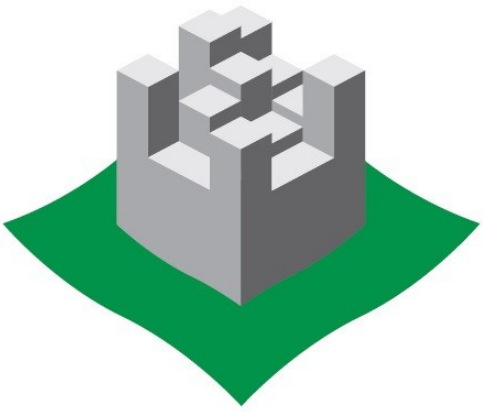

Exeter
City Council

2018 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the
Environment Act 1995
Local Air Quality Management

April 2018

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Executive Summary: Air Quality in Our Area

Air Quality in Exeter

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

Air quality in Exeter is affected by a small number of hot spots where levels of nitrogen dioxide are above government objectives. These are along the Heavitree corridor (at Livery Dole junction, Fore Street Heavitree, East Wonford Hill and Honiton Road), Alphington Street and the Blackboy Road/Pinhoe Road junction. All these are included within Exeter's Air Quality Management Area, an area where the Council will bring forward and facilitate actions to improve air quality. In the majority of the city, outside these areas, pollution levels are below the government objectives.

Further details of the Air Quality Management Area, and the Council's Action Plan are available online at https://exeter.gov.uk/airpollution/. During 2018 the Council has undertaken a significant engagement project on a draft new Air Quality Action Plan. The c.2000 responses to this will be reviewed and an updated plan brought forward during the year.

The monitoring that the Council has done shows that concentrations of nitrogen dioxide have fallen throughout the city since around 2009, despite significant housing and commercial development over the same period. However levels have remained broadly consistent over the last five years. There were no exceedences of the hourly objective proxy in 2017 and no new sources of pollution have been identified that are likely to cause new areas to exceed the objective levels for any form of air pollution.

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Actions to Improve Air Quality

Exeter City Council has taken forward a number of direct measures during the current reporting year of 2017 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

Exeter has committed to a vision of the future which sees it as one of the world's most sustainable cities. A strategic priority for Exeter City Council in 2018 is to reduce congestion and enhance mobility within the City. To deliver this priority Exeter City Council have partnered with key City stakeholders to form Exeter City Futures (ECF); an independent Community Interest Company that aims to help Exeter to solve its urbanisation challenges in a way that reduces social inequality and contributes to economic growth. ECF has set out a bold mission to make Exeter energy independent and congestion free by 2025 and is working to meet specific goals relating to reduction in private car use and improvement in air quality.

Key completed measures are:

- A 3 month engagement process based around the draft AQAP, which generated circa 2,000 responses. This was an enormously positive process which generated public debate about air quality and congestion, and demonstrated the level of interest amongst the local and business population.
- Development of the GESP (Greater Exeter Strategic Plan) has been ongoing throughout 2017.
- Councillor commitment to air quality, sustainable travel and related issues has been evidenced. A Transport Board has been set up, to discuss and coordinate transport policy between the city and county councils. Members at both Councils have implemented Task and Finish Groups or Scrutiny Groups looking at the subjects of green travel and air pollution.
- Devon County Council has been successful in obtaining funding for a Devon-wide Electric Vehicle charging network (DELETTI project).
- A successful partnership between the local Heavitree community, Exeter University and Exeter City Futures has been supported to undertake community air quality monitoring in 2018 and will use the data in locally-led projects to influence behaviour.

- A Exeter University research project 'Commute Exeter' has provided valuable evidence on how to 'nudge' commuter behaviour towards active and sustainable modes.

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

- Publication of an updated AQAP following the public engagement process.
- Development of the role of the Transport Board, further improving liaison and joint working between Exeter City and Devon County Councils at senior level.
- Exeter and Cranbrook will embark on the development of the Sport England Local Delivery Pilot Programme, tackling physical activity within our communities. We will create a strategy for walking and cycling to improve active travel across the city and align this with the actions in the final Air Quality Action Plan.
- We will agree targets and programmes of work with key stakeholders through the creation of an active travel focus group.

Conclusions and Priorities

Although the number of sites where measured levels were above the objective has increased since 2016, 36 of the 67 sites in the city recorded levels that were the same as 2016 or lower. It does not seem possible to draw conclusions about any long-term trend in pollution levels over time, except to say that there has been a reduction since 2009. Hotspots of pollution clearly remain, and need to be addressed in the new AQAP. These are in locations where congestion and poor dispersion combine to create specific local conditions that cause higher pollution levels. The extent of these areas is smaller than the extent of the AQMA, however Exeter City Council has no current plans to amend the AQMA and reduce the area included. The AQMA boundary was originally drawn to include a larger area than just the strict areas of exceedence (Exeter City Council 2011). The rationale for this boundary remains sound.

