Annual Progress Report (APR)

2016 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 2016

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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 exceedences of the Air Quality Objectives (AQOs) for nitrogen dioxide (NO_2)(annual mean and hourly mean) and particulate matter (PM_{10})(annual mean). The main source contributing to these exceedences 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 NO_2 and PM_{10}, the latest results and trends are discussed in Chapter 3. The majority of monitoring locations are showing a decreasing trend in pollutant concentrations, though exceedences of the AQOs are still predicted 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 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 intend to liaise with Transport Scotland to discuss possible actions to reduce pollutant concentrations at the newly identified exceedence areas adjacent 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 2015 in pursuit of improving local air quality Key completed measures are:

- Transportation and air quality study reports have been undertaken for the Seagate, North-West arterial route, Stannergate area, and Kingsway/Forfar Road junction by specialist consultants. A summary of the conclusions from the studies is contained in Appendix C of this report;
- Continuation and expansion of both ECOSTARS Schemes for Heavy Duty Vehicles and Taxis/Private Hire vehicles. There are now 79 members (3948 vehicles) in the HDV Scheme and 11 members (201 vehicles) in the Taxi/PHV Scheme;
- Dundee City Council commissioned an Ultra Low Emission Vehicle (ULEV) freight distribution feasibility study in partnership with TACTRAN for an ULEV last mile delivery system operated by a social enterprise. A Freight Consolidation business plan has been prepared and there are ongoing discussions with a potential operator to develop a small scale Freight consolidation centre in the city;
- Provision of permanent infrastructure to increase separation distances between receptors and road traffic at Meadowside will be completed in 2016.

The 2015 NO_2 monitoring results demonstrate that the air quality improvements attributable to this infrastructure change have been maintained;

- The Council's Fleet Management Team has developed an Asset Management Plan with an emphasis on the replacement of the oldest and most polluting vehicles. Approximately £1.8 million was spent in 2015/16 replacing 31 vehicles and 45 items of plant;
- Introduction of "I-Bike" scheme. An officer was appointed in July 2015 initially working with Grove and Menzieshill Secondary Schools and their respective feed-in primary schools to encourage cycling and promote modal shift for school journeys, and to help in securing long-term change in travel behaviour, and;
- "Dr Bike" has visited Dundee City Square, Dundee University & Abertay University Campus several times offering bike maintenance workshops.

In addition to the implementation of the above measures Dundee City Council (Fleet Management Team) were awarded the Low Carbon Vehicle Operator of the Year at the prestigious Low Carbon Champions Award in Milton Keynes in September 2015. The council also received the Public Sector Fleet of the Year (medium to large fleet), in October 2015, at the Green Fleet Awards in Birmingham. This was awarded to the UK public sector organisation with a fleet of more than 250 vehicles that demonstrated a reduction in CO_2 and other pollutants through fuel efficiency programmes, green fleet management and driver awareness training. This demonstrates the council's strategic approach to both fleet and infrastructure and in leading the way in contributing to providing a cleaner and greener fleet in the city.

"Dundee City Council has put into practice what they preach using alternative fuel technology and encouraging other cities to do the same. Dundee has demonstrated a strategic approach to both fleet and infrastructure and carefully thought about perceptions and users' experience."

JUDGING PANELS' COMMENTS ON AWARDING DUNDEE CITY COUNCIL THE ACCOLADE OF 2015 LOW CARBON VEHICLE OPERATOR OF THE YEAR AT LOWCVP LOW CARBON CHAMPIONS AWARDS

Local Priorities and Challenges

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

- Detailed assessment of traffic, air quality improvements and urban realm issues of the proposed traffic management changes in the Seagate will be undertaken to inform the viability of the proposed change;

- Review of Bus movements in Crichton Street/Whitehall Street/Nethergate to investigate and identify measures to improve air quality;
- 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;
- Develop a cost effective monitoring strategy for $PM_{2.5}$ to satisfy the requirements of new air quality legislation and undertake the proposed LAQM tasks highlighted in Section 6.3 (dependant on funding);
- Consider whether specific action plan measures are possible to target the newly identified exceedence areas on the inner ring road and trunk road network;
- Active participation in the Cleaner Air for Scotland Governance Group and in the implementation/consideration of aims and objectives of CAFS across all relevant service/policy areas to contribute to the achievement of the necessary air quality improvements;
- Continuation of delivery of air pollution and active/sustainable travel workshops to every Primary 5 class in Dundee and the "I-bike" officer initiative to raise awareness and encourage modal shift to gain air quality improvements.

'Every day pupils take 20,000 breaths. If we could take all of the air that one pupil breathes in one day how much space would this take? All this air would fill Dundee's Olympia pool'. ***Quote from Active Sustainable Travel Workshop***	

How to Get Involved

Further information on air quality in Dundee can be found on the website at the following location: http://www.dundeecity.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 having a garden bonfire or burning wood.

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 ii

How to Get Involved iii

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

3. Air Quality Monitoring Data and Comparison with Air Quality Objectives 41

3.1 Summary of Monitoring Undertaken 41

3.1.1 Automatic Monitoring Sites 41

3.1.2 Non-Automatic Monitoring Sites 41

3.2 Individual pollutants 42

3.2.1 Nitrogen Dioxide (NO_2) 42

3.2.2 Particulate Matter (PM_{10}) 43

3.2.3 Particulate Matter ($PM_{2.5}$) 44

3.2.4 Sulphur Dioxide (SO_2) 45

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene 45

4. New Local Developments 46

4.2 Other Transport Sources 46

4.1 Road Traffic Sources 46

4.3 Industrial Sources 48

- **New or Proposed Installations for which an Air Quality Assessment has been Carried Out** 49
- **Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced** 49
- **New or Significantly Changed Installations with No Previous Air Quality Assessment** 49
- **Major Fuel (Petrol) Storage Depots** 50
- **Petrol Stations** 50
- **Poultry Farms** 50

4.4 Commercial and Domestic Sources 50

4.5 New Developments with Fugitive or Uncontrolled Sources 51

5. Planning Applications 52

6. Conclusions and Proposed Actions 53

6.1 Conclusions from New Monitoring Data 53

6.2 Conclusions relating to New Local Developments 54

6.3 Proposed Actions 54

Appendix A: Monitoring Results 56

Appendix B: Full Monthly Diffusion Tube Results for 2015 82

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC 87

Glossary of Terms 134

References 136

List of Tables

Table 2.1 Declared Air Quality Management Area 2
Table 2.2 Progress on Measures to Improve Air Quality 5
Table 3.1 Locations of Exceedences of the NO_2 annual mean AQO in 2015 42
Table A.1 Details of Automatic Monitoring Sites 56
Table A.2 Details of Non-Automatic Monitoring Sites 59
Table A.3 Annual Mean NO_2 Monitoring Results 66
Table A.4 1-Hour Mean NO_2 Monitoring Results 74
Table A.5 Annual Mean PM_{10} Monitoring Results 76
Table A.6 24-Hour Mean PM_{10} Monitoring Results 79
Table C.2 Manual Approximate Orthogonal Regression Calculation 2014 90
Table C.3 Period Adjustment Calculation 91
Table C.4 Screened Radar Count Locations 107
Table C.5 Screening Assessment of Radar Count Locations 108
Table C.6 Road Traffic Reduction Act Sites 109
Table C.7 Road Traffic Reduction Act Sites (Percentage Growth) 110
Table C.8 Department of Transport Count Locations 111
Table C.9 Comparison of 2014 DfT Count Point with Previous Assessments 113

List of Figures

Figure A.1 Automatic Monitoring Sites 2015 58
Figure A.2a NO_2 Diffusion Tube Locations (City Centre) 63
Figure A.2b NO_2 Diffusion Tube Locations (East) 64
Figure A.2c NO_2 Diffusion Tube Locations (West) 65
Figure A.3a Trends in NO_2 at Automatic monitors 72
Figure A.3b Trend Analysis at Long-term NO_2 Monitoring Locations 73
Figure A.4 Trend in 99.8th percentile of hourly mean NO_2 concentrations at Lochee Road . 75
Figure A.5a Trends in Annual Mean PM_{10} concentrations at Automatic monitors 77
Figure A.5b Trend analysis of PM_{10} annual means at long term monitoring sites 78
Figure A.6a Frequency of Exceedences of PM_{10} 24 hour Mean Objective (50µg/m^3, 7 allowed) 2008-2015 80
Figure A.6b Trends in 98.08th Percentile PM_{10} values at Automatic monitors 81
Figure C.1 NO_2 Monitoring Locations in Union Street and Whitehall Street 92
Figure C.2 Overview of NO_2 Concentrations in Union St and Nethergate (east of Marketgait) 92
Figure C.3 Overview of NO_2 Concentrations in Whitehall St and Crichton St. 93
Figure C.4 NO_2 Monitoring Locations in Seagate 94
Figure C.5 Overview of NO_2 Concentrations in Seagate. 94

Figure C.6 NO_2 Diffusion Tube Locations in Nethergate 95
Figure C.7 Overview of NO_2 Diffusion Tube Concentrations in Nethergate 95
Figure C.8 NO_2 Diffusion Tube Locations in Victoria Road / Meadowside 96
Figure C.9 Overview of NO_2 Diffusion Tube Concentrations in Victoria Road/Meadowside 96
Figure C.10 NO_2 Diffusion Tube Locations in Albert Street / Dura Street 97
Figure C.11 Overview of NO_2 Diffusion Tube Concentrations in Albert Street / Dura Street. 97
Figure C.12 NO_2 Monitoring Locations in Lochee Road 98
Figure C.13 Overview of NO_2 Concentrations in Lochee Road 98
Figure C.14 NO_2 Diffusion Tube Locations in Logie Street 99
Figure C.15 Overview of NO_2 Diffusion Tube Concentrations in Logie St. 99
Figure C.16 NO_2 Diffusion Tube Locations in Albert St. / Arbroath Road 100
Figure C.17 Overview of NO_2 Diffusion Tube Concentrations in Albert St. /Arbroath Road 100
Figure C.18 NO_2 Diffusion Tube Locations on/near the Kingsway 101
Figure C.19 Overview of NO_2 Diffusion Tube Concentrations on/near the Kingsway 101
Figure C.20 NO_2 Diffusion Tube Locations on Bus Corridor 102
Figure C.21 Overview of NO_2 Diffusion Tube Concentrations on Bus Corridor 102
Figure C.22 NO_2 Diffusion Tube Locations on Inner Ring Road 103
Figure C.23 Overview of NO_2 Diffusion Tube Concentrations on Inner Ring Road 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 Department of Transport Count Point Locations in Dundee 112
Figure C.31 Dundee East – Stannergate Modelled Area 114
Figure C.32 Forfar – Kingsway Modelled Area 116
Figure C.33 Lochee Road Modelled Area 118
Figure C.34 Bus Emissions Modelled Road Network and Receptors 120
Figure C.35 Kingsway West – Myrekirk Road Modelled Area 122
Figure C.36 Preliminary Layout for Seagate (One Way City-Bound) 124

1. Local Air Quality Management

This report provides an overview of air quality in Dundee during 2015. 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 exceedence is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Progress Report (APR) is summarises the work being undertaken by Dundee City Council to improve air quality and any progress that has been made.

Table 1.1 – Summary of Air Quality Objectives (AQOs) in Scotland

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

2. Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

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

Table 2.1 Declared Air Quality Management Area

AQMA Name	Pollutants and Air Quality Objectives	City / Town	Description	Action Plan
Dundee City Council AQMA	• NO_2 annual mean • PM_{10} annual mean • NO_2 hourly mean	Dundee	The whole of the local government area of the City of Dundee was declared an AQMA in respect of the annual mean objective for NO_2 in July 2006. In October 2010 the AQMA Order was amended to include the annual mean objective for PM_{10}. The AQMA was further amended in March 2013 to include the hourly mean objective for NO_2	Air Quality Action Plan for Nitrogen Dioxide (NO_2) and Fine Particulate Matter (PM_{10})-January 2011 https://www.dundeecity.gov.uk/sites/default/files/publications/Dundee%20CC%20FinalAQAP_Jan11.pdf

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 2015 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 each AQMA. Key completed measures are:

- Transportation and air quality study reports have been undertaken for the Seagate, North-West arterial route, Stannergate area, and Kingsway/Forfar Road junction by specialist consultants. A summary of the conclusions from the studies is contained in **Appendix C** of this report;
- Continuation and expansion of both ECOSTARS Schemes for Heavy Duty Vehicles and Taxis/Private Hire vehicles. There are now 79 members (3948 vehicles) in the HDV Scheme and 11 members (201 vehicles) in the Taxi/PHV Scheme;

- Dundee City Council commissioned an Ultra Low Emission Vehicle (ULEV) freight distribution feasibility study in partnership with TACTRAN for an ULEV last mile delivery system operated by a social enterprise. A Freight Consolidation business plan has been prepared and there are ongoing discussions with a potential operator to develop a small scale Freight consolidation centre in the city;
- Provision of permanent infrastructure to increase separation distances between receptors and road traffic at Meadowside will be completed in 2016. The 2015 NO_2 monitoring results demonstrate that the air quality improvements attributable to this infrastructure change have been maintained;
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- Introduction of "I-Bike" scheme. An officer was appointed in July 2015 initially working with Grove and Menzieshill Secondary Schools and their respective feed-in primary schools to encourage cycling and promote modal shift for school journeys, and to help in securing long-term change in travel behaviour; and,
- "Dr Bike" has visited Dundee City Square, Dundee University & Abertay University Campus several times offering bike maintenance workshops.

In addition to the implementation of the above measures Dundee City Council (Fleet Management Team) were awarded the Low Carbon Vehicle Operator of the Year at the prestigious Low Carbon Champions Award in Milton Keynes in September 2015. The council also received the Public Sector Fleet of the Year (medium to large fleet), in October 2015, at the Green Fleet Awards in Birmingham. This was awarded to the UK public sector organisation with a fleet of more than 250 vehicles that demonstrated a reduction in CO_2 and other pollutants through fuel efficiency programmes, green fleet management and driver awareness training. This demonstrates the council's strategic approach to both fleet and infrastructure and in leading the way in contributing to providing a cleaner and greener fleet in the city.

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

- Detailed assessment of traffic, air quality improvements and urban realm issues of the proposed traffic management changes in the Seagate will be undertaken to inform the viability of the proposed change;
- Review of Bus movements in Crichton Street/Whitehall Street/Nethergate to investigate and identify measures to improve air quality;
- 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 delivery of air pollution and active/sustainable travel workshops to every Primary 5 class in Dundee and the i-bike officer initiative to raise awareness and encourage modal shift to gain air quality improvements;
- Active participation in the Cleaner Air for Scotland Governance Group and in the implementation/consideration of aims and objectives of CAFS across all relevant service/policy areas to contribute to the achievement of the necessary air quality improvements.

Key to Table 2.2

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 +

2015 Updates are shown in blue text

Table 2.2 Progress on Measures to Improve Air Quality

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	DCC City Development Department (Transportation Division)			Implementation of improvements	High	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.	Union Street Road infrastructure improvements completed 2011	The levels of NO_2 at Union St have shown a consistent improving downwards trend to well below the objective level since 2010. .
		Transport planning and infrastructure	►NW Arterial Route Improvement - Lochee Rd					Not estimated	Alterations carried out at Lochee Road/Rankine Street in February 2012 removed central reservation to free up road space and reduce congestion	Completed 2012	NO_2 concentrations reduced in 2014 to below those recorded in 2006 when the AQMA was first declared. .

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	□►City Centre Improvements - Meadowside		1 year trial of closing of nearside lane to increase distance between traffic and receptors successful. Funding received in 2015/16 to make temporary surface permanent.	2013 +		Not estimated	Meadowside – in 2012 trial of lane closure at the north end of street to increase separation distance between traffic and receptors was put in place for two weeks from the 26/11/12. As the monitoring results were **inconclusive**, it was agreed to install a temporary paving surface which was completed in October 2013 to allow the impact on monitored concentrations to be studied for a 12month period. During the extended trial period nitrogen dioxide concentrations reduced by 19% and there was an 11% reduction in PM_{10}. Due to the significant improvement in pollutant concentrations permanent street infrastructure changes will be completed in Feb/March 2016	2015/16	The greatest improvement in pollutant concentrations between 2013 and 2014 was seen at the Meadowside automatic monitor. nitrogen dioxide concentrations, reduced by 19% and 11% for PM_{10}.
1 cont		Transport planning and infrastructure	►Arterial Route Improvements - Stannergate		Traffic/Pollution Modelling Dundee East area (including Stannergate roundabout) to identify options for AQ improvement	2013		Not estimated	Consultants engaged in 2013 to carry out traffic micro-simulation modelling and air dispersion modelling. Final draft of the AD Modelling received in April 2016, Dundee City Council currently reviewing the report and considering the implications of the modelled scenarios.	2015/16	
1 cont		Transport planning and infrastructure	□►City Centre Improvements – Seagate / St. Andrews Street.		Funding provided in Financial Year 14/15 to provide engineering design and air dispersion modelling of changes to bus stop locations	2014/15		Not estimated	In late 2014, JMP 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. Their commission included engagement with local bus operators given that buses account for around 60% of harmful emissions. . Subject to funding being secured from the Scottish Government Air Quality Fund, the Council will review the recommendations and undertake pollution dispersion modelling and traffic modelling.	2015/16	.

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
2	**Measure M2**: DCC will enhance the Urban Traffic Management and Control (UTMC) system to reduce congestion	Traffic management	►Real-time traffic monitoring. ►Improved control regime to smooth out peak traffic.	DCC City Development Department (Transportation Division)	Implementation of UTMC improvements and carry out annual review to measure % reduction in congestion in line with target		►10% reduction in congestion (journey times) in targeted areas during peak times before and after implementation of measure. ►Annual review of impact	Small	Scheme designed to expand UTMC to two congested junctions in Lochee Rd AQ hotspots. Schemes now implemented and the traffic management improvements will be assessed in terms of AQ improvements by Environmental Protection Division. ►UTMC was implemented in March 2013 which will see further traffic management enhancements.► Seagate / Commercial Street traffic light refurbishment to improve bus and traffic flows through this AQ hotspot on the main bus corridor completed Feb 2013. Coupled with increased enforcement of waiting restrictions to reduce congestion.► Successful trial of bluetooth journey time monitoring of western arterial route, possibility of expansion to include AQ hotspots. Schemes now implemented and the traffic management improvements will be assessed in terms of AQ improvements by Neighbourhood Service.	Completed 2013	NO_2 concentrations in Seagate reduced slightly between 2013 and 2014 but show an increasing trend. .

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
2 cont		Traffic management			TACTRAN Capital Grant funding for expanded automation of journey time monitoring to allow activation of traffic management systems to alleviate congestion.	2013		Not estimated	Funding provided in FY 14/15 to expand Bluetooth Traffic Speed Monitoring System to Include the Lochee Road corridor a known air pollution hotspot was completed by 31st March 2015 Equipment scheduled to be installed in the eastern part of the city in 2016. On going work with Transport Scotland to develop the system further.	2015	n/a
		Traffic management			Improve traffic flow/ management strategies in Lochee Rd- introduce MOTES	2013		Not estimated	MOTES now unlikely to be deployed as it appears to have limited effect. Expansion of Bluetooth traffic speed monitoring to include the Lochee Road corridor was completed by 31st March 2015	2015	n/a
		Traffic management			Paramic/AIRE modelling of key junctions – Kingsway/Forfar Road& Lochee Road Corridor to test option improvements	2013		Not estimated	Consultants engaged in 2013 to carry out traffic micro-simulation modelling and air dispersion modelling. Final Modelling received in April 2016 Dundee City Council currently reviewing reports and considering options. Summary of options contained in Appendix C of this report.	2016	Modelling work currently being reviewed.

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
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	►Social Marketing Campaign undertaken - focussing on the Lochee Road corridor (Reported in AQAP Progress Report 2012, Appendix 1). ►DCC initiated partnership with a local social enterprise to develop a Behavioural Change Centre of Excellence. ►Designed a programme of in-class workshops to promote sustainable and active travel in 11 primary schools. ►Established a new Bike Boost programme to promote cycling to work and other journeys. ►DCC is actively working to secure funds for future investment in Dundee Travel Active. 2012 summary - Broughty Ferry targeted for Personalised Travel Planning delivered by Social Enterprise Positive Steps.. ►DCC staff travel policy now being implemented and this will further encourage modal shift to active modes. ►Investigated a school based travel behaviour change programme for 2013. ►19.7% of people estimated to be walking or cycling to work in Dundee. The data is published by the Scottish Government every two years. The 19.7% data is taken from the Scottish Household Surveys undertaken in 2009 and 2010. The target in the City Development Service Plan 2012-2017 is 25%. Summary 2013► Broughty Ferry has had Personalised Travel Planning delivered by Social Enterprise Positive Steps. 41% of trips to work by Active Travel (walking and cycling) in 2012. This figure is taken from Scottish households survey (SHS) undertaken in 2012 and relates to a very small sample size (92 people). Summary 2014--Sustans Funding used to help deliver improved cycling and walking connectivity. A limited level of SCSP funding has been used to improve signage around the Green circular. Doctor Bike has visited Dundee City Square several times offering bike maintenance workshops. Summary 2015-Dr Bike has visited the City Square, Dundee University and Abertay University Campus several times offering bike maintenance workshops. I-bike initiative also commenced in July as detailed below.	2012+ on-going	A reduction in transport / unnecessary journeys is predicted however this may be difficult to measure.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
		Promoting travel alternatives			Behavioural Change Primary School programme to promote sustainable travel options in all primary schools in Dundee. Funding provided in FY 2014/15 to extend programme to P5 pupils over two academic years Funding sought in FY for 2015/16 .	2013+			Primary school focussed Personalised Travel Planning contract awarded and all P5 pupils in Dundee to be given classroom sessions on Air Quality, Sustainable Travel, Active Travel benefits March – October 2013. Summer term & Autumn Term 2014 Feedback from these sessions has been very positive. It was the intention to undertake the Primary school focussed Personalised Travel Planning Sessions in-house but this was not feasible. The work was put out to tender and awarded to JMP Consultant in December 2015 with the intention of programming completion by the end of June 2016 for the 2015/16 intake of pupils.	Ongoing	
3 cont.		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	2013/14 2015/16			Doctor Bike has visited Dundee City Square several times offering bike maintenance workshops i-bike officer in place from July 2015. Initially working with Grove and Menzieshill Secondary Schools and their respective feed-in primary schools encouraging cycling.		
4	**Measure M4**: DCC will introduce measures to improve bus services and reduce emissions	Transport planning and infrastructure Vehicle Fleet efficiency	† ►Statutory Bus Quality Partnership. † ►Voluntary Bus Quality Partnership	DCC City Development Department (Transportation Division)		2011+	► Identification of new corridors that directly benefit air quality. ► Average age fleet and Euro category, fuel type	Medium	Opportunities investigated as part of Air Quality Low Emission Charter Publication of Cleaner Air for Scotland Strategy (launched November 2015)	Medium Term 2012+	

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
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	►National Express Dundee introduced 15 new Euro V buses during December 2011 for use on Services 22 (Ninewells Hospital - City Centre-Downfield-Craigowl View) and 28/29 (Douglas-Charleston-Douglas via City Centre). ►During 2010/11 Stagecoach invested in 20 new Euro V double-deckers on its major Service 73 corridor (Ninewells-City Centre-Broughty Ferry-Carnoustie-Arbroath) and Service 20 (Dundee-Forfar). ►4 new Euro V coaches also have also been introduced in new route (Dundee-Arbroath-Montrose-Aberdeen) 2012 summary -►No bids submitted for Green Bus fund 3 ►DCC looking at Hydrogen Fuel cell opportunities for buses in a collaborative approach through the Scottish Cities Alliance. ►National Express Dundee applied to Scottish Government's Green Bus Fund 2 and invest in hybrid engine technology. ►Stagecoach invested in 6 new Euro V buses on their Dundee to Blairgowrie route (Service 57) 2013 Summary - Through the Scottish Cities Alliance (SCA) investigations into potential for Hydrogen fuel alternatives are being developed with major EU funding opportunity hopefully being available 2014 - 2020. SCA and ten Cities are engaged with EU proposal in terms of Scotland's suitability for Hydrogen Fuel cell bus expansion.2014 Summary - In Dundee, National Express has been operating Diesel Electric Hybrid buses since 2013 and these have been operationally very successful in terms of the 'green' message and attracting users. National Express are also looking to modernise the smaller midi bus sized vehicles in their fleet. Stagecoach will introduce 15 Diesel Electric buses in Spring 2015 to Service 73 corridor Electric Vehicle operation and charging infrastructure expansion has put Dundee to the forefront of this technology. Dundee alongside the Scottish Cities Alliance is exploring Hydrogen Fuel cells as alternative fuel technology for buses, through EU funded Hydrogen Fuel cell Joint Undertaking. Stagecoach have announced that approximately 18 new Diesel Electric buses will replace existing Euro 5 buses in Spring 2015 and new Euro 6 diesel vehicles will replace Euro 5 vehicles later this year also. These major bus industry investments will have a positive impact on air quality in Dundee. 2015 Summary- The Council continues to work in informal partnership with the main bus operators in Dundee. Stagecoach introduced 18 Euro VI electric-hybrid buses on their Service 73 route in May 2015. Investment in new buses at Xplore Dundee has been limited with the arrival of just 5 new buses in 2015.. Some ''younger' buses from the wider National	2013+	

									Express group have been redeployed to Dundee during 2015.		

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
		Vehicle Fleet efficiency					►Lobby Scottish Government for fuel duty rebates for low carbon fleet		Bus Service Operators Grant (BSOG) changes from April 2012 will reward use of cleaner fuels and incentivise the use of cleaner vehicles. 2013 Summary-Current enhanced BSOG available for operation of Diesel Electric Hybrid buses. Further investigate enhanced BSOG where Hydrogen Fuel Cell vehicles are introduced. 2014 –No Change 2015 Summary - The government continues to review its BSOG payments and Dundee City Council officers have contributed to that discussion and debate.		
		Vehicle Fleet efficiency			National Express Dundee will introduce nine 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 being introduced	2013/14			See Measure 6 – National Express Dundee one of the 12 inaugural members and Stagecoach joined the scheme in 2014		
4 cont.	**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' signage on bus routes. ► Driver Training/ Awareness Raising	Small	►Opportunities being 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+	

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) see Measure 5 re Park and Ride Facilities)	Med Term, 2015-2016+	

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
		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 submitted July 2015, summary of findings available in Appendix C of this report.	2015	
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	Site at Wright Avenue selected as preferred location for P&R at Dundee West and at site on south side of Tay Road Bridge identified for Dundee South and confirmed by NE Local Plan reporter. ► Both sites taken forward with detailed design. Dundee West underwent pre - planning application consultation and detailed planning consent applied for in mid-2013. Dundee West site at Wright Avenue rejected by Development Management Committee In October 2013.This will require TACTRAN and DCC to review Dundee area Park and Ride strategy. Summary 2014-TACTRAN and DCC to review Dundee area Park and Ride strategy. Also to engage with Transport Scotland as there are national transport policy implications in terms of Park and Ride around Scotland's cities It is not anticipated that Dundee West Park and Ride option will be revisited in the timeframe of this monitoring framework. Wider strategy around city under review with TACTRAN, SESTRAN, Fife Council and Transport Scotland DCC, Fife Council, TACTRAN and SESTRAN actively investigating funding opportunities to secure land purchase at Dundee South (Tay Road Bridge) landfall. Summary 2015- TACTRAN and DCC to review Dundee area Park and Ride strategy. Also to engage with Transport Scotland as there are national transport policy implications in terms of Park and	+	

									Ride around Scotland's cities. Wider strategy around city under review with TACTRAN, SESTRAN, Fife Council and Transport Scotland DCC, Fife Council, TACTRAN and SESTRAN actively investigating funding opportunities to secure land at Dundee South (Tay Road Bridge) landfall.		

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	**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) Summary 2013-LaMILO (Last Mile Logistics) projects to deliver exploratory social enterprise model freight consolidation based on successful Dutch model. ENCLOSE project developed and looking at Sustainable Urban Logistics Plan for Dundee (SULP Summary 2014- Dundee City Council is working with the Heavy Duty Vehicle operators to reduce environmental impact of these vehicles. An accreditation scheme - ECO STARS is operating that recognises green fleets. DCC are also partners in an EU funded project ENCLOSE that is looking to make City Logistics more efficient and environmentally friendly. The Dundee Sustainable Urban Logistics Plan was approved by the City Development Committee on 27.10.14 Summary 2015-A number of new members joined ECO STARS Scheme for Heavy Duty Vehicles in 2015 with the membership increasing to 79 by the 31st December.	2012+	
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 Summary 2015 - A Freight Consolidation business plan has been prepared and ongoing discussions with a potential operator to develop a small scale Freight consolidation centre in the city.	Long term	

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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 The 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 27.10.14		
6 cont.		Vehicle Fleet Efficiency			ECO Stars Dundee Fleet Management Recognition Scheme being introduced in 2013 Funding to continue in 2015/16 Seeking funding for 2016/17	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 ECO Stars Recognition Scheme for heavy duty vehicles fleets had 79 members by the 31st December 2015	Ongoing	A number of participating members are now demonstrating working towards operating cleaner /greener fleets.
		Promoting Low Emission Transport			Seeking match funding for feasibility study for ULEV/ZEV deliveries in 2015/16 FY				A Freight Consolidation business plan has been prepared and ongoing discussions with a potential operator to develop a small scale Freight consolidation centre in the city.		

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 NO2 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	► New Corporate Fleet Manager appointed December 2011 ►New Fleet Section to develop a reporting procedure to compare replacement vehicles in relation to emission improvements ►New Fleet Section will create a replacement plan for all vehicles to maintain fleet age profile ► 2011 makeup of the waste collection fleet - 12 x Euro 3, 17 x Euro 4 and 23 x Euro 5. Fleet is continually moving towards newest Euro Category ► The Fleet section replaced 60 vehicles 2012/13 all with improved emissions standards Summary 2013The Fleet Section has bought in over 50 new vehicles in 2013 replacing the oldest and most polluting vehicles where possible. And have also undertaken an exercise with hire company to replace over 30 of the oldest hire vehicles in the fleet. ►2 new Euro 6 engine Refuse Collection vehicles have been ordered to join the fleet in 2014. There are also 39 electric vehicles in the Council Fleet contributing to lower emissions. DCC Transportation delivering in partnership with Developing Car Clubs in Scotland and Co-Wheels seven additional car club vehicles all of which are Electric Vehicles Summary 2014-Following the introduction of 7 Euro 6 refuse collection vehicles in 2014. The Fleet are looking to introduce another 5 in 2015. A further 7 electric cars have been added to the Fleet towards the end of 2014 with further cars and 1 van on order. The Fleet Section have also been offered a government grant to lease a number of vehicles, the leasing is currently out to tender but it is hoped to lease a further 7 vehicles. Summary 2015- The Fleet Section has spent approximately £1.8 million in 2015/16 replacing 31 vehicles and 45 items of plant. ► See also Measure 14	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 remain however the oldest and most polluting vehicles		

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
		Promoting Low Emission Transport			**Initial discussions for 2013/14 vehicle/plant replacement programme has identified improved emissions as a high priority**	**2013/14**			**Summary 2013/14-Replaced over 30 of the oldest hire vehicles in the fleet. .** **See Measure 7 above**		**An equivalent number of poorer quality emission vehicles have now been removed from service.**
		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	
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	►Opportunities are being investigated as part of Air Quality Low Emission Charter (See AQAP 2012 Appendix 2). ►Education Transport contracts to be let with condition that all vehicles must be Euro 4 compliant. ►Approximately 400 Taxi / PHC driver training sessions were made available in FY 2013/14 -limited uptake alternative training options being considered Summary 2014-As part of Air Quality Low Emission Charter, opportunities are being investigated for: 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. Education Transport contracts were let with condition that all vehicles must be Euro 4 compliant. Engaging with taxi operators who are actively investigating electrification of taxi fleet - one operator has indicated desire to convert diesel fleet to all electric (100+ vehicles), currently DCC working with partners to support this major proposal. Summary 2015- ECO Stars fleet recognition scheme for Taxis was launched on the 11th March 2015. There were 11 members in the scheme by the 31st December 2015. DCC also looking at collaborative work with taxi operators in developing an Electric Vehicle trial for taxis in Dundee. Dundee was successful in the 1st stage of bidding to Office of Low Emission Vehicles Ultra Low Taxi Scheme. This awarded us a fully funded feasibility study to be carried out by Energy Savings Trust. This was undertaken in December 2015 and we are waiting on final report.	Ongoing+	Objective to remove poor emission vehicles from service

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
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+			Ongoing		
8		Vehicle Fleet Efficiency			Explore the potential of introducing Licensing Conditions for minimum taxi Euro category for certain classes of vehicles;				2013-Assuming successful implementation of the proposed ECOSTARS scheme for Taxi Operators, the Council will consider making achievement of a certain minimum star rating a pre-requisite for Council Contracted work. 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.		
		Traffic Management			Provide 'No Idling' street signage; Monitoring for idling.				No progress as the funding that was provided in 2015/16 was allocated to cover the additional costs of installing permanent infrastructure in Meadowside. ➢ See Measure 1		
8 cont.		Promoting low emission transport			DCC also looking at collaborative work with taxi operators in developing an Electric Vehicle trial for taxis in Dundee				2014-Looking at City Wide rapid charger network to support individuals use, where they can't easily home charge and this will support a taxi fleet of EVs (over and above their home / depot charging infrastructure). Up to seven rapid chargers would be located in neighbourhoods city wide 2015- Dundee was successful in the 1st stage of bidding to Office of Low Emission Vehicles Ultra Low Taxi Scheme. This awarded us a fully funded feasibility study to be carried out by Energy Savings Trust. This was undertaken in December 2015 and we are waiting on final report.		
		Vehicle Fleet Efficiency			Expansion of ECOSTARS to include taxi / private hire operators	2014/15			ECO Stars expanded to include taxi operators in 2014/15. Seeking funding in 2015/16 to continue scheme The scheme was launched on the 11th March 2015 and there were 11 members by the 31st December 2015.		

