045	25406	25235	25484	24753	24770	24925	21762	25993	26631	

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	Bar Chart
Arbroath Rd (E of Kenilworth Ave)	100	101	107	100	105	98	101	104	100	100	101	104	105	
Blackness Rd (W of Marchfield)	100	102	98	94	93	90	90	89	78	84	86	99	89	
Broughty Ferry Rd (E of Dalglish Rd)	100	100	99	94	86	87	85	77	92	95	84	88	91	
Dens Rd (S of Hillbank Rd)	100	98	98	102	100	93	93	94	90	89	95	95	99	
Forfar Rd (N of Janefield Pl)	100	104	106	89	99	99	96	98	95	98	99	96	97	
Hilltown (N of Stirling St)	100	95	98	95	96	94	90	91	93	71	96	97	91	
Lochee Rd (N of Rankine St)	100	102	100	99	99	96	94	86	84	88	88	87	92	
Perth Rd (E of Windsor St)	100	89	91	90	92	88	85	86	86	86	88	80	88	
Pitkerro Rd (S of Baxter Park)	100	94	99	98	97	93	85	85	87	88	90	90	95	
Rankine St (N of Lochee Rd)	100	90	100	98	94	88	88	85	89	86	88	87	87	
Riverside Dr (nr Airport)	100	101	100	101	95	94	90	84	86	84	84	92	93	
Rosebank St (N of Kinloch St)	100	101	98	96	94	95	92	93	96	95	97	96	87	
Tay Bridge	100	101	101	102	104	103	104	101	101	102	89	106	109	

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 2018?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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	IPPC S5.01a & S5.01b	No	No	No	Yes, previously assessed	No	No	No Change, planning application granted for new incinerator. Substantial Variation for replacement plant issued in February 2019 ¹
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 burning natural gas, with a much reduced inventory of bitumen and oil products.

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2018?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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
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

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2018?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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
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

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2018?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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	No Change
Wm Morrison Supermarkets Plc, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	No	No	No	No Change
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,	Chapter 6: Other Activities	Section 6.4 Part A Paragraph (a)	No	No	No	No	No	No	No Change

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2018?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Dundee DD1 5JH									
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
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	No change .Plant still operating but likely to cease operating.
Michelin Tyre Plant, Dundee	Chapter 1: Energy Industries, Combustion	1.1.a	No	No	No	Yes, previously assessed	No	No	No change .Plant still operating but likely to cease 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.

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2018?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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
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.

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2018?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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
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
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.
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
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 ²

Process Name/Address	Process Type	PPC Sector	New source since APR 2018?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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

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

Figure C.32 Proposed Substantial Variation to PPC Permit PPC/A/1151594 in port and location of nearby real-time monitors



Glossary of Terms

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 (Defra funded 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
DERL	Dundee Energy Recycling Ltd
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
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	Oxides of nitrogen
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 _{2.5}	Legal definition ¹⁴ of Particulate Matter less than 2.5µm aerodynamic diameter
PM ₁₀	Legal definition ¹⁵ of Particulate Matter less than 10µm aerodynamic diameter
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
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

¹⁴ <http://www.legislation.gov.uk/ssi/2016/162/regulation/2/made>

¹⁵ <http://www.legislation.gov.uk/ssi/2000/97/schedule/made>

References

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