Exeter City Council's priorities for the coming year are:

- to build on the significant local interest raised during the AQAP engagement to bring forward a updated plan, with Devon County Council, which meets the aspirations of the people of Exeter,
- through the Sport England Local Delivery Pilot we will seek to further understand commuter behaviour and the step change required to make a population level shift in the number of people walking and cycling,
- identify practical solutions with local partners on how we can enable residents to walk and cycle more, and
- to ensure that work in the congestion, sustainable travel and active travel spheres is co-ordinated as part of a single vision for the city.

The principal challenges and barriers to implementation are whole system and they are political, cultural and behavioural in relation to individuals, organisations and communities. In addition local authorities are constrained by reducing resources and the consequent need to focus on resources on strategic and operational priorities. Whilst reducing congestion and thus improving air quality, is a priority for Exeter City Council, it may not be for all of our partners.

Local Engagement and How to get Involved

Everyone in Exeter can take action on a personal level to improve our air quality. Some examples are shown below.

Walk or cycle

Replacing a car journey by walking or cycling helps reduce traffic and traffic emissions. It has proven health and mental health benefits too.

Take public transport or carshare

For longer journeys, why not use public transport or car share?

And if you have to use your car…

Make sure your tyre pressure is correct (low tyre pressure increases fuel use, fuel costs and emissions).

Think about whether you need to use the air conditioning. Using it increases fuel consumption by 30%; driving with windows open only increases it by 5%.

Using a roof rack on your car can increase fuel consumption by 20 to 30%. Bicycles are better attached to the back of the car.

If you need to buy a car, check its fuel economy. With an ultra-low emission vehicle (ULEV) you will use less fuel and produce less exhaust fumes.

Go for local produce!

Transporting goods a long way creates more air pollution than transporting them short distances. Try to buy locally produced goods and eat local foods that are in season: transporting and producing them doesn't generate as much air pollution.

Tell us what you think

Consultation on the new AQAP closed on 12 May 2018, however this will not be the only opportunity to comment on and help direct future actions to improve air quality. Information will be available online at https://exeter.gov.uk/ and in local media as part of consultations on specific measures.

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1 Local Air Quality Management

This report provides an overview of air quality in Exeter during 2017. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by Exeter City Council can be found in Table 2.1. This includes information on the highest pollution levels measured in the city. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://exeter.gov.uk/airpollution/. Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA(s).

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (inc. date of publication)
						At Declaration	Now	
Exeter AQMA	Declared 2007, Amended 2011	NO2 Annual Mean	Exeter	An area encompasing the radial routes into the city and other major routes	NO	70 µg/m^3	59 µg/m^3	Exeter AQAP www.exeter.gov.uk/airpollution
Exeter AQMA	Declared 2007, Amended 2011	NO2 1 Hour Mean	Exeter	An area encompasing the radial routes into the city and other major routes	NO	65 µg/m^3 (annual average as proxy)	59 µg/m^3 (annual average as proxy)	Exeter AQAP www.exeter.gov.uk/airpollution

☒ **Exeter City Council confirm the information on UK-Air regarding their AQMA(s) is up to date**

2.2 Progress and Impact of Measures to address Air Quality in Exeter

The Department for Food and Rural Affairs (DEFRA)'s appraisal of last year's ASR concluded that 'the report uses the standard template, is well structured, detailed, and provides the information specified in the Guidance'. The appraisal goes on to say that 'following the completion of this report, Exeter City Council should submit the new Action Plan to DEFRA within the period of statutory consultation, prior to adoption by the Council'. DEFRA note that 'action to address consistent hotspots should be a key within the developing action plan' and measures should be prioritised to address the exceedences identified in the ASR.

Exeter City Council have submitted a copy of the draft new Air Quality Action Plan to DEFRA's appraisal team but has had no response yet. The Council identifies the areas of exceedance in the draft plan, and the magnitude of the reductions in emissions required to meet the objective at each location. The air pollution hotspots are areas of significant local congestion, and where the street canyons hinder the dispersion of pollution.

The draft plan does not predict the air quality improvements to be expected as a result of the plan, or prioritise measures for implementation. It was intended to start a period of extensive community engagement and policy development. The Council will update the draft plan with further detail on the expected outcome of measures, prioritisation and implementation plans.

Exeter has committed to a vision of the future which sees it as one of the world's most sustainable cities. A strategic priority for Exeter City Council in 2018 is to reduce congestion and enhance mobility within the City. To deliver this priority Exeter City Council have partnered with key City stakeholders to form Exeter City Futures (ECF); an independent Community Interest Company that aims to help Exeter to solve its urbanisation challenges in a way that reduces social inequality and contributes to economic growth. ECF has set out a bold mission to make Exeter energy independent and congestion free by 2025 and is working to meet specific goals relating to reduction in private car use and improvement in air quality.