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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	2013+	
		Traffic Management			To seek funding to undertake feasibility study of introduction of RET	2015/16+			Project on hold		
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	►Main Issues Report Consultation exercise completed 2/12/2011. Proposed Plan by late autumn 2012. ►Method of integrating AQ into SPG considered. ► Air Quality Policy incorporated into draft LDP. Air Quality Supplementary Planning Guidance approved as part of a package of SPGs for adoption of the Local Development Plan. Supplementary Guidance approved at Committee in February 2015. Implications of Cleaner Air for Scotland Strategy to be considered in future LDPs.	2015 +	

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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	Procedure implemented for exchange of information between the Climate Change Board & Corporate Air Quality Steering Group. All matters (e.g. Action Plan updates) that the Climate Change Board & Corporate Air Quality Steering Group require attention in general, will be dealt with by the Executive Director of Neighbourhood Services and / or the Strategic Management Team. In addition an update on Air Quality progress was presented to the Climate Change Board in December 2014 and the 2015 AQ Update Report included the implications of the Cleaner Air for Scotland Strategy (CAFS).	2014+	
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.	On-going	

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
LEADING BY EXAMPLE MEASURES											
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 ►►Electric vehicle charging station infrastructure for council vehicles has been implemented with Electric Charging points installed in underground car park (below City Square. ►Pool EVs now available for city centre DCC staff and expanded across several DCC Multi Storey Car Parks and out of city centre DCC offices. ►Also investigating alternative Low Carbon Vehicle technologies i.e. Hydrogen Fuel cells ►8 Electric vehicle charging stations installed by DCC (double-headed) 2014-Electric vehicle charging station infrastructure for council vehicles has been implemented with Electric Charging points installed in underground car park (below City Square. Pool EVs now available for city centre DCC staff and further expansion now being implemented across several DCC Multi Storey Car Parks and out of city centre DCC offices. Also investigating alternative Low Carbon Vehicle technologies i.e. Hydrogen Fuel cells Looking at City Wide rapid charger network to support individuals use and taxi fleet of EVs 2015- DCC have submitted final bid to OLEV for their Go Ultra Low City Scheme and are waiting for the announcement which is due in early 2106. Dundee City Council have installed 2 x 22kw chargers within the city funded by Transport Scotland as well as a number of charge points in the city centre which will be shared with Car Clubs. Work is also underway on new car park at the rear of council headquarters which will accommodate 12 of the council's electric pool cars therefore freeing up the spaces in car parks for more use by the public. Four on-street public charging bays were created in Spring 2015. Trades Lane, Dock Street, South Tay Street and Nethergate. Co-wheels introduced 7 EVs into their Dundee fleet – available for hire by Co-wheels members	2012+ on-going	
					See also Measure 7-	2013/14+					

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
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	►New Corporate Fleet Manager appointed December 2011. ► Procurement of vehicles through Scotland Excel Framework which gives consideration to Green Credentials. 2011 saw the introduction of 6 electric vehicles with a further 6 by end March 2012 ► The Fleet section has replaced 60 vehicles 2012/13 all with improved emissions standards 2013-The oldest and some of the most polluting vehicles have been identified and will be replaced with the current Euro 5 engines in the 2013/14 replacement plan. ►2 new Euro 6 engine refuse collection vehicles ordered and will add to the existing rolling programme of replacing older and more polluting vehicles. ►Over 80 vehicles were replaced in 2013 2014-A draft 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 remain however the oldest and most polluting vehicles. 2015- An annual replacement programme has been introduced to replace older and more polluting vehicles. The Fleet Section has spent approximately £1.8 million in 2015/16 replacing 31 vehicles and 45 items of plant. ►See also Measure 7	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
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	►New Fleet Section created (2012) ►Environment Department LGV drivers have undertaken SAFED (Safe & Fuel Efficient Driving) as part of their decision driving training and there is a proposal to roll this out across all council drivers. ►New computerised Fleet Management Systems to be introduced will help monitor fuel use across the council. Fuel saving measures being trialled in vehicles including Throttle Intervention Systems and Gear Box Prognostics. Fleet Section are developing reports to help tackle idling issues, which will improve fuel efficiency. 25 of the new small vans are fitted with stop/start technology which will be monitored to ascertain benefits. ►2013 Summary - Fleet Section are working with other departments and telematics company to develop reporting tools to monitor mileage and driving styles. ►Fleet section is beginning to develop action plan for rolling out Routesmart to plan routes for all council vehicles to assist with reducing mileage. ►Fuel cards have been introduced to reduce mileage for RCV's in the east of the city. ►2014 Summary-The Routesmart officers introduced the 1st new route in January 2014 and have an extensive programme to look at all refuse collection routes. ►2015 Summary – A recent trial of rev technology failed to produce any noticeable impact. A recent crackdown on speeding events across the council fleet will hopefully help improve fuel consumption. No further developments in the use of the Routesmart technology that would help with AQ improvement. See Also Measures 7,13,14	2014+	
		Vehicle Fleet Efficiency			Analysis of the information provided by the telematics system in relation to idling time etc.	2014+			A monthly review is undertaken of the telematics data that includes total mileage, idling time and drivers' behaviour. This data is used to identify any trends and help departments manage their fuel usage		

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
16	**Measure M16:** DCC will promote options for better travel planning amongst Dundee City Council employees	Promoting Travel Alternatives	□► Review DCC Travel Plan ►† DCC to investigate use of annual survey on how/what modes of transport employees use to travel to work	DCC City Development (Transportation Division)		2011+	►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	►Staff Travel Policy adopted Autumn 2011. This includes CO2 usages for lease vehicles ►DCC senior managers monitor effectiveness of staff travel policy The staff travel policy is encouraging innovation in terms of pool fleet,public and active travel by DCC officers / management to support staff travel.(2012). 2015-2015 - Office bikes made available at Dundee House from October 2015. Increased engagement with cyclists through the development of a Cycling Strategy for Dundee	2015+	
17	**Measure M17:** DCC will continue to promote and encourage their employees to consider the use of bicycles in their daily duties by providing cycle usage mileage	Promoting Travel Alternatives	† ►Continue to investigate and develop the use of various incentive schemes ►Develop cycling strategies ►DCC to investigate use of annual survey on how/what modes of transport employees use to travel to work	DCC City Development (Transportation Division)		2011+	►% 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	►Get Cycling engaged to deliver cycling initiatives at DCC and other major employers in Dundee. ►Improved cycling facilities provided at Dundee House (Dundee City Council Headquarters) and other Council properties. ►Bike Boost and Cycle to Work initiatives delivered over the summer of 2012 to encourage staff to consider cycling. ►2014 -Staff Travel Policy now fully implemented and walking and cycling modes are encouraged for shorter distances. ►2015- Staff Travel Policy now fully implemented and walking and cycling modes are encouraged for shorter distances. No data being collected	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 2011/12 - 36,506 tonnes of CO_2 2012/13 -39,570 tonnes of CO_2 2013/14 - 34,645 tonnes of CO_2 2014/15 - 34,001 tonnes of CO_2 Fleet transport baseline figure of 5,976 tonnes (i.e. reported 2007 estimate) has reduced to 4,164 in 2013/14 3,965 in 2014/15 3776 tonnes in 2015/16	On-going	
					New annual aspirational reduction target of 5% until 2020	2013+					

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
19	**Measure M19:** DCC to promote and support localised energy generation that doesn't compromise Air Quality in private households	Promoting Low Emission Plant	†► Determine strategy/advise note and annually review content	►DCC Housing Department ►Solar Cities		2011+	►List of any promotion campaigns planned/ implemented	Small	►In 2012 Solar PV – Annual 25,055kg C02 (nominated installers calculated figures) ►Solar thermal – Annual 197 kg C02 (nominated installers calculated figures)The above figures are all annual savings as not all installation dates have been collected yet to allow calculation of the actual amount saved within the project period. ►Participant in Maryfield and Coldside areas CO_2 reduction► Groups pending start date = 59►Groups working with = 23►Groups Complete= 2►Total number of people engaged = 853 Summary 2013 City-wide Solar PV review carried out following the Westminster Government's resolution of the Feed In tariff (FIT). 25 DCC locations are FIT compliant. A further 18 additional locations being considered based on energy generation and pay back periods. Financial assessment complete. Report to be brought forward recommending approval to proceed. Summary 2014-PV Scheme business plan is being prepared for 28 Feb 2015 Further review of PV Scheme being undertaken due to further reductions in FIT payments.	2012+	

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	►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	► DCC Environment Department ►DCC City Development (Transportation Division)			►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	► Funding to improve air quality pages on the Council Website identified. The Scottish Government took forward their "Know & Respond" service linked to the new air quality index in 2012. This allows people with respiratory conditions to be alerted when moderate and high pollution levels are forecast. The Council have provided a link and information about this service on the web-site.► The existing website achieved a higher rating in the 2012 peer review than the previous year.► Real-time pollutant monitoring concentrations are available from the Scottish Air Quality Website (www.scottishairquality.co.uk). The Council have provided a link on the web-site to this service.► No progress on provision of real-time information on pollution levels to assist traffic management through pollution hotspots. In 2013 -the new air quality webpages completed apart from section on Air Quality Planning due to Supplementary Planning Guidance not yet being finalised. Historical data for all monitoring points for 2006 to 2012 available via interactive map while address search function for smoke control areas also available. LAQM reports available for download including 2013 Progress report. Previous air quality pages have been removed. Air quality information was included on new bus route map that was delivered to 75000 residences in Dundee at end of June to start of July 2013. Workshops held at four primary schools in Broughty Ferry in April / May which included discussions on air quality. In 2014-The air quality webpages on the DCC website have been updated however the section on Air Quality and Planning is still to be finalised as the Supplementary Planning Guidance is awaiting Committee approval. The DCC AQ pages were ranked at number 7 in the UK for local authority AQ webpages in the 2014 peer review, with top marks of 5 stars awarded for the AQ content available on the DCC website. The Air Quality pages of the DCC website have been upgraded with features available to enable the public to view historical data for the 2006 - 2013 period for all monitoring stations via an interactive map. This page also creates a graph for the monitoring results for those years to provide trend at monitoring location. A link to the Scottish Air Quality website is also present to allow real-time data to be viewed. All LAQM reports are summarised with some available for downloading, with most recent addition being the 2015 USA report. ECO Stars pages updated to ensure that lists of members up to date. The peer review for local authority air quality websites not conducted in 2015. Data base for air quality monitoring data still to be completed so historical monitoring information for 2014 still to be uploaded.	2012+	

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		Public Information			►Complete improvements to AQ website	2013/15			Almost completed (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			Initial discussions held with IT Department in regards to development of a database for the handling and retrieval of air quality monitoring data. 2014 Summary -Development of the AQ database has progressed with the DCC IT Department building a specification for the database for AQ monitoring data, However the proposed period for development of the database in November to December 2014 delayed due to be undertaken in early 2015. 2015 Summary- Information on website updated as necessary to ensure that links to external websites correct. ECO Stars pages updated to ensure that lists of members up to date. The peer review for local authority air quality websites not conducted in 2015. Data base for air quality monitoring data still to be completed so historical monitoring information for 2014 still to be uploaded.		

21	**Measure M21:** DCC will continue its work to increase uptake and implementation of School and Workplace Travel Plans, particularly where likely to impact on the AQMA	Promoting Travel Alternatives	►DCC to ensure all relevant commercial planning applications have travel plan conditions applied in accordance with current best practice. ► DCC 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	►DCC City Development Department, (Planning Division, Transportation Division) ►DCC Education Department			►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	►Work in 2011 focussed on reducing the impacts of school traffic on the Lochee Road hotspots. (See AQAP 2012 Appendix 1) ► Further work to promote sustainable travel in primary schools across Dundee scheduled for 2012. ► Planning applications for significant developments are required to submit travel plans. The submission of travel plans is actively pursued and approved, if appropriate. ► In 2012 investigated development of city wide programme of pupil involvement (P5 - 7) in travel behaviour change. Education Department also encouraged to refresh all school travel plans In 2013 Funding secured to commence a city wide programme of pupil involvement (P5 - 7) in travel behaviour change. Education Department agreed that all school travel plans would be reviewed over 13/14. Tender issued 22 November 2013 .Contract Awarded and in class sessions commenced March through to September 2014, all P5 pupils in Dundee reached through in class sessions. Travel Behaviour Change Programme for (P5-P7) now being delivered annually the current contract runs to 2016/17 All primary schools were given support during 2015 in updating their school travel plans. A number of primary schools have engaged in active travel initiatives but many have not engaged positively.	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	►Identify walking & cycling schemes (such as Park & Cycle). ►Identify walking & cycling promotional opportunities around Dundee City	DCC City Development (Transportation Division)		2011+	►Number of walking and/or cycling initiatives in operation. ►Establish the use of cycle monitoring counts at key points on cycle routes	Small	►Get Cycling engaged to undertake promotion of cycling and delivered Bike Boost. ►Positive Steps implemented Dundee Travel Active Personal Travel Plans in Broughty Ferry ►Cycle to Work Scheme promoted during august 2012 ►City Engineer currently implementing major cycling scheme at Douglas Terrace 2013 Summary - Transportation Division have secured further funding from SUSTRANS for FY13/14, which will deliver several off and on road cycle schemes,. 2014-Working with City Engineers at Riverside Drive / Seabraes Pedestrian Bridge, including pedestrian crossing improvements on Riverside Drive Sustrans officer embedded in TACTRAN will encourage more focus on Community Based active travel initiatives Works all underway and additional 'Safer Routes to School' funds bid for to implement minor improvements to support active travel to and from school 2015 - Key developments in 2015 included the new Seabraes Bridge, improvements on Coupar Angus Road near Camperdown Park, Lower Broughty Ferry Road (west end of Grassy Beach) and Riverside Avenue to Perth Road.	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 On hold until resolution of land ownership		
					Provide Pedestrian Bridge over the railway at Riverside Drive / Seabraes	2013/14			Transportation Division & City Engineers at Riverside Drive / Seabraes Pedestrian Bridge, including pedestrian crossing improvements on Riverside Drive As above		

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
23	**Measure M23:** DCC will continue to work with transport providers to support and promote increased uptake of public transport modes	Transport planning and infrastructure	□ ►Promote schemes such as the SQUID card including Dundee and surrounding towns. ► † Introduce smart and integrated ticketing	► DCC City Development (Transportation Division)		2011+	► % uptake schemes ►Passenger numbers	Small	The development of Smart Card based integrated ticketing (National Entitlement Card) is being undertaken by DCC, National Express and Transport Scotland. . 2013 Summary -This matter has the support of the Scottish Cities Alliance with a view to proof of concept for a Scottish roll out. Initial smart ticketing has been successfully deployed by National Express Dundee and Dundee College. DCC commenced discussion with other transport operators in support of the Scottish Cities Alliance priority for smart ticketing - Delivery action Group hosted by DCC 06 December 2013. . 2014 Summary-Projects now being implemented nation wide, the new Green Buses and the EcoMobility SHIFT assessment, potential Bus Innovation Fund bid with Angus Council, Tactran and NHS Tayside and additional off peak bus services (funded by DCC) will raise profile and attractiveness of travelling by bus in Dundee. Scottish government review of Dundee rail fares will also attract new and retain existing passengers by making rail travel an attractive and more affordable option 2015 - DCC continues to promote public transport as an attractive and affordable alternative to private car. Significant work and investment is invested in infrastructure and promotion.	2012+	

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
		Transport planning and infrastructure			NEC SMART Ticketing to Go Live 2014	2014			Completed	July 2014	
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 Climate Change Board re-introduced the Carbon Management Action Plan in 2013 Examples of partnership initiatives undertaken by DCC can be viewed in the Council's annual 'Scotland's Climate Change Declaration' Report: http://www.keepscotlandbeautiful.org/sustainability-climate-change/sustainable-scotland-network/climate-change/scotlands-climate-change-declaration/ Examples include: Dundee Energy Advice Project; European ENCLOSE project (Energy Efficiency in City Logistics Services). The Climate Change Board's continuous review of the Carbon Management Action Plan has identified a number of revisions required to support the climate change aspirations and to improve work in partnership with other organisations to promote and implement energy efficiency measures.	2012+	

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
MEASURES SECURING AIR QUALITY BENEFITS THROUGH STATUTORY FUNCTIONS											
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	Environment Department Officers check weekly planning lists and comment on all applications which may adversely impact on local air quality. ►In 2011 19 planning applications responded to.►16% had air quality conditions/ assessments (this included smoke control area informatives) ► 19 planning applications in 2012. ► 38% of the planning applications determined in the calendar year had air quality conditions. ►. 31 planning applications were responded to in 2013. ►. 30 planning applications were responded to in 2014. . ►. 37 planning applications were responded to in 2015.	n/a	*Suggestions on best practice and mitigation measures* advised accordingly.
					see Measure 10 regarding the introduction of Supplementary Planning Guidance						

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 in 2010-11 financial year (01/01/11-31/03/11) a total of 15 relevant complaints were investigated of which 93% were resolved. ► For period in 2011-12 financial year (01/04/11 - 31/12/11), a total of 26 relevant complaints were investigated of which 69% had been resolved by 31/12/2011. In 2012, officers investigated 21 relevant complaints, of which 90% were resolved In 2013, officers investigated a total of 10 relevant complaints were investigated of which 90% have been resolved and one complaint is still being investigated. In 2014, officers investigated a total of 22 relevant complaints of which 90.9% have been resolved and two complaints are still being investigated. In 2015, officers investigated a total of 17 relevant complaints of which 94% have been resolved and one complaint is 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	►In 2011 - 1 complaint of the burning of commercial waste was investigated under the Environmental Protection Act 1990 (EPA) Section 33 requirements which was resolved. ►7 complaints of smoke from commercial bonfires were investigated under EPA Section 79 and Clean Air Act legislation. ►11 complaints of smoke from the burning of domestic waste (domestic bonfires) were investigated under EPA Section 79 and Clean Air Act legislation in 2011 of which 94% of these complaints had been resolved by 31/12/2011 In 2012 Officers dealt with 9 complaints of smoke from commercial bonfires and 17 complaints of smoke from the burning of domestic waste. 92% of these complaints were resolved. In 2013, officers investigated 11 complaints of smoke from commercial bonfires under Environmental Protection and Clean Air legislation. 12 complaints of smoke from the burning of domestic waste (domestic bonfires) were investigated under the same legislation. 96% of these complaints were resolved.. During 2014 officers investigated 9 complaints of smoke from commercial bonfires under Environmental Protection and Clean Air legislation. 13 complaints of smoke from the burning of domestic waste (domestic bonfires) were investigated under the same legislation. 100% of these complaints have been resolved. During 2015 officers investigated 10 complaints of smoke from commercial bonfires under Environmental Protection and Clean Air legislation. 25 complaints of smoke from the burning of domestic waste (domestic bonfires) were investigated under the same legislation. 100% of these complaints have been resolved.	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
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	►The Waste Resources Action Programme (WRAP) subsidised discount compost bins ended due to funding cuts in March 2011 with a total of 5243 discounted bins being sold in the DCC area in the period between 2006 and end 2010 representing 2% of the total discounted bins for Scotland. The promotion of home composting continues under the Zero Waste Scotland campaign banner with a Recycling Projects Officer employed in the Environment Department. ►Composting is undertaken at the Environment Department's green waste processing facility at Riverside Drive. 37,526 brown bins for garden waste have been issued. In 2013 - The area Zero Waste Scotland Volunteer Co-Ordinator helped to promote the home composting message across Dundee. DCC staff continued to utilise educational talks etc. to reaffirm the message. A total of 48 composting bins (and associated accessories) were purchased through the home composting framework scheme during 2013 In 2014 the Council continued to participate in the national home composting framework scheme - an online retail network of subsidised composting bins & accessories to help encourage self-management of organic waste - as well as providing a fortnightly kerbside collection service for garden waste across the city with seasonal additional uplifts for real Christmas trees which may otherwise end up in domestic bonfires. A total of 28 composting bins were purchased through the home composting framework scheme between January - Dec 2014 In 2015 -Promotion of the separate collection of garden waste for central composting by Dundee City Council continues throughout the city, with a total of 1821 brown bins being requested between June / December 2015. In addition, we continued to participate in the national home composting framework which allows residents who are keen to compost their own garden waste rather than have this collected by the council, to purchase discounted composting containers and accessories through an online retail network. From June to November 2015 a total of 13 units were purchased by Dundee residents. Both the home composting purchases & garden waste bin requests reflect the work ongoing within the Projects team to promote the composting process as an alternative to burning domestic garden waste.	On-going	

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.			► Number of monitoring sites ► Identification of sites in new hotspots ► Monitoring data via DCC website	n/a	► Dundee City Council operate an extensive network of real-time monitoring sites. The majority are located at roadside sites (Meadowside, Logie Street, Lochee Road, Seagate, Union Street, Whitehall St, Albert Street/Arbroath Road, Myrekirk Terrace and Stannergate). There is also a background monitoring site (Mains Loan), and an urban industrial location: (Broughty Ferry Road),. The monitors at Albert Street/Arbroath Road, Myrekirk Terrace and Stannergate were installed at these locations in September 2012. One new real-time monitoring site added in 2011 for PM_{10} and NO_2 in hotspot area (Meadowside). ►2 additional PM_{10} "reference equivalent" analysers installed at hotspot locations in Lochee Road and Seagate in 2011.►New NOx analyser installed at background location in 2011. The real time monitor in Union Street is due to be decommissioned in January 2016 as Nitrogen Dioxide Levels have been below the annual mean objective since 2011. ►DCC operate an extensive network of NO2 diffusion tube sites across the city. Located at busy roads and junctions and a number of background locations. 14 new diffusion tube locations added in 2011. 2 new NO_2 diffusion tube locations were added in 2012 while one 2011 diffusion tube was stopped in 2012. One 2011 site has been moved at it's location due to infrastructure changes. A comprehensive review of the diffusion tube network took place in 2013. The network was extended to investigate new potential exceedence areas and a large number of sites that were consistently below the objective were removed from the network. 25 new diffusion tube sites were added to the network in 2013 and 30 were discontinued. ►One potential new hotspot identified for NO_2 in Strathmore Avenue based on 2009 data. Additional tubes deployed in the area in 2011 (see Measure 31). The potential new hotspot identified for NO2 in Strathmore was assessed and it was determined that monitoring with the additional tubes in the area could cease Additional potential exceedence area identified at South Road (Denbank) in 2012.. A new exceedence of the annual mean NO2 objective was identified at West Marketgait near Guthrie Street in 2013. In 2014 2 new diffusion tube sites were added to the network in 2014 and a further 12 were discontinued. In 2014 Sulphur Dioxide monitoring ceased at the urban industrial monitoring location at Broughty Ferry Road. Monitored levels were consistently below the air quality objectives. 2015-The details of diffusion tube changes undertaken in 2015 are detailed in Section 3 of the main report. ►See also Measure 20 re monitoring data on the website.	n/a	Annual mean concentrations of NO_2 at Strathmore Avenue and South Road (Denbank) were below the NAQS in 2014 when predicted to façade. West Marketgait /.

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	□ ►Regular calibrations and filter changing of continuous monitoring equipment in DCC's air quality stations ►At least annual audit of air quality stations' equipment □► Appropriate use and care of NO_2 diffusion tubes regularly deployed around the City Council area.	► DCC Environment Department/ Tayside Scientific Services			► QA/QC measures adopted ► Auditing reports	n/a	►External consultant undertakes calibrations and filter changing of the continuous monitoring equipment in the air quality monitoring stations. ►Osiris meters - indicative PM_{10} meters - filter change undertaken on quarterly basis and annual calibration. ►Audits of continuous monitoring stations' equipment undertaken by external consultants and auditing reports received. ►Public Analyst participates in AIR PT Scheme and field inter-comparison study. Ongoing, -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)	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			Initial discussions held with IT Department in regards to development of a database for the handling and retrieval of air quality monitoring data. The DCC IT Department are in the process of development of a database for the handling and retrieval of air quality monitoring data. Specifications of database have been built by the IT Department which were discussed during a meeting held in August 2014. The development of the database was planned to be carried out in November - December 2014 however this has been delayed and is now planned to be carried out in early 2015 The database framework has been completed and trialling will commence in 2016.	2015	

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► The potential new hotspot identified for NO2 in Strathmore was assessed and it was determined that monitoring with the additional tubes in the area could cease. ►See Measure 29 ►A review of the diffusion tube locations was undertaken in 2012 and 21 new sites identified as requiring monitoring during 2013 See Measure 29	n/a	
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	Classified Traffic Counts Undertaken at 18 junctions in 2011► Classified Traffic Counts undertaken at 18 junctions in Sept 2012. Classified Traffic Counts were undertaken at 9 junctions in 2013. There were no traffic counts undertaken for air quality purposes in 2014 or in 2015	On-going	

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

Dundee City Council undertook automatic (continuous) monitoring at 11 sites during 2015. **Table A.1** in **Appendix A** shows the details of the sites. There are three different PM_{10} monitors (CM3, CM13, CM16) co-located at the Broughty Ferry Road site to help improve data accuracy. 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**. The automatic monitoring site at Union Street (CM 2) was discontinued at the end of 2015 as the monitored levels of NO_2 in Union Street for the past 4 years had shown no risk of exceeding the Air Quality Objectives.

3.1.2 Non-Automatic Monitoring Sites

Dundee City Council undertook non- automatic (passive) monitoring of NO_2 at 82 sites during 2015. **Table A.2** in **Appendix A** shows the details of the sites.

Maps showing the location of the monitoring sites are provided in **Appendix A.** Further details on how the monitors are calibrated and how the data has been adjusted are included in **Appendix C.1**. Four new diffusion tube sites were added to the network at the start of 2015 at the following locations where new relevant exposure had been introduced or identified close to busy roads:

- Broughty Ferry Road (129) (DT 204)
- Coupar Angus Road / Sinclair Street (DT 203)
- High Street – Lochee (22-24) (DT 204)
- West Marketgait / Old Mill (DT 205)

The diffusion tube results were reviewed in December 2015 (when 10 months data was available) in order to identify those monitoring locations where either concentrations were well below the AQO, no longer needed for model verification or unnecessary for long term trend analysis. The tube at Arbroath Road 27 was relocated further east to an area identified from the review of radar count data as requiring assessment. The following tube locations were discontinued at the end of 2015:

- Broughty Ferry Road (Streetsign) (DT 142)
- Broughty Ferry Road (59) (LP2) (DT 166)
- Coupar Angus Road / Sinclair Street (DT 203)
- Union St Rollalong (1,2,and 3) (DT 61)
- Arbroath Road 27 (DT 168)
- Perth Road (320) (DT 91)

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.1**.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in **Appendix A** compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2015 dataset of monthly mean values is provided in **Appendix B**. Locations marked in green were new in 2015.

The procedure specified in paragraphs 7.77 to 7.79 of LAQM.TG16 was used to estimate the concentrations at the nearest receptor. The annual mean background concentration used in the calculation was 16.6µg/m^3, the average of 5 urban background locations (DT 7, DT 164, DT 155, DT 185, and DT 82). Exceedences of the NO_2 annual mean that were identified at relevant locations near the monitoring locations are shown in **Table 3.1**.

Table 3.1 Locations of Exceedences of the NO_2 annual mean AQO in 2015

Site ID	Location	2015 Bias adjusted NO_2 annual mean (µg/m^3)	2015 Predicted annual mean NO_2 concentration at Receptor (µg/m^3)
DT 156	Dock St (57)	**51.4**	**44.3**
DT 31	Lochee Rd (140) Traffic Lts	**50.3**	**49.4**
CM 4	Lochee Rd Romon	**47.8**	**40.8**
DT 37	Logie St (114)	**51.0**	**48.9**
DT 190	Seagate (97)	**44.6**	**44.6**
CM 5	Seagate Romon	**49.9**	**42.8**
DT 70	Victoria Rd/Hilltown	**54.1**	**46.3**
DT 183	West Marketgait / Guthrie St	**46.8**	**40.5**
DT 205	West Marketgait/Old Mill (23)	**54.0**	**53.8**

West Marketgait, which is part of the inner ring road has been identified as a new hot-spot area. There are no specific measures within the AQAP targeting this area. Other locations in Dock Street, Lochee Road, Meadowside and Seagate were close to exceeding (>36µg/m^3) when predicted to façade as well as, Commercial Street, Rankine Street and Whitehall Street. All of these locations are within the AQMA.

An analysis of apparent trends in the 64 monitoring locations with at least 5 years data is shown in **Figure A.3b**. The majority of sites (48) show an improving trend with the greatest improvements taking place in Meadowside and Union Street where action plan measures have been successful in reducing concentrations. A small increasing trend is evident at monitoring locations close to the trunk road network (in Dock Street & Forfar Road), on or near the north-west arterial route (Logie Street & Rankine Street) and on the main bus corridor (Nethergate, Whitehall Crescent, Whitehall Street and Seagate).

An overview of how NO_2 annual mean concentrations are improving in different areas across the city can be seen in **Appendix C.2**.

Table A.4 in **Appendix A** compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be

exceeded more than 18 times per year. No exceedences of the hourly mean objective were identified by automatic monitors or indicated by diffusion tubes.

Previously the hourly mean objective had only been exceeded at the Lochee Road automatic monitor, though there have been no exceedences for the past 2 years. The data capture in 2015 was below 90% hence the 99.8th percentile concentration of hourly means was used to determine compliance and compared with previous year's values to examine the trend. There are a large number of years where the data capture was less than 90% as shown in **Figure A.4**. **Figure A.4** shows the long-term trend at Lochee Road is still upward. 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 should remain.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in **Appendix A** compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 18µg/m^3.

Table A.6 in **Appendix A** compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 7 times per year.

Exceedences of the PM_{10} annual mean objective (18µg/m^3) were predicted at the following locations, within the AQMA:

- Albert Street (Osiris);
- Lochee Road (BAM) and;
- Stannergate (Osiris).

Annual mean PM_{10} concentrations at monitoring sites with a least five years data are shown in **Figure A.5a** and an analysis of the trends is shown in **Figure A.5b**. A decreasing trend is evident at all current monitoring locations apart from Lochee Road. The largest decrease has been in Meadowside where action plan measures have contributed to the decrease in concentrations. The largest increasing trend was at Lochee Road.

The PM_{10} daily mean objective was exceeded at the following locations:

- Stannergate (Osiris)
- Albert Street (Osiris)
- Myrekirk (Osiris)

The data capture at the Myrekirk Osiris was less than 90%, so the exceedence is based on the 98.08th percentile concentration which was greater than 50µg/m^3.

The Osiris monitor is an indicative PM_{10} analyser and is known to over-estimate the number of daily exceedences, hence it is not proposed to declare an AQMA for the daily PM_{10} objective at the present time. Traffic is not the only source of PM_{10} in the Stannergate area, and source characterisation and identification work in the area is proposed (dependant on funding).

Figure A.6a shows the frequency of the daily mean PM_{10} concentrations greater than 50µg/m^3 recorded at the real-time monitors. There are a large number years where the data capture was less than 90%. Where the measured data capture is less than 90%, 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** shows trends for those analysers with at least 5 years data capture. Trend lines have been drawn using an Excel simple regression statistical program.

Logie Street continues to show the downward trend in 98.08th percentile PM_{10} concentrations reported last year. 2015 saw a large increase at Mains Loan background site and Union Street resulting in an upward trend. Union Street was the only long term site where the 98.08th percentile concentration was greater than 50µg/m^3 in 2015. Both locations were affected by dust from construction activities or road works during the year. The construction work near Mains Loan was completed in 2015 but nearby current and forthcoming construction activities are likely to continue to affect Union St. The improving trend at Meadowside may be as a result of action plan measures targeting this area. It is hard to draw conclusions from analysis of trends in short-term PM_{10} exceedences because apart from the influence of annual trans-boundary 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 has tightened the annual mean objective for $PM_{2.5}$ to be in line with the World Health Organisation guidelines, and brought this pollutant within the LAQM regime, requiring local authorities to review and assess for it and work towards achieving the objective of 10µg/m^3 by 2020**.** Dundee City Council do not currently monitor for $PM_{2.5}$. Potential exceedences of the $PM_{2.5}$ annual mean objective have been estimated from the PM_{10} annual mean concentrations using the methodology described in LAQM.TG16 (paragraph 7.109). Potential exceedences were identified at the following locations:

- Albert Street (Osiris);
- Lochee Road (BAM);
- Logie Street (Osiris);
- Meadowside (BAM);
- Myrekirk Terrace (Osiris);
- Stannergate (Osiris), and
- Union Street (BAM)

There is currently no guidance available on how to predict forward $PM_{2.5}$ monitoring concentrations to 2020 in LAQM.TG16. Before embarking on a monitoring programme, it is important to have a clear understanding of what the monitoring will achieve, and how it will aid the review and assessment process. The following points will need to be considered to determine a suitable air quality monitoring strategy:

- what monitoring methods are appropriate;
- what monitoring equipment is needed;
- how much will it cost - to purchase and to operate;
- the availability of funding;
- how long to monitor for;
- where to monitor;
- how many monitoring sites are needed;
- what data quality is required and;
- how to process and evaluate the data.

3.2.4 Sulphur Dioxide (SO_2)

Dundee City Council does not currently monitor SO_2.

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

4.2 Other Transport Sources

None of the following transport sources have been identified as new since the last Updating & Screening Assessment in 2015:

- 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.

The National Renewables Infrastructure Plan (N-RIP) has identified the Port of Dundee as one of the most appropriate integrated manufacturing locations critical to delivering Scotland's offshore wind market and future offshore wave and tidal market. The two main locations identified in N-RIP, Dundee and Leith, are considered as the primary opportunity sites for realising the Scottish Government's objectives for this sector. Scottish Enterprise has been working closely with Forth Ports with the aim of providing facilities for the marine renewable energy industry and subsequently, other port users.

The Port is currently constrained by the availability of land and has applied for a Harbour Revision Order and a suite of Marine Licences to including mineral extraction from the sea bed. A scoping opinion for an Environmental Impact Assessment (EIA) was requested from Dundee City Council in 2014, as yet a full EIA has not been provided.

4.1 Road Traffic Sources

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 since the last Updating and Screening Assessment;
- Roads with significantly changed traffic flows; and
- Bus or coach stations.

Since the last Updating and Screening Assessment in 2015, 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;
- Roads with significantly changed traffic flows; and
- Bus or coach stations.

Screening of available traffic data is presented in **Appendix C.3,** which includes a review of the remaining radar counts examined for the 2015 USA, updated traffic count data from the council's Road Traffic Reduction Act Count Sites and DFT major count sites from 2014.

Screening of the radar count data is shown in **Tables C.4** and **C.5**, identified three locations with greater than 10,000 vehicles per day (vpd) and relevant exposure within 10m which had not been previously assessed and were not part of ongoing modelling studies, these are:

- Arbroath Road (West of Ellengowan Drive)(2010) Site No.00000332
- Hawkhill (Nr Blackness Primary School)(2010) Site No.00000325
- Drumgeith Road (nr Summerfield Avenue) (2011) Site No.00000364

New NO_2 diffusion tubes have been deployed in these areas in 2016. Another three locations had been assessed for NO_2 using diffusion tubes but had not been previously assessed for PM_{10}, these are:

- Coupar Angus Road (South of Lansdowne Gardens) (2005) Site No.00000158
- Coupar Angus Road (nr Dryburgh Gardens) (2010) Site No.00000326
- Queen Street (East of Gray Street) (2010) Site No.00000346

An application for funding has been made to the Scottish Government to carry out classified traffic counts at roads and junctions in these areas to allow assessment of PM_{10} using Design Manual for Roads and Bridges screening tool (DMRB). The DMRB methodology does not currently calculate $PM_{2.5}$.

Data from the council's Road Traffic Reduction Act Sites from 2005-2015 is presented in **Table C.6**, there has been no significant increase in traffic flows in these areas. Data from the Department of Transport major count points throughout Dundee have been examined in **Table C.7**, there has been no significant increase in traffic flows in areas with relevant exposure. However, new relevant exposure is proposed near to 'Count Point 20857' which is close to the busy junction of the A92T and the A991, which has not needed to be assessed previously as there were no relevant receptors. A new NO_2 diffusion tube has been installed in this area (Jan 2016) which is adjacent to the Central Waterfront Development. This area is within the boundary of the current AQMA, though there are no specific actions in the AQAP, targeting trunk road traffic in this area. It is proposed that this area will be included in the dispersion modelling of possible action plan measures to reduce pollutant concentrations at receptors in the Seagate.

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 changes are located on Dock Street which is already an identified exceedence area. New residential developments are likely 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.

The USA 2015, identified several areas requiring assessment that were the subject of ongoing modelling studies. The results of these studies are summarised in **Appendices C.4**, **C.5**, **C.6**, **C.7** and **C.8**. New exceedences of the annual mean objectives for NO_2 and/or PM_{10} were predicted at relevant receptors at the following locations, the majority of which are part of the trunk road network:

- A92 (between Broughty Ferry Road and Greendykes Road;
- Scott Fyfe roundabout (A92/A972/B961/B959/C223);
- Claypotts junction (A92/B978);
- A972T (Kingsway – Pitkerro Road roundabout);

- A90 (north of the Kingsway); and
- Forfar Road (A929) / Clepington Road (C244) junction.

Additional NO_2 diffusion tubes have been added to the network at three of the above locations, which did not already have diffusion tubes: A90 (North of Kingsway); A972T (Kingsway / Pitkerro roundabout) and; Claypotts junction. Exceedences of the NO_2 hourly mean were also predicted based on the greater than 60µg/m^3 criteria outlined in LAQM.TG (16) at the following locations:

- Lochee Road north of the junction with Mitchell Street;
- Seagate near the existing bus-stops, and on; and
- Meadowside near the junction with Victoria Road.

These areas are all within the boundary of the current AQMA. There are no specific actions within the AQAP, targeting trunk road traffic in these areas which are currently being pursued. The local authority intends to liaise with Transport Scotland to discuss whether any additional actions are possible to reduce pollutant concentrations at relevant locations close to the trunk road network in Dundee.

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 exceedences of the short-term air quality objectives (e.g. 15-minute mean for SO_2, 1-hour mean for NO_2 or 24-hour mean for PM_{10}). 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 NO_2, PM_{10} and potentially SO_2.

A list of industrial processes in the city which are regulated by the Scottish Environmental Protection Agency (SEPA) is provided in **Appendix C.10**. This Appendix also includes a screening assessment of all the SEPA regulated processes and contains updated information provided by SEPA. Those highlighted thus "*" in the table and the notes are discussed in the relevant sections below.

- **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, there responses are summarised in **Appendix C.10,** and no new or proposed installations with an air quality assessment were identified.

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

SEPA were consulted regarding any changes that meet the above criteria at SEPA regulated sites, there responses are summarised in **Appendix C.10,** 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**

Dundee City Council was consulted by SEPA on three PPC applications during 2015. Two Part B processes [1] [2] are potential sources of fugitive particulate emissions. There were no sensitive receptors identified within ten stack heights of these processes, therefore no further assessment is required. Building height was used to represent a worst case approximation of stack height, for the release of fugitive emissions.

Comments provided to SEPA regarding the proposed Part B process: PPC/B/1142921

"*The proposed installation is located within an Air Quality Management Area for Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}) annual means and NO_2 hourly mean. Nearby monitoring and modelling of PM_{10} indicate potentially elevated concentrations of PM_{10} (annual mean and 24 hour mean) at relevant receptors. The proposed installation is approx. 315m from the nearest relevant receptors. At this distance, no screening assessment is required under the LAQM Technical Guidance for process or fugitive emissions of PM_{10}. Given the non-threshold nature of PM_{10} and $PM_{2.5}$, it is considered appropriate that all reasonably practical measures to reduce PM_{10} and $PM_{2.5}$ emissions should be employed by the applicant, e.g. improved filter efficiencies for PM_{10} and $PM_{2.5}$ removal where practicable."*

Comments provided to SEPA regarding the proposed Part B process: PPC/B/1141206

"The proposed installation is located within an Air Quality Management Area for Nitrogen

[1] PPC/B/1142921 Sherburn Cement
[2] PPC/B/1141206 - Vericore Ltd

Dioxide (NO_2) and Particulate Matter (PM_{10}) annual means and NO_2 hourly mean. The proposed installation is approx. 217m from the nearest relevant receptors. At this distance, no screening assessment is required under the LAQM Technical Guidance for process or fugitive emissions of PM_{10}. Given the non-threshold nature of PM_{10} and $PM_{2.5}$, it is considered appropriate that all reasonably practical measures to reduce PM_{10} and $PM_{2.5}$ emissions should be employed by 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 2000m^3 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 PM_{10}.

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 Updating and Screening Assessment:

- Biomass[3] combustion plant – individual installations (50kW to 20MW);
- Areas where the combined impact of several biomass combustion sources may be relevant;

[3] 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.

- Areas where domestic solid fuel burning may be relevant; and
- Combined Heat and Power (CHP) Plant.

Since the USA (2015), 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 not had to report previously. During 2015 one new CHP plant has come to the attention of the local authority[4]. Ninewells Hospital in Dundee propose to install a new 4.3MW gas fired CHP plant adjacent to their main energy centre. The applicants provided a D1 calculation which estimated the required stack height to be 25m, the applicant proposes to use the main hospital stack instead, which is over 50m high. The CHP screening tool referred to in LAQM (TG(16)) was not available at the time of writing but it is not anticipated that the introduction of the new CHP plant will result in any exceedences of the Air Quality Objectives 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 USA (2015), Dundee City Council has not identified any new sources of fugitive or uncontrolled particulate matter, other than temporary demolition/construction activities (see **Section 3.2.2**). The DCC 2015 USA identified that annual mean PM_{10} concentrations at the Stannergate roundabout (located at the eastern entrance to the port) are higher than other similar roadside locations suggesting contributions from PM_{10} sources other than road traffic. There are a number of uncontrolled, transient and unpredictable sources of PM_{10} in the area which require further investigation to help inform potential action plan measures. Dundee City Council has applied for funding from the Scottish Government to carry out source identification and characterisation at this location.

[4] Planning Application 15/00194/FULL - http://idoxwam.dundeecity.gov.uk/idoxpa-web/applicationDetails.do?activeTab=documents&keyVal=NLO1ILGCG4W00

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

Exceedences of the NO_2 annual mean objective (40µg/m^3) were predicted at the following locations, within the AQMA:

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

An analysis of trends in NO_2 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 and Union Street where action plan measures have been successful in reducing concentrations. A small increasing trend is evident at monitoring locations close to the trunk road network (in Dock Street & Forfar Road), on or near the north-west arterial route (Logie Street & Rankine Street) and on the main bus corridor (Nethergate, Whitehall Crescent, Whitehall Street and Seagate).

No exceedences of the NO_2 hourly mean (200µg/m^3) were identified by automatic monitors or indicated by diffusion tubes in 2015. Lochee Road is the only area of the city where the hourly AQO has been exceeded previously. No exceedences have been recorded here for the past 2 years but there is an increasing trend in the 99.8th percentile concentrations. Until there is an established downward trend the AQMA for the hourly AQO should remain.

Exceedences of the PM_{10} annual mean objective (18µg/m^3) were predicted at the following locations, within the AQMA:

- Albert Street (Osiris);
- Lochee Road (BAM); and
- Stannergate (Osiris).

A decreasing trend is evident at all current monitoring locations apart from Lochee Road. The largest decrease has been in Meadowside where action plan measures have contributed to the decrease in concentrations. The largest increasing trend was at Lochee Road.

The PM_{10} daily mean objective was exceeded at the following locations:

- Stannergate (Osiris);
- Albert Street (Osiris); and
- Myrekirk (Osiris).

The Osiris monitor is an indicative PM_{10} analyser and is known to over-estimate the number of daily exceedences, hence it is not proposed to declare an AQMA for the daily PM_{10} objective at the present time. Traffic is not the only source of PM_{10} in the Stannergate area, and source characterisation and identification work in the area is proposed (dependant on funding).

Dundee City Council do not currently monitor for $PM_{2.5}$, potential exceedences of the $PM_{2.5}$ annual mean objective have been estimated from the PM_{10} annual mean concentrations

using the methodology described in LAQM.TG16. Potential exceedences were identified at the following locations:

- Albert Street;
- Lochee Road;
- Logie Street;
- Meadowside;
- Myrekirk Terrace;
- Stannergate; and
- Union Street.