Exeter City Council has taken forward a number of direct measures during the current reporting year of 2017 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

Key completed measures are:

- A 3 month engagement process based around the draft AQAP, which generated circa 2,000 responses. This was an enormously positive process which generated public debate about air quality and congestion, and demonstrated the level of interest amongst the local and business population.
- Development of the GESP (Greater Exeter Strategic Plan) has been ongoing throughout 2017.
- Councillor commitment to air quality, sustainable travel and related issues has been evidenced. A Transport Board has been set up, to discuss and coordinate transport policy between the city and county councils. Members at both Councils have implemented Task and Finish Groups or Scrutiny Groups looking at the subjects of green travel and air pollution.
- Devon County Council has been successful in obtaining funding for a Devon-wide Electric Vehicle charging network (DELETTI project).
- A successful partnership between the local Heavitree community, Exeter University and Exeter City Futures has been supported to undertake community air quality monitoring in 2018 and will use the data in locally-led projects to influence behaviour.
- An Exeter University research project ‘Commute Exeter’ has provided valuable evidence on how to ‘nudge’ commuter behaviour towards active and sustainable modes.

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

- Publication of an updated AQAP following the public engagement process.
- Development of the role of the Transport Board, further improving liaison and joint working between Exeter City and Devon County Councils at senior level.

- Exeter and Cranbrook will embark on the development of the Sport England Local Delivery Pilot Programme, tackling physical activity within our communities. We will create a strategy for walking and cycling to improve active travel across the city and align this with the actions in the final Air Quality Action Plan.
- We will agree targets and programmes of work with key stakeholders through the creation of an active travel focus group.

Exeter City Council's priorities for the coming year are:

- to build on the significant local interest raised during the AQAP engagement to bring forward a updated plan, with Devon County Council, which meets the aspirations of the people of Exeter,
- through the Sport England Local Delivery Pilot we will seek to further understand commuter behaviour and the step change required to make a population level shift in the number of people walking and cycling,
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- to ensure that work in the congestion, sustainable travel and active travel spheres is co-ordinated as part of a single vision for the city.

The principal challenges and barriers to implementation are whole system and they are political, cultural and behavioural in relation to individuals, organisations and communities. In addition local authorities are constrained by reducing resources and the consequent need to focus on resources on strategic and operational priorities. Whilst reducing congestion and thus improving air quality, is a priority for Exeter City Council, it may not be for all of our partners.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Exeter City Council expects to bring forward further measures in 2018/2019 in the new AQAP which will work towards compliance and enable the future revocation of the Exeter AQMA. Action by the UK government using powers not available to Exeter City Council could also be effective in reducing vehicle emissions within the city.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Develop new AQAP for Exeter through process of in-depth community and partner engagement	Policy Guidance and Development Control	Other policy	ECC	2018	2018	publish revised AQAP	TBC once plan developed. Plan will aim to achieve a reduction in emissions commensurate with the exceedences identified	Consultation closed May 2018, c.2000 replies	Dec-18	
2	GESP	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	ECC, DCC. And neighbouring districts (TDC, EDDC and MDDC)	2018-2020	2021	Publish GESP	To be confirmed once plan developed. ECC Env. Health will seek for the impact of GESP to be a substantial reduction in emissions from new development.	Sites have been submitted, and are being evaulated against a range of criteria including sustainable travel	ongoing	Need to deliver housing means that new development cannot be prevented. Aim is to achieve sustainable developments.
3	InnovaSUMP	Transport Planning and Infrastructure	Other	DCC	2018	dates TBC	Develop a Sustainable Urban Mobility Plan for Exeter (SUMP)	To be confirmed once plan developed by DCC	DCC have obtained funding for an EU project to develop a SUMP for the city	ongoing	
4	Transport Board	Other	Other	ECC and DCC	2018	ongoing	Transport Board to meet, agree terms of reference and develop work programme	To be confirmed once workplan developed	First meeting held	To be confirmed once work plan developed	A new joint initiative between DCC and ECC consisting of officers and councillors from both organisations, with a remit to discuss transport in the city

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
5	Green Travel Task and Finish Groups	Policy Guidance and Development Control	Other policy	ECC and DCC	2018	2018	Groups to make recommendations for ECC and DCC to implement	TBC once recommendations agreed	Meetings held and recommendations proposed. To be reported to committee during 2018	2018	Councillor led groups looking at how green travel plans could be improved, through the planning process and more widely
6	Sport England Pilot Project	Promoting Travel Alternatives	Other	ECC	2018	2019	To be confirmed	To be confirmed	Funding available from Sport England for projects to shift commuters to more active modes	2023	Program is being developed during 2018
7	Highways works, reduce congestion	Transport Planning and Infrastructure	Other	DCC	Ongoing	2011-2026 (LTP3 period)	Use of real-time technology and signage to smooth traffic flows	1% reduction in emissions in AQMA based upon measures contained in 'LES lite'	Bridge Road works complete	2026	
8	Electric vehicle charging network	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, Electric charging, Gas fuel recharging	DCC and ECC	2018	2019	DELETTI project to implement a county-wide charging network	dependent on rate of uptake of electric cars	Charging points installed in 6 car parks in Exeter and application approved in principle for significant further expansion across Devon	2020	
9	Community-led projects	Promoting Travel Alternatives	Other	Schools, community and interest groups, supported by ECC and DCC	ongoing	ongoing	ECC supports groups to deliver projects identified by the community	Depending on projects proposed by communities	ECC work with Heavitree community on a community monitoring project and work in schools with Sustrans	ongoing	Led by the community and therefore dependent on what projects are proposed. ECC will support and advise, but not lead.
10	Air Quality Communications Strategy	Public Information	Other	ECC	2018	2019	Communications Strategy developed and implemented	not possible to quantify	Monitoring data available on ECC website	ongoing	The aim is to encourage and support behavioural change on an individual level by raising awareness
11	Walking and cycling infrastructure	Promoting Travel Alternatives	Promotion of cycling	DCC	Complete	2010-2020	· 20% of journeys to work by bike · 20% of journeys to primary school by bike · 30% of journeys to	Not quantified	Exeter Cycle Strategy and Exeter Walking Strategy published and developer contributions towards key infrastructure improvements	2020	http://www.devon.gov.uk/eldf-exeter-cycle-strategy.pdf and http://www.devon.gov.uk/exeter-walking-strategy-august-2012.pdf. The InnovaSUMP project and the GESP are likely to inform further

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
							secondary school by bike				development of policy in this area
12	Bus, smart ticketing, Real Time Information, new bus services, new rail stations	Alternatives to private vehicle use	Other	DCC	Ongoing	2011-2026 (LTP3 period)	· Introduce real-time information · Investigate options for smart ticketing or cross-ticketing · New and extended services to major areas of development, and new stations to serve areas of demand	1% reduction in emissions in AQMA based upon measures contained in 'LES lite'	Real-time information infrastructure installed at bus stops Newcourt services operating	2026	The InnovaSUMP project and the GESP are likely to inform further development of policy in this area
14	Park and Ride	Alternatives to private vehicle use	Bus based Park & Ride	DCC	Ongoing	2011-2026 (LTP3 period)	· Expand electric vehicle charging at P&R sites, potentially incorporated with solar panels · Maintain and expand existing P&R schemes where possible	1% reduction in emissions in AQMA based upon measures contained in 'LES lite'	Application made for funding for charging points and solar panels	2026	The InnovaSUMP project and the GESP are likely to inform further development of policy in this area
15	Travel planning support, car clubs (inc bikes) and Park & Change	Alternatives to private vehicle use	Car & lift sharing schemes	DCC	Ongoing	2011-2026 (LTP3 period)	· Developers to contribute towards establishment of car clubs · Expansion of bike hire scheme · Provide travel planning support service where	1% reduction in emissions in AQMA based upon measures contained in 'LES lite'	· Car Clubs established at Newcourt and Rougemont Park and on street electric bike hire scheme set up · Contributions received from developers for travel plans at 8 housing sites in the city	2026	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
							funding available				
16	Taxi licensing	Promoting Low Emission Transport	Taxi Licensing conditions	ECC	complete	2015-2020	At least 50% of hackney carriage fleet to be Ultra low or Zero emissions	1% reduction in emissions in AQMA based upon measures contained in 'LES lite'	Emissions standard set in policy	2020	https://exeter.gov.uk/media/1428/taxi-policy-2015.pdf
17	ECC vehicle fleet	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	ECC	Complete	2016-2018	Demonstration of electric RCV	Unquantified because of difficulty in estimating contribution of emissions from ECC vehicles	Two electric vans purchased in 2017, 7% reduction in annual waste fleet fuel use due to new technology	Rolling program to be continue in 2018	No vans due for replacement in 2018 so no new electric vans expected to be added to the fleet in this year

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

There is not yet capacity for direct monitoring of $PM_{2.5}$ in Exeter. However it is possible to estimate concentrations based upon local PM_{10} data using the correction factor in TG(16). This method suggests that $PM_{2.5}$ concentrations at Exeter RAMM and Alphington Street are 10.6 $\mu g/m^3$ and 10.3$\mu g/m^3$ respectively. The annual average EU limit value for $PM_{2.5}$ is 25 $\mu g/m^3$ so there is no suggestion that this level is being exceeded in Exeter. However the council still has a duty to reduce emissions of and exposure to this pollutant.