Before embarking on a monitoring programme Dundee City Council intends to carefully consider the available techniques; ongoing costs and labour; number of sites required etc. to identify a cost effective air quality monitoring strategy for $PM_{2.5}$.

6.2 Conclusions relating to New Local Developments

The review of new road traffic data identified new roads and junctions meeting the criteria for assessment and new relevant exposure close to a busy junction that had not needed to be assessed previously. All of these areas are within the current AQMA.

Detailed air dispersion modelling studies of possible action plan measures predicted new exceedences of the annual mean NO_2 and PM_{10} objectives at relevant locations. The majority of these are close to the trunk road network to the east of Dundee. These studies also predicted exceedences of the hourly objective for NO_2 at relevant locations on Seagate, Meadowside and Lochee Road. All of these areas are within the current AQMA.

6.3 Proposed Actions

The 2015 monitoring data did not identify the need to declare an AQMA for any additional pollutants or objectives. Continuous monitoring in Union Street was discontinued at the end of 2015 as the NO_2 annual mean concentrations were well below the objective for a number of years. The equipment from the Union Street monitoring station has been relocated, the NO_2 analyser to the Broughty Ferry Road monitoring station and the PM_{10} analyser has been installed in Whitehall Street. The following actions are proposed following the review and assessment of monitoring data and new developments:

- Develop a cost effective monitoring strategy for $PM_{2.5}$;
- Consider whether specific action plan measures are possible to target the newly identified exceedence areas on the West Marketgait (part of the inner ring road), identified through monitoring, and on the trunk road network, identified through monitoring and modelling;
- Liaise with Transport Scotland to discuss whether any additional actions are possible to reduce pollutant concentrations at relevant locations close to the trunk road network in Dundee;
- Report the results of new NO_2 diffusion tubes installed in 2016, at the following locations: Arbroath Road (West of Ellengowan Drive); Hawkhill (near Blackness Primary School); Drumgeith Road (near Summerfield Avenue); A90 (North of Kingsway); A972T (Kingsway / Pitkerro roundabout); 57 Cleghorn Street; 26 East Dock Street; 3 King Street; 64 Nethergate, 2 St Ann Street and , Claypotts junction;
- Carry out classified traffic counts at roads and junctions identified as meeting the criteria for assessment to allow for DMRB screening assessments (dependant on funding);

- Carry out traffic counts so that the assessment of new exposure proposed adjacent to the busy junction of the A92T and the A991, can be included within dispersion modelling of proposed action plan options for Seagate;
- Carry out source identification and characterisation of fugitive emission sources close to the Stannergate roundabout (dependant on funding);
- Review the results of recent air dispersion modelling studies to determine if additional monitoring locations are required;
- Implement the action plan measures being taken forward in 2016/17 (see Section 2) (dependant on funding); and
- Submit the next Air Quality Progress Report in 2017.

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
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	Chemiluminesent[b]	2.24	1.15	1.77
					PM_{10}		Beta Attenuation (BAM)			2.06
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	Chemiluminesent[c]	0	n/a	1.80
					PM_{10}		TEOM			1.98
CM 5	Seagate Romon	Roadside	340487	730446	NO_2	Y	Chemiluminesent[b]	2	1.10	1.70
					PM_{10}		Beta Attenuation (BAM)			2.06
CM 2	Union Street Rollalong	Roadside	340235	730091	NO_2	Y	Chemiluminesent[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	Chemiluminesent[b]	1.86	3.26	1.80
CM 14	Meadowside Romon	Roadside	340243	730653	NO_2	Y	Chemiluminesent[d]	0.42	1.60	2.26
					PM_{10}		Beta Attenuation (BAM)		1.63	2.17

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

Figure A.1 Automatic Monitoring Sites 2015

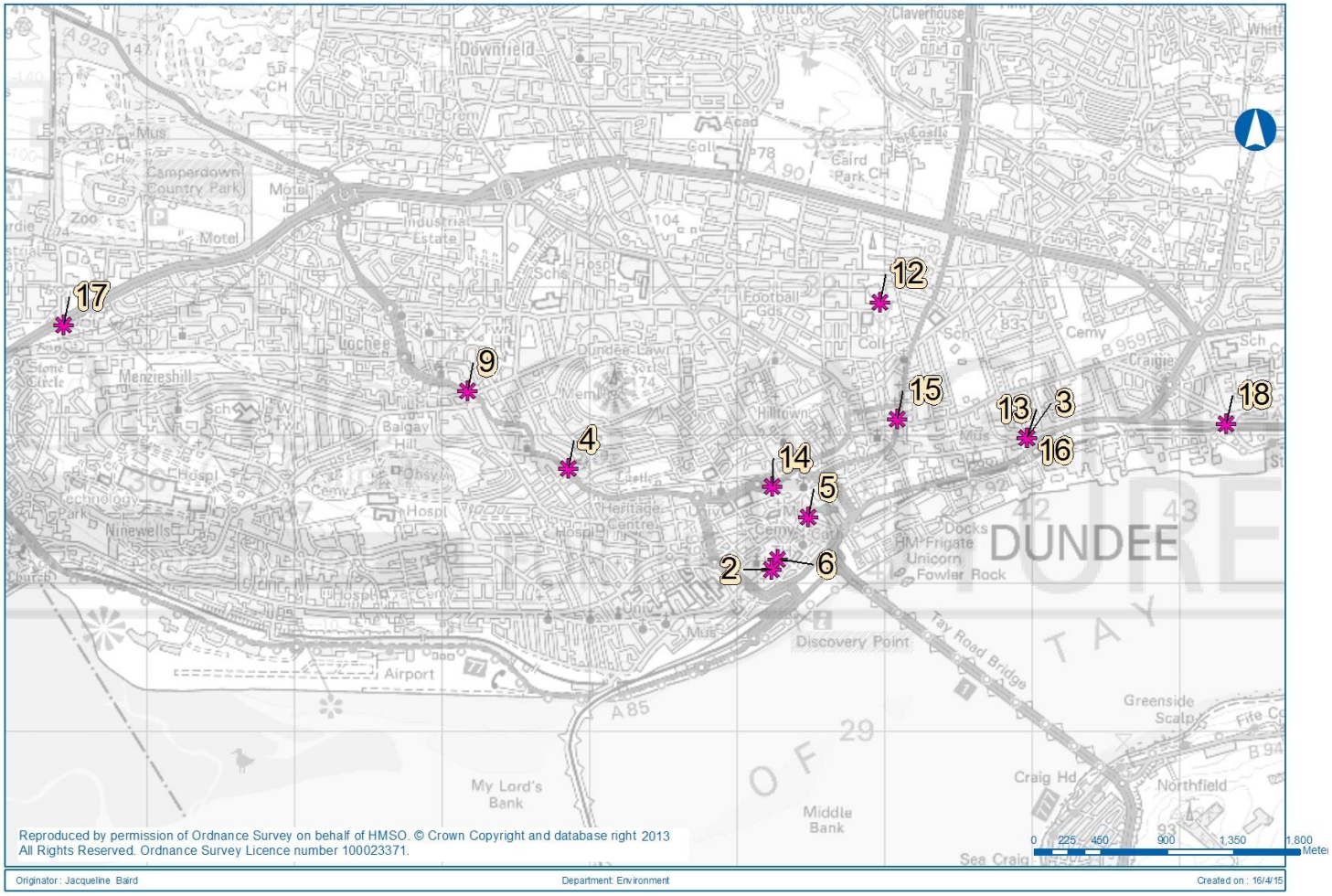

Table A.2 Details of Non-Automatic Monitoring Sites

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 168	Arbroath Rd (27)	R	341223	731089	NO_2	Y	PDT	2.43	1.88	N
DT 147	Arbroath Rd (38)	K	341202	731097	NO_2	Y	PDT	2.97	0.50	N
DT 164	Broughty Ferry Rd - Lower	UB	343545	730942	NO_2	Y	PDT	0	3.15	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 142	Broughty Ferry Rd (141) (St.Sign)	R	343302	731075	NO_2	Y	PDT	0.20	3.82	N
DT 145	Broughty Ferry Rd (Greendykes)	R	342662	731112	NO_2	Y	PDT	7.72	4.10	N
DT 166	Broughty Ferry Rd LP 59(2)	R	343129	731081	NO_2	Y	PDT	4.53	2.97	N
DT 140	Broughty Ferry Rd (L/P 66)	R	343297	731096	NO_2	Y	PDT	8.50	2.10	N
DT 7	Balgavies Place	UB	343082	731465	NO_2	Y	PDT	0	n/a	N
DT 9	Birnam Place	UB	337531	730914	NO_2	Y	PDT	0	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	0	n/a	N
DT 13	Clepington Rd/ Forfar Rd	K	341385	732121	NO_2	Y	PDT	8.28	0.78	N
DT 188	Commercial St (9)	R	340544	730291	NO_2	Y	PDT	2.44	2.57	N

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 84	Commercial St/Dock St (40)	R	340565	730263	NO_2	Y	PDT	0.17	2.78	N
DT 203	Coupar Angus Rd/Sinclair St	R	337749	731627	NO_2	Y	PDT	5.65	2.19	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
DT 156	Dock St (57)	R	340656	730343	NO_2	Y	PDT	3.25	2.53	N
DT 20	Dura St (100)	K	341150	731576	NO_2	Y	PDT	1.65	0.57	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 202	High St Lochee (22-24)	R	338062	731345	NO_2	Y	PDT	0.05	2.29	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 42	Muirton Rd (6)	R	338152	731293	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	0	n/a	N
DT 189	Myrekirk Rd (29)	R	335420	731726	NO_2	Y	PDT	5.17	2.00	N
DT 48	Nethergate(132) / Marketgait	R	340074	729984	NO_2	Y	PDT	3.60	1.33	N
DT 47	Nethergate (40)	R	340230	730124	NO_2	Y	PDT	2.72	1.26	N
DT 45	Nethergate (6)	R	340274	730171	NO_2	Y	PDT	2.51	1.25	N
DT 44	Nethergate (88)	K	340163	730061	NO_2	Y	PDT	5.00	0.86	N
DT 46	Nethergate (95)	K	340033	729957	NO_2	Y	PDT	1.84	0.86	N
DT 91	Perth Rd (320)	K	338776	729798	NO_2	Y	PDT	3.78	0.42	N
DT 49	Rankine St (2)	R	338768	730900	NO_2	Y	PDT	0.40	1.76	N
DT 50	Seagate (101)	R	340545	730532	NO_2	Y	PDT	0.19	1.94	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 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 151	South Rd (1 Denbank)	R	335188	731528	NO_2	Y	PDT	0.28	1.79	N
DT 56	St Andrews St (26)	K	340516	730584	NO_2	Y	PDT	1.77	0.71	N
DT 162	St Andrews St PB (façade)	R	340532	730548	NO_2	Y	PDT	0.18	2.53	N
DT 59	Strathmore Avenue (353)	K	339609	731871	NO_2	Y	PDT	1.45	0.67	N
DT 60	Trades Lane (31)	K	340575	730500	NO_2	Y	PDT	1.82	0.44	N
DT 61	Union St (Rollalong) Average	R	340235	730091	NO_2	Y	PDT	3.25	1.20	Y
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

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 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 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	0	0.55	N

Notes:

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

(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. 'Kerb' is taken as being the edge of the carriageway with flowing traffic

Figure A.2a NO_2 Diffusion Tube Locations (City Centre)

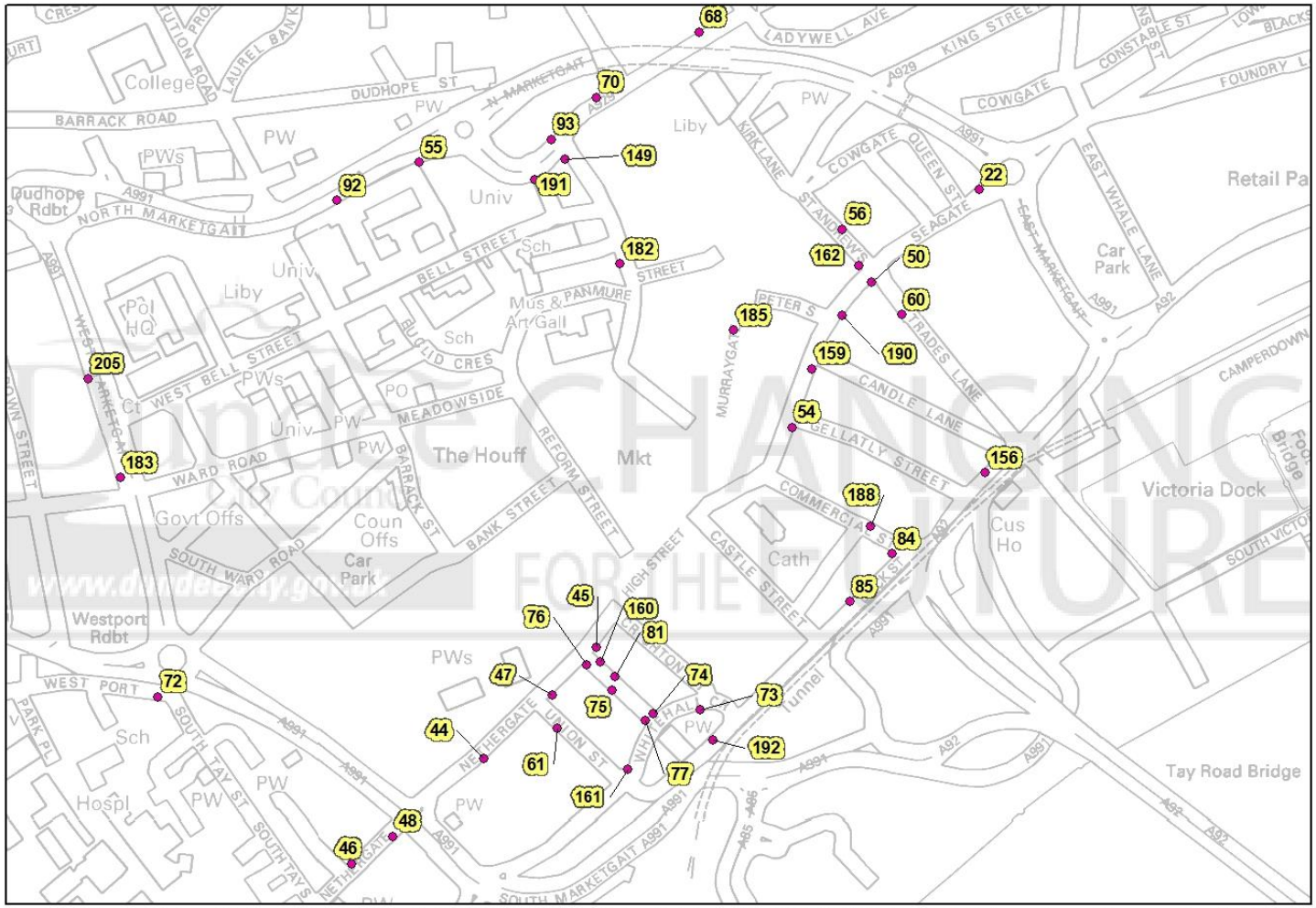

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Figure A.2b NO_2 Diffusion Tube Locations (East)

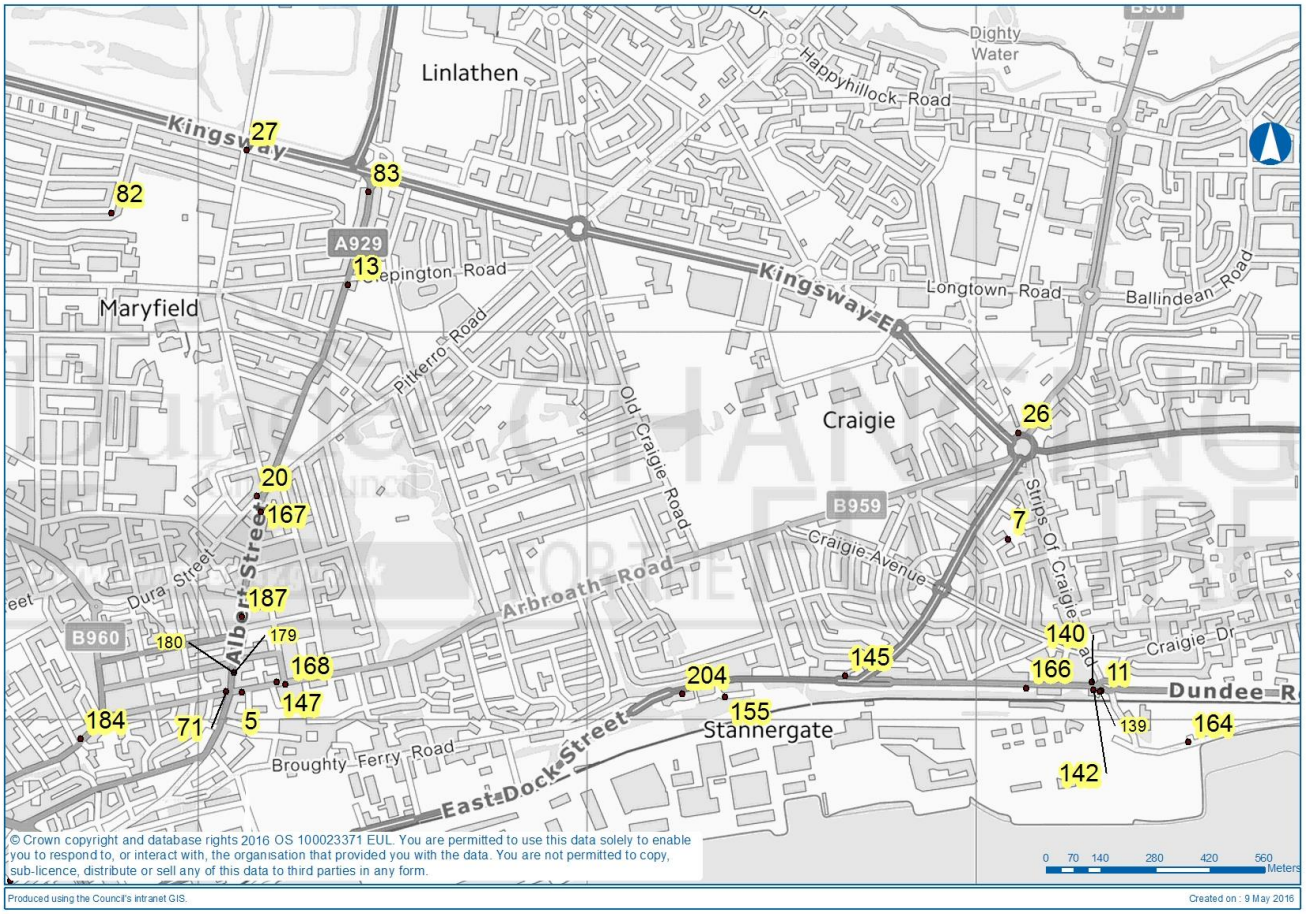


Figure A.2c NO_2 Diffusion Tube Locations (West)

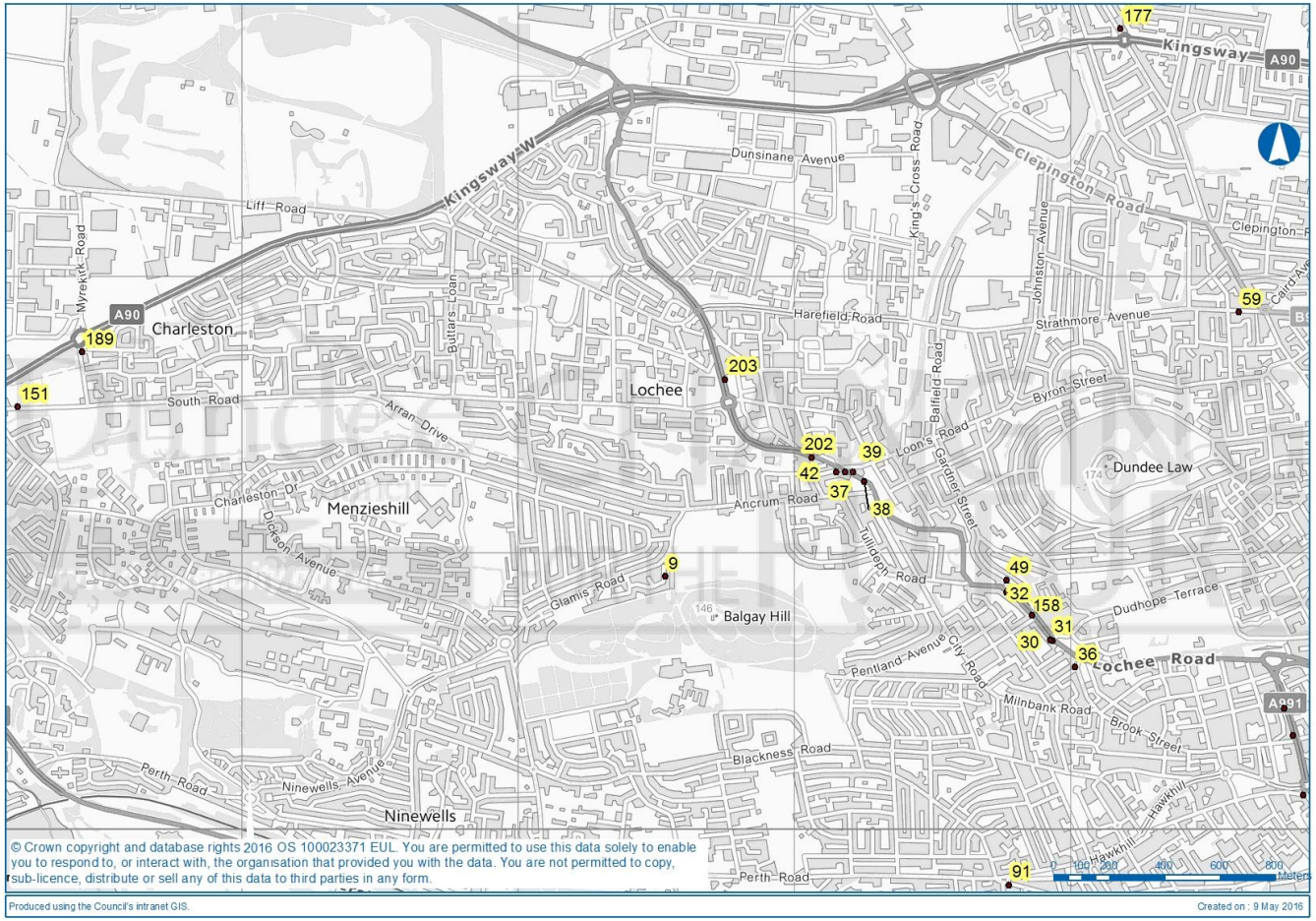


Table A.3 Annual Mean NO_2 Monitoring Results

Site ID.	Site Name	Site Type[1]	Monitoring Type	Valid Data Capture 2015 (%)[2]	NO_2 Annual Mean Concentration ($\mu g/m^3$)[3]				
					2011	2012	2013	2014	2015
CM4	Lochee Rd Romon	R	Automatic	86.9	**58.2**	**52.9**	**51.6**	**45.8**	**47.8**
CM12	Mains Loan	UB	Automatic	96.5	11.6	9.8	11.5	12.4	10.3
CM14	Meadowside Romon	R	Automatic	82.8	**66.4**	**53.9**	**49.1**	39.6	38.2
CM5	Seagate	R	Automatic	99.6	**52.2**	**47.6**	**55.0**	**54.5**	**49.9**
CM2	Union St Rollalong	R	Automatic	99.6	35.6	31.7	30.5	28.4	28.0
CM6	Whitehall St Romon	R	Automatic	95.6	34.7	**44.4**	**41.2**	**42.5**	36.3
DT 92	Abertay 2	R	PDT	100.0	**40.1**	**41.5**	**40.2**	39.7	36.3
DT 179	Albert St (15) (Facade)	R	PDT	100.0			36.5	36.5	33.4
DT 180	Albert St (15) (Rdside)	K	PDT	91.7			38.0	38.0	35.5
DT 167	Albert St (191)	K	PDT	100.0			36.5	35.0	31.2
DT 157	Albert St (71-73)	K	PDT		29.7	30.4			
DT 187	Albert St (81)	K	PDT	100.0			31.8	31.1	30.3
DT 2	Albert St (Fish)	K	PDT		29.2	31.7			
DT 3	Albert St (Shandon Place)	R	PDT		35.1	35.7			
DT 5	Arbroath Rd (13)	K	PDT	91.7	36.6	39.9	38.3	35.7	34.4
DT 168	Arbroath Rd (27)	R	PDT	33.3			34.1	32.4	29.5
DT 147	Arbroath Rd (38)	K	PDT	83.3	34.6	39.4	37.6	34.3	33.7
DT 6	Arthurstone Terrace (10)	K	PDT		21.4	22.3			
DT 7	Balgavies Place	UB	PDT	100.0	17.1	18.0	17.0	15.5	15.0
DT 8	Bank St/ Reform St	K	PDT		26.6	28.0			
DT 9	Birnam Place	UB	PDT	100.0	9.6	10.4	10.1	9.6	8.7
DT 140	Broughty Ferry Rd (L/P 66)	R	PDT	91.7	34.2	35.4	31.8	30.6	32.0
DT 164	Broughty Ferry Rd - Lower	UB	PDT	91.7		16.7	15.6	14.9	14.9

Site ID.	Site Name	Site Type[1]	Monitoring Type	Valid Data Capture 2015 (%)[2]	NO_2 Annual Mean Concentration ($\mu g/m^3$)[3]				
					2011	2012	2013	2014	2015
DT 144	Broughty Ferry Rd LP 59	R	PDT		22.2				
DT 204	Broughty Ferry Rd (129)	R	PDT	100.0					38.3
DT 139	Broughty Ferry Rd (141 Downpipe)	R	PDT	100.0	36.5	37.4	32.4	31.1	32.3
DT 11	Broughty Ferry Rd (141)	R	PDT	91.7	**42.5**	**44.2**	39.9	36.5	35.4
DT 142	Broughty Ferry Rd (141) (St.Sign)	R	PDT	100.0	27.3	32.2	30.4	29.5	27.6
DT 145	Broughty Ferry Rd (Greendykes)	R	PDT	100.0	32.6	36.2	36.4	34.3	31.8
DT 141	Broughty Ferry Rd Lower (L/P 5)	UB	PDT		17.1				
DT 166	Broughty Ferry Rd LP 59(2)	R	PDT	100.0		26.1	25.6	24.0	21.1
DT 186	Carolina Court 30 mph sign	R	PDT				28.6	25.0	
DT 155	Carolina Court LP6	UB	PDT	83.3		22.5	21.6	19.4	18.6
DT 171	Claypotts / Arbroath Rd (502)	R	PDT				28.6		
DT 12	Claypotts Junction	R	PDT		25.4	26.5			
DT 174	Clepington Rd (172)	K	PDT				31.4		
DT 13	Clepington Rd/ Forfar Rd	K	PDT	100.0	34.7	38.0	36.4	33.6	36.5
DT 14	Commercial St	K	PDT		27.8	29.9			
DT 188	Commercial St (9)	R	PDT	100.0			**43.1**	39.4	35.6
DT 15	Commercial St (Waterstones)	R	PDT		38.0	39.5			
DT 84	Commercial St/Dock St (40)	R	PDT	100.0	37.6	**41.2**	**40.1**	35.9	36.4
DT 175	Coupar Angus Rd (38)	R	PDT				32.9	29.8	
DT 203	Coupar Angus Rd/Sinclair St	R	PDT	100.0					23.1
DT 16	Crichton St	K	PDT		29.0	31.6			
DT 17	Dens Rd Crossing	R	PDT		31.7	32.8	32.1		
DT 148	Dock St - Tay Hotel	K	PDT			32.9			
DT 192	Dock St (12)	R	PDT	100.0				25.8	25.9

Site ID.	Site Name	Site Type[1]	Monitoring Type	Valid Data Capture 2015 (%)[2]	NO_2 Annual Mean Concentration ($\mu g/m^3$)[3]				
					2011	2012	2013	2014	2015
DT 18	Dock St (14)	K	PDT		36.3	33.1			
DT 85	Dock St (21)	R	PDT	100.0	34.2	**40.8**	**42.6**	38.2	37.4
DT 156	Dock St (57)	R	PDT	100.0	**43.4**	**53.1**	**53.9**	**51.7**	**51.4**
DT 19	Dock St (Unicorn)(No.60)	R	PDT		36.3				
DT 20	Dura St (100)	K	PDT	91.7	36.4	39.6	36.9	34.4	34.9
DT 169	Dura St (30)	R	PDT				29.6		
DT 21	Earl Grey Place (Park)	UB	PDT		19.4	22.8			
DT 22	Eastport Roundabout	R	PDT	100.0	33.1	32.0	35.2	32.9	30.7
DT 83	Forfar Rd (104)	K	PDT	100.0	**45.6**	**50.2**	**45.9**	**44.8**	**45.1**
DT 23	Harefield Rd (35)	K	PDT		27.7	29.8			
DT 178	Hawkhill / Horsewater Wynd	K	PDT				29.6		
DT 154	High St Lochee (106)	R	PDT			23.2			
DT 202	High St Lochee (22-24)	R	PDT	100.0					31.6
DT 24	Hilltown (Suites)	R	PDT		29.5	32.4			
DT 193	Horsewater Wynd	K	PDT					21.9	
DT 25	King St (12 & 14)	K	PDT		26.5	27.2			
DT 177	Kingsway / Strathmartine Rd (279)	R	PDT	100.0			38.3	36.8	36.2
DT 26	Kingsway East Roundabout	R	PDT	91.7	**40.7**	**40.3**	39.5	38.8	36.1
DT 27	Kingsway/ Mains Loan	R	PDT	100.0	31.3	34.4	36.4	32.0	29.3
DT 29	Kingsway/ Strathmartine Rd (S)	K	PDT		39.4	**45.9**			
DT 30	Lochee Rd (138)	K	PDT	100.0	**52.7**	**53.4**	**51.2**	**49.6**	**49.6**
DT 31	Lochee Rd (140) Traffic Lts	R	PDT	100.0	**51.9**	**54.8**	**52.8**	**51.1**	**50.3**
DT 32	Lochee Rd (184)	K	PDT	100.0	36.9	37.6	36.1	34.4	36.2
DT 158	Lochee Rd (Romon) Average	K	PDT	100.0	**47.2**	**48.7**	**44.4**	**43.1**	**44.8**
DT 36	Lochee Rd/Polepark Rd	K	PDT	100.0	29.0	31.8	29.6	28.9	28.1

Site ID.	Site Name	Site Type[1]	Monitoring Type	Valid Data Capture 2015 (%)[2]	NO_2 Annual Mean Concentration ($\mu g/m^3$)[3]				
					2011	2012	2013	2014	2015
DT 37	Logie St (114)	R	PDT	100.0	**53.7**	**54.6**	**54.8**	**51.7**	**51.0**
DT 38	Logie St (98)	K	PDT	91.7	31.9	34.5	37.5	33.1	32.3
DT 176	Logie St / Grays Lane	R	PDT				24.1		
DT 39	Loons Rd (1)	R	PDT	100.0	38.4	**42.0**	**40.3**	39.1	35.6
DT 146	Mains Loan Average	UB	PDT		12.2	15.0			
DT 40	Marketgait	R	PDT		30.8	31.1			
DT 41	Meadowside	R	PDT		**53.0**	**59.0**			
DT 182	Meadowside (28)	K	PDT	83.3			38.4	34.7	37.1
DT 149	Meadowside (Romon) Average	R	PDT	100.0	**56.4**	**56.9**	**49.9**	**43.7**	**41.2**
DT 163	Meadowside / Bell St	K	PDT			**49.1**			
DT 170	Monifieth Rd (4)	R	PDT				25.2		
DT 42	Muirton Rd (6)	R	PDT	100.0	26.5	27.2	30.0	29.2	25.0
DT 185	Murraygate (46)	UB	PDT	91.7			25.9	23.9	21.4
DT 43	Myrekirk Rd	K	PDT		29.5	34.2			
DT 189	Myrekirk Rd (29)	R	PDT	91.7			34.8	31.7	32.2
DT 181	Myrekirk Terrace (8)	R	PDT				30.4	27.6	
DT 47	Nethergate (40)	R	PDT	83.3	38.1	**42.5**	**45.0**	**42.8**	37.4
DT 45	Nethergate (6)	R	PDT	91.7	38.0	**42.3**	**41.7**	**40.4**	38.2
DT 44	Nethergate (88)	K	PDT	100.0	**44.8**	**50.2**	**48.4**	**50.9**	**42.7**
DT 46	Nethergate (95)	K	PDT	91.7	32.5	35.9	34.3	32.2	31.0
DT 48	Nethergate(132) / Marketgait	R	PDT	100.0	30.2	33.5	32.5	29.3	28.6
DT 87	Nethergate/South Tay St	R	PDT		24.4	24.5			
DT 173	Old Glamis Rd(9) / Balgray St	K	PDT				24.3		
DT 91	Perth Rd (320)	K	PDT	100.0	36.0	36.3	37.1	35.1	34.0
DT 172	Pitkerro Rd (3)	R	PDT				29.6		

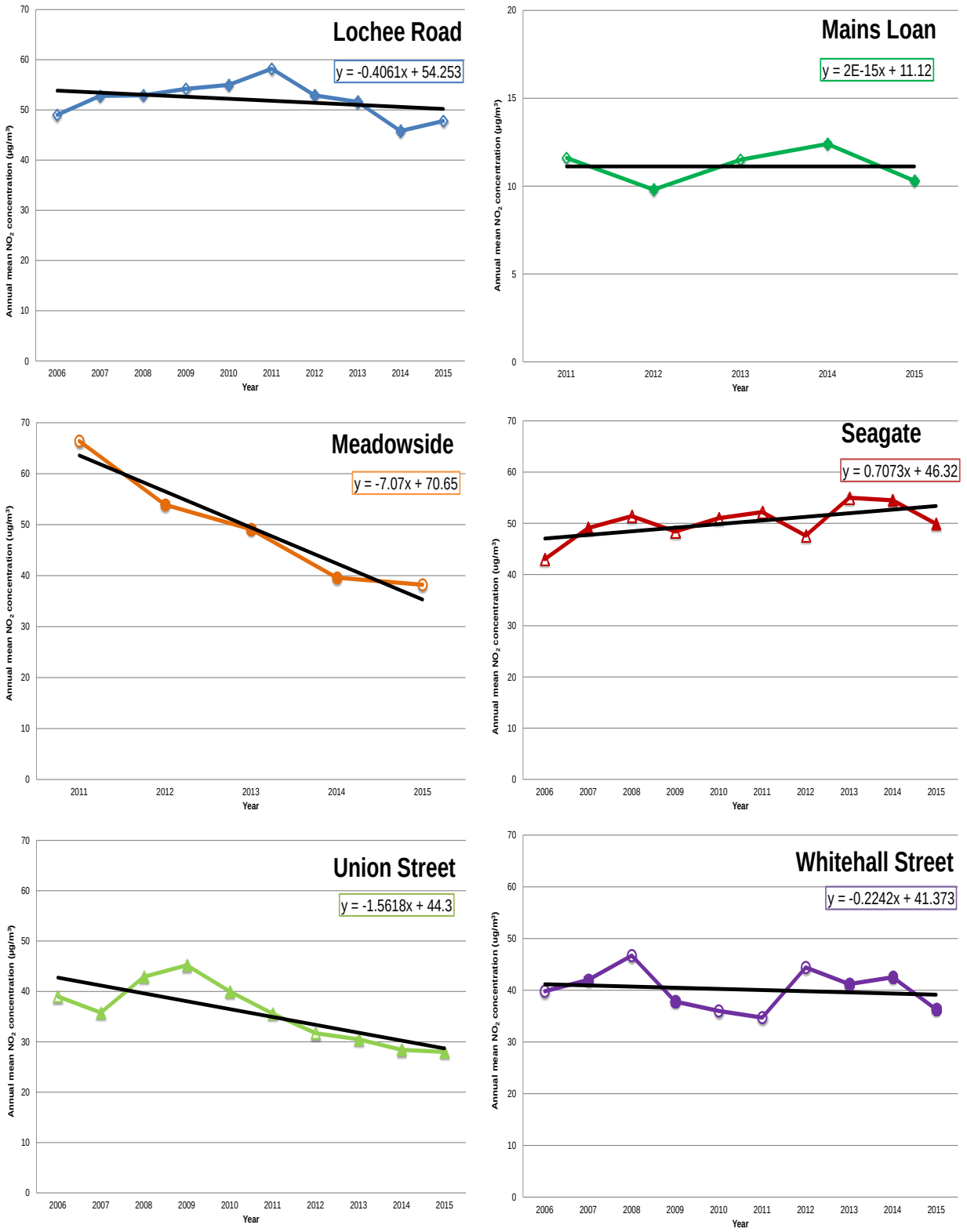
Site ID.	Site Name	Site Type[1]	Monitoring Type	Valid Data Capture 2015 (%)[2]	NO_2 Annual Mean Concentration ($\mu g/m^3$)[3]				
					2011	2012	2013	2014	2015
DT 88	Queen St B/F	R	PDT		25.1	27.7			
DT 49	Rankine St (2)	R	PDT	100.0	**40.5**	**44.4**	**40.1**	38.1	**40.2**
DT 50	Seagate (101)	R	PDT	100.0	**40.2**	39.4	**41.9**	**40.8**	39.6
DT 54	Seagate (9)	R	PDT	100.0	35.6	38.4	38.1	36.0	32.8
DT 150	Seagate (95-97)	R	PDT		**46.2**	**51.4**	**40.7**		
DT 190	Seagate (97)	R	PDT	100.0			**59.4**	**46.5**	**44.6**
DT 159	Seagate(Romon) Average	K	PDT	100.0	**45.0**	**49.2**	**48.0**	**45.5**	**42.3**
DT 55	Soapwork Lane	R	PDT	100.0	32.8	34.8	34.7	31.9	32.0
DT 151	South Rd (1 Denbank)	R	PDT	100.0	34.6	36.9	34.7	33.2	32.5
DT 56	St Andrews St (26)	K	PDT	91.7	33.5	36.2	36.4	35.3	28.9
DT 57	St Andrews St (PB)	K	PDT		38.1				
DT 162	St Andrews St PB (façade)	R	PDT	100.0		38.8	37.3	36.3	34.9
DT 153	Strathmore Ave - Ped X	R	PDT		26.7	29.4			
DT 152	Strathmore Avenue (337)	K	PDT		29.9	35.0			
DT 59	Strathmore Avenue (353)	K	PDT	83.3	35.5	38.8	38.0	38.8	35.9
DT 60	Trades Lane (31)	K	PDT	100.0	29.4	30.4	31.4	27.3	27.7
DT 64	Union St (Goodfellows)	K	PDT		26.9				
DT 65	Union St (McIntyres)	K	PDT		28.9				
DT 61	Union St (Rollalong) Average	R	PDT	100.0	36.2	34.6	34.8	32.0	32.4
DT 66	Victoria Rd	R	PDT		30.9	34.2			
DT 184	Victoria Rd (104) / William St	R	PDT	100.0			33.3	30.7	27.3
DT 93	Victoria Rd (10b)	K	PDT	100.0	33.8	36.2	34.0	30.6	29.3
DT 191	Victoria Rd (4) - India Buildings	R	PDT	100.0			32.7	31.8	29.7
DT 68	Victoria Rd (60)	R	PDT	100.0	38.6	**42.2**	39.8	37.5	34.9
DT 69	Victoria Rd / Cotton Rd	K	PDT		34.0	36.7			