During 2018, Exeter City Council will be taking the measures described in Table 2.2 that will address $PM_{2.5}$ as well as NO_2. During the year the Council will also be working on an updated AQAP.

Approximately 60% of Exeter is designated as Smoke Control Areas. Controls on solid fuel combustion appliances and fuels are likely to have restricted $PM_{2.5}$ emissions in these areas.

During 2017 the City Council signed a contract to replace its two PM_{10} analysers at Exeter Roadside (RAMM) and Alphington Street. The new analysers, to be installed in 2018 will provide the capacity to measure $PM_{2.5}$ at both these sites.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Exeter City Council undertook automatic (continuous) monitoring at 2 sites during 2017. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at https://uk-air.defra.gov.uk/.

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

3.1.2 Non-Automatic Monitoring Sites

Exeter City Council undertook non- automatic (passive) monitoring of NO_2 at 67 sites during 2017. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D and online at www.exeter.gov.uk/airpollution. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

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

For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

The data shows that eight locations measured an exceedence of the annual objective in 2016. Six of these are at relevant locations (DT19 Alphington Street, DT42 Pinhoe Road (Polsloe Road), DT52 Livery Dole, DT 53 Rowancroft, DT56 Fore Street Heavitree inbound and DT57 East Wonford Hill). The other two (DT54 Salutary Mount and DT58 Honiton Road) are not at relevant receptors. When corrected for the distance to the nearest receptor the objective is still exceeded at the façade of the nearest houses at DT54 Salutary Mount, but not at DT58 Honiton Road (Appendix B). For DT58 there is also a tube located at the nearest property (DT59 Honiton Road façade); this tube does not show an exceedence.

All eight locations that exceeded the objective are within the AQMA. The extent of the exceedence of the objective ranges from 0.8 µg/m^3 at Alphington Street to 19 µg/m^3 at East Wonford Hill. No annual average level was over a level of 60µg/m^3, suggesting that an exceedance of the 1-hour mean objective is unlikely at these sites. Levels at East Wonford Hill are close to this level however, and so the Council has no plans to remove exceedence of the short-term objective from the AQMA designation.

Two new diffusion tubes were added to the network in 2017. These were DT26 Alphington Cross and DT32 Station Road Exwick. Neither measured levels above the objective in 2017 (32.7 and 27.1 µg/m^3 respectively). Three locations were added in 2016 to identify any trend caused by increased traffic in areas of significant new development. Two of these (DT45 Venny Bridge and DT48 Pinn Lane) have shown a slight reduction in 2017. The third such site at Newcourt Way (DT62) has shown an increase from 17.8 to 20.2 µg/m^3 but levels remain well below the objective.

Although the number of sites where measured levels were above the objective has increased since 2016, 36 of the 67 sites in the city recorded levels that were the same as 2016 or lower. It does not seem possible to draw conclusions about any long-term trend in pollution levels over time, except to say that there has been a reduction since 2009 (appendix 1). Hotspots of pollution clearly remain, and need to be addressed in the new AQAP. These are in locations where congestion and poor dispersion combine to create specific local conditions that cause higher pollution

levels. The extent of these areas is smaller than the extent of the AQMA, however Exeter City Council has no current plans to amend the AQMA and reduce the area included. The AQMA boundary was originally drawn to include a larger area than just the strict areas of exceedence (Exeter City Council 2011). The rationale for this boundary remains sound.

Exeter City Council has always chosen to monitor at expected hot spots and relevant worst-case locations and so no further revision to the monitoring network is proposed in order to identify suspected exceedences. However in 2018 the Council has added four new diffusion tube locations to its network. These are in parks and on off-road cycle routes, and are intended to demonstrate the difference in pollution levels between these and busy congested roads.

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 40µg/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 35 times per year.

There were no measured exceedences of the PM_{10} air quality objectives in Exeter in 2016. Annual average concentrations have been broadly consistent, with some interannual variability, for the last five years, and there were just three exceedences of an hourly mean of 50µg/m^3 In 2017. The long-term trend in annual concentrations is a decline since 2005 or 2006. The current TEOM equipment is being replaced in 2018, which will provide the opportunity to measure $PM_{2.5}$ as well as PM_{10} at both sites.

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?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Exeter Roadside	Kerbside	291939	92830	NO2; O3; PM10	YES	Chemiluminescent; UVA; TEOM	0	1	1.7
CM2	Alphington Street	Roadside	291670	91773	PM10	NO	TEOM	12	3	1.7

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
DT1	High Street /Castle Street	Kerbside	292199	92814	NO_2	YES	50	0.5	NO	2
DT2	Longbrook Street	Kerbside	292315	93016	NO_2	NO	0	1	NO	1.7
DT3	New North Road	Kerbside	292185	93049	NO_2	YES	0	1	NO	2
DT4	Queen Street	Kerbside	291779	93011	NO_2	YES	0	1.5	NO	2
DT5	RAMM 1	Kerbside	291944	92826	NO_2	YES	0	1	YES	1.7
DT6	RAMM 2	Kerbside	291944	92826	NO_2	YES	0	1	YES	1.7
DT7	High Street Guildhall	Roadside	291984	92626	NO_2	YES	0	2	NO	2
DT8	North Street	Kerbside	291895	92569	NO_2	YES	0	1	NO	1.7
DT9	South Street	Roadside	291943	92511	NO_2	YES	3	1.5	NO	2
DT10	Market Street	Kerbside	291833	92433	NO_2	YES	0	1	NO	1.7
DT11	Magdalen Street	Kerbside	292291	92292	NO_2	YES	8	1	NO	1.7
DT12	Magdalen Street façade	Kerbside	292422	92320	NO_2	YES	0	1	NO	1.7
DT13	Archibald Road	Roadside	292590	92743	NO_2	NO	0	1.5	NO	1.7
DT14	Heavitree Road inbound	Roadside	292832	92731	NO_2	YES	0	10	NO	2
DT15	Heavitree Road outbound	Kerbside	292703	92807	NO_2	YES	0	1	NO	1.7
DT16	Holloway Street	Kerbside	292378	92039	NO_2	YES	0	1	NO	1.7
DT17	Carder's Court, Shilhay	Roadside	291699	92091	NO_2	NO	0	15	NO	1.7
DT18	Rear of Gervase Avenue	Roadside	291657	91973	NO_2	YES	5	5	NO	2
DT19	Alphington Street	Kerbside	291669	91812	NO_2	YES	0	1	NO	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
DT20	Alphington Road inbound	Roadside	291532	91349	NO_2	YES	0	2	NO	1.7
DT21	Queen's Road	Urban Background	291460	91390	NO_2	NO	8	2	NO	1.7
DT22	Alphington Road outbound	Roadside	291509	91151	NO_2	YES	0	8	NO	1.7
DT23	Alphington Road outer	Roadside	291518	90813	NO_2	YES	15	2	NO	1.7
DT24	Church Road Alphington	Roadside	291691	90425	NO_2	YES	0	1.5	NO	1.7
DT25	Church Road II	Kerbside	291767	90160	NO_2	YES	0	1	NO	1.7
DT26	Alphington Cross	Roadside	291520	90531	NO_2	YES	0	1.8	NO	1.7
DT27	Cowick Street (Cowick Lane)	Kerbside	290864	91725	NO_2	YES	0	1	NO	1.7
DT28	Cowick Street (inbound)	Roadside	291249	91874	NO_2	YES	0	4	NO	1.7
DT29	Cowick Street (outbound)	Roadside	291376	91944	NO_2	YES	0	1.5	NO	1.7
DT30	Cowick Street (Exe Bridges)	Roadside	291500	92055	NO_2	YES	0	2	NO	1.7
DT31	Okehampton Street	Roadside	291351	92169	NO_2	YES	0	4	NO	1.7
DT32	Station Road	Roadside	290830	96598	NO_2	NO	0	2.1	NO	1.7
DT33	Bonhay Road (St Clements Lane)	Roadside	291253	93299	NO_2	YES	0	2	NO	2
DT34	Red Cow Village	Kerbside	291242	93483	NO_2	YES	0	1	NO	1.7
DT35	Red Cow II	Kerbside	291272	93468	NO_2	YES	0	1	NO	1.7
DT36	Cowley Bridge Road	Roadside	291054	94399	NO_2	YES	0	4	NO	1.7
DT37	Pennsylvania Road	Roadside	292391	93291	NO_2	NO	0	1	NO	1.7
DT38	York Road School	Roadside	292469	93245	NO_2	NO	3.5	2.5	NO	1.7
DT39	York Road	Kerbside	292579	93146	NO_2	NO	1.5	0	NO	1.7