Site ID.	Site Name	Site Type(1)	Monitoring Type	Valid Data Capture 2015 (%)(2)	NO_2 Annual Mean Concentration ($\mu g/m^3$)(3)				
					2011	2012	2013	2014	2015
DT 70	Victoria Rd/Hilltown	R	PDT	100.0	**52.8**	**57.9**	**56.1**	**51.5**	**54.1**
DT 71	Victoria St/Albert St	K	PDT	100.0	33.8	34.8	32.2	30.0	27.6
DT 90	Ward Rd	R	PDT		32.4	30.2	30.3		
DT 95	West Marketgait	K	PDT		35.0	37.2			
DT 183	West Marketgait / Guthrie St	R	PDT	91.7			**50.7**	**46.1**	**46.8**
DT 205	West Marketgait/Old Mill (23)	R	PDT	100.0					**54.0**
DT 72	Westport (2)	R	PDT	100.0	37.0	37.7	39.0	36.3	33.0
DT 73	Whitehall Cr (4)	K	PDT	100.0	26.1	37.6	39.4	36.3	35.6
DT 161	Whitehall Cr /Union St (50)	K	PDT	100.0		29.8	30.4	30.5	25.0
DT 76	Whitehall St (1)	K	PDT	100.0	**41.4**	**47.3**	**49.9**	**45.9**	**44.1**
DT 81	Whitehall St (12)	R	PDT	91.7	35.8	39.6	**41.8**	**40.8**	34.5
DT 77	Whitehall St (15)	K	PDT	100.0	34.7	37.9	**40.7**	36.1	32.5
DT 74	Whitehall St (40)	K	PDT	100.0	33.1	39.7	39.7	39.5	35.6
DT 75	Whitehall St (5)	R	PDT	100.0	**45.7**	**49.5**	**46.7**	**44.1**	**44.2**
DT 160	Whitehall St (Romon) Average	R	PDT	100.0	36.0	**41.6**	**43.1**	**42.2**	36.5
DT 82	Woodside Ave	UB	PDT	100.0	15.4	16.2	15.4	14.9	13.2

Notes: Exceedences of the NO_2 annual mean objective of $40\mu g/m^3$ are shown in bold.
NO_2 annual means exceeding $60\mu g/m^3$, indicating a potential exceedence of the NO_2 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 NO_2 at Automatic monitors



Note: Hollow data points indicate those years when the vaild data capture was less than 90%

Figure A.3b Trend Analysis at Long-term NO_2 Monitoring Locations

Site Id.	Location	Trend
CM 14	Meadowside Romon	-7.07
DT 149	Meadowside (Romon) Average	-4.35
CM 2	Union St Rollalong	-1.56
DT 93	Victoria Rd (10b)	-1.48
DT 139	Broughty Ferry Rd (141 Downpipe)	-1.46
DT 61	Union St (Rollalong) Average	-1.37
DT 92	Abertay 2	-1.37
DT 140	Broughty Ferry Rd (L/P 66)	-0.92
DT 151	South Rd (1 Denbank)	-0.80
DT 147	Arbroath Rd (38)	-0.70
DT 46	Nethergate (95)	-0.70
DT 60	Trades Lane (31)	-0.58
DT 71	Victoria St/Albert St	-0.53
DT 91	Perth Rd (320)	-0.51
DT 48	Nethergate(132) / Marketgait	-0.49
DT 5	Arbroath Rd (13)	-0.44
CM 4	**Lochee Rd Romon**	-0.41
DT 82	Woodside Ave	-0.41
DT 54	Seagate (9)	-0.40
DT 11	Broughty Ferry Rd (141)	-0.40
DT 20	Dura St (100)	-0.39
DT 145	Broughty Ferry Rd (Greendykes)	-0.35
DT 56	St Andrews St (26)	-0.34
DT 68	Victoria Rd (60)	-0.33
DT 72	Westport (2)	-0.29
DT 50	Seagate (101)	-0.27
DT 39	Loons Rd (1)	-0.25
DT 159	Seagate(Romon) Average	-0.24
DT 75	Whitehall St (5)	-0.23
DT 158	Lochee Rd (Romon) Average	-0.23
CM 6	Whitehall St Romon	-0.22
DT 142	Broughty Ferry Rd (141) (St.Sign)	-0.22

Site Id.	Location	Trend
DT 27	Kingsway/ Mains Loan	-0.21
DT 22	Eastport Roundabout	-0.19
DT 7	Balgavies Place	-0.19
DT 30	Lochee Rd (138)	-0.18
DT 9	Birnam Place	-0.17
DT 84	Commercial St/Dock St (40)	-0.17
DT 36	Lochee Rd/Polepark Rd	-0.16
DT 13	Clepington Rd/ Forfar Rd	-0.12
DT 59	Strathmore Avenue (353)	-0.11
DT 26	Kingsway East Roundabout	-0.11
DT 55	Soapwork Lane	-0.09
DT 42	Muirton Rd (6)	-0.09
DT 32	Lochee Rd (184)	-0.08
DT 70	**Victoria Rd/Hilltown**	-0.04
DT 38	Logie St (98)	-0.04
DT 31	**Lochee Rd (140) Traffic Lts**	-0.03
DT 77	Whitehall St (15)	0.00
CM 12	Mains Loan	0.00
DT 81	Whitehall St (12)	0.03
DT 83	Forfar Rd (104)	0.03
DT 37	**Logie St (114)**	0.03
DT 45	Nethergate (6)	0.22
DT 85	Dock St (21)	0.25
DT 49	Rankine St (2)	0.28
DT 47	Nethergate (40)	0.32
DT 160	Whitehall St (Romon) Average	0.40
DT 76	Whitehall St (1)	0.40
DT 74	Whitehall St (40)	0.43
DT 44	Nethergate (88)	0.47
CM 5	**Seagate**	0.71
DT 73	Whitehall Cr (4)	1.09
DT 156	**Dock St (57)**	1.45

Note: (1) Locations where the 2015 NO_2 annual mean is exceeded at receptor nearest the monitor are shown in bold, borderline locations are orange
(2) Blue is an improving trend, red an increasing trend
(3) Methodology explained after **Figure A.5b**

Table A.4 1-Hour Mean NO_2 Monitoring Results

Site ID.	Site Name	Site Type(1)	Monitoring Type	Valid Data Capture 2015 (%)(2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2011	2012	2013	2014	2015
CM4	Lochee Rd Romon	R	Automatic	86.9	**43 (241.6)**	**36**	**99**	0	0 (186.0)
CM12	Mains Loan	UB	Automatic	96.5	0 (80.7)	0	0 (84.8)	0	0
CM14	Meadowside Romon	R	Automatic	82.8	0 (157.3)	0	0	0	0 (109.5)
CM5	Seagate	R	Automatic	99.6	2 (156.5)	0 (143.9)	10 (171.9)	0	0
CM2	Union St Rollalong	R	Automatic	99.6	0	0 (98.5)	0	0	0
CM6	Whitehall St Romon	R	Automatic	95.6	0 (117.8)	0 (136.4)	0	0	0

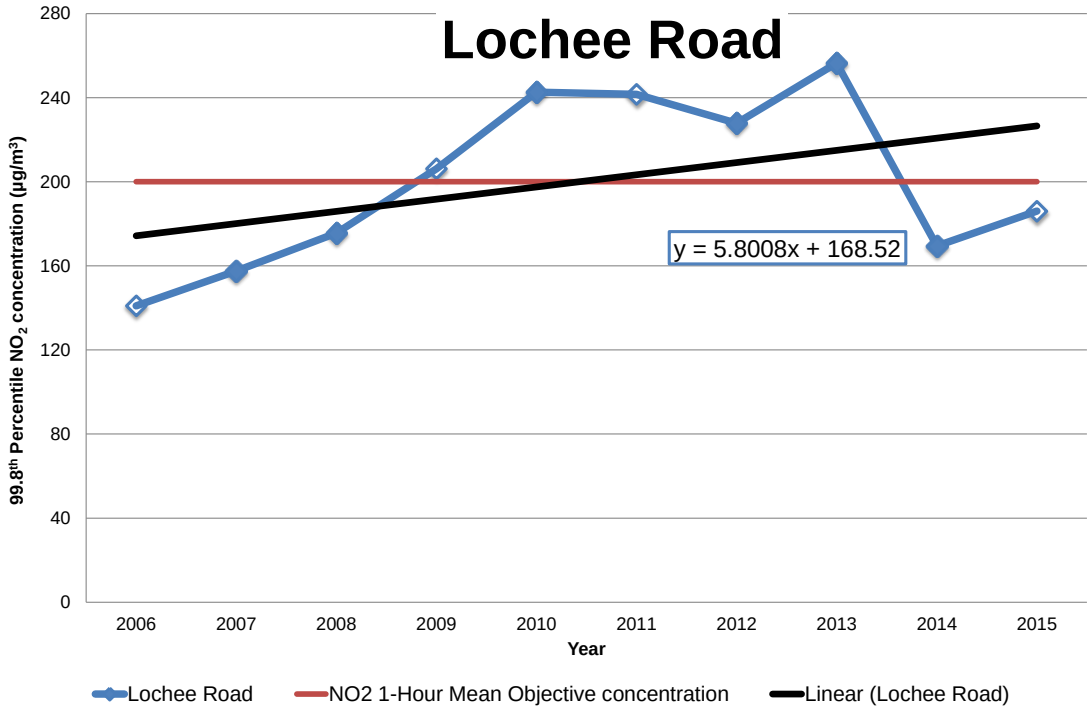
Notes: Exceedences of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold**.

(1) 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) If the period of valid data is less than 90%, 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 NO_2 concentrations at Lochee Road



Note: Hollow data points indicate those years when the valid data capture was less than 90%

Table A.5 Annual Mean PM_{10} Monitoring Results

Site ID	Site Name	Site Type(1)	Monitoring Type	Valid Data Capture 2015 (%)(2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$)(3)				
					2011	2012	2013	2014	2015
CM 2	Union St (TEOM/BAM)	R	Automatic	95.6	**18.8**	15.5	15.1	16.5	16.8
CM 7	Union St (Osiris)	R	Automatic	n/a	**18.9**	15.5	n/a	n/a	n/a
CM 3	Broughty Ferry Rd (TEOM)	UI	Automatic	99.3	16.1	14.2	15.9	14.7	12.6
CM 13	Broughty Ferry Rd (Partisol)	UI	Automatic	93.4	15.2	14.3	15.1	14.5	12.6
CM 16	Broughty Ferry Rd (Osiris)	UI	Automatic	83.4	n/a	13.4	15.0	14.6	12.1
CM 12	Mains Loan (TEOM)	UB	Automatic	96.9	12.8	11.4	11.9	12.9	11.9
CM 5	Seagate (BAM)	R	Automatic	97.0	17.1	14.1	16.0	17.7	14.5
CM 10	Seagate (Osiris)	K	Automatic	n/a	**23.6**	**20.6**	n/a	n/a	n/a
CM 14	Meadowside (BAM)	R	Automatic	96.3	**23.3**	**18.6**	**18.6**	16.6	16.1
CM 11	Victoria Rd (Osiris)	K	Automatic	n/a	**19.5**	15.5	n/a	n/a	n/a
CM 4	Lochee Rd (BAM)	R	Automatic	92.4	**19.4**	16.5	17.9	**18.6**	**19.8**
CM 8	Lochee Rd (Osiris)	K	Automatic	n/a	**26.3**	18.3	n/a	n/a	n/a
CM 9	Logie St (Osiris)	K	Automatic	79.9	**21.6**	18.0	16.5	16.1	15.5
CM 17	Myrekirk Tce (Osiris)	R	Automatic	82.0	n/a	16.1	15.5	18.3	18.4
CM 15	Albert St (Osiris)	K	Automatic	82.9	n/a	16.8	18.3	**21.4**	**19.0**
CM 18	Stannergate (Osiris)	R	Automatic	83.7	n/a	**19.9**	**24.5**	**26.7**	**26.9**

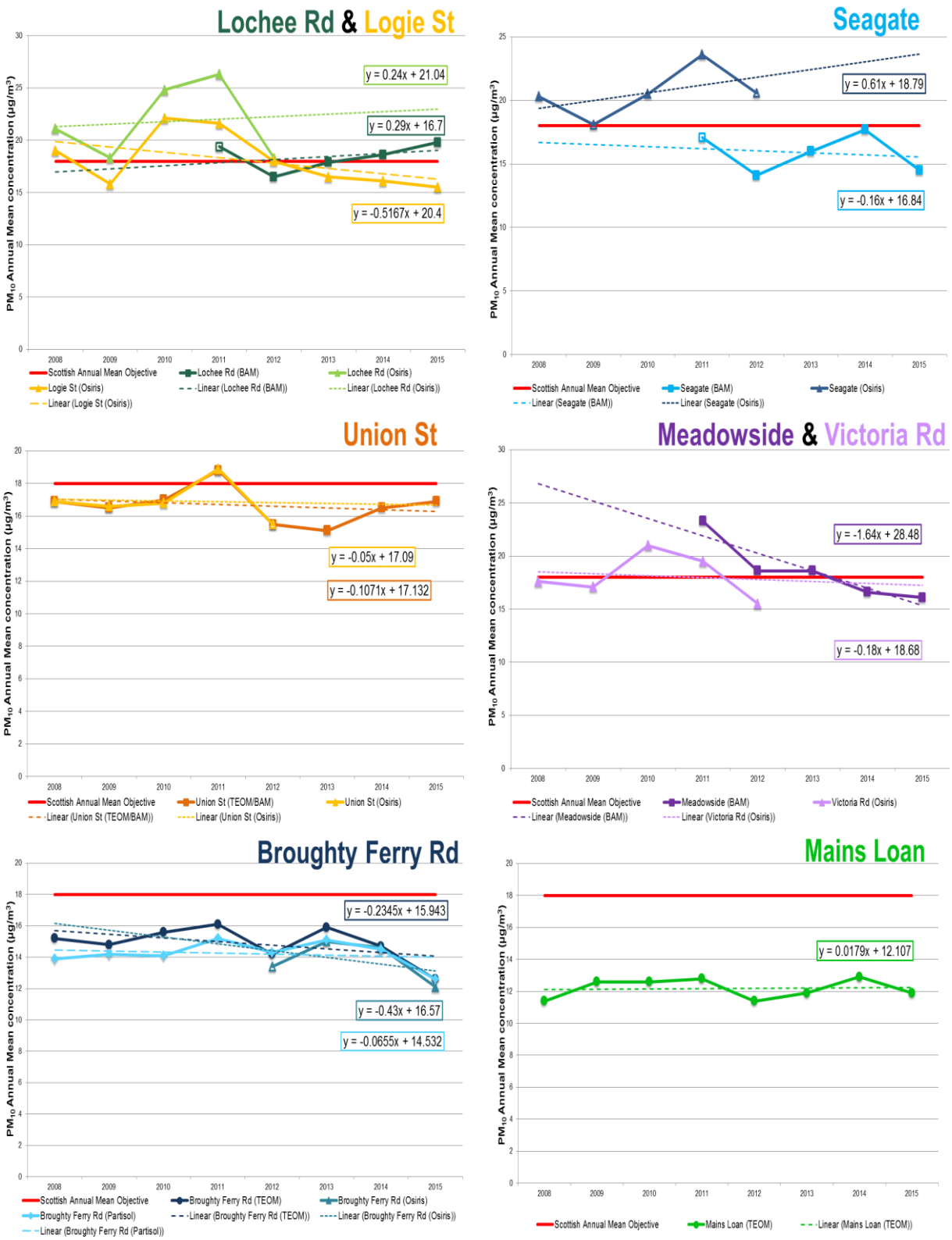
Notes: Exceedences of the PM_{10} annual mean objective of 18$\mu g/m^3$ are shown in **bold**.

(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) 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 PM_{10} concentrations at Automatic monitors



Note: Hollow data points indicate those years when the valid data capture was less than 90%

Figure A.5b Trend analysis of PM_{10} annual means at long term monitoring sites

Site Id.	Location	No. of years for trend	Trend
CM 2	Union St (TEOM/BAM)	8	-0.107
CM 3	Broughty Ferry Rd (TEOM)	8	-0.235
CM 13	Broughty Ferry Rd (Partisol)	8	-0.065
CM 12	Mains Loan (TEOM)	8	0.018
CM 5	Seagate (BAM)	5	-0.160
CM 14	Meadowside (BAM)	5	-1.640
CM 4	**Lochee Rd (BAM)**	5	0.290
CM 9	Logie St (Osiris)	8	-0.517

Notes: (1) Locations where the 2015 PM_{10} annual mean is exceeded are shown in **bold**, borderline locations are orange
(2) Blue is an improving trend, red a increasing trend.

Explanation of Methodology for Figures **A.3b** and **A.5b** 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 PM_{10} Monitoring Results

Site ID.	Site Name	Site Type(1)	Monitoring Type	Valid Data Capture 2015 (%)(2)	PM10 24-Hour Means > 50µg/m3 (3)				
					2011	2012	2013	2014	2015
CM 2	Union St (TEOM/BAM)	R	Automatic	95.6	1	2 (36.3)	1	2	7*
CM 7	Union St (Osiris)	R	Automatic	n/a	2	2 (42.3)	n/a	n/a	n/a
CM 3	Broughty Ferry Rd (TEOM)	UI	Automatic	99.3	0	2	3	1 (33.3)	2
CM 13	Broughty Ferry Rd (Partisol)	UI	Automatic	93.4	1	3	2	1	0
CM 16	Broughty Ferry Rd (Osiris)	UI	Automatic	83.4	n/a	0 (30.5)	4 (47.3)	3 (40.7)	2 (35.4)
CM 12	Mains Loan (TEOM)	UB	Automatic	96.9	0	1	1	1	1
CM 5	Seagate (BAM)	R	Automatic	97.0	1 (38.1)	1	4	3	3
CM 10	Seagate (Osiris)	K	Automatic	n/a	**20**	**13 (59.5)**	n/a	n/a	n/a
CM 14	Meadowside (BAM)	R	Automatic	96.3	4 (49.8)	4	4	2	4
CM 11	Victoria Rd (Osiris)	K	Automatic	n/a	**11**	3 (48.0)	n/a	n/a	n/a
CM 4	Lochee Rd (BAM)	R	Automatic	92.4	2 (43.5)	3	3	1	5
CM 8	Lochee Rd (Osiris)	K	Automatic	n/a	**28**	6 (50.7)	n/a	n/a	n/a
CM 9	Logie St (Osiris)	K	Automatic	79.9	**16**	5 (46.3)	2	2 (38.6)	4 (39.2)
CM 17	Myrekirk Tce (Osiris)	R	Automatic	82.0	n/a	0 (30.1)	2	3 (43.8)	7 **(54.2)**
CM 15	Albert St (Osiris)	K	Automatic	82.9	n/a	2 (43.3)	7*	**14 (57.8)**	**8 (63.9)**
CM 18	Stannergate (Osiris)	R	Automatic	83.7	n/a	0 (35.9)	**9 (54.1)**	**16 (60.1)**	**15 (72.3)**

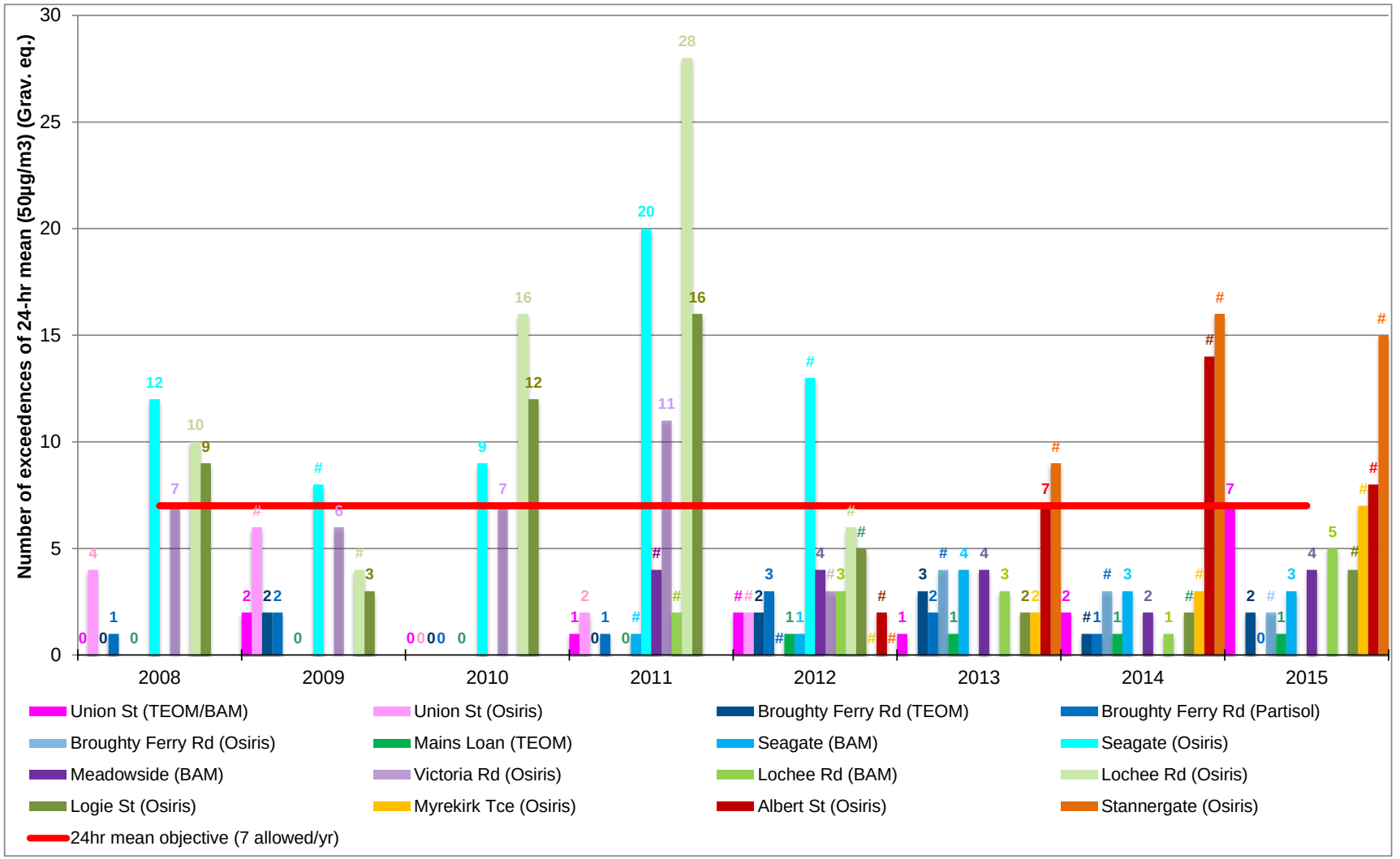
Notes: Exceedences of the PM10 24-hour mean objective (50µg/m3 not to be exceeded more than 7 times/year) are shown in **bold**.

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

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

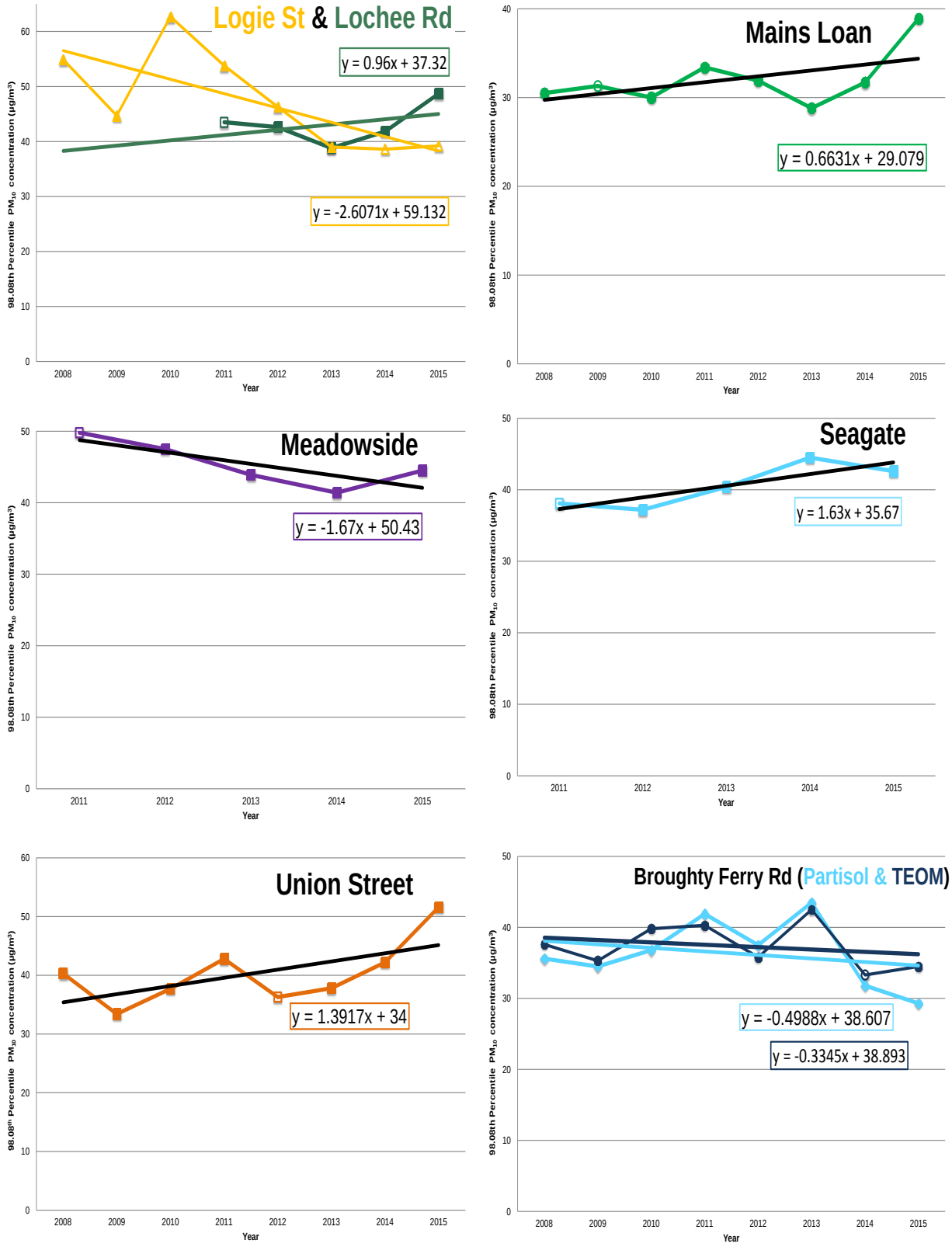
(3) If the period of valid data is less than 90%, the 98.08th percentile of 24-hour means is provided in brackets (and shaded grey).

Figure A.6a Frequency of Exceedences of PM_{10} 24 hour Mean Objective (50µg/m^3, 7 allowed) 2008-2015



Note: # denotes that the actual number of exceedences is unknown as the data capture was less than 90%

Figure A.6b Trends in 98.08th Percentile PM_{10} values at Automatic monitors



Note: Hollow marker points show when data capture for the year was less than 90%.

Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO_2 Monthly Diffusion Tube Results for 2015

Site Id. (DT)	Location	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.82)
92	Abertay 2	39.9	49.2	47.4	43.4	39.4	37.8	44.1	41.0	45.1	50.3	47.6	45.8	**44.3**	100.0	1.0	**44.3**	36.3
179	Albert St (15) (Facade)	39.1	40.7	42.3	42.0	35.3	36.8	38.4	42.1	44.3	49.9	43.3	35.3	**40.8**	100.0	1.0	**40.8**	33.4
180	Albert St (15) (Rdside)	39.5	40.4	44.5	44.4	-	40.7	38.6	43.5	46.6	51.7	46.0	40.7	**43.3**	91.7	1.0	**43.3**	35.5
187	Albert St (81)	35.6	35.5	38.8	37.7	30.2	31.5	33.0	35.1	38.7	45.3	43.8	38.6	37.0	100.0	1.0	37.0	30.3
167	Albert St (191)	32.9	33.2	40.5	36.5	35.7	34.5	39.0	38.0	39.4	49.0	37.4	40.9	38.1	100.0	1.0	38.1	31.2
5	Arbroath Rd (13)	41.8	42.5	45.6	-	38.3	32.5	36.3	41.7	45.8	46.6	47.6	43.0	**42.0**	91.7	1.0	**42.0**	34.4
168	Arbroath Rd (27)	-	42.7	41.2	-	-	-	-	34.1	-	-	42.5	-	40.1	33.3	**0.896**	35.9	29.5
147	Arbroath Rd (38)	49.8	45.9	45.3	36.9	-	32.7	34.7	37.1	42.2	-	47.8	38.4	**41.1**	83.3	1.0	**41.1**	33.7
7	Balgavies Place	23.2	22.3	20.5	16.8	11.3	11.0	11.3	14.2	16.6	23.0	26.9	22.7	18.3	100.0	1.0	18.3	15.0
9	Birnam Place	14.2	14.5	10.2	8.5	7.3	7.4	7.2	9.2	9.4	15.6	11.8	12.5	10.7	100.0	1.0	10.7	8.7
164	Broughty Ferry Rd - Lower	26.5	30.9	18.7	14.5	-	10.5	9.6	12.1	14.0	19.5	25.4	18.2	18.2	91.7	1.0	18.2	14.9
140	Broughty Ferry Rd (L/P 66)	54.4	49.9	37.2	36.3	33.1	28.7	31.6	36.5	37.9	43.9	39.2	-	39.0	91.7	1.0	39.0	32.0
139	Broughty Ferry Rd (141 Downpipe)	49.9	50.0	40.1	33.6	32.7	31.7	33.4	36.1	35.5	40.8	49.1	39.7	39.4	100.0	1.0	39.4	32.3
11	Broughty Ferry Rd (141)	54.7	48.9	43.4	39.2	38.0	36.8	38.6	42.9	43.8	-	44.6	43.7	**43.1**	91.7	1.0	**43.1**	35.4
142	Broughty Ferry Rd (141) (St.Sign)	38.9	35.9	33.1	30.9	30.7	26.8	29.1	29.1	37.9	40.4	39.9	30.5	33.6	100.0	1.0	33.6	27.6
166	Broughty Ferry Rd LP 59(2)	40.8	27.7	27.1	18.8	17.2	17.7	14.8	22.6	25.9	31.4	34.6	30.0	25.7	100.0	1.0	25.7	21.1
145	Broughty Ferry Rd (Greendykes)	48.0	43.4	45.2	37.4	35.5	35.0	38.0	39.0	41.0	41.4	26.8	34.8	38.8	100.0	1.0	38.8	31.8
204	Broughty Ferry Rd (129)	49.0	52.8	42.4	42.6	39.7	41.5	41.2	42.7	48.1	51.7	68.3	40.4	**46.7**	100.0	1.0	**46.7**	38.3

Site Id. (DT)	Location	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.82)
155	Carolina Court LP6	31.8	30.7	24.1	17.3	15.0	14.8	15.2	18.1	-	-	33.6	25.9	22.7	83.3	1.0	22.7	18.6
13	Clepington Rd/ Forfar Rd	46.6	51.1	46.5	36.2	38.6	45.3	51.9	38.8	40.7	49.2	47.1	42.3	**44.5**	100.0	1.0	**44.5**	36.5
188	Commercial St (9)	49.5	37.6	51.1	48.4	43.6	37.1	43.9	38.6	43.2	49.4	42.0	37.1	**43.5**	100.0	1.0	**43.5**	35.6
84	Commercial St/Dock St (40)	46.3	51.5	53.5	45.0	42.1	40.9	36.1	42.9	41.7	48.4	46.1	38.4	**44.4**	100.0	1.0	**44.4**	36.4
203	Coupar Angus Rd/Sinclair St	29.5	32.7	28.1	25.7	19.8	20.7	25.0	24.8	31.2	37.5	33.0	29.7	28.1	100.0	1.0	28.1	23.1
192	Dock St (12)	32.0	38.7	34.5	30.4	28.5	26.3	28.1	27.9	33.0	37.5	34.1	28.6	31.6	100.0	1.0	31.6	25.9
85	Dock St (21)	50.7	45.8	50.1	45.1	42.3	39.7	41.9	44.9	45.8	48.2	55.2	37.8	**45.6**	100.0	1.0	**45.6**	37.4
156	Dock St (57)	77.9	75.6	65.8	58.6	54.3	51.4	50.5	59.9	62.0	58.5	78.5	58.8	**62.7**	100.0	1.0	**62.7**	**51.4**
20	Dura St (100)	47.1	43.4	44.1	41.0	36.4	-	38.4	35.5	47.1	48.0	46.9	40.2	**42.6**	91.7	1.0	**42.6**	34.9
22	Eastport Roundabout	40.0	41.8	44.3	31.7	35.4	30.7	34.9	33.9	36.9	42.9	42.5	34.6	37.5	100.0	1.0	37.5	30.7
83	Forfar Rd (104)	64.6	68.5	59.8	53.8	51.3	34.1	35.3	55.2	56.1	57.5	68.3	55.2	**55.0**	100.0	1.0	**55.0**	**45.1**
202	High St Lochee (22-24)	44.4	48.1	41.5	38.9	29.5	32.5	30.2	35.5	38.6	44.9	40.2	37.9	38.5	100.0	1.0	38.5	31.6
26	Kingsway East Roundabout	48.7	50.2	47.0	41.7	34.1	38.9	40.0	48.2	44.5	46.2	-	45.0	**44.0**	91.7	1.0	**44.0**	36.1
27	Kingsway/ Mains Loan	33.2	34.0	37.6	34.6	34.2	33.0	37.3	34.7	35.5	47.0	39.1	28.2	35.7	100.0	1.0	35.7	29.3
177	Kingsway / Strathmartine Rd (279)	49.4	52.1	51.8	40.4	29.3	38.4	34.5	43.5	46.1	47.4	55.5	41.4	**44.2**	100.0	1.0	**44.2**	36.2
30	Lochee Rd (138)	67.8	72.5	63.9	53.5	49.8	53.2	56.4	59.7	65.0	55.6	73.2	55.2	**60.5**	100.0	1.0	**60.5**	**49.6**
31	Lochee Rd (140) Traffic Lts	72.8	70.1	51.8	58.7	43.0	58.3	59.3	57.9	68.6	69.4	67.0	58.8	**61.3**	100.0	1.0	**61.3**	**50.3**
32	Lochee Rd (184)	51.0	61.0	45.8	41.1	32.8	33.2	36.1	36.3	43.2	47.0	57.8	44.2	**44.1**	100.0	1.0	**44.1**	36.2
	Lochee Rd (Romon 1)	64.3	68.6	57.6	47.0	42.7	45.6	46.6	50.7	58.1	55.4	69.3	54.8	**55.1**	100.0	1.0	**55.1**	**45.1**
	Lochee Rd (Romon 2)	62.3	66.9	58.6	50.1	42.1	48.8	43.9	50.1	56.6	53.6	60.7	54.8	**54.0**	100.0	1.0	**54.0**	**44.3**
	Lochee Rd (Romon 3)	63.2	65.5	61.9	45.0	44.6	43.8	48.0	52.5	58.4	58.5	60.1	57.1	**54.9**	100.0	1.0	**54.9**	**45.0**
158	Lochee Rd (Romon) Average	63.3	67.0	59.4	47.4	43.1	46.1	46.2	51.1	57.7	55.8	63.4	55.6	**54.7**	100.0	1.0	**54.7**	**44.8**
36	Lochee Rd/Polepark Rd	42.3	43.0	36.8	29.6	25.4	24.9	26.5	28.7	34.8	39.0	44.0	36.3	34.3	100.0	1.0	34.3	28.1

Site Id. (DT)	Location	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.82)
37	Logie St (114)	64.9	69.0	72.6	63.3	51.0	52.4	56.2	61.1	62.7	72.6	57.1	63.0	**62.2**	100.0	1.0	**62.2**	**51.0**
38	Logie St (98)	48.2	50.0	43.6	40.5	34.5	33.0	25.6	32.8	37.6	-	48.1	39.1	39.4	91.7	1.0	39.4	32.3
39	Loons Rd (1)	41.1	47.4	47.0	44.9	34.8	36.1	39.8	41.0	45.8	50.7	52.2	40.2	**43.4**	100.0	1.0	**43.4**	35.6
182	Meadowside (28)	53.1	55.2	44.4	44.3	-	38.9	32.4	41.2	-	46.6	53.2	43.7	**45.3**	83.3	1.0	**45.3**	37.1
	Meadowside (Romon 1)	58.6	53.5	54.2	50.8	43.8	45.8	46.6	47.2	48.4	50.7	45.8	45.8	**49.3**	100.0	1.0	**49.3**	40.4
	Meadowside (Romon 2)	55.8	57.8	57.8	50.4	46.0	43.5	46.2	49.7	48.4	54.2	45.1	45.3	**50.0**	100.0	1.0	**50.0**	**41.0**
	Meadowside (Romon 3)	50.7	58.3	52.2	49.0	52.5	40.9	44.3	49.9	53.2	57.7	62.0	47.3	**51.5**	100.0	1.0	**51.5**	**42.2**
149	Meadowside (Romon) Average	55.0	56.5	54.7	50.1	47.4	43.4	45.7	48.9	50.0	54.2	51.0	46.1	**50.3**	100.0	1.0	**50.3**	**41.2**
42	Muirton Rd (6)	28.5	31.1	29.2	30.9	26.7	27.2	27.5	31.4	30.0	38.6	32.7	32.3	30.5	100.0	1.0	30.5	25.0
185	Murraygate (46)	23.5	35.0	28.9	19.9	18.4	20.4	-	23.4	25.3	30.8	34.1	27.1	26.1	91.7	1.0	26.1	21.4
189	Myrekirk Rd (29)	46.6	50.3	36.3	39.3	33.4	-	32.6	35.7	37.3	40.2	45.0	34.8	39.2	91.7	1.0	39.2	32.2
45	Nethergate (6)	49.8	52.9	54.2	40.5	38.9	40.1	41.0	45.1	-	48.8	57.1	44.6	**46.6**	91.7	1.0	**46.6**	38.2
47	Nethergate (40)	-	46.6	52.0	-	42.9	42.7	46.0	48.6	45.1	50.5	41.2	40.9	**45.7**	83.3	1.0	**45.7**	37.4
44	Nethergate (88)	50.1	54.7	56.5	56.6	46.4	50.6	51.3	50.3	46.9	54.6	59.7	47.9	**52.1**	100.0	1.0	**52.1**	**42.7**
48	Nethergate(132) / Marketgait	38.9	35.4	39.2	37.8	32.7	29.7	32.6	30.2	35.8	38.2	35.0	33.2	34.9	100.0	1.0	34.9	28.6
46	Nethergate (95)	42.9	43.6	-	38.7	37.7	28.7	31.2	32.4	39.9	41.7	43.0	36.1	37.8	91.7	1.0	37.8	31.0
91	Perth Rd (320)	46.6	47.1	49.5	40.2	32.4	38.9	32.6	38.4	44.0	49.9	43.3	35.3	**41.5**	100.0	1.0	**41.5**	34.0
49	Rankine St (2)	49.2	61.0	52.2	40.1	41.7	35.8	47.8	38.0	47.4	48.8	77.8	49.1	**49.1**	100.0	1.0	**49.1**	40.2
54	Seagate (9)	40.8	44.5	42.9	39.6	35.3	33.8	34.5	40.4	39.9	43.3	45.6	40.1	40.1	100.0	1.0	40.1	32.8
190	Seagate (97)	53.0	58.0	63.9	53.9	51.6	50.4	49.9	53.3	53.8	55.2	52.9	56.8	**54.4**	100.0	1.0	**54.4**	**44.6**
50	Seagate (101)	56.7	62.3	54.4	49.1	43.6	41.0	38.2	45.8	43.3	49.0	38.6	56.8	**48.2**	100.0	1.0	**48.2**	39.6
	Seagate(Romon 1)	54.6	59.3	57.4	53.1	50.2	49.2	45.8	47.2	47.1	51.7	59.7	48.3	**52.0**	100.0	1.0	**52.0**	**42.6**
	Seagate(Romon 2)	55.0	60.5	56.6	55.5	52.5	47.3	46.8	49.2	52.9	51.5	60.4	42.3	**52.5**	100.0	1.0	**52.5**	**43.1**

Site Id. (DT)	Location	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.82)
	Seagate(Romon 3)	48.4	53.1	55.6	55.8	46.7	45.8	49.2	50.7	46.8	54.8	47.8	47.1	**50.2**	100.0	1.0	**50.2**	**41.1**
159	Seagate(Romon) Average	52.7	57.6	56.5	54.8	49.8	47.4	47.3	49.0	48.9	52.7	56.0	45.9	**51.6**	100.0	1.0	**51.6**	**42.3**
55	Soapwork Lane	44.0	44.8	39.5	29.7	28.7	30.2	31.4	36.7	38.2	47.0	54.2	43.7	39.0	100.0	1.0	39.0	32.0
151	South Rd (1 Denbank)	43.4	49.5	46.2	40.2	34.3	33.5	32.2	37.5	38.9	48.4	31.5	39.6	39.6	100.0	1.0	39.6	32.5
162	St Andrews St PB (façade)	49.1	45.8	48.6	41.7	37.0	35.0	36.1	42.1	39.2	45.8	47.8	42.2	**42.5**	100.0	1.0	**42.5**	34.9
56	St Andrews St (26)	38.5	-	42.0	40.4	30.4	30.2	32.4	31.6	34.8	37.3	37.4	32.3	35.2	91.7	1.0	35.2	28.9
59	Strathmore Avenue (353)	-	36.8	47.2	-	39.2	41.5	40.8	46.2	46.0	54.0	40.9	45.1	**43.8**	83.3	1.0	**43.8**	35.9
60	Trades Lane (31)	37.8	40.3	38.6	35.0	25.9	25.6	27.9	28.9	33.0	36.5	42.5	33.5	33.8	100.0	1.0	33.8	27.7
	Union St (Rollalong 1)	45.1	49.4	41.9	40.3	33.3	34.0	30.2	36.9	38.6	42.1	46.6	40.1	39.9	100.0	1.0	39.9	32.7
	Union St (Rollalong 2)	48.7	45.1	48.4	40.7	34.9	33.6	30.8	35.7	39.7	39.8	43.8	36.6	39.8	100.0	1.0	39.8	32.6
	Union St (Rollalong 3)	44.5	45.1	46.5	37.3	33.6	35.3	30.6	34.1	37.6	39.6	48.8	33.5	38.9	100.0	1.0	38.9	31.9
61	Union St (Rollalong) Average	46.1	46.5	45.6	39.0	33.9	34.3	30.5	35.6	38.6	40.5	46.4	36.7	39.5	100.0	1.0	39.5	32.4
191	Victoria Rd (4) - India Buildings	37.7	37.4	37.6	29.7	28.8	25.1	31.2	32.6	32.0	42.1	61.1	39.2	36.2	100.0	1.0	36.2	29.7
93	Victoria Rd (10b)	38.9	37.7	37.2	32.4	33.7	30.7	32.2	32.6	35.6	40.4	42.8	34.0	35.7	100.0	1.0	35.7	29.3
70	Victoria Rd/Hilltown	75.2	88.9	67.8	49.4	58.7	49.7	52.3	69.4	64.3	59.5	91.9	65.3	**66.0**	100.0	1.0	**66.0**	**54.1**
68	Victoria Rd (60)	41.9	41.3	44.9	37.6	41.3	37.8	42.3	40.2	40.1	50.3	54.5	39.1	**42.6**	100.0	1.0	**42.6**	34.9
184	Victoria Rd (104) / William St	33.4	35.6	37.1	33.6	30.0	29.2	30.4	34.9	34.3	37.3	29.1	34.1	33.3	100.0	1.0	33.3	27.3
71	Victoria St/Albert St	37.9	33.8	35.3	30.5	29.5	28.9	31.0	31.6	35.0	40.4	39.1	31.2	33.7	100.0	1.0	33.7	27.6
72	Westport (2)	48.9	50.6	45.3	36.1	37.2	31.0	31.8	37.5	38.4	42.1	46.8	37.9	40.3	100.0	1.0	40.3	33.0
183	West Marketgait / Guthrie St	65.4	60.1	64.9	55.6	52.5	-	45.1	55.2	61.4	55.6	63.4	48.6	**57.1**	91.7	1.0	**57.1**	**46.8**
205	West Marketgait/Old Mill (23)	69.3	68.9	62.7	54.3	46.8	50.2	51.1	60.7	68.6	80.0	109.6	68.3	**65.9**	100.0	1.0	**65.9**	**54.0**
73	Whitehall Cr (4)	44.8	53.9	50.1	45.7	37.9	40.2	39.2	39.6	41.2	45.3	49.1	34.5	**43.5**	100.0	1.0	**43.5**	35.6
161	Whitehall Cr /Union St (50)	38.4	36.4	35.9	30.3	25.4	25.3	25.9	26.9	31.0	34.9	28.7	27.1	30.5	100.0	1.0	30.5	25.0

Site Id. (DT)	Location	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.82)
74	Whitehall St (40)	46.0	47.3	51.9	44.3	40.5	40.2	42.1	38.2	42.0	46.0	41.7	40.1	**43.4**	100.0	1.0	**43.4**	35.6
81	Whitehall St (12)	36.5	43.1	49.6	43.5	-	41.9	45.3	33.0	41.5	50.3	37.6	41.0	**42.1**	91.7	1.0	**42.1**	34.5
76	Whitehall St (1)	53.5	63.3	57.5	56.1	50.9	48.4	51.3	50.7	48.1	55.4	62.7	47.6	**53.8**	100.0	1.0	**53.8**	**44.1**
75	Whitehall St (5)	61.4	68.4	62.1	49.9	48.9	48.9	48.2	51.9	52.2	51.7	58.1	45.5	**53.9**	100.0	1.0	**53.9**	**44.2**
77	Whitehall St (15)	43.9	42.8	49.6	39.7	30.2	35.9	35.5	37.8	38.4	44.9	42.2	35.1	39.7	100.0	1.0	39.7	32.5
	Whitehall St (Romon 1)	42.2	48.4	52.7	48.4	41.2	43.3	46.2	43.9	41.4	44.1	44.6	40.5	**44.7**	100.0	1.0	**44.7**	36.7
	Whitehall St (Romon 2)	46.5	39.8	52.1	46.5	39.4	43.7	38.0	44.1	44.0	50.3	44.3	42.2	**44.2**	100.0	1.0	**44.2**	36.3
	Whitehall St (Romon 3)	45.9	46.9	42.8	44.6	40.9	44.2	47.0	44.1	44.8	48.8	46.8	39.1	**44.7**	100.0	1.0	**44.7**	36.6
160	Whitehall St (Romon) Average	44.9	45.0	49.2	46.5	40.5	43.7	43.7	44.0	43.4	47.7	45.2	40.6	**44.5**	100.0	1.0	**44.5**	36.5
82	Woodside Ave	19.8	21.9	14.7	14.3	10.8	11.3	10.7	13.3	14.4	22.0	18.1	21.2	16.0	100.0	1.0	16.0	13.2

(1) See **Appendix C** for details on bias adjustment

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

Dundee City Council secured funding from the Scottish Executive to commission Ricardo-AEA to assist with data management and ratification procedures. Dundee joined the 'Calibration Club' run by Ricardo-AEA at the end of 2006. Ricardo-AEA 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).

QA/QC of Diffusion Tube Monitoring

Monitoring of NO_2 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/qa-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.[5]

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 calculated using this spreadsheet[6] is are 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 Website[7] for Tayside Scientific Services is **0.77** (Spreadsheet version 03/16). This is based on four roadside sites from Fife Council and the kerbside National inter-comparison site at Marylebone Road (0.76).

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 5 automatic monitoring locations in 2015. 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 Council co-location studies met the criteria in 2015. 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 February 2016. The automatic analyser period means are calculated from mid-day on tube changeover days.

[5] http://laqm.defra.gov.uk/documents/LAQM-AIR-PT-Rounds-1-12-(April-2014-February-2016)-NO2-report.pdf
[6] http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html
[7] http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Table C.1 Bias Factors from 2015 Co-location Studies and National Bias Adjustment Spreadsheet (Version 03/16)

Site Name	Site Type[1]	Length of Study (months)	PDT[2] Mean Conc. (Dm) (µg/m^3)	Analyser Mean Conc. (Cm) (µg/m^3)	%DC[3]	Bias (B)	Tube Precision & average CV [4]	Bias Adjustment Factor (A) (Cm/Dm)
Lochee Road	R	10	56	48	98	16%	G (4%)	**0.86**
Meadowside	R	9	50	39	100	30%	G (6%)	**0.77**
Seagate	R	12	52	51	100	2%	G (5%)	**0.98**
Union Street	R	12	40	28	100	41%	G (4%)	**0.71**
Whitehall Street	R	11	45	37	99	20%	G (5%)	**0.83**
Marylebone Road Intercomparison	K	12	107	81	n/a	31.5%	G	**0.76**

1 - R= Roadside, K= Kerbside

2 - PDT = Passive Diffusion Tube for NO_2

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 spreadsheets[8]) 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 Consultants[9] (AQC) (see **Table C.2**). The factor obtained using only local roadside sites was **0.82**, and **0.81** when the kerbside site at Marylebone Road was included. The **0.82** bias correction factor represents a more conservative approach and has been used to bias correct the diffusion tube data presented in this report.

[8] http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html

[9] http://laqm.defra.gov.uk/documents/NO2-Diffusion-Tube-Collocation-Methodology.pdf

Table C.2 Manual Approximate Orthogonal Regression Calculation 2014

Co-location Sites 2015	Site Type[1]	Bias Factor A	Bias B	Manual orthogonal regression Calculation as para 2.4 AQC doc[2]		
				Express as a factor	Add 1	Inverse
Lochee Road	R	0.86	16%			
Meadowside	R	0.77	30%			
Seagate	R	0.98	2%			
Union St	R	0.71	41%			
Whitehall St	R	0.83	20%			
Mean Local		0.83	21.8%	0.218	1.218	**0.82**
National: Marylebone Road Intercomparison	K	0.76	31.5%			
Combined Local & National: Mean Combined		0.82	23.4%	0.234	1.234	**0.81**

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 (PM_{10}) within the city. TEOM and Osiris monitors have heated inlets. These tend to drive off volatile organic particulate matter and in consequence the measured concentrations tend be lower than those measured by gravimetric reference standard monitors. The Partisol is a reference equivalent method and had been used historically to determine a local correction factor for the TEOMs, which were designated as non-equivalent in 2006. TEOM PM_{10} data presented in this report have been corrected using the Volatile Correction Methodology (VCM) since 2008.

DCC have five Osiris analysers, four of which were re-located during 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 PM_{10} 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 2015 data can be made available on demand[10]. 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 2015 data was **1.689**. This methodology although reasonable for annual mean data, has a tendency to over-estimate the number of daily mean exceedences. Consequently, these results should be treated with some caution.

[10] T:\Pollution\Air Quality\Progress Reports\Progress Report 2016\PM10\Osiris Intercomparison Factors for 2015.docx

In addition, DCC have four unheated Beta-Attenuation Monitors (BAM), which are gravimetric equivalent monitors. The PM_{10} data from these have been corrected for slope by Ricardo-AEA using the factor (0.833) determined by the UK Equivalence Testing Programme[11]. For comparison with the NAQS objectives annual mean concentrations are calculated from an hourly time base. It should be noted that the annual mean concentrations for each of the BAM analysers in 2015 is based on ratified 15min values derived from the hourly averages recorded by the BAM. BAM analysers record one PM_{10} value for each hour. The logger at each site records 4 identical 15 min values (e.g.00:15, 00:30, 00:45 and 01:00) to represent the hourly average recorded by the BAM. It was discovered that during 2013 some of these 15 min values had been allocated incorrectly by the logger (e.g. 00:00, 00:15, 00:30 and 00:45). The consequence of this is that some of the hourly averages calculated would be incorrect. The issue was discussed with Ricardo-AEA[12] and it was agreed that, the annual average would be better calculated from the 15 min values. However, the hourly values and annual means for the DCC BAMs on the Scottish Government website[13] remain based on the hourly averages from the logger.

Short-term to Long-term Data adjustment

Annualisation of data was required for one tube location with less than 75% data capture in 2015, Arbroath Road 27. The methodology outlined in Box 7.9 of LAQM.TG(16) was used. The background sites used are shown in **Table C.3**. The annualisation factor derived was **0.896**.

Table C.3 Period Adjustment Calculation

Urban Background Locations		Annual Mean, A_m ($\mu g/m^3$)	Period Mean*, P_m ($\mu g/m^3$)	Ratio, A_m/P_m	Average Ratio, R_a
DT 7	Balgavies Place	18.3	21.0	0.8733	**0.896**
DT 9	Birnam Place	10.7	11.4	0.9322	
DT 164	Broughty Ferry Rd - Lower	18.2	21.8	0.8346	
DT 82	Woodside Ave	16.0	17.0	0.9436	

Note: *P_m based on February, March, August and November values (in Appendix B)

[11] http://laqm.defra.gov.uk/laqm-faqs/faq104.html
[12] Personal communication between Rachel Brooks DCC and Stephen Stratton Ricardo-AEA
[13] www.scottishairquality.co.uk

Appendix C.2 Overview of NO_2 Annual Mean Concentrations Across the City

Union Street & Whitehall Street

Figure C.1 NO_2 Monitoring Locations in Union Street and Whitehall Street

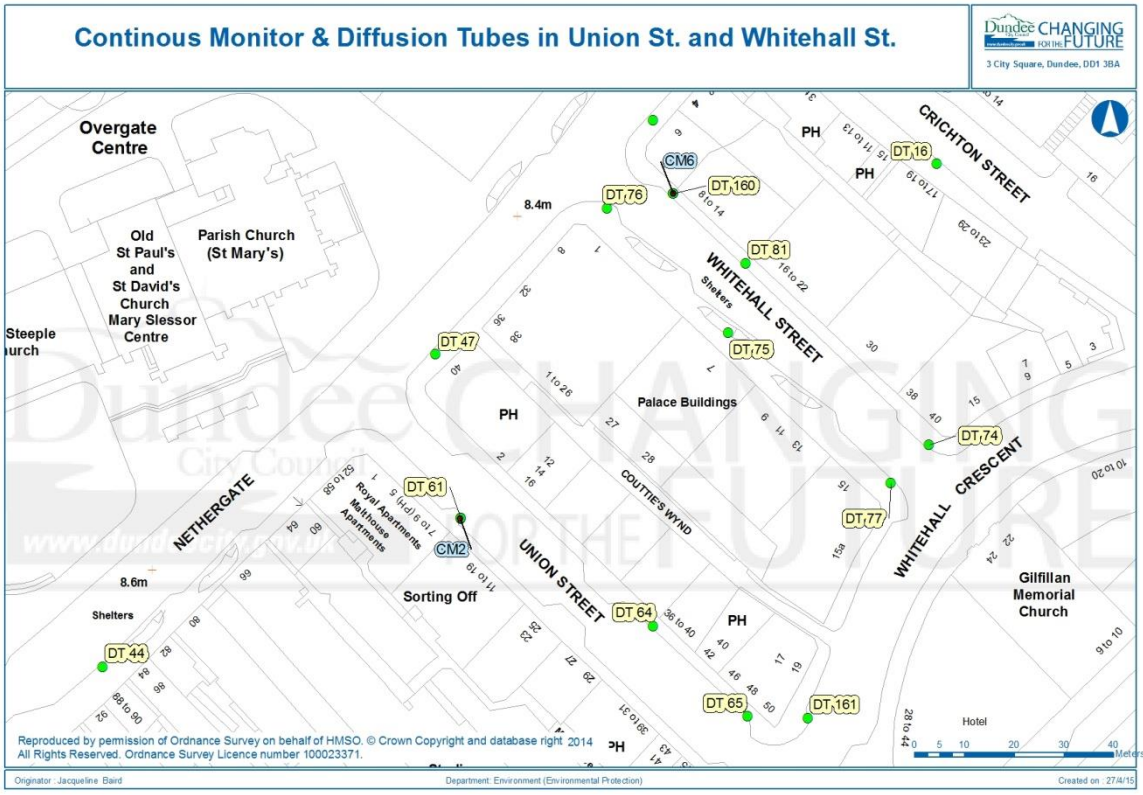


Figure C.2 Overview of NO_2 Concentrations in Union St and Nethergate (east of Marketgait)

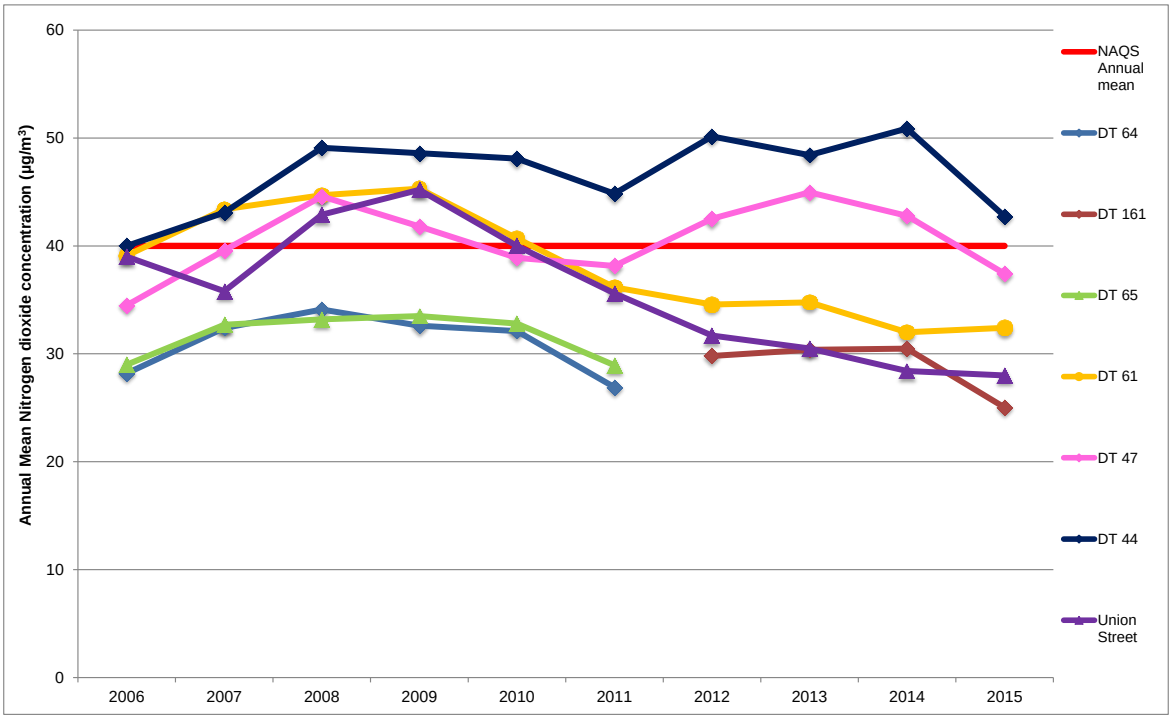
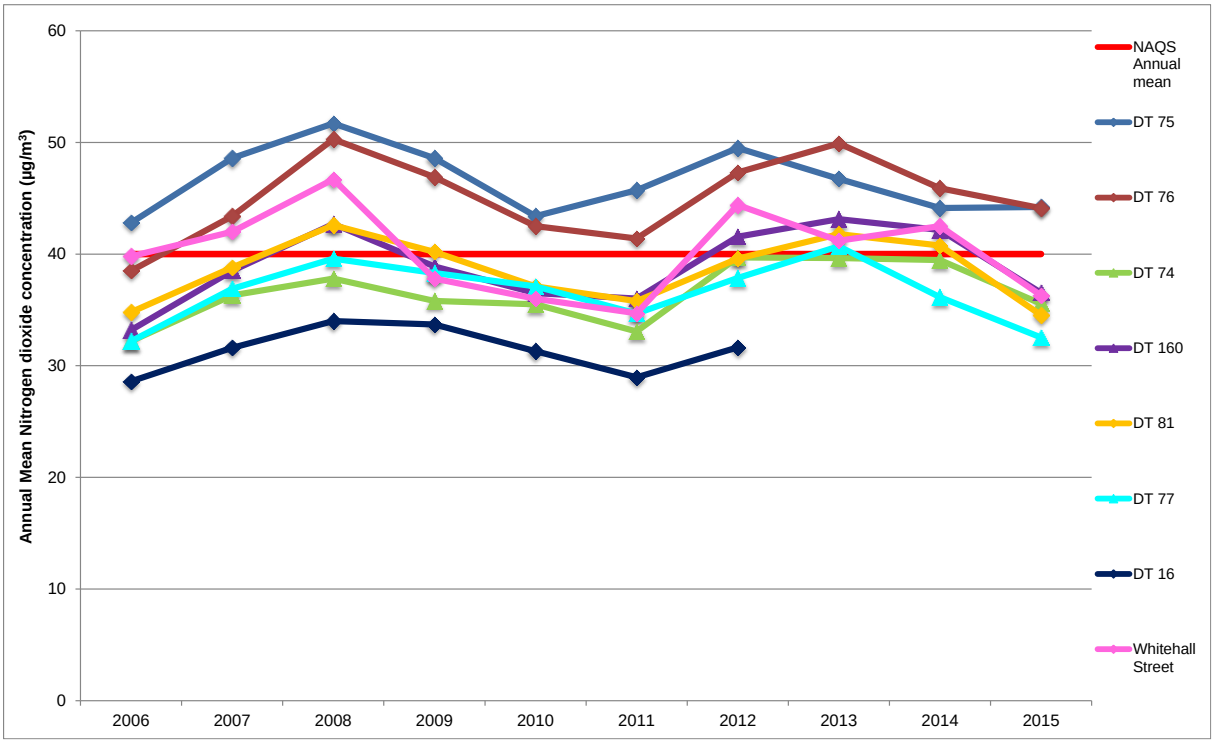


Figure C.3 Overview of NO_2 Concentrations in Whitehall St and Crichton St.



Seagate

Figure C.4 NO_2 Monitoring Locations in Seagate

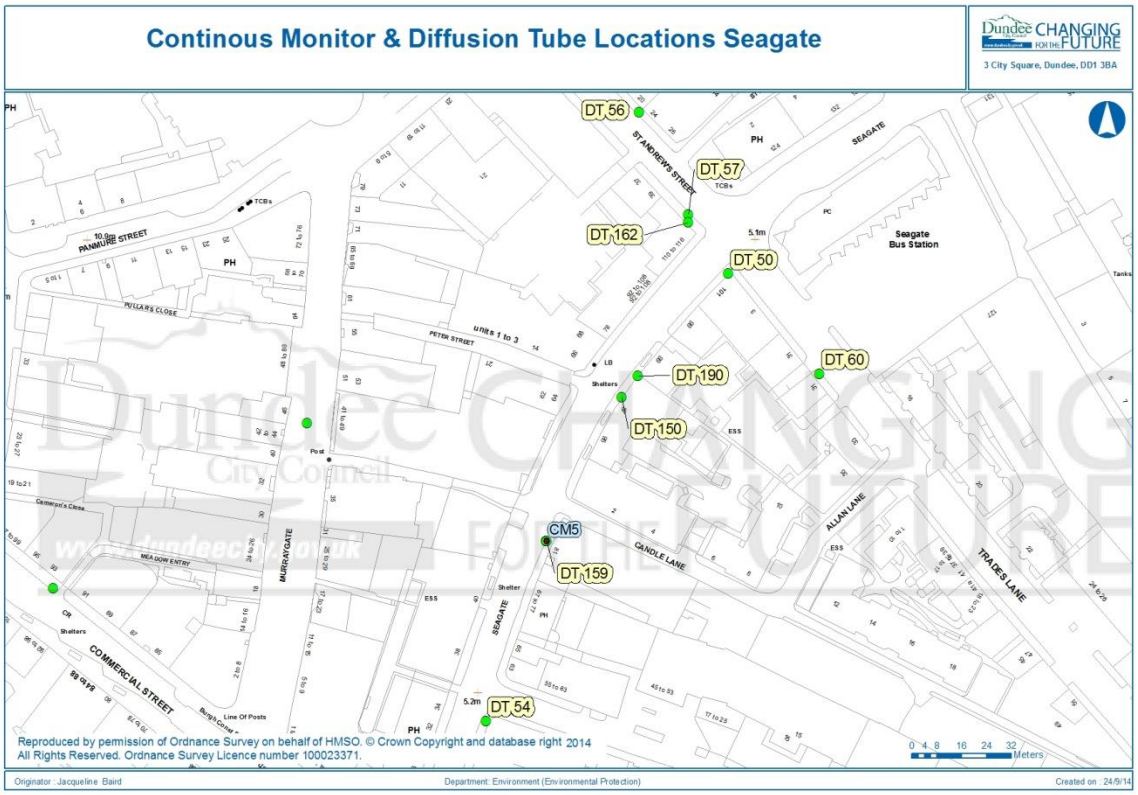
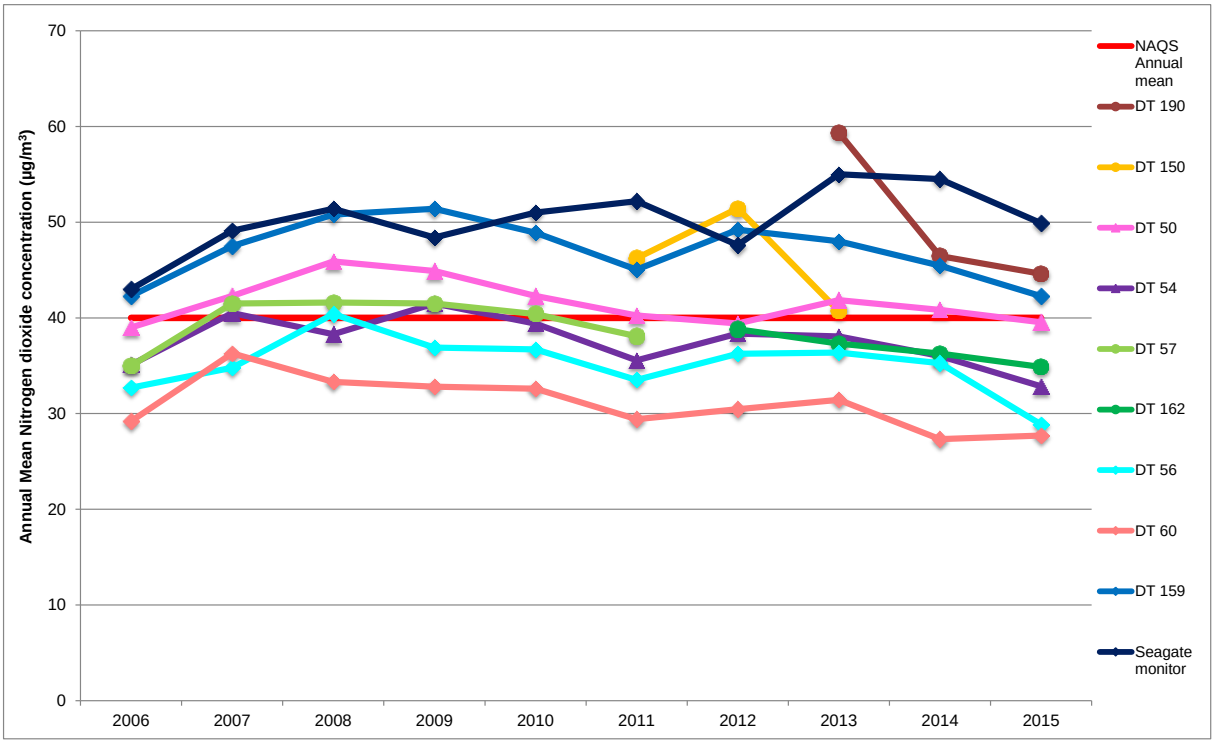


Figure C.5 Overview of NO_2 Concentrations in Seagate.



Nethergate

Figure C.6 NO_2 Diffusion Tube Locations in Nethergate

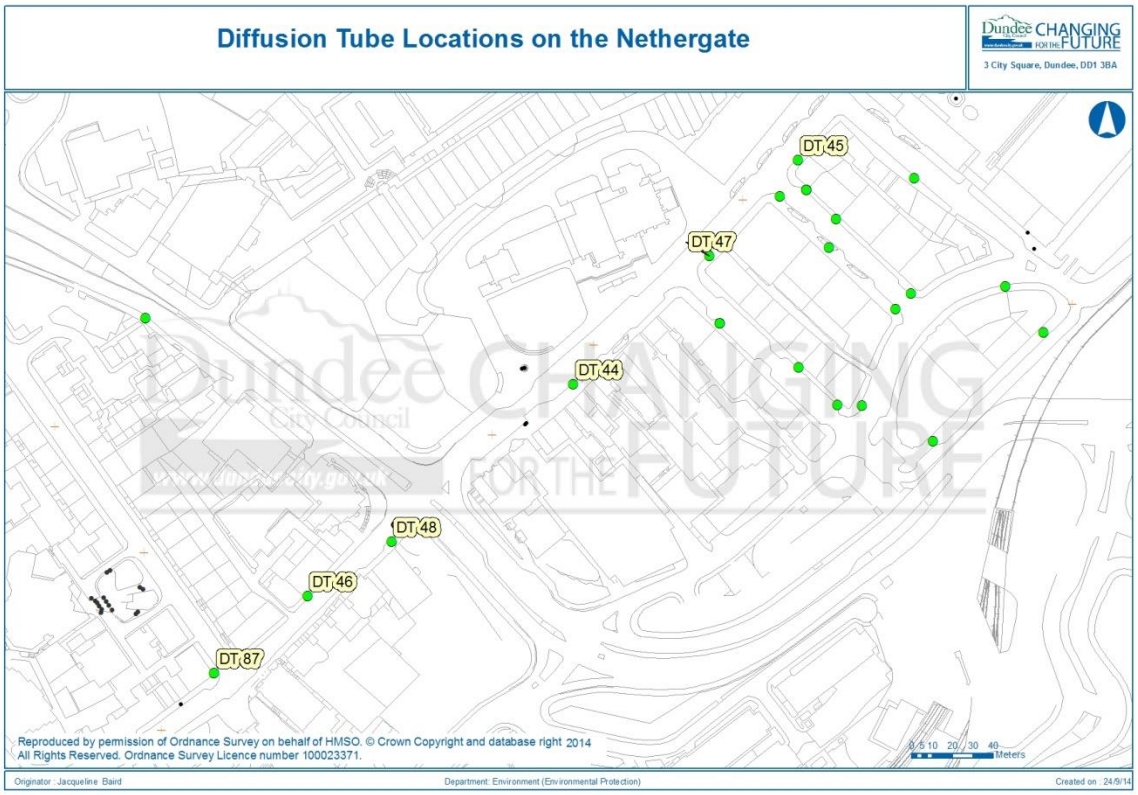
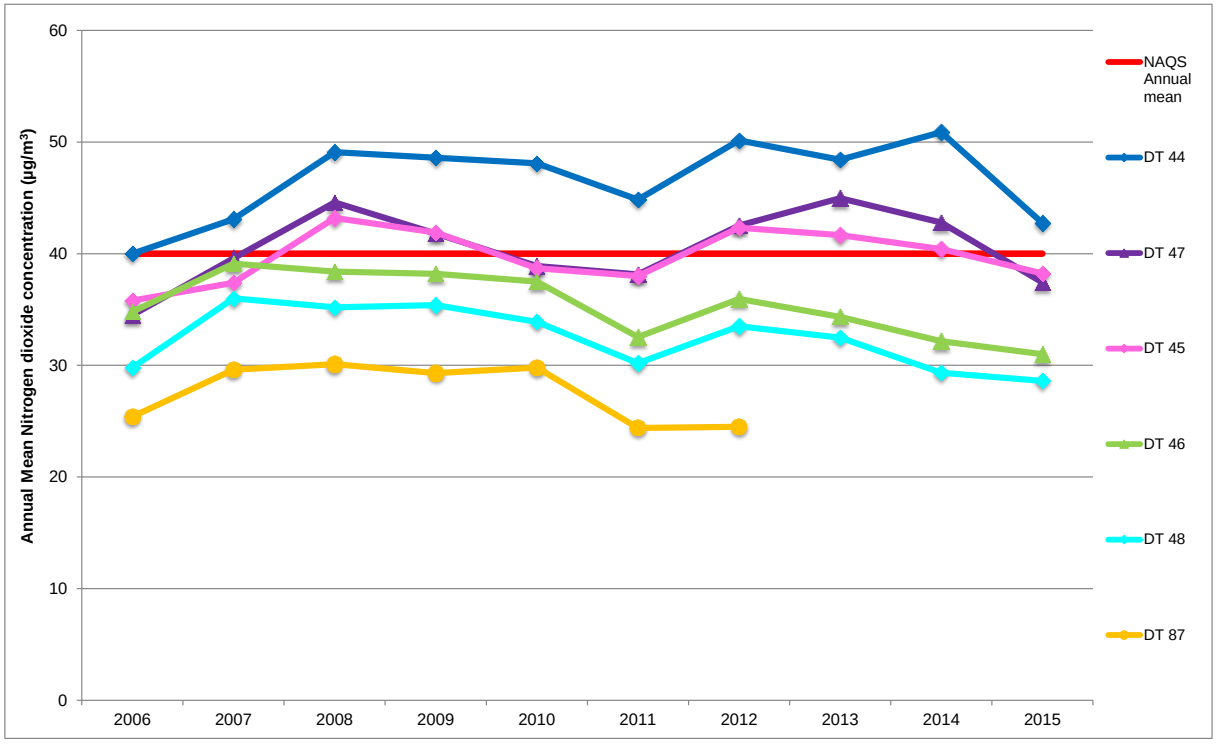


Figure C.7 Overview of NO_2 Diffusion Tube Concentrations in Nethergate.



Victoria Road / Meadowside

Figure C.8 NO_2 Diffusion Tube Locations in Victoria Road / Meadowside

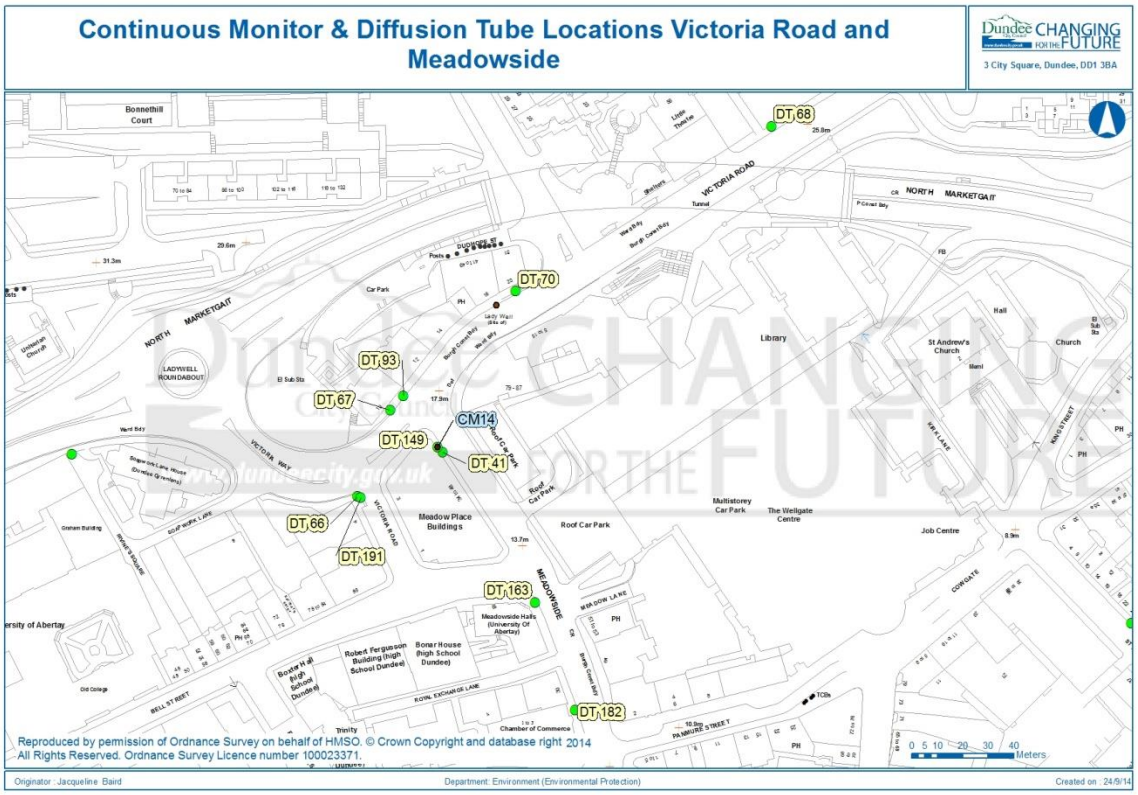
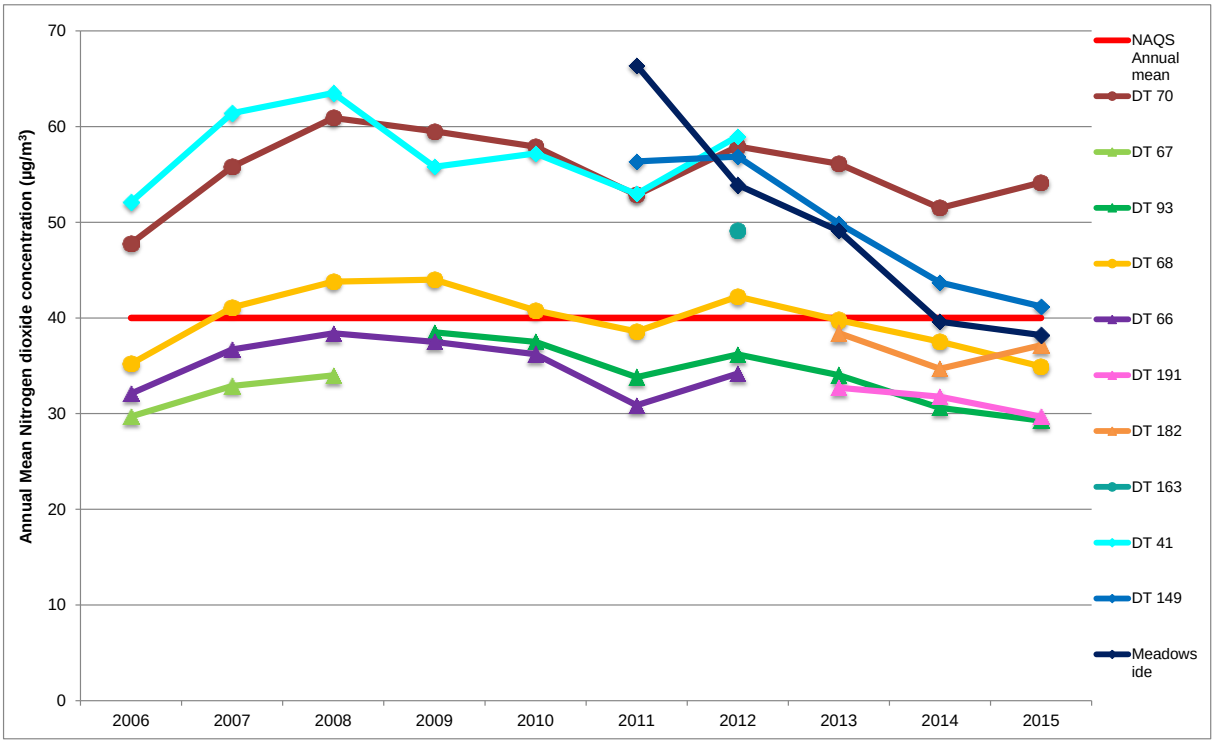


Figure C.9 Overview of NO_2 Diffusion Tube Concentrations in Victoria Road / Meadowside.