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
DT40	Union Road	Roadside	293047	93877	NO_2	NO	0	1	NO	1.7
DT41	Pinhoe Road inbound	Roadside	293405	93395	NO_2	YES	0	3	NO	1.7
DT42	Pinhoe Road (Polsloe Road)	Kerbside	293251	93375	NO_2	YES	0	1	NO	1.7
DT43	Blackboy Road (Polsloe Road)	Roadside	293227	93356	NO_2	YES	0	2	NO	1.7
DT44	Beacon Heath	Kerbside	295068	94487	NO_2	NO	10	1	NO	1.7
DT45	Venny Bridge	Kerbside	295888	94101	NO_2	NO	10	0.2	NO	1.7
DT46	Pinhoe	Kerbside	296418	94470	NO_2	NO	1	0	NO	1.7
DT47	Langaton Lane	Urban Background	296984	94327	NO_2	NO	20	0	NO	1.7
DT48	Pinn Lane	Roadside	296494	93782	NO_2	NO	10	1.5	NO	2
DT49	Pinhoe Road (Fairfield Avenue)	Roadside	295413	93689	NO_2	YES	0	5	NO	1.7
DT50	East John Walk	Urban Background	293091	92825	NO_2	NO	1.5	N/A	NO	1.7
DT51	Magdalen Road (Barrack Road)	Kerbside	293448	92419	NO_2	YES	0	1	NO	1.7
DT52	Livery Dole	Roadside	293418	92497	NO_2	YES	0	1.5	NO	1.7
DT53	Rowancroft	Kerbside	293533	92473	NO_2	YES	0	0.2	NO	2
DT54	Salutary Mount	Roadside	293738	92396	NO_2	YES	4.5	1.5	NO	1.7
DT55	Fore Street Heavitree outbound	Roadside	293781	92409	NO_2	YES	8	4	NO	1.7
DT56	Fore Street Heavitree inbound	Roadside	294043	92359	NO_2	YES	0	2	NO	1.7
DT57	East Wonford Hill	Roadside	294410	92310	NO_2	YES	0	2	NO	1.7
DT58	Honiton Road	Roadside	295203	92378	NO_2	YES	13	1.5	NO	1.7
DT59	Honiton Road façade	Roadside	295191	92395	NO_2	NO	0	15	NO	1.7

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
DT60	Sidmouth Road lamp post	Roadside	295466	92365	NO_2	YES	6	1.5	NO	2
DT61	Sidmouth Road Middlemoor	Roadside	295636	92232	NO_2	YES	0	10	NO	1.7
DT62	Newcourt Way	Roadside	295710	90571	NO_2	NO	20	1.5	NO	2
DT63	Topsham Road (Countess Wear)	Roadside	294694	90001	NO_2	YES	0	5	NO	2
DT64	Bridge Road (Countess Wear)	Roadside	294652	89974	NO_2	NO	0	15	NO	1.7
DT65	High Street Topsham	Kerbside	296415	88477	NO_2	NO	0	1	NO	1.7
DT66	Topsham Road (Tollards Road)	Roadside	294227	90435	NO_2	YES	0	1.5	NO	1.7
DT67	Topsham Road (Barrack Road)	Roadside	293213	91245	NO_2	YES	0	10	NO	1.7

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2017 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2013	2014	2015	2016	2017
CM1	Kerbside	Automatic		95%	32	31	28	30.5	27.7
DT1	Kerbside	Diffusion Tube		100%	28.7	29.9	25	26.8	28.0
DT2	Kerbside	Diffusion Tube		100%			24.8	25.5	25.9
DT3	Kerbside	Diffusion Tube		83%	30	28.1	26.5	26.3	26.5
DT4	Kerbside	Diffusion Tube		83%	27.2	26	21.6	23.2	24.3
DT5	Kerbside	Diffusion Tube		100%	32.5	30.6	29.6	29.6	27.7
DT6	Kerbside	Diffusion Tube		100%	32.7	31.1	28.9	29.5	27.9
DT7	Roadside	Diffusion Tube		100%	27.3	29.2	25	25.2	24.4
DT8	Kerbside	Diffusion Tube		100%	**40**	39.8	34.8	33.4	35.7
DT9	Roadside	Diffusion Tube		100%	34.8	33.6	30.6	31.1	31.5
DT10	Kerbside	Diffusion Tube		100%	32.4	34.1	28.3	29.6	31.0
DT11	Kerbside	Diffusion Tube		100%	31.7	31.5	27.6	28.1	29.2
DT12	Kerbside	Diffusion Tube		92%	33.9	31.9	28	30.1	31.8
DT13	Roadside	Diffusion Tube		100%	24.8	22.1	20.5	22.5	20.8
DT14	Roadside	Diffusion Tube		100%	23.2	21.7	19.6	21.0	19.6
DT15	Kerbside	Diffusion Tube		100%	39.6	38.8	33.5	36.4	34.1
DT16	Kerbside	Diffusion Tube		100%	39.2	35.9	28.8	33.4	31.3
DT17	Roadside	Diffusion Tube		100%	24.1	23.5	20.5	22.4	22.0
DT18	Roadside	Diffusion Tube		92%	24.7	26.6	23.7	23.4	23.4
DT19	Kerbside	Diffusion Tube		92%	**45.8**	**44.4**	35.2	**40.3**	**40.8**
DT20	Roadside	Diffusion Tube		100%	35.7	36.3	32.5	32.9	33.9
DT21	Urban Background	Diffusion Tube		100%	15.3	15.2	12.8	14.2	13.7
DT22	Roadside	Diffusion Tube		100%	29.6	30.7	25.3	27.5	26.8