Albert Street / Dura Street

Figure C.10 NO_2 Diffusion Tube Locations in Albert Street / Dura Street

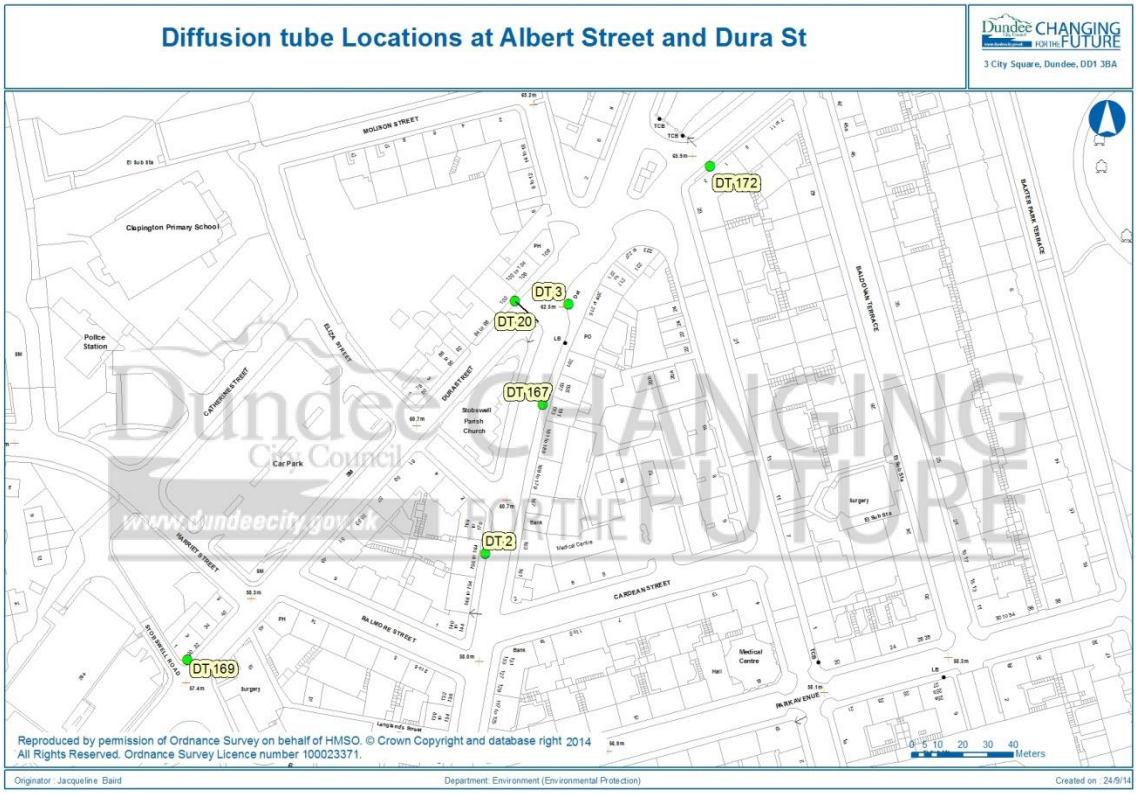
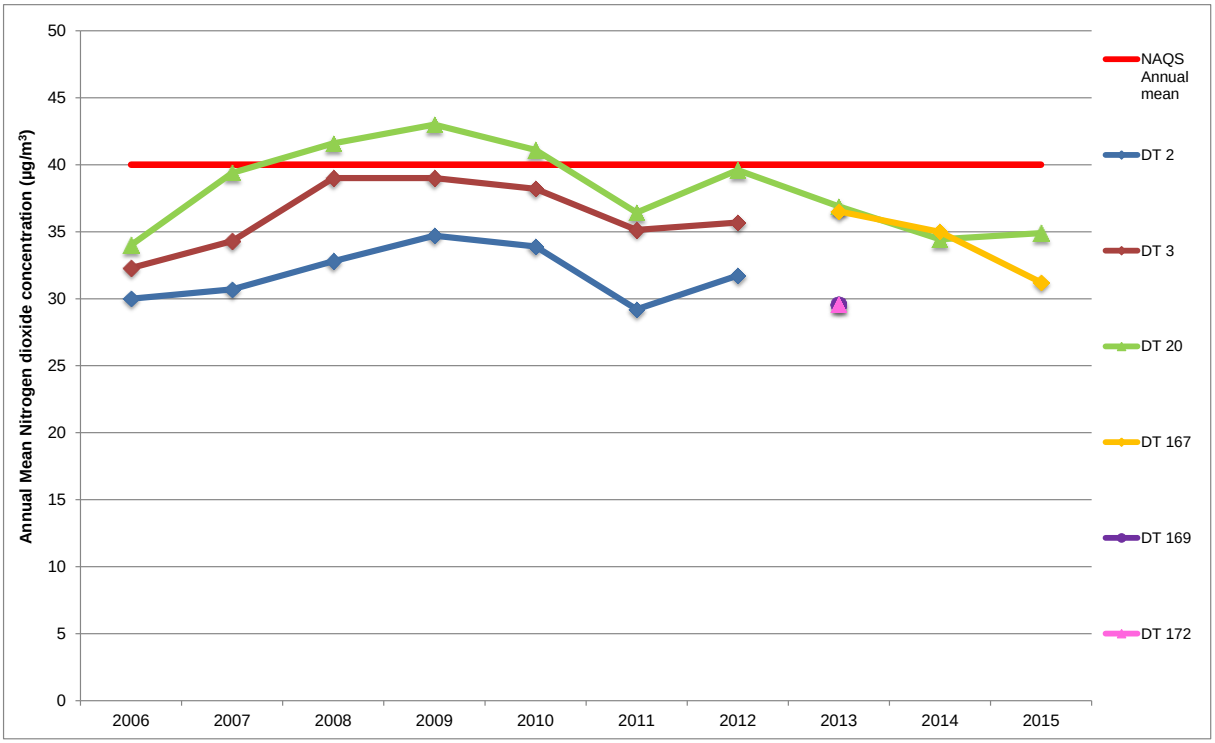


Figure C.11 Overview of NO_2 Diffusion Tube Concentrations in Albert Street / Dura Street.



Lochee Road

Figure C.12 NO_2 Monitoring Locations in Lochee Road

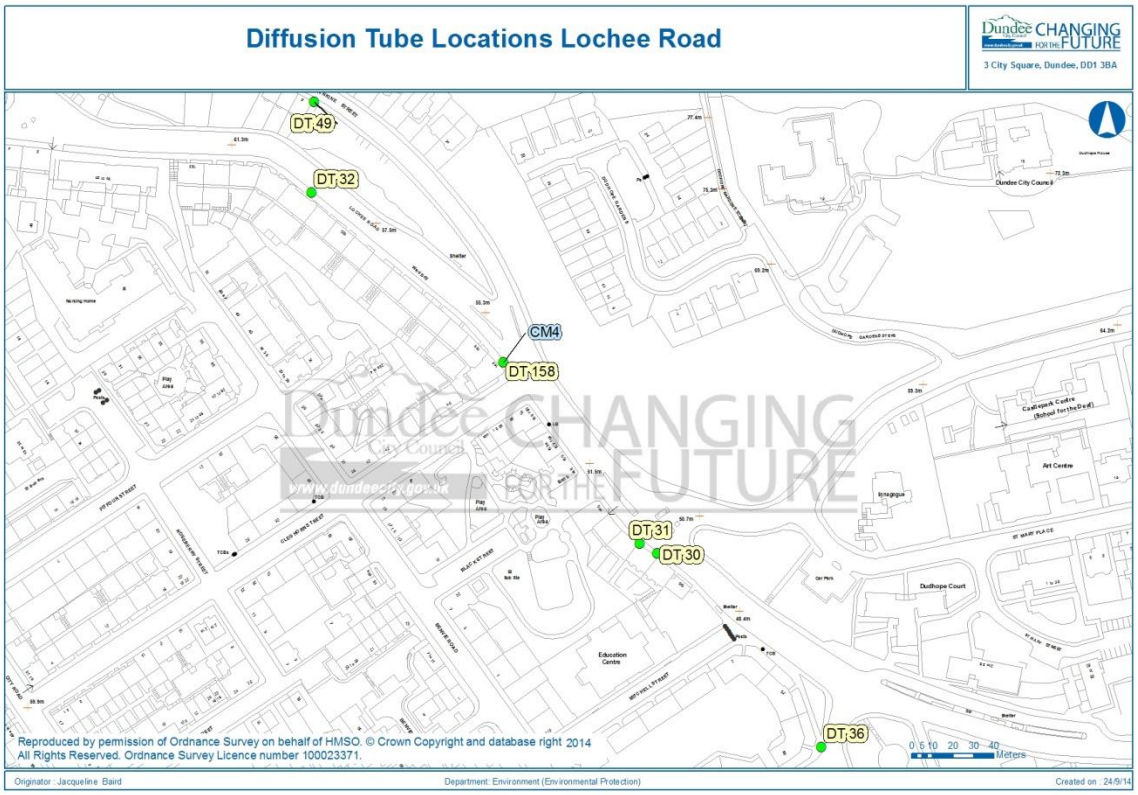
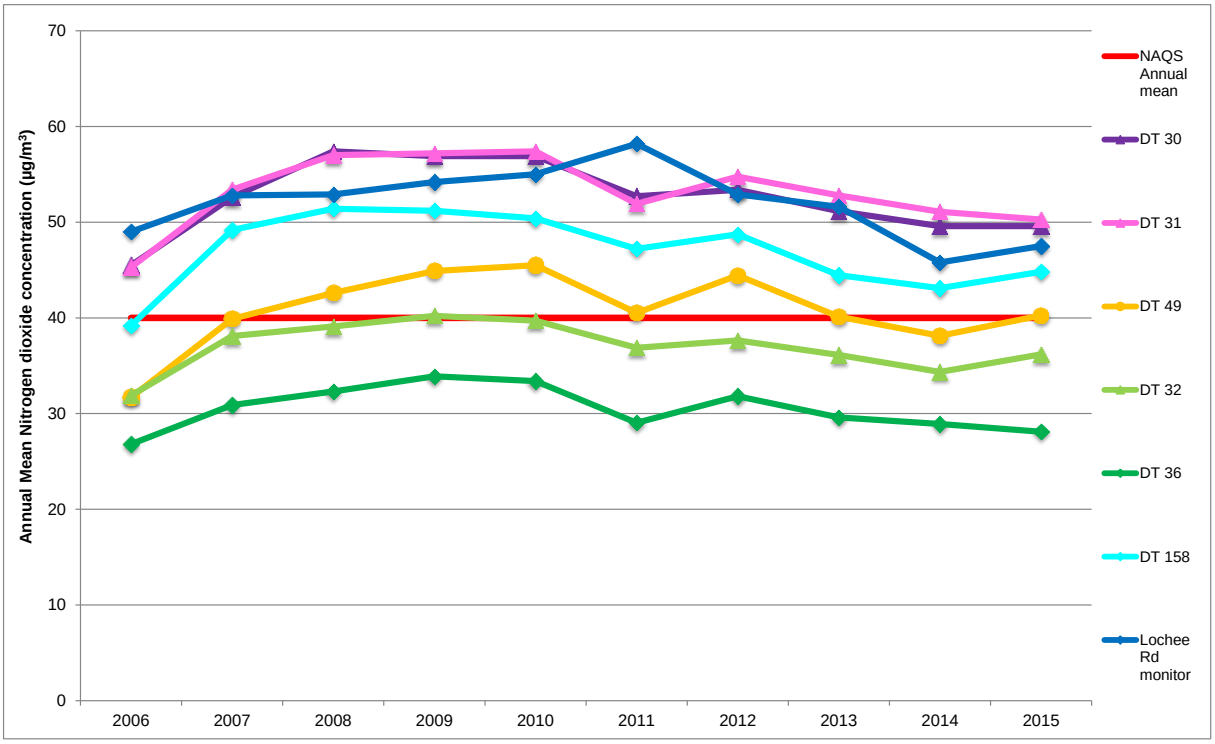


Figure C.13 Overview of NO_2 Concentrations in Lochee Road



Logie Street

Figure C.14 NO_2 Diffusion Tube Locations in Logie Street

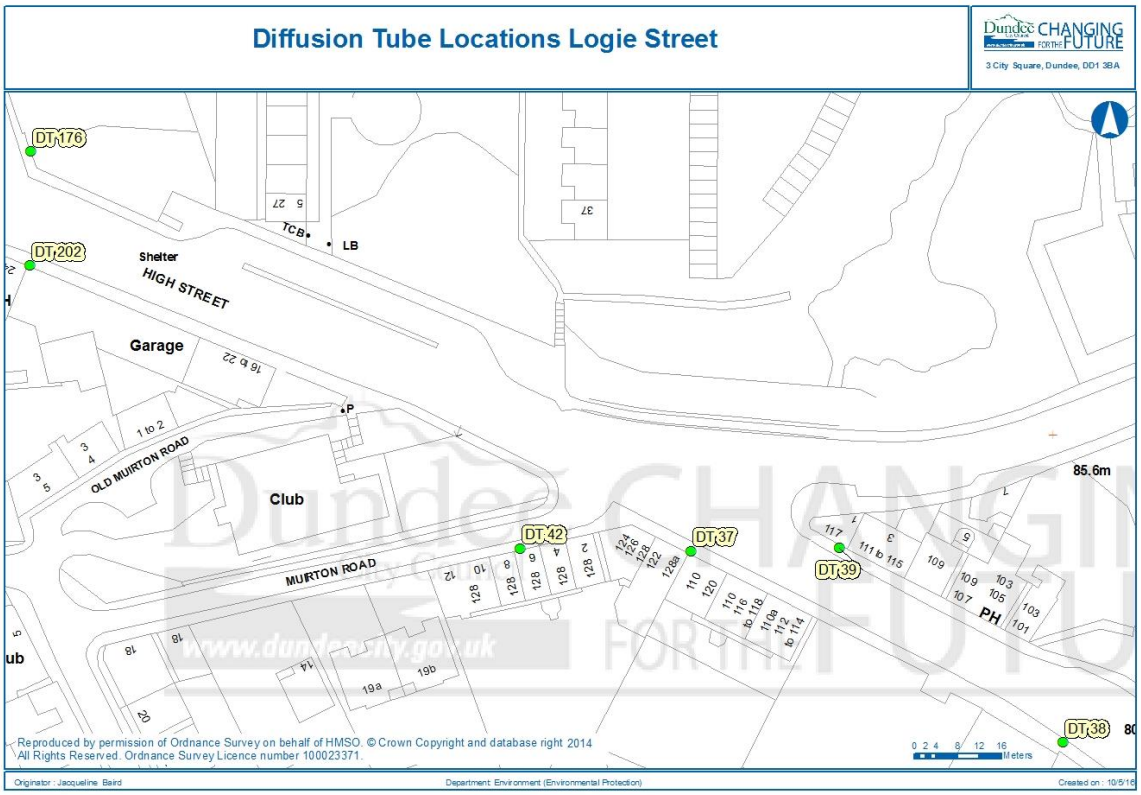
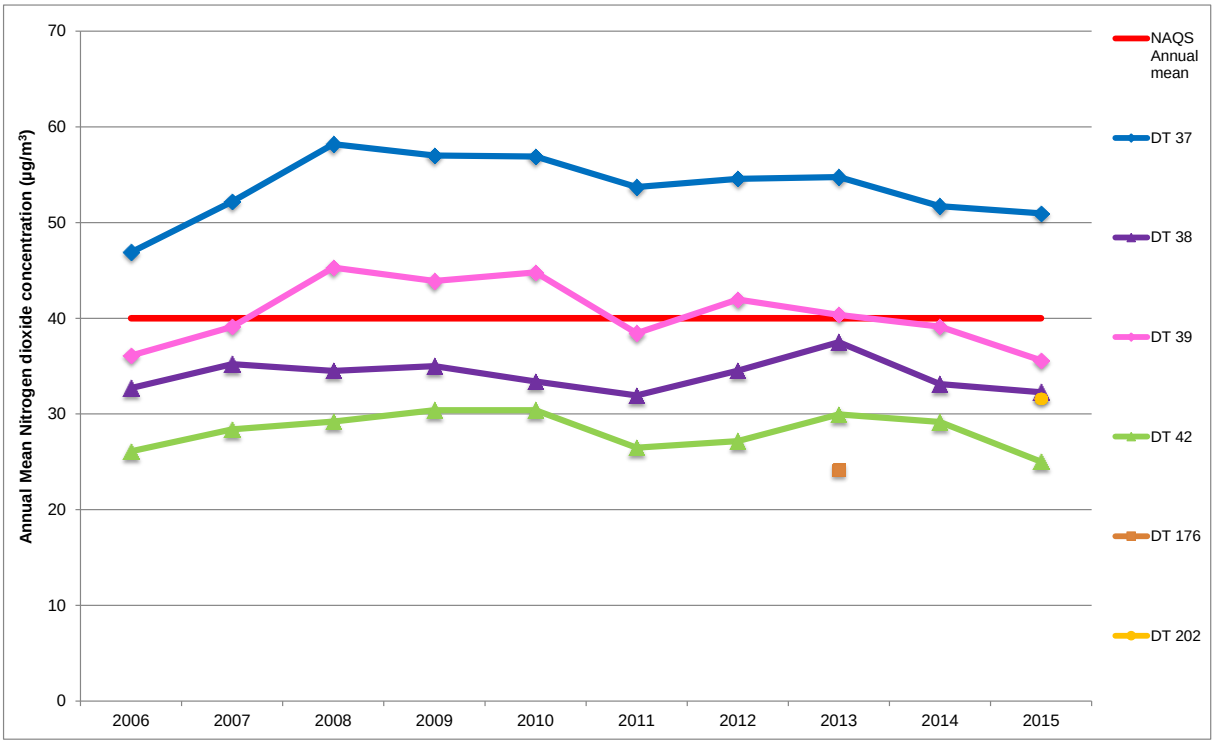


Figure C.15 Overview of NO_2 Diffusion Tube Concentrations in Logie St.



Albert Street / Arbroath Road

Figure C.16 NO_2 Diffusion Tube Locations in Albert St. / Arbroath Road

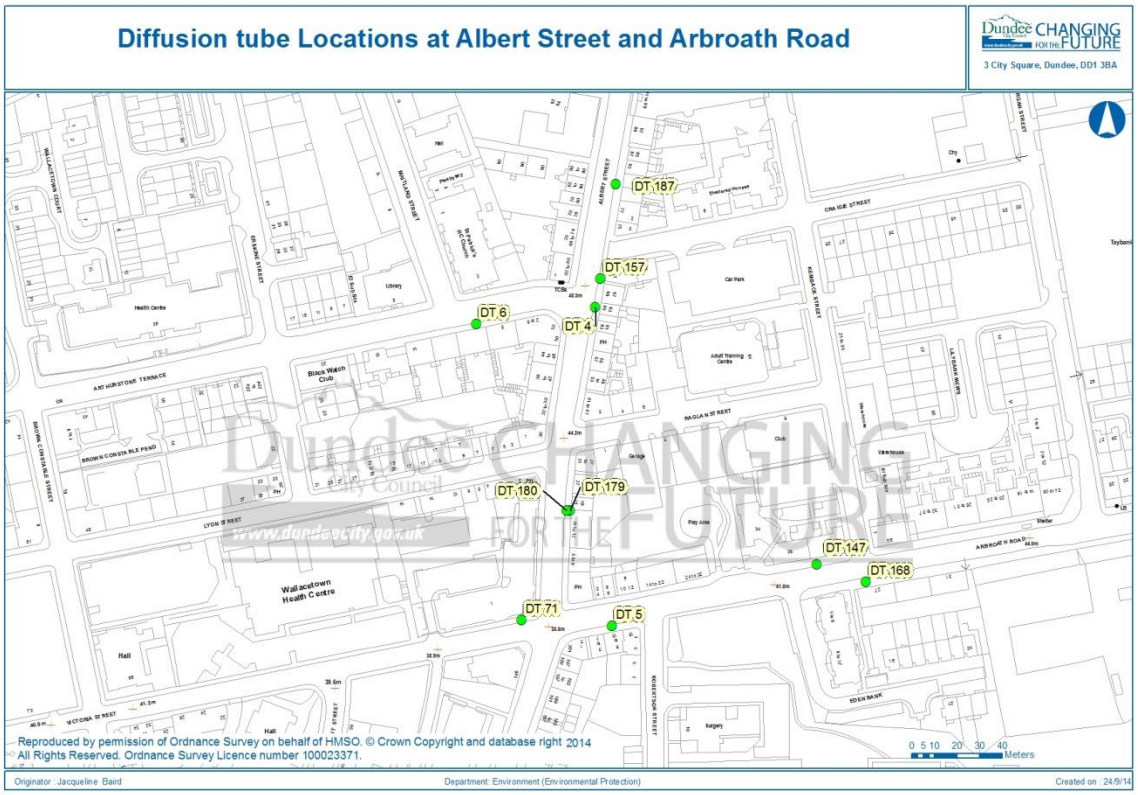
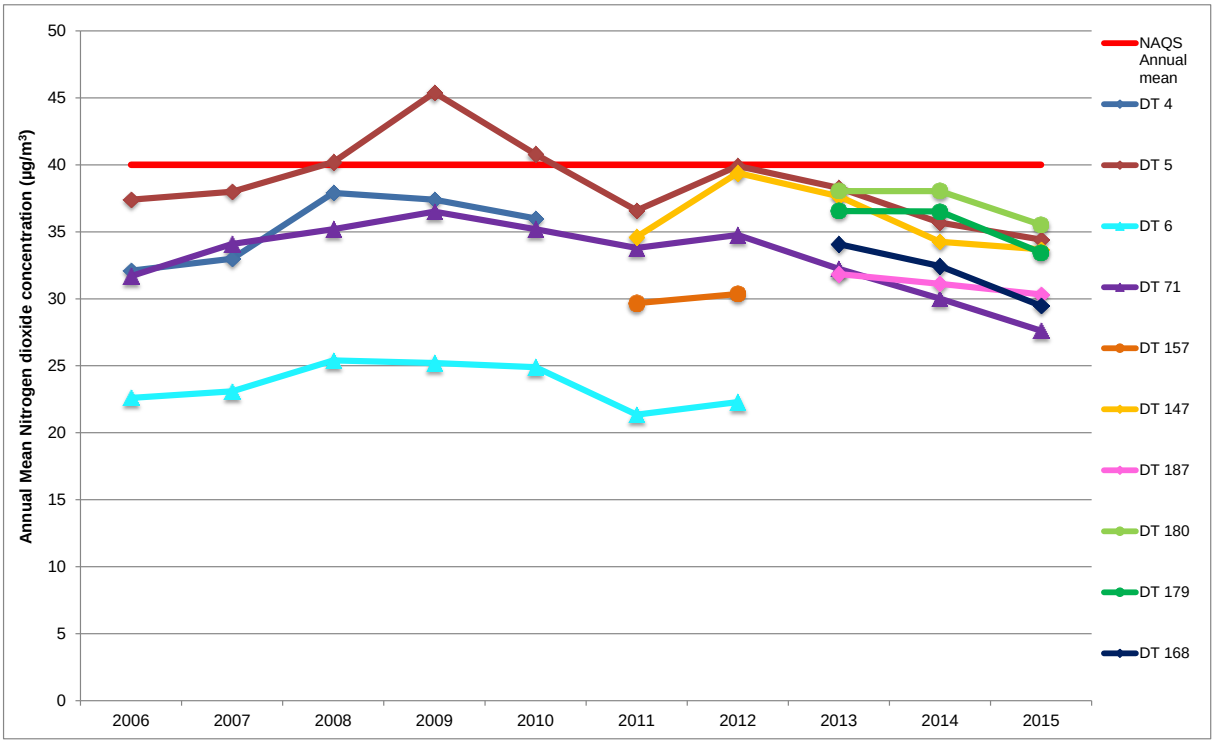


Figure C.17 Overview of NO_2 Diffusion Tube Concentrations in Albert St. / Arbroath Road



Kingsway / Forfar Road.

Figure C.18 NO_2 Diffusion Tube Locations on/near the Kingsway

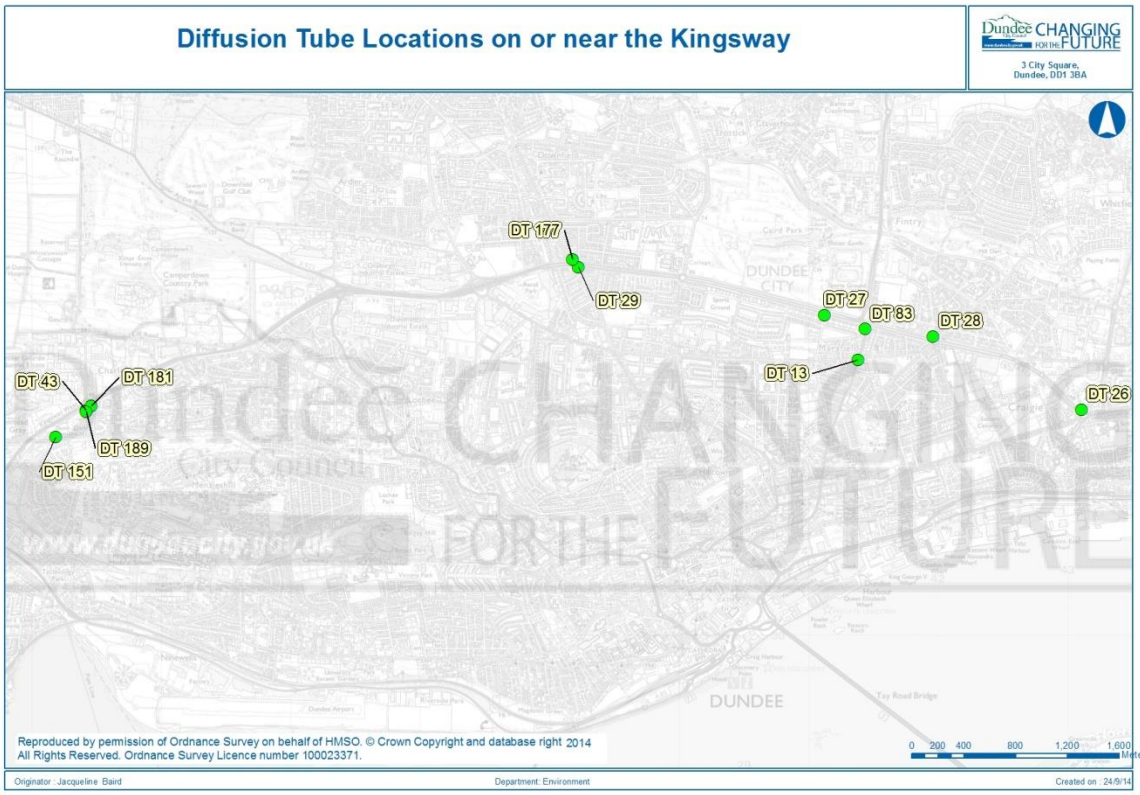
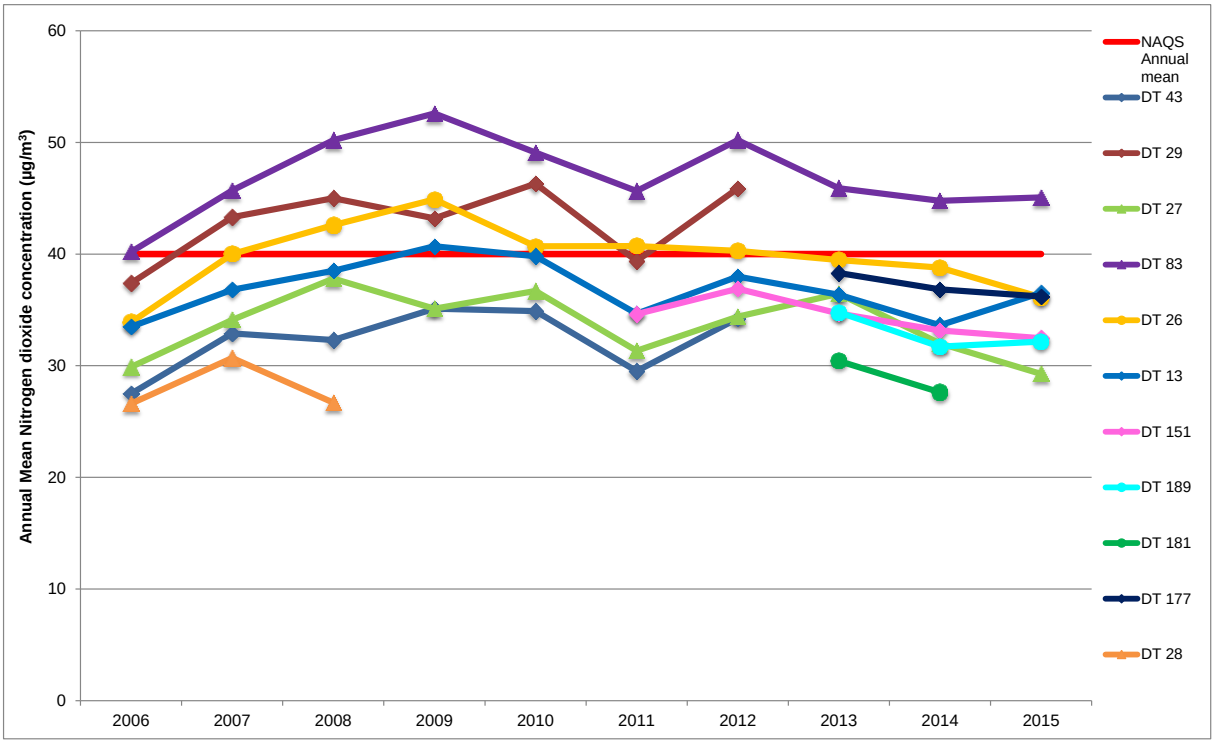


Figure C.19 Overview of NO_2 Diffusion Tube Concentrations on/near the Kingsway



Bus Corridor

Figure C.20 NO_2 Diffusion Tube Locations on Bus Corridor

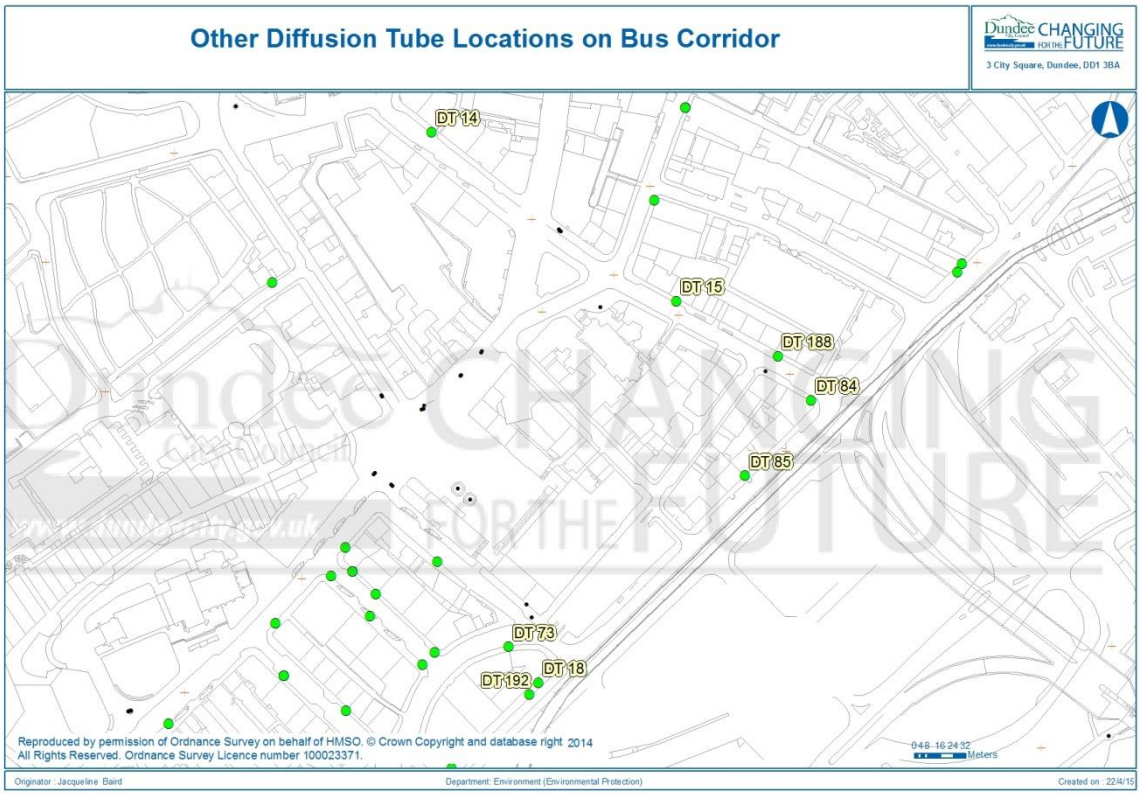
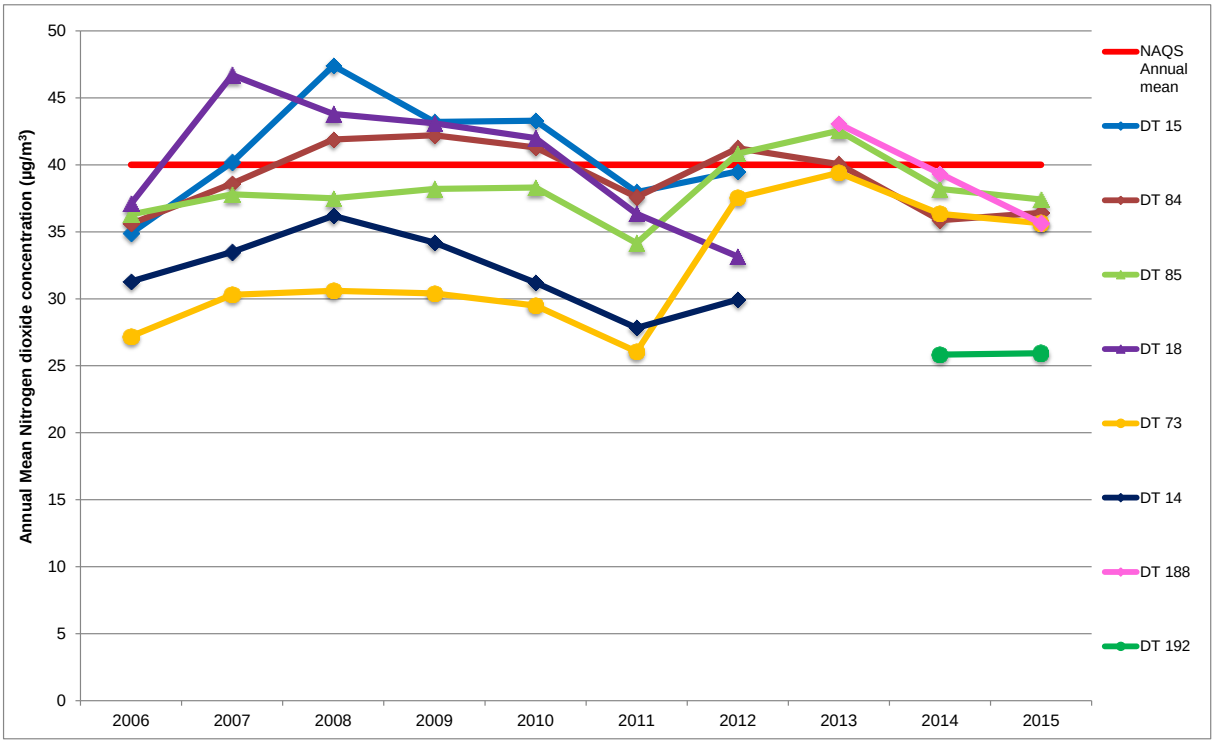


Figure C.21 Overview of NO_2 Diffusion Tube Concentrations on Bus Corridor



Inner Ring Road

Figure C.22 NO_2 Diffusion Tube Locations on Inner Ring Road

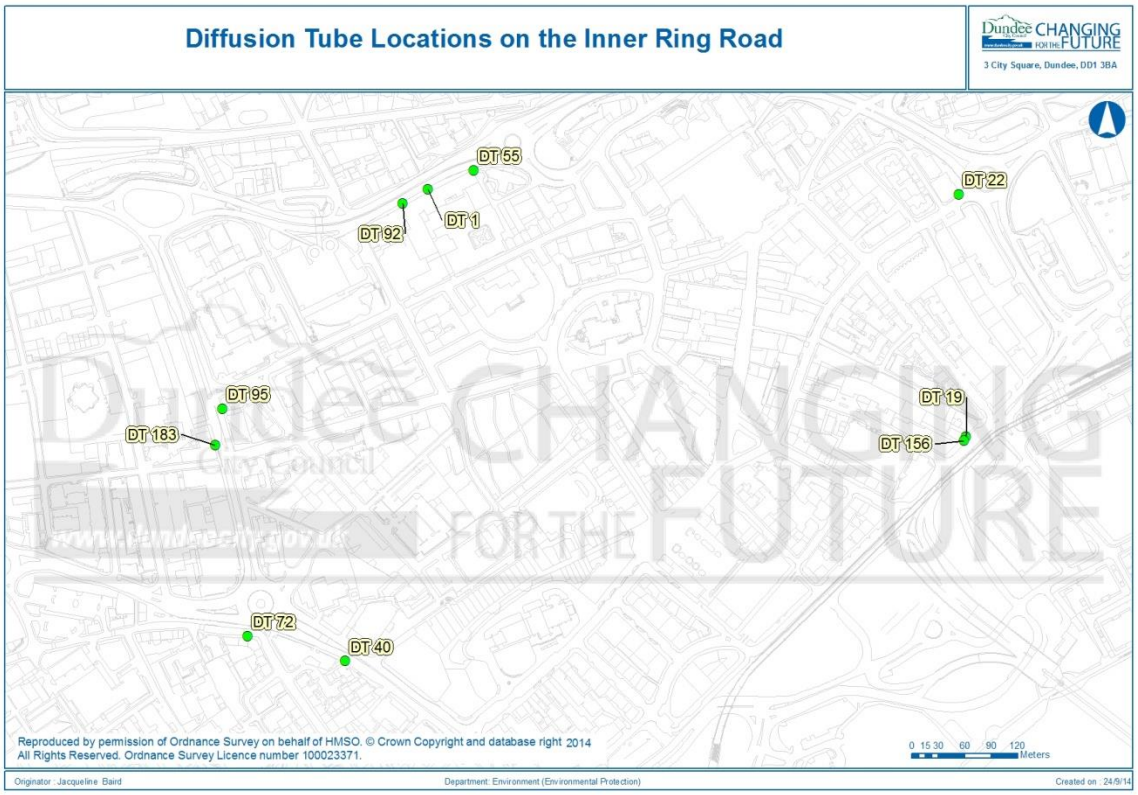
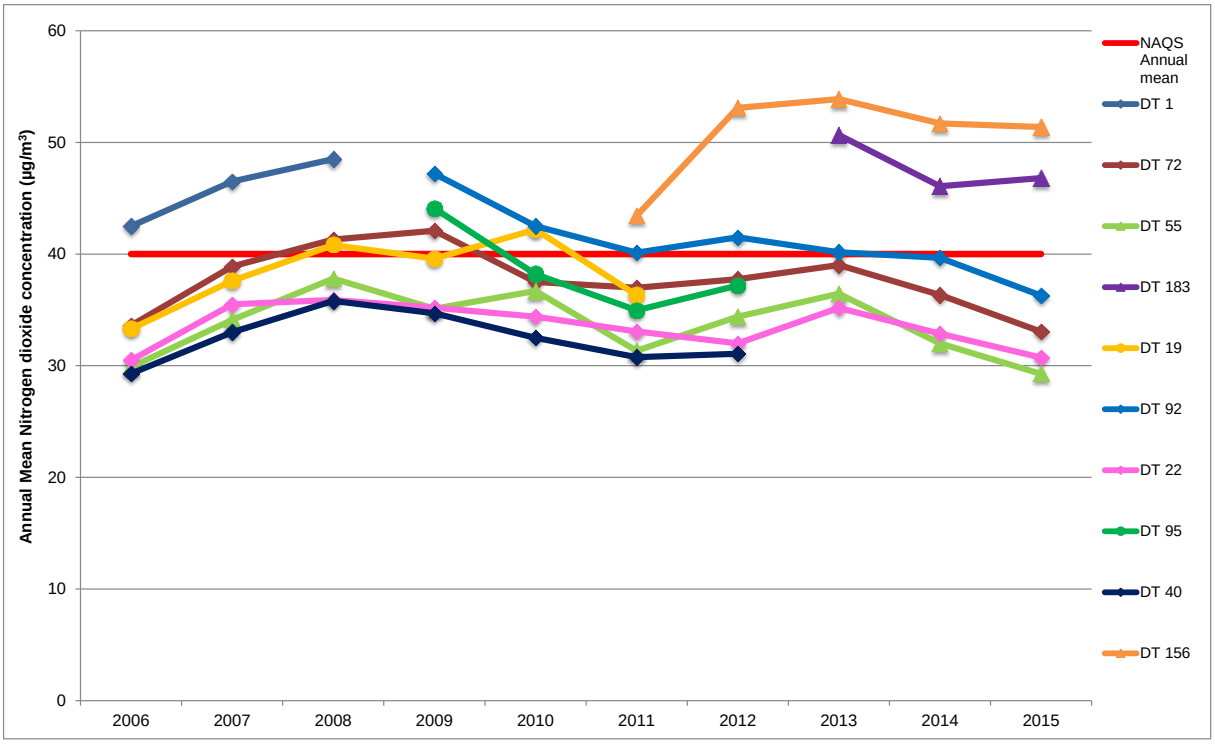


Figure C.23 Overview of NO_2 Diffusion Tube Concentrations on Inner Ring Road



Stannergate Roundabout

Figure C.24 NO_2 Diffusion Tube Location at Stannergate Roundabout

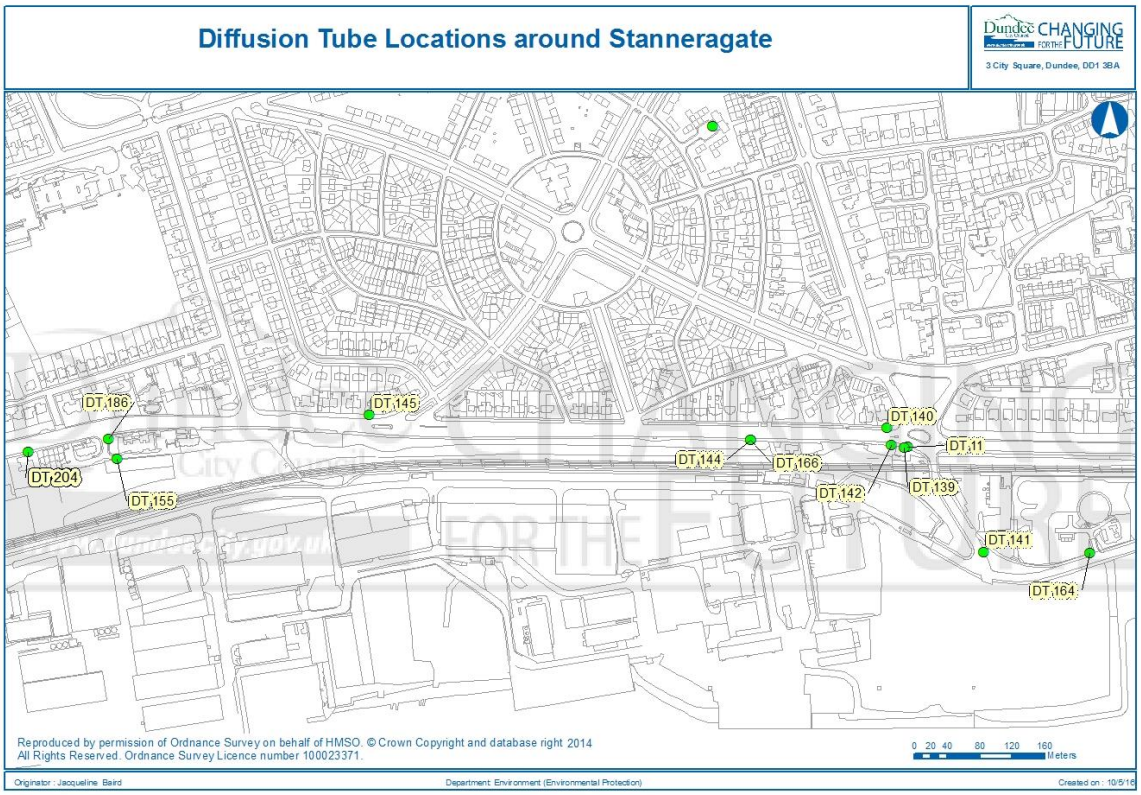
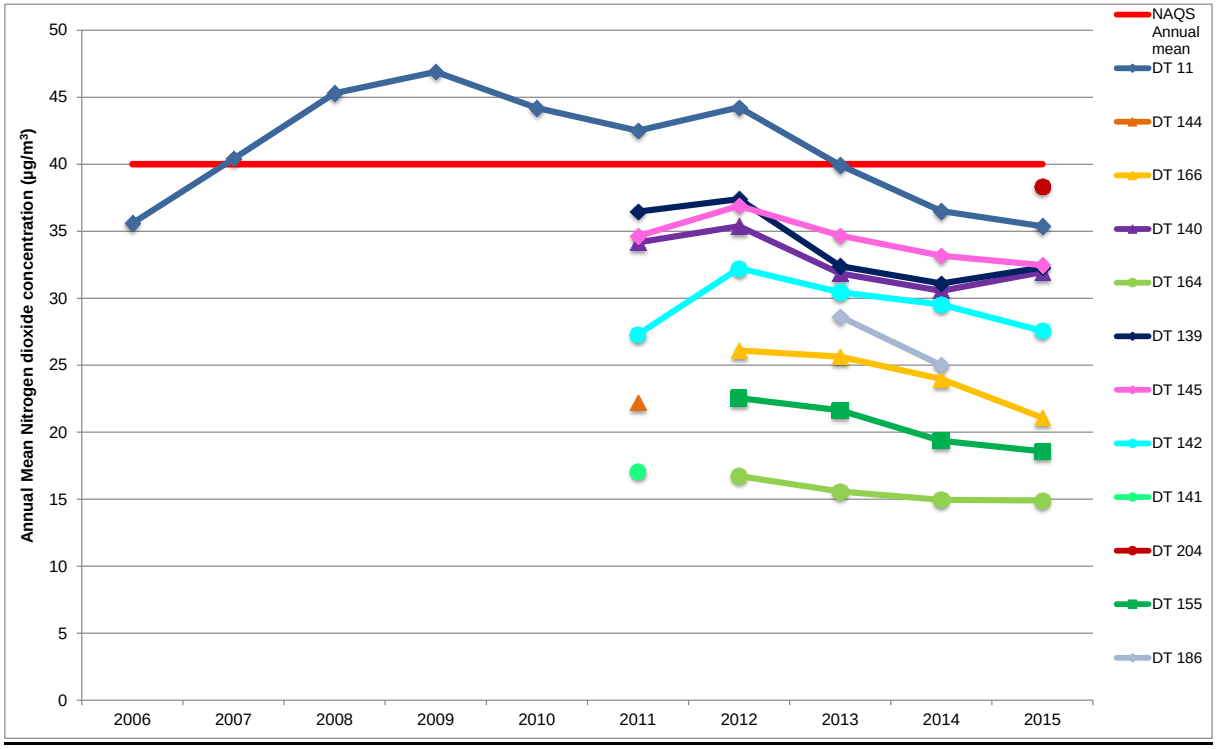


Figure C.25 Overview of NO_2 Diffusion Tube Concentration at Stannergate Roundabout



Strathmore Avenue

Figure C.26 NO_2 Diffusion Tube Location at Strathmore Avenue

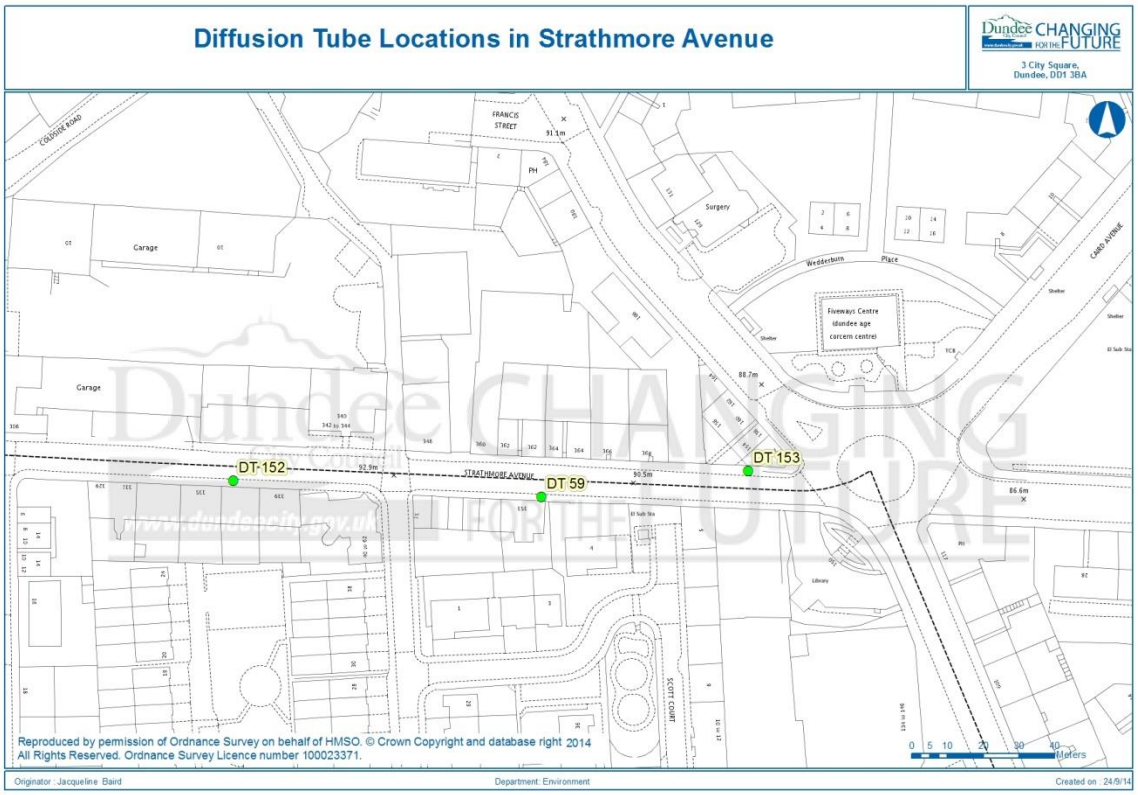


Figure C.27 Overview of NO_2 Diffusion Tube Concentration at Strathmore Avenue

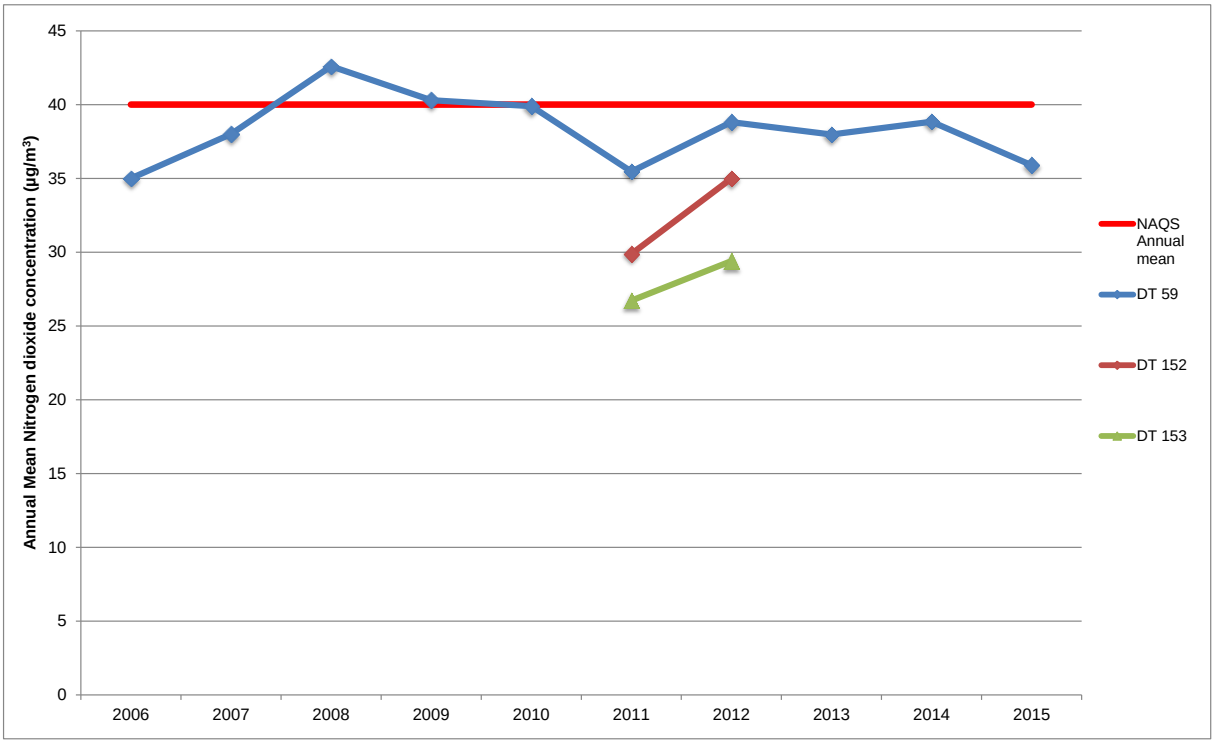


Figure C.28 Urban Background NO_2 Monitoring Locations

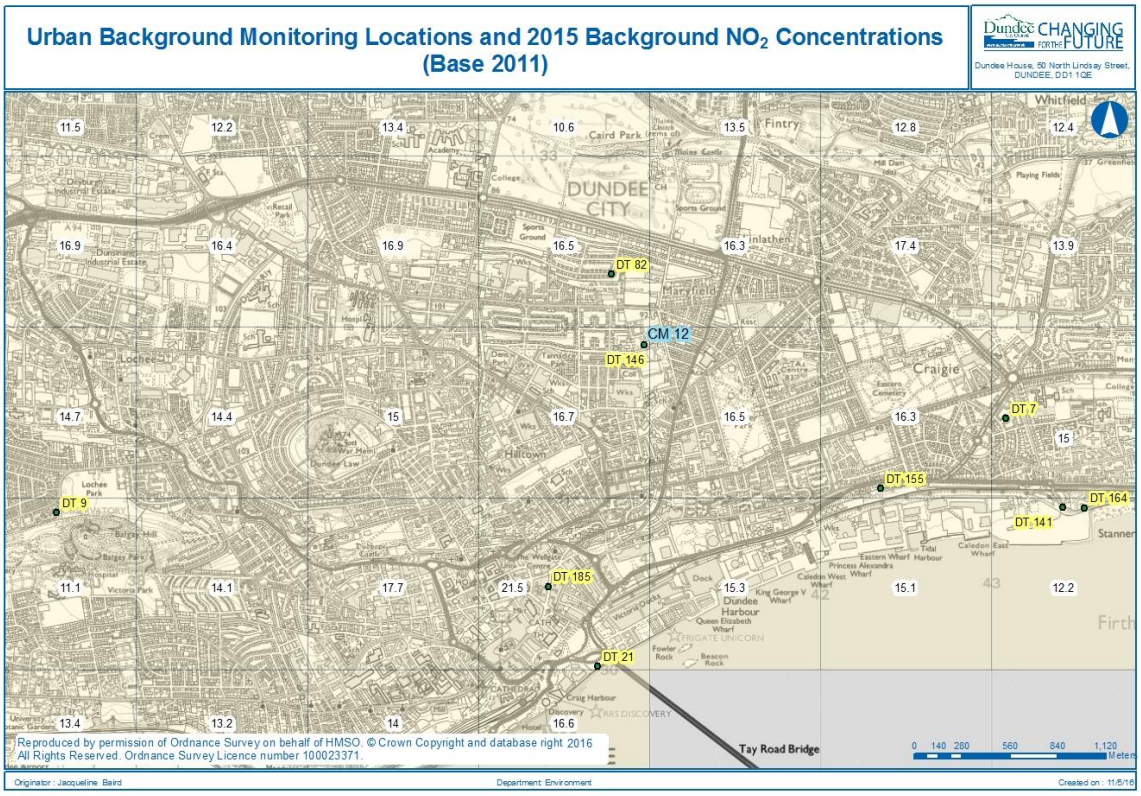
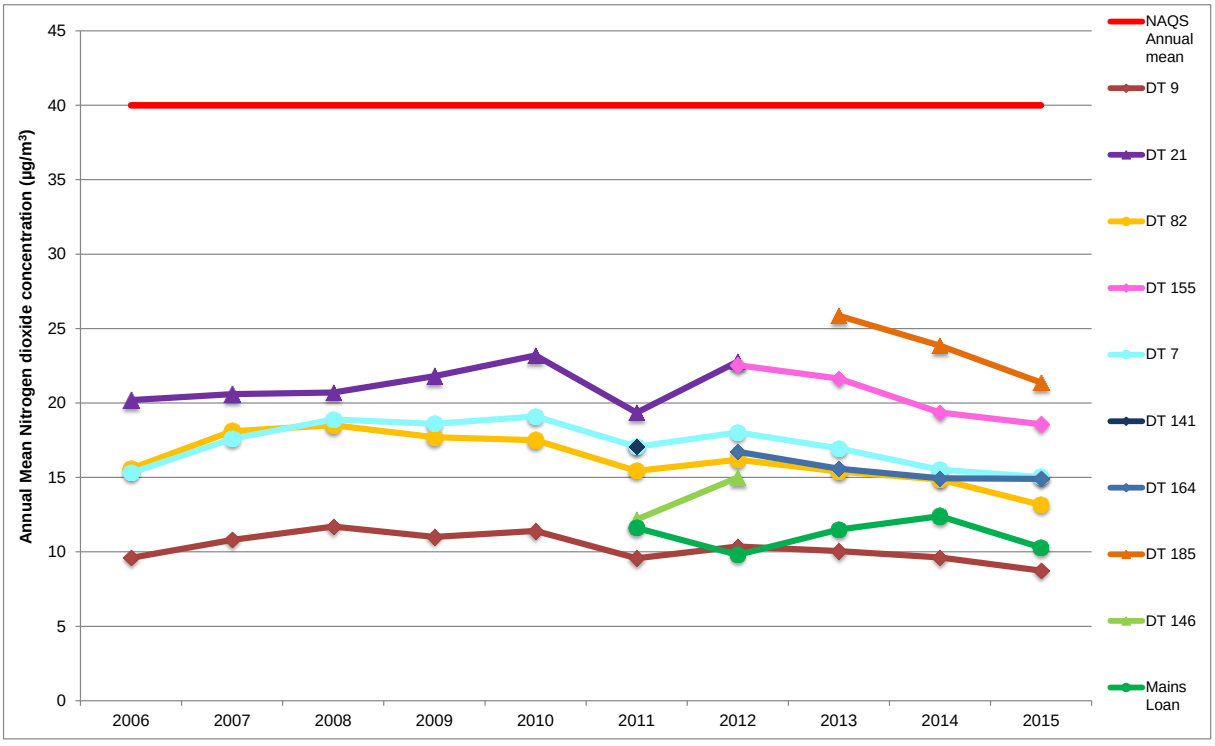


Figure C.29 Overview of NO_2 Concentrations at Urban Background Locations



Appendix C.3 Road Traffic Data

Table C.4 Screened Radar Count Locations

Year	Site No.	Site Description	AADT	Speed (m	Narrow & Congested	Receptors within 10m
2005	00000145	Dalhousie Road (East of Shops)	**14726**	31	n	y
2005	00000158	Coupar Angus Road (South of Lansdowne Gardens)	**15363**	29	n	y
2006	00000165	Forfar Road (South of Kingsway)	**10500**	27	n	y
2007	00000202	Clepington Road (East of Johnston Avenue)	**11963**	32	n	y
2008	00000238	Arbroath Road (West of Ruthven Road)	**17682**	32	n	y
2008	00000251	Monifieth Road (West of Reresmount Place)	**12241**	34	n	y
2009	00000277	Strathmore Avenue (West of Glenprosen Terrace)	**11774**	30	n	y
2010	00000293	Lochee Road (East of Gardners Lane)	**14826**	33	n	y
2010	00000295	Riverside Drive (East of Rail Bridge) Eastbound	**23737**	41	n	y
2010	00000298	West Marketgait (North of Nethergate) Northbound	**10522**	28	n	y
2010	00000299	West Marketgait (@ Overgate) Southbound	**14915**	22	n	y
2010	00000300	Riverside Drive (@ Tesco) Eastbound	**26655**	36	n	y
2010	00000320	Lochee High Street (east of nicoll's lane)	**12055**	26	n	y
2010	00000322	Clepington Road (East of Johnston Avenue)	**10796**	32	n	y
2010	00000326	Coupar Angus Road (nr Dryburgh Gardens)	**14704**	30	n	y
2010	00000327	Victoria Road nr Wellington Street	**11604**	29	n	y
2010	00000329	Dura Street nr Balmore street	**11147**	26	n	y
2010	00000330	Forfar Road (North of Maryfield Terrace)	**10089**	28	n	y
2010	00000332	Arbroath Road (West of Ellengowan Drive)	**13600**	29	n	y
2010	00000333	Arbroath Road (West of Monymusk)	**24166**	33	n	y
2010	00000341	Arbroath Road (West of Clarence Road)	**12124**	33	n	y
2010	00000342	Dalhousie Road (West of Tesco filling station)	**12414**	33	n	y
2010	00000343	Monifieth Road (nr Ochar Park)	**12805**	35	n	y
2010	00000345	Monifieth Road (East of St Vincent Street)	**12420**	31	n	y
2010	00000346	Queen Street (East of Gray Street)	**12714**	26	n	y
2010	00000347	West Queen Street (East of Dundee Road)	**12093**	29	n	y
2010	00000325	Hawkhill (Nr Blackness Primary School)	**13106**	27	n	y
2010	00000340	Ancrum Road (west of Peel Street)	**13807**	29	n	y
2010	01000302	North Marketgait (@ Bells Street Car Park) Westbound	**13407**	31	n	y
2011	00000356	Broughty Ferry Road (nr Lunan Terr) Westbound	**12070**	38	n	y
2011	00000357	Broughty Ferry Road (nr Lunan Terr) Eastbound	**15747**	38	n	y
2011	00000364	Drumgeith Road (nr Summerfield Avenue)	**12663**	35	n	y
2014	00000343	Monifieth Road (nr Ochar Park)	**11138**	34	n	y

Table C.5 Screening Assessment of Radar Count Locations

Year	Site No.	comments	Counts needed	Tube needed
2005	00000145	ATC Site 92000010 nearby 10855 vpd (2014) less than previously assessed in 2006 (13515vpd 2010 4.7 %HDV)	n	n
2005	00000158	assessed by diffusion tube for NO2 ok	y for PM10	n
2006	00000165	area assessed in paramics - aire study exceedences predicted	n	n
2007	00000202	ATC Site 92000023 nearby 13,481 vpd (2014) assessed 2012 USA	n	n
2008	00000238	ATC Site 92000012 nearby 22,833 vpd (2014), less than previous, area to be assessed in paramics - aire study	n	n
2008	00000251	DFT Count Point 74327 7047 vpd (2013)	n	n
2009	00000277	previously assessed NO2 tube OK at worst case location - PM10 assessed as ok at 11619 AADT (2010) (4.9% HDV) in 2006 USA	n	n
2010	00000293	Assessed in paramics - aire study ok NO2 and Pm10	n	n
2010	00000295	Previously assessed - DMRB 2012 ok NO2 and Pm10	n	n
2010	00000298	Area assessed as ok by diffusion tube and further assessment (25828 vpd combined 2010 4.6% HDV)	n	n
2010	00000299	Area assessed as ok by diffusion tube and further assessment (25828 vpd combined 2010 4.6% HDV)	n	n
2010	00000300	new receptors previously assessed as ok 2012 USA (26661 vpd 2010 2.25%HDV)	n	n
2010	00000320	Traffic flow now one way only, weekday 5 min count in middle of the day suggested less than 5,000 vpd (18)	n	n
2010	00000322	ATC Site 92000023 nearby 13,481 vpd (2014) assessed 2012 USA (13862 vpd 2011 1.9%HDV	n	n
2010	00000326	assessed by diffusion tube for NO2 ok	y for PM10	n
2010	00000327	NO2 tubes present, area assessed in bus emissions modelling study	n	n
2010	00000329	NO2 tubes below 40ug/m3, PM10 ok in FA/DA (2007 count=10986, predicted to 2010 for assessment 11392)	n	n
2010	00000330	area assessed in paramics - aire study exceedence of NO2 annual mean predicted near Clepington Road Junction	n	n
2010	00000332	no previous assessment	y for PM10	y
2010	00000333	ATC Site 92000012 nearby 22,833 vpd (2014), less than previous, area to be assessed in paramics - aire study	n	n
2010	00000341	ATC Site 00000009 nearby 13176 vpd (2014) DFT Count Point 990553 nearby 13,862 (2013), to be assessed in paramics aire study	n	n
2010	00000342	ATC Site 92000010 nearby 10855 vpd (2014) less than previously assessed in 2006 (13515vpd 2010 4.7 %HDV)	n	n
2010	00000343	DFT Count Point 74327 7047 vpd (2013) - lower than 10,000	n	n
2010	00000345	DFT Count Point 74327 7047 vpd (2013), assessed as ok for NO2 via diffusion tube in 2013	n	n
2010	00000346	assessed by diffusion tube to the west for NO2 ok removed 2013	y for PM10	n
2010	00000347	Junction assessed for 2006 USA - 2010 predicted traffic flows higher & background PM10 higher than now - was OK	n	n
2010	00000325	Sinderins junction assessed but traffic flows lower & receptors further from the kerb than some on Hawkhill	y	y
2010	00000340	area assessed as part of paramics -aire study NO2 ok, PM10 exceedence questionable	n	n
2010	01000302	DFT Count Point 11027 29,719vpd (2013) two-way flow less than previous	n	n
2011	00000356	Counts suspect - possibly double-counting -area part of Dundee East Paramics Model	n	n
2011	00000357	Counts suspect - possibly double-counting -area part of Dundee East Paramics Model	n	n
2011	00000364	no previous assessment	y	y
2014	00000343	DFT Count Point 74327 7047 vpd (2013) - lower than 10,000	n	n

Table C.6 Road Traffic Reduction Act Sites

RTRA count location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Arbroath Rd (E of Kenilworth Ave)	13186	13335	14054	13153	13846	12869	13283	13697	13142	13174	13287
Blackness Rd (W of Marchfield)	6574	6675	6435	6195	6145	5938	5911	5844	5102	5509	5676
Broughty Ferry Rd (E of Dalgleish Rd)	31956	31802	31535	30098	27640	27756	27315	24741	29322	30272	26809
Dens Rd (S of Hillbank Rd)	10852	10664	10672	11023	10833	10083	10062	10178	9744	9707	10315
Forfar Rd (N of Janefield Pl)	9278	9640	9880	8222	9224	9213	8861	9053	8768	9063	9209
Hilltown (N of Stirling St)	6024	5710	5895	5701	5753	5656	5416	5492	5608	4268	4305
Lochee Rd (N of Rankine St)	13477	13681	13438	13286	13296	12983	12684	11603	11285	11880	11821
Perth Rd (E of Windsor St)	8341	7434	7583	7531	7695	7352	7053	7184	7180	7214	7328
Pitkerro Rd (S of Baxter Park)	10107	9522	9975	9950	9789	9359	8623	8608	8827	8899	9085
Rankine St (N of Lochee Rd)	8098	7294	8069	7927	7605	7121	7115	6862	7188	6939	7118
Riverside Dr (nr Airport)	18875	19056	18918	19045	17907	17654	17024	15900	16213	15932	15923
Rosebank St (N of Kinloch St)	4821	4867	4722	4623	4528	4603	4426	4489	4621	4587	4655
Tay Bridge	24475	24686	24748	25045	25406	25235	25484	24753	24770	24925	21762

Table C.7 Road Traffic Reduction Act Sites (Percentage Growth)

Percentage growth annually relative to 2005 base year

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

Table C.8 Department of Transport Count Locations

Count Point Id	Road	Location of count	Easting	Northing
798	A90	Kingsway - E of Old Glamis Rd	340500	732650
1045	A92	Arbroath Rd - W of Claypotts	345000	731940
1166	A991	W Marketgait - N of Nethergate	340000	730100
1170	A930	Dundee Rd West - E of Stannergate	343500	731100
10803	A90	Kingsway - E of Coupar Angus Road	338000	732600
10856	A92	Broughty Ferry Rd - W of Dalgleish Rd	342400	731100
11027	A991	N Marketgait E of Bell St Car Park	340000	730600
20857	A92	Dock St - W of Trades Lane	340700	730400
20978	A929	Princes St - King St	341000	730900
30847	A85	Riverside Drive Nr Tesco	340000	729550
40803	A90	Kingsway West- E of Myrekirk	336000	732070
40858	A92	East Dock St. - Nr Gallacher Retail Park	341000	730600
40982	A929	Forfar Rd - N of Walrond St	341370	732100
50817	A923	Logie Street	338250	731270
50844	A972	Kingsway East - S of Longtown Road	342700	732060
50875	A929	Victoria Rd - W of William St.	340710	730950
74325	A90	A90 Forfar Rd - N of Jack Martin Way	341610	734400
74326	A92	Arbroath Rd - E of Balgillo Rd East	347000	732620
74327	A930	Monifeith Rd - Nr Reres Rd	347000	731070
74332	A923	Coupar Angus Rd - Camperdown Park	336500	733090
77104	A92	S Marketgait - below Tay Bridge Ramps	340630	730200
78561	A92	Arbroath Rd E of West Grange Road	348500	733150
78562	A923	Coupar Angus Rd - E of Leisure Park	337300	732750
78563	A90	A90 Forfar Rd - Nr Hebrides Drive	341570	733500
80321	A85	Riverside Ave - S of Riverside Place	336200	729880
80364	A92	Greendykes Rd - N of Balgavies Ave	343000	731500
80558	A991	East Marketgait - N of Eastport	340620	730690
80559	A991	East Marketgait - N of King Street	340450	730750

Figure C.30 Department of Transport Count Point Locations in Dundee

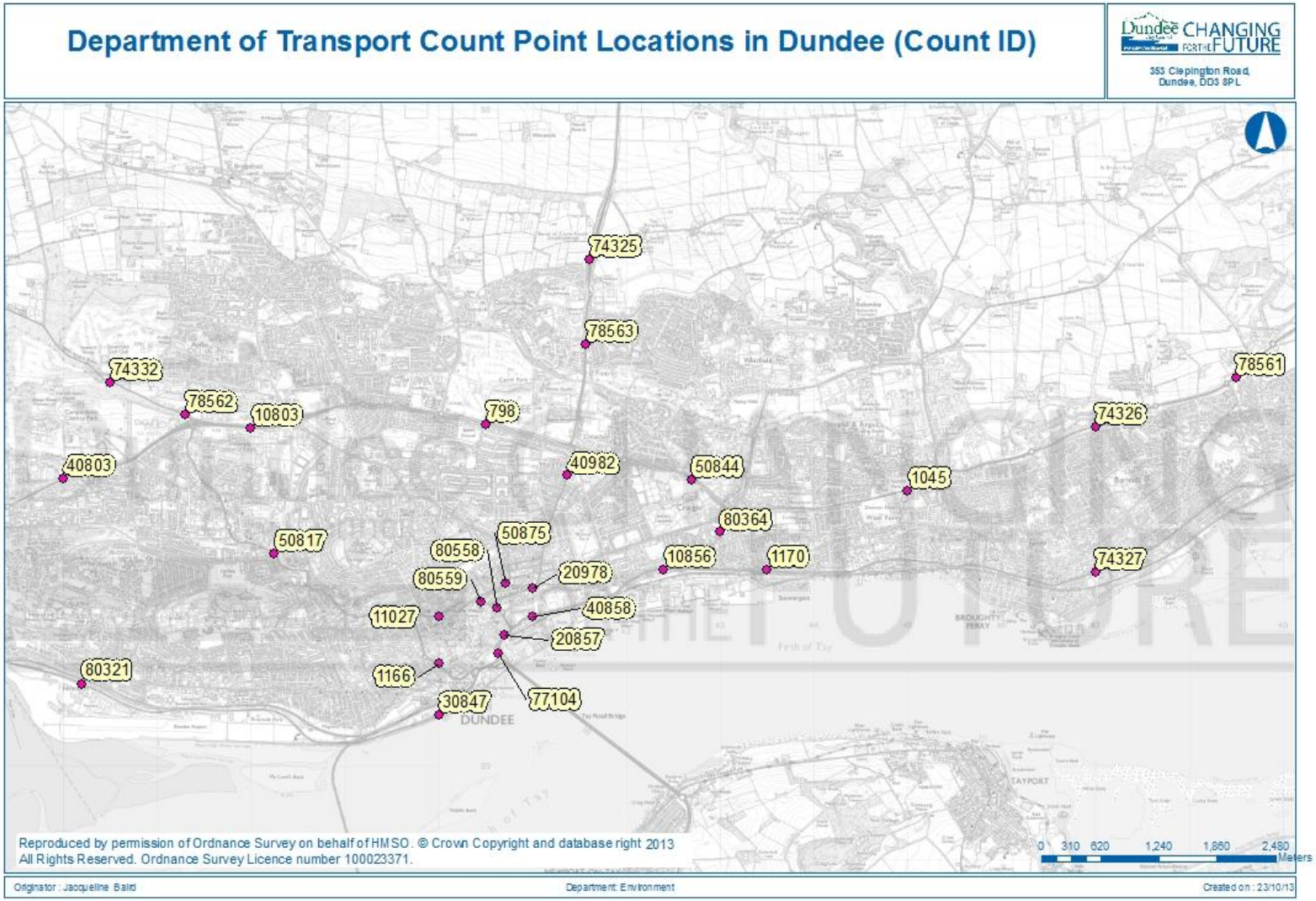


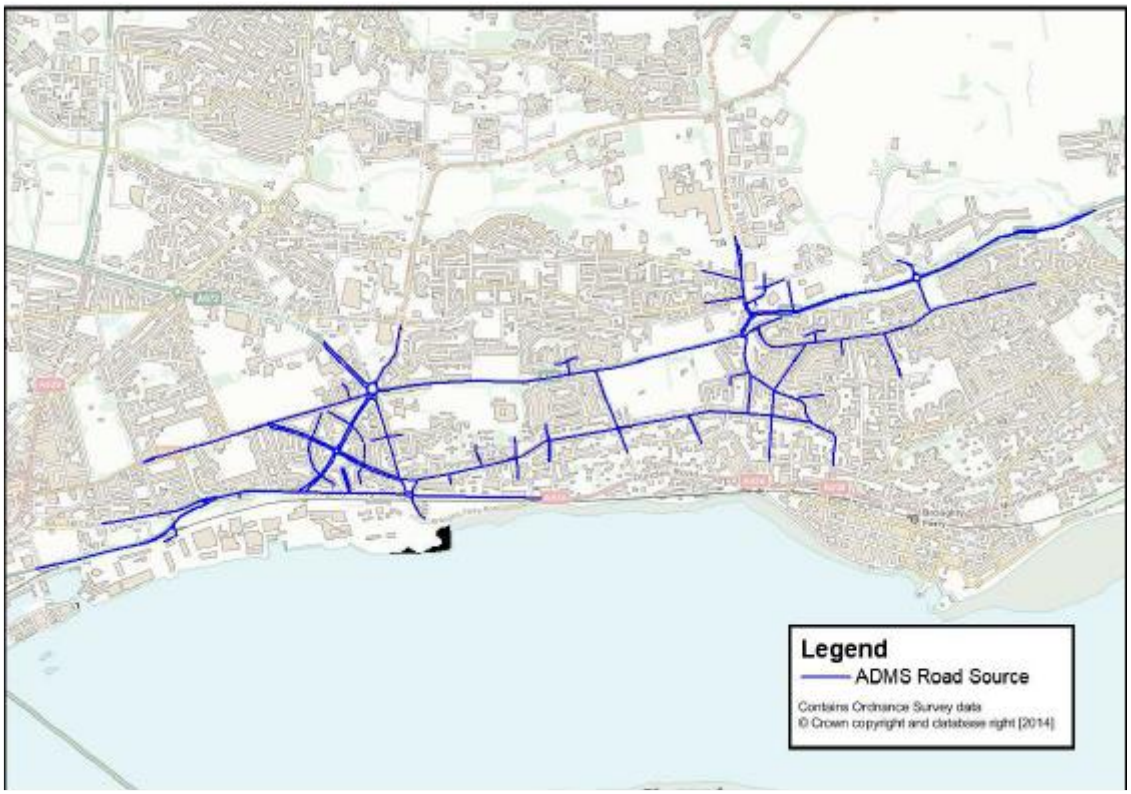
Table C.9 Comparison of 2014 DfT Count Point with Previous Assessments

2014 Traffic Data			Predicted 2010 traffic Flow assessed in 2003 USA	Estimated HDV % in 2003	Predicted 2010 traffic flow assessed in 2005 DA	Estimated HDV % in 2005	Predicted 2010 traffic flow assessed in 2006 USA	Estimated HDV % in 2006	Predicted 2010 traffic flow assessed in 2009 FA-DA	Estimated HDV % in 2007	2012 USA(2011 AADF)	2012 USA (HDV %)	percent increase (in AADF)	Assessment - DMRB required	Reasons
Count Point Id	2014 AADF	HDV %													
798	38860	7.8												n	no relevant receptors
1045	22106	5.26					29001	10						n	less than previous
1166	21602	3.48	28956	7					20472	7.1				n	less than previous
1170	13967	1.14							17799	2.3				n	less than previous
10803	43710	9.47												n	no relevant receptors
10856	30061	4.31					33981	6						n	less than previous
11027	29883	1.28	21538	6			32787	1.63	29699	2.8				n	less than previous
20857	35343	4.26	34328	8			37078	4.3						y?	less than previous, new exposure
20978	1081	38.6			1059	49.8							2.1	n	less than 10 percent increase
30847	20089	3.66					18515	3.3			21089	2.8		n	less than previous
40803	24373	9.97					32907	13						n	less than previous
40858	25420	4.36												n	no relevant receptors
40982	8546	6.63	12506	11	11767	4.5			8684	7.8				n	less than previous
50817	16429	4.36	20730	8			17299	2	17347	5.8				n	less than previous
50844	26627	5.55												n	no relevant receptors
50875	11586	7.77	13680	16	15413	9.8	15413	10.3						n	less than previous
74325	24835	8.66												n	no relevant receptors
74326	22646	5.15									23667	3.7		n	less than previous
74327	7223	3.28					15619	7						n	less than previous
74332	9823	3.04												n	no relevant receptors
77104	27214	4.27												n	no relevant receptors
78561	16762	6.07												n	no relevant receptors
78562	10412	3.04												n	no relevant receptors
78563	27291	8.66												n	no relevant receptors
80321	14559	4.6												n	no relevant receptors
80364	14953	5.56					14231	6					5.1	n	less than 10 percent increase
80558	18303	2.76	17622	7	16779	3.6							3.9	n	less than 10 percent increase
80559	14946	1.51	22168	4			18612	2.9						n	less than previous

y? see Section 4.1

Appendix C.4 Dundee East – Stannergate Model

Figure C.31 Dundee East – Stannergate Modelled Area



The dispersion modelling of the above area predicted exceedences of the NO_2 and/or PM_{10} annual mean objective at relevant locations adjacent to the trunk road network at the following locations (Base 2012):

A92T – between Broughty Ferry Road and Greendykes Road;

A92T – at Scott Fyfe roundabout;

A92T – Claypotts junction.

A source apportionment study found that cars accounted for the highest proportion of road NOx, road NO_2 and road PM_{10}, when averaged across: all receptors; those receptors exceeding the NO_2 annual mean objective; and, at the receptor with the highest predicted road pollutant concentrations.

The study looked at the traffic impacts of proposed developments in the port area on air quality. The scenarios tested are listed below:

Scenario 1 (SC1) – Assessment of impacts of the Wind Turbine Manufacturing Plant and the Eastern Port Expansion;

Scenario 2 (SC2) – Assessing impact on air quality should all heavy goods vehicles (HGVs) using the bridge crossing the railway line on Broughty Ferry Road (Stannergate Bridge) have a Euro Class V engine type;

Scenario 3 (SC3) – Assessment of impacts of the Wind Turbine Manufacturing Plant and the Eastern Port Expansion, but with redesigned Stannergate Roundabout;

Scenario 4 (SC4) – Assessment of impacts of the Wind Turbine Manufacturing Plant and the Eastern Port Expansion, but with closure of Craigie Place in both directions;

Scenario 5 (SC5) – Assessment of impacts of the Wind Turbine Manufacturing Plant and the Eastern Port Expansion, but with the layout of Stannergate Roundabout modelled as a 5-arm priority junction; and

Scenario 6 (SC6) – Assessment of impacts assuming all heavy goods vehicles (HGVs) using the bridge crossing the railway line on Broughty Ferry Road (Stannergate Bridge) have a Euro Class VI engine type.

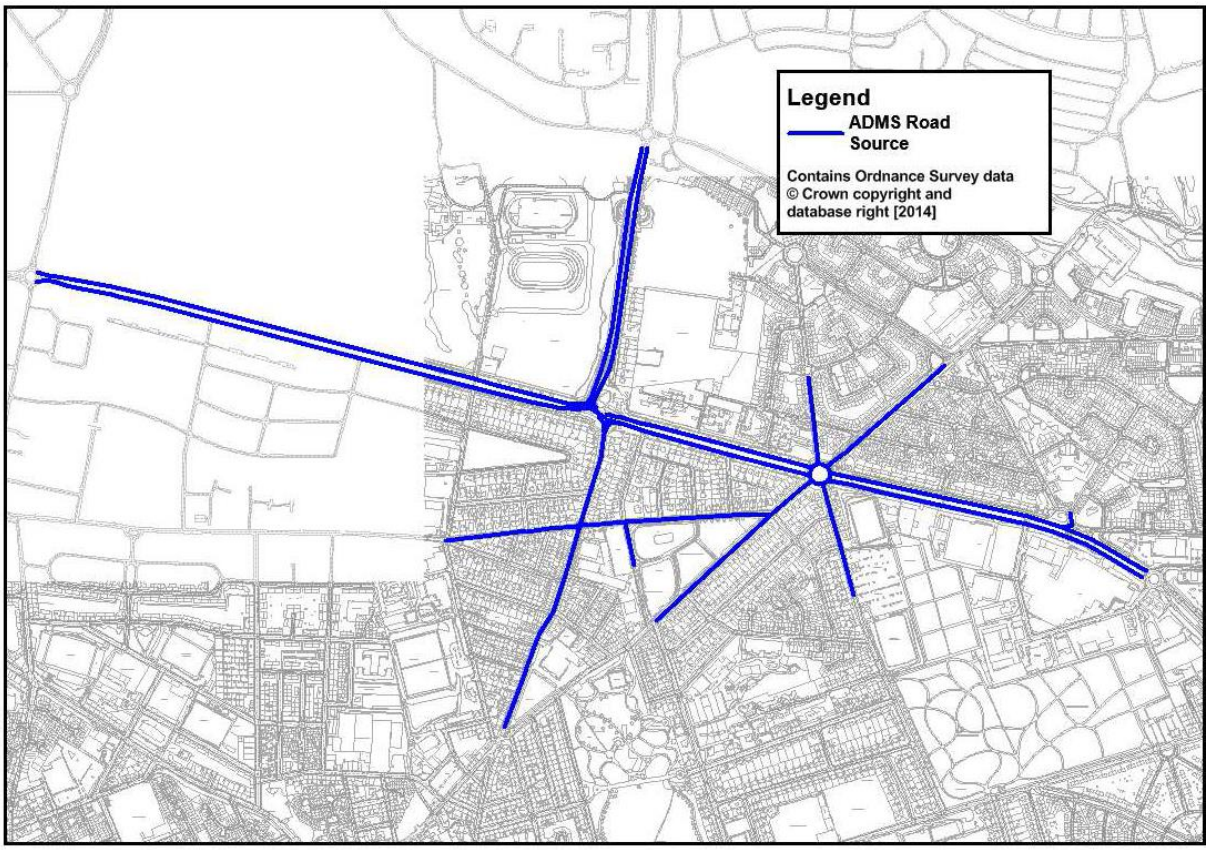
Scenario 1 was predicted to have a slight adverse impact at one receptor close to the Stannergate roundabout, this impact was mitigated by implementing Scenario 3 (a redesigned roundabout). Scenario 3 showed no change in the number of exceedences of the annual mean NO_2 objective and a reduction in the number of exceedences of the annual mean PM_{10} objective.

Scenarios 4 and 5 were predicted to increase the number of exceedences of the NO_2 and PM_{10} annual mean objectives. Scenarios 2 and 6 were predicted to decrease the number of exceedences of the annual mean PM_{10} objective.

The full report will be available at the following link: http://www.dundeecity.gov.uk/air-quality/StannergateAQmodellingstudyApril2016

Appendix C.5 Forfar Road – Kingsway Model

Figure C.32 Forfar – Kingsway Modelled Area



The dispersion modelling of the above area predicted exceedences of the NO_2 and / or PM_{10} annual mean objective at relevant locations adjacent to the trunk and local road network at the following locations (Base 2012):

A90T –A972T –A929 Kingsway / Forfar Road junction;

A972T – Kingsway / Pitkerro Road roundabout;

A929 – C244 Forfar Road / Clepington Road junction.

A source apportionment study found that HGVs accounted for the highest proportion of road NOx and road NO_2 concentrations when results were averaged across all modelled receptors, and when averaged across receptors with NO_2 concentrations greater than 40µg/m^3. Cars were found to cause the greatest proportion of road NOx at the receptor with the maximum road NOx concentration.

Cars were found to cause the highest proportion of road PM_{10} concentrations when results were averaged across all modelled receptors; when averaged across receptors with PM_{10} concentration greater than 18µg/m^3; and, at the receptor with the maximum road PM_{10} concentration.

The study looked at possible actions to reduce pollutant concentrations. The scenarios tested were:

Scenario 1 (SC1) – A90 Bypass; and

Scenario 2 (SC2) – Forfar Road Signal Timing Optimisation

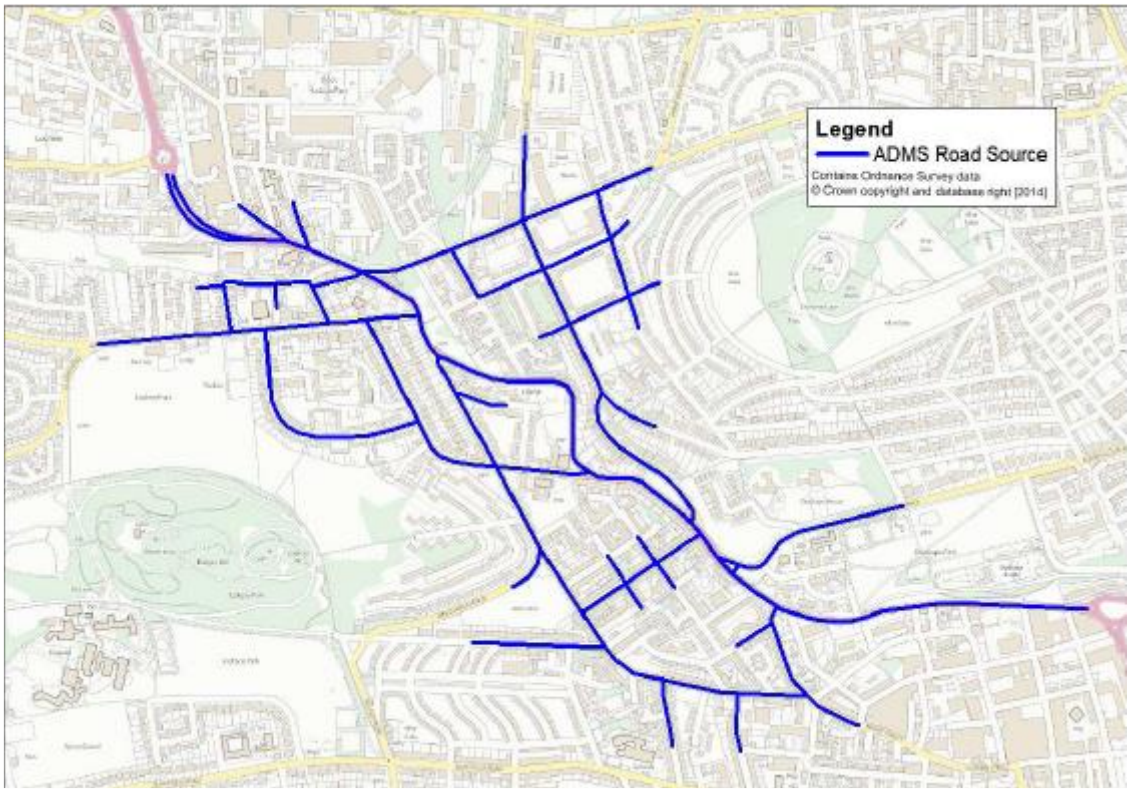
Scenario 1 was identified as the most beneficial scenario, it predicted the removal of 12 of the 25 exceedences of the annual mean NO_2 objective and 2 of the 10 exceedences of the annual mean PM_{10} objective.

Scenario 2, involved extending the green time available to northbound traffic at the A929 Forfar Road – Kingsway junction. This Scenario was predicted to have slight adverse impact on NO_2 concentrations on other road links approaching this junction, but no new exceedences were predicted. It was also predicted to remove 5 of the 25 exceedences of the annual mean NO_2 objective, with no change in the number of annual mean PM_{10} exceedences.

The full report will be available at the following link: http://www.dundeecity.gov.uk/air-quality/ForfarRoadAQmodellingstudyMarch2016

Appendix C.6 Lochee Road Area Model

Figure C.33 Lochee Road Modelled Area



The dispersion modelling of the above area predicted exceedences of the NO_2 and / or PM_{10} annual mean objectives at relevant locations (Base 2012):

On Lochee Road between Polepark Road and Tullideph Road;

At the Logie Street/High Street junction; and

On High Street near Gray's Lane.

Exceedences of the NO_2 hourly mean were also predicted on Lochee Road north of the junction with Mitchell Street based on the greater than 60µg/m^3 criteria outlined in LAQM.TG (16).

A source apportionment study found that cars accounted for the highest proportion of road NOx, road NO_2 and road PM_{10} concentrations when results were averaged across all modelled receptors, and when averaged across receptors with a NO_2 concentration greater than 40µg/m^3. Cars were also found to account for the greatest proportion of road NOx, NO_2 and PM_{10} at the receptor with the maximum road pollutant concentrations.

The study looked at possible actions to reduce pollutant concentrations. The scenarios tested are listed below:

Scenario 1 (SC1) – Assessment of Cleghorn Street Closure;

Scenario 2 (SC2) – Optimisation of signalised corridor. Testing of this Scenario using the Paramics micro-simulation model[14] identified that the urban traffic control system currently in place demonstrated good operational progression between each junction and there was limited scope for further benefits to be achieved. No further modelling work was undertaken for this Scenario.

Scenario 3 (SC3) – Scenario assessing the potential impact should the bus fleet in the Lochee Road modelled area be entirely made up of Euro Class V vehicles; and

Scenario 4 (SC4) – Scenario assessing the potential impact should the bus fleet in the Lochee Road modelled area be entirely made up of Euro Class VI vehicles.

Scenario 1 is predicted to reduce the number of exceedences of the NO_2 annual mean objective from 30 to 29, and increase the number of exceedences of the PM_{10} annual mean objective from 8 to 9.

Scenario 3 is predicted to reduce the number of exceedences of the NO_2 annual mean from 30 to 22, and reduce the number of exceedences of the PM_{10} annual mean from 8 to 1. There are no exceedences of the NO_2 hourly mean predicted for Scenario 3.

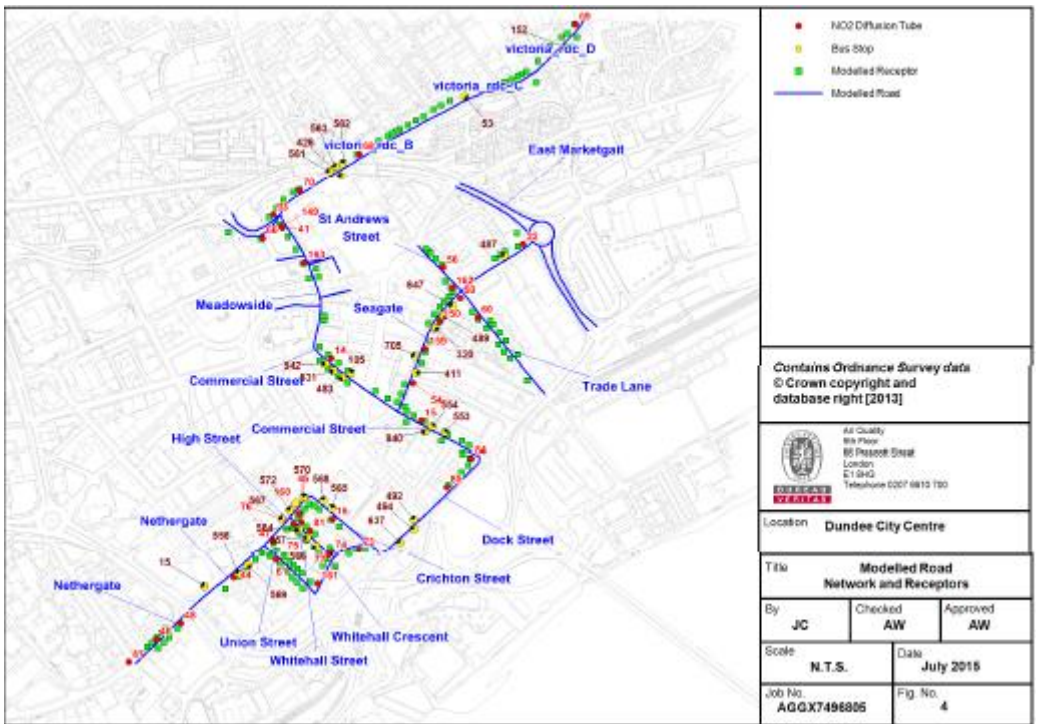
Scenario 4 is predicted to reduce the number of exceedences of the NO_2 annual mean from 30 to 17, and reduce the number of exceedences of the PM_{10} annual mean from 8 to 1. There are no exceedences of the NO_2 hourly mean predicted for Scenario 4.

The full report will be available at the following link: http://www.dundeecity.gov.uk/air-quality/LocheeRoadAreaAQmodellingstudyApril2016

[14] Lochee Road S-Paramics Model TPDCCLAA/76999

Appendix C.7 Quantitative Appraisal of Bus Emission Options

Figure C.34 Bus Emissions Modelled Road Network and Receptors



The dispersion modelling of the above area predicted exceedences of the NO_2 and / or PM_{10} annual mean objectives at relevant locations (Base 2012):

- Commercial Street (south of Seagate)
- Dock Street (between Crichton Street and Commercial Street)
- High Street
- Meadowside
- Nethergate (east of West Marketgait)
- St. Andrews Street
- Seagate
- Whitehall Street
- Victoria Road

Exceedences of the NO_2 hourly mean were also predicted on Seagate near the existing bus-stops and on Meadowside near the junction with Victoria Road based on the greater than 60µg/m^3 criteria outlined in LAQM.TG (16).

The study looked at the possible impact on air quality of various bus-stop and fleet improvement scenarios. The scenarios tested are listed below:

Current baseline 2012, to verify the model against the latest monitoring data, based on the latest available information related to bus fleet composition;

Current baseline 2012 with the 3 west bound bus-stops in Seagate moved into St. Andrews Street south bound;

Future baseline 2017, assuming same bus fleet composition as in current baseline 2012, apart from Euro I and Euro II buses assumed to be replaced by Euro III buses;

Future baseline 2017 with the 3 west bound bus-stops in Seagate moved into St. Andrews Street south bound;

Scenario 1 - 2017, assuming bus fleet composition all Euro V;

Scenario 2 - 2017, assuming bus fleet composition all Euro VI;

Scenario 3 - 2017 assuming all buses and HGV are Euro V; and

Scenario 4 - 2017, assuming all buses and HGV are Euro VI.

Moving three west bound bus stops on Seagate to St Andrews Street is predicted to result in 'Large' decreases in annual mean NO_2 concentrations, giving extensive 'Substantial Beneficial' impacts at receptors on Seagate and 'Large' increases in concentrations on St Andrews Street, giving 'Substantial Adverse' impacts and creating new exceedences in both the 2012 and 2017 Baseline Scenarios.

Overall, 19 exceedences of the annual mean objective for NO_2 were modelled at the façade of properties in 2017 baseline. It is predicted that implementation of all modelled intervention scenarios would reduce this considerably; with no exceedences if all buses and HGVs were Euro VI emission standard.

All modelled intervention scenarios showed 'Large' decreases in annual mean NO_2 concentrations, giving extensive 'Substantial Beneficial' impacts. There are 19 'Substantial Beneficial' and 20 'Moderate Beneficial' impacts predicted at modelled sensitive receptors under all scenarios. Scenario 4, with all buses and HGVs of Euro VI emissions standard, is predicted to result in the highest number of 'Slight Beneficial' impacts and is therefore considered to be the most beneficial measure overall.

Across the modelled area, the maximum predicted annual average for NO_2 at sensitive receptors under all the modelled scenarios for 2017 is below 60 µg/m^3. Therefore, the NO_2 hourly mean AQS objective is expected to be met at all relevant locations, assuming fleet renewal takes place.

No exceedences of the annual mean objective for PM_{10} were predicted at the façade of properties under any of the intervention scenarios. All modelled intervention scenarios showed decreases in annual mean PM_{10} concentrations, giving extensive beneficial impacts. There are 57 and 62 beneficial impacts predicted at modelled sensitive receptors under the two Euro VI scenarios (Scenarios 2 and 4 respectively). Scenarios 2 and 4 are predicted to result in the highest number of beneficial impacts and the lowest maximum PM_{10} concentrations and are therefore the most beneficial measures overall.

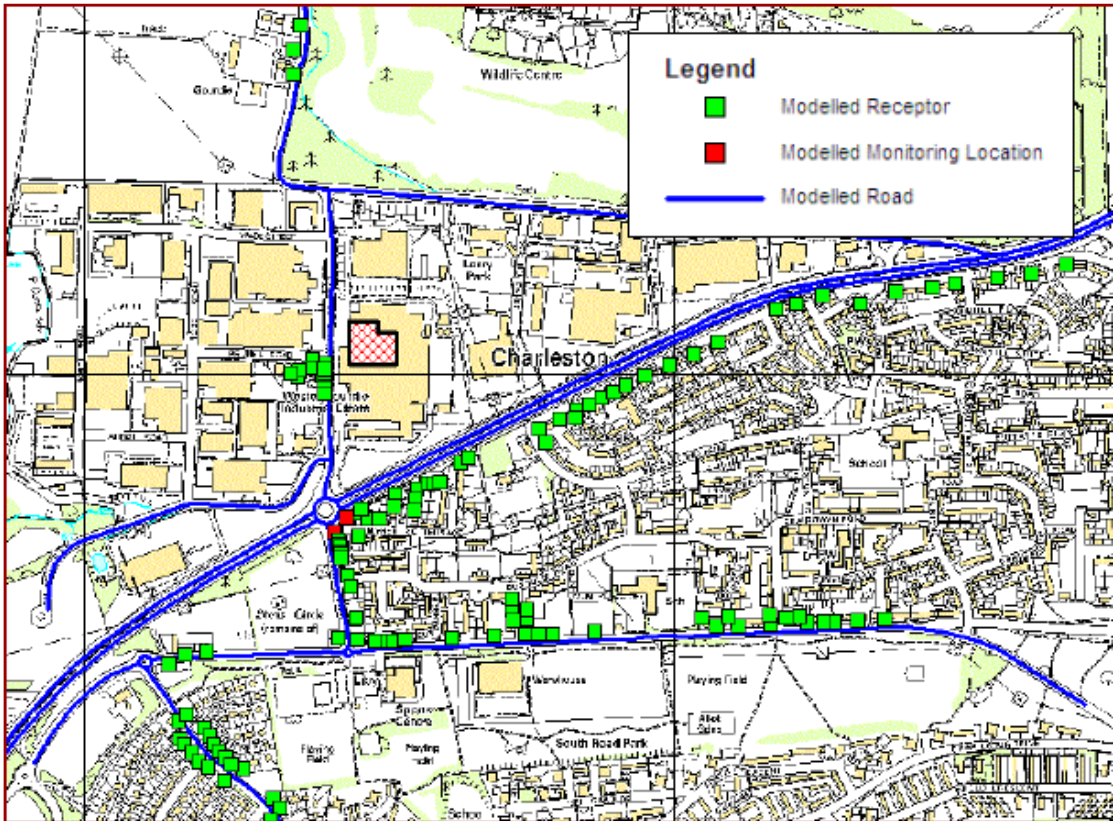
Across the modelled area, the maximum predicted annual average for PM_{10} at sensitive receptors under the modelled scenarios is below 22.5 µg/m^3 (maximum of 19.7 µg/m^3 for Baseline 2012). Therefore, the 24-hour mean AQS objective is expected to be met at all relevant locations (see paragraph 7.92 of LAQM. TG16)

Whilst the full implementation of these intervention scenarios may be challenging, this modelling does however indicate the degree of improvement that could be achieved through strategic implementation of such measures. It is therefore recommended that bus fleet improvement and freight quality initiatives are considered for implementation.

The full report will be available at the following link: http://www.dundeecity.gov.uk/air-quality/BusEmissionsAppraisalStudyJuly2015

Appendix C.8 Kingsway West – Myrekirk Road Area Model

Figure C.35 Kingsway West – Myrekirk Road Modelled Area



In compliance with planning conditions, ASDA commissioned air quality monitoring and modelling to be carried out in the vicinity of their new superstore on Kingsway West. An air quality monitoring station was sited at the junction of Myrekirk Road and Kingsway West from March 2014 to January 2015 to measure levels of NO_2 and PM_{10}. In addition dispersion modelling of road traffic emissions was carried out using traffic data collated in March 2015. Modelling results were also compared with those reported in the previous air quality assessment prepared to discharge planning conditions on the outline consent in 2011, which had predicted exceedences of the annual mean PM_{10} objective at receptors close to the Kingsway / Myrekirk roundabout.

Results of the monitoring survey indicate that none of the relevant air quality objectives (AQOs) for either pollutant were breached during 2014.

Results of the dispersion modelling indicate that concentrations of NO_2 and PM_{10} at relevant receptors along the main roads near the development are all below the respective annual mean AQOs.

A comparison of modelled concentrations with those reported in the 2011 air quality assessment show that both NO_2 and PM_{10} concentrations are lower than previously reported. A number of reasons explain the reduction in modelled air pollutant levels, including:

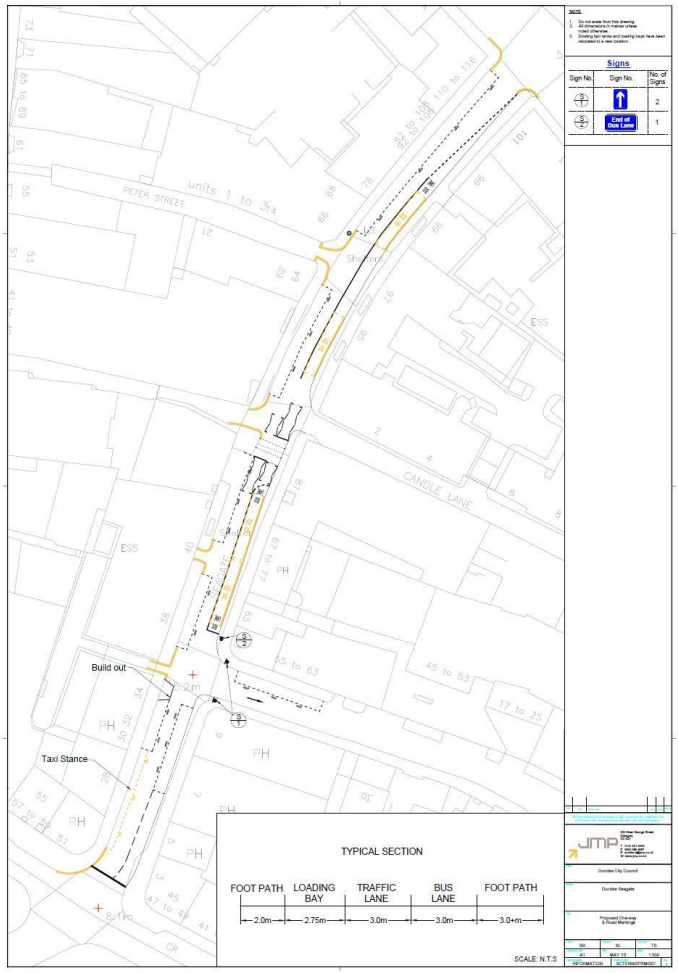
- the use of a different year for prediction of air pollutant concentrations;
- a reduction in background concentrations of NO_2 and PM_{10}
- a decrease in monitored pollutant concentrations in the vicinity of the development;
- lower traffic flows, compared to those used in the 2011 air quality assessment;
- the use of more up to date road traffic emission factors; and
- changes to the road layout around Myrekirk roundabout as part of the infrastructure upgrades associated with the development.

The assessment shows that no exceedences of the AQOs are predicted in the vicinity of the new ASDA Dundee West Superstore.

The full report will be available at the following link: http://www.dundeecity.gov.uk/air-quality/AQstudyASDADundeeWestNovember2015

Appendix C.9 Dundee Seagate Air Quality and Transportation Study (Draft)

Figure C.36 Preliminary Layout for Seagate (One Way City-Bound)



Summary and Next Steps from the Consultant's Findings

"Seagate is one of the most important streets for the effective functioning of Dundee City Centre. Whilst lacking the profile of Murraygate or Commercial Street, Seagate provides one of the main access routes to the city centre (especially for buses, taxis and their passengers), an essential route for deliveries to many businesses and for local car access, including to the Gellatly Street car park. Seagate is home to business premises and residential dwellings (DCC's Corporate Address Gazetteer states that there are 142 residential properties on Seagate).

As with many such urban settings, air quality is poor, with both NO_2 and PM_{10} being pollutants of concern. The volume of traffic, the high proportion of large vehicles and the time spent idling by many of them combines with the canyon effect of the urban form to create and trap pollution. The large number of people using the street (as pedestrians, in vehicles) or living and working nearby mean that exposure to this pollution is high.

This commission has undertaken a review of the transport issues that are currently being experienced by all road users (including pedestrians, cyclists, bus users and operators, taxi users and operators, hauliers and car drivers/passengers), residents and businesses. It

identifies options that will improve traffic movement and reduce air pollution, ideally to a point where air quality standards are met.

In order for air quality standards to be met on Seagate, NO_2 levels need to reduce by at least around one third (to below 40 from 59.4µg/m^3) and PM_{10} by at least around 13% (to below 18 from 20.6µg/m^3). Buses are the largest source of locally-emitted pollution in Seagate.

This study has considered options which could meet the following objectives:

- Priority 1: to improve air quality on the Seagate such that air quality standards are met whilst avoiding creating breaches of standards in any other location;
- Priority 2: to improve road safety for all users of the Seagate and surrounding roads;
- Priority 3=: to improve access to the city centre for bus and taxi passengers;
- Priority 3=: to improve access for vehicles delivering to businesses, accessing car parks and other relevant needs;
- Priority 4=: to improve the attractiveness of the Seagate as a place to live, shop and work;
- Priority 4=: to improve the convenience and quality of journeys to and from the city centre for bus passengers.

The required reduction in pollution can only be achieved by reducing emissions from buses in the area. There are two ways by which this could be achieved:

- Reducing the tailpipe emissions from buses using the street (by investing in new vehicles with the latest engine technology); or
- Reducing the number of buses operating on Seagate.

Whilst the former of these options is attractive, we currently foresee see no mechanism which would provide the funding to enable what would be millions of pounds of investment in the bus fleet. Our attention has therefore turned to traffic management solutions to reduce the number of vehicles operating on Seagate. Of these, there is just one option which appears to be feasible, meets objectives and could enable air quality standards to be met.

This option comprises:

- Making Seagate one-way city-bound between Trades Lane and Commercial Street, with existing city-bound buses continuing to use their current route, but outbound buses using Dock Street and Trades Lane;
- Reversing the direction of the one-way section of Gellatly Street, so that all traffic leaving the car park must do so via Dock Street.

This option would reduce pollution levels to around, and possibly below, the standard thresholds. It would enable, through provision of wider footways, a much enhanced urban realm in Seagate and better facilities for bus passengers on the southeast side of the street.

It would, however, result in inconvenience to bus passengers currently choosing to board outbound services at the Marks & Spencer stop (they would need to use existing stops on Commercial Street and/or new stops provided on Trades Lane or Seagate in the vicinity of the bus station) and may increase bus journey times as they leave the city centre. It would also marginally increase traffic flow on Dock Street (which is itself an air quality hotspot) and result in traffic wishing to head south or west from Gellatly Street having a convoluted route via the East Port roundabout.

It is JMP's expectation that this option could be acceptable to the main stakeholders (bus operators, Transport Scotland, bus passengers, local residents and businesses) if the following conditions were met:

- That the roadspace no longer required for moving traffic on Seagate was used to widen the footways and make easier pedestrian crossing points, such that bus passengers enjoyed a higher quality urban environment while waiting at stops, when walking between the town centre and bus station, and cross Seagate more easily;
- That one or more high quality and convenient bus stop was placed close to the Seagate/Trades Lane junction, to replace the current Marks & Spencer stop for outbound passengers;
- That detailed traffic modelling was able to demonstrate no significant delay to buses caused by the Dock Street/Trades Lane rerouting, and that traffic signals at the Trades Lane/Seagate junction could be reconfigured in order to minimise any delay for buses as they headed north on Trades Lane;
- That a campaign to promote bus use in the city accompanied the changes, in order to offset any potential reduction in bus patronage that relocation of the Marks & Spencer stop might have.

We therefore recommend that DCC and its partners consider this one option more fully and determine whether it, and associated measures, can be implemented.

Next Steps

We recommend that DCC undertake the following next steps in relation to this recommendation:

- Determine whether there is a potential funding source that would enable this option, including its accompanying urban realm improvements, to be delivered;
- Undertake traffic modelling of the proposal, in order to test its impacts on different types of road user and network operation issues;
- Undertake detailed air pollution dispersion modelling to test that air quality standards would be met on Seagate and that other locations would not suffer undue detriment;
- Continue to engage with key stakeholders to discuss and refine the proposals.**"**

Appendix C.10 List of Industrial Processes

Process Name/Address	Process Type	PPC Sector	New source since USA 2015?	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	No Change
Dundee Energy Recycling, Baldovie, Dundee	Chapter 5: Waste Management	IPPC S5.01	No	No	No	Yes, previously assessed	No	No	No Change
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 now running on gas leading to reduction in NOx and particulate emissions. Large parts of the site have been demolished or mothballed also reducing fugitive VOC emissions.
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.

Process Name/Address	Process Type	PPC Sector	New source since USA 2015?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Subsea Protection Systems	Chapter 3: Mineral Industries cement batching	3.1.b	No	No	No	Yes, previously assessed	No	No	No Change
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
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
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

Process Name/Address	Process Type	PPC Sector	New source since USA 2015?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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
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
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
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	No Change

Process Name/Address	Process Type	PPC Sector	New source since USA 2015?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Stay-Press Dry Cleaning Centre, Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	Surrendered
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, I Afton Way	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	No Change
Tesco Filling Station, South Road, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	No	No	No	No Change
Halley Stevensons (Dyers & Finishers) Limited, Baltic Works, Annfield Road, Dundee DD1 5JH	Chapter 6: Other Activities	Section 6.4 Part A Paragraph (a)	No	No	No	No	No	No	No Change
Discovery Flexibles, Kemback St Dundee	Chapter 6: Other Activities surface treatment using organic solvents also Chapter 7 SED coating flexible packaging	6.4.b	No	No	No	No	No	No	No Change

Process Name/Address	Process Type	PPC Sector	New source since USA 2015?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
J T Inglis, Riverside Works, Dundee	Chapter 6: Other Activities Textile Treatment	6.4.d	No	No	No	No	No	No	Site Closed
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	New extension under construction. No change to emissions.
Michelin Tyre Plant, Dundee	Chapter 1: Energy Industries, Combustion	1.1.a	No	No	No	Yes, previously assessed	No	No	New extension under construction. No change to combustion emissions.
D C Thomson Printers, Dundee	Chapter 6: Other Activities printing process	6.4.b	No	No	No	No	No	No	Not operating permitted activity
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	No Change, currently still operating.
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	No change

Process Name/Address	Process Type	PPC Sector	New source since USA 2015?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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	No change
New PVR at Asda, Myrekirk Road	Chapter 1: Energy Industries, Petrol Station	1.2.c.(ii)	No	No	No	Yes, but no relevant receptors	No	No	New site
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	New biodiesel PPC processing site. Permit issued Sept 2014 – currently not being persued
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)	Yes*	No	No	Yes (possible fugitive emissions of particulates)	No	No	Application in progress PPC/B/1142921

Process Name/Address	Process Type	PPC Sector	New source since USA 2015?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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)	Yes	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		Yes*	No	No	Yes (possible fugitive emissions of particulates)	No	No	Application in progress – PPC/B/1141206

Notes: Yes* see Section 4.3
~ With reference to Annex 2 Appendix E TG.03
Part A - Processes shaded purple

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 exceedence (e.g. sites above 36µg/m^3 for NO_2 or 16.2µg/m^3 for PM_{10} annual mean)
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)
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
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
Osiris	the brand name given by Turnkey Instruments Ltd. to their particle measuring nephalometer
PDT	Passive Diffusion Tube
P&T	Planning and Transportation
$PM_{2.5}$	Particulate Matter less than 2.5μm aerodynamic diameter
PM_{10}	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
USA	Updating and Screening Assessment
$\mu g/m^3$	Micrograms per cubic metre
VCM	Volatile Correction Method
VOC	Volatile Organic Compound
vpd	Vehicles per day
WASP	Workplace Analysis Scheme for Proficiency

References

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