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2017 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2013	2014	2015	2016	2017
DT23	Roadside	Diffusion Tube		100%	31.2	28.6	22.3	24.8	23.4
DT24	Roadside	Diffusion Tube		92%	26	26.4	24.1	25.8	29.1
DT25	Kerbside	Diffusion Tube		100%	29.6	29.1	26.9	26.9	25.6
DT26	Roadside	Diffusion Tube		83%					32.7
DT27	Kerbside	Diffusion Tube		100%	**47.7**	**45.4**	36.4	37.0	37.0
DT28	Roadside	Diffusion Tube		92%	24.7	24.6	20.5	23.0	20.7
DT29	Roadside	Diffusion Tube		83%	38.6	**40.8**	34	33.6	33.6
DT30	Roadside	Diffusion Tube		100%	35.6	35.7	32.4	31.7	32.0
DT31	Roadside	Diffusion Tube		100%	27.8	26.5	23.7	24.3	24.6
DT32	Roadside	Diffusion Tube		100%					27.1
DT33	Roadside	Diffusion Tube		100%	32.6	31.5	27.2	29.4	28.7
DT34	Kerbside	Diffusion Tube		100%	**40.8**	**42.7**	36.1	37.7	38.0
DT35	Kerbside	Diffusion Tube		100%	34	36.8	32	31.7	31.9
DT36	Roadside	Diffusion Tube		92%	36.4	38.3	33.2	31.5	32.3
DT37	Roadside	Diffusion Tube		100%	31.2	31.3	25.6	28.0	26.7
DT38	Roadside	Diffusion Tube		100%			27.9	29.1	28.4
DT39	Kerbside	Diffusion Tube		100%	37.3	38.8	32	36.2	37.6
DT40	Roadside	Diffusion Tube		100%	31.2	32.1	22.3	26.4	24.0
DT41	Roadside	Diffusion Tube		100%	34.1	37.7	30.6	31.2	30.2
DT42	Kerbside	Diffusion Tube		92%	**48.4**	**48.3**	**42.1**	**42.1**	**41.2**
DT43	Roadside	Diffusion Tube		92%	32.9	33.4	29.2	30.9	29.2
DT44	Kerbside	Diffusion Tube		92%	17.3	19	17.5	19.7	19.7
DT45	Kerbside	Diffusion Tube		100%				18.8	18.5
DT46	Kerbside	Diffusion Tube		75%	35.9	38.4	24.9	27.4	23.3
DT47	Urban Background	Diffusion Tube		100%	17.7	18.7	16.7	18.1	15.7

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2017 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2013	2014	2015	2016	2017
DT48	Roadside	Diffusion Tube		92%				17.4	17.2
DT49	Roadside	Diffusion Tube		92%	20.7	20.2	18.5	19.7	18.9
DT50	Urban Background	Diffusion Tube		100%	15	15.7	13.9	15.3	14.5
DT51	Kerbside	Diffusion Tube		100%	**43.1**	**40.4**	37.2	36.9	37.2
DT52	Roadside	Diffusion Tube		92%	**49.3**	**52**	**48.8**	**46.8**	**49.9**
DT53	Kerbside	Diffusion Tube		100%	**41.6**	**42.5**	38.2	39.8	**43.5**
DT54	Roadside	Diffusion Tube		83%	39.3	39.5	35.5	**49.7**	**52.7**
DT55	Roadside	Diffusion Tube		100%	29.2	30.3	29.5	31.4	30.0
DT56	Roadside	Diffusion Tube		100%	**46.2**	**48.5**	38.6	38.5	**40.9**
DT57	Roadside	Diffusion Tube		100%	**60.8**	**64.2**	**59.2**	**57.9**	**59.0**
DT58	Roadside	Diffusion Tube		100%	**53.9**	**58.4**	**42.7**	**49.9**	**49.3**
DT59	Roadside	Diffusion Tube		100%	20.9	21.9	18.4	20.1	19.7
DT60	Roadside	Diffusion Tube		92%	34.6	35.3	31.4	35.0	35.8
DT61	Roadside	Diffusion Tube		100%	23.8	24	21.2	22.0	23.3
DT62	Roadside	Diffusion Tube		92%				17.8	20.2
DT63	Roadside	Diffusion Tube		100%	27.3	29	26.3	24.6	25.0
DT64	Roadside	Diffusion Tube		100%	22.5	21.6	19.3	20.5	19.9
DT65	Kerbside	Diffusion Tube		92%	26.6	26.1	21.6	24.3	26.9
DT66	Roadside	Diffusion Tube		92%	38.1	**40.2**	36.6	34.9	35.4
DT67	Roadside	Diffusion Tube		100%	26.9	27.6	24.1	25.0	23.4

☒ **Diffusion tube data has been bias corrected**

☒ **Annualisation has been conducted where data capture is <75%**

☐ **If applicable, all data has been distance corrected for relevant exposure (following guidance from the LAQM helpdesk that distance corrections should not be presented here, but in B.1)**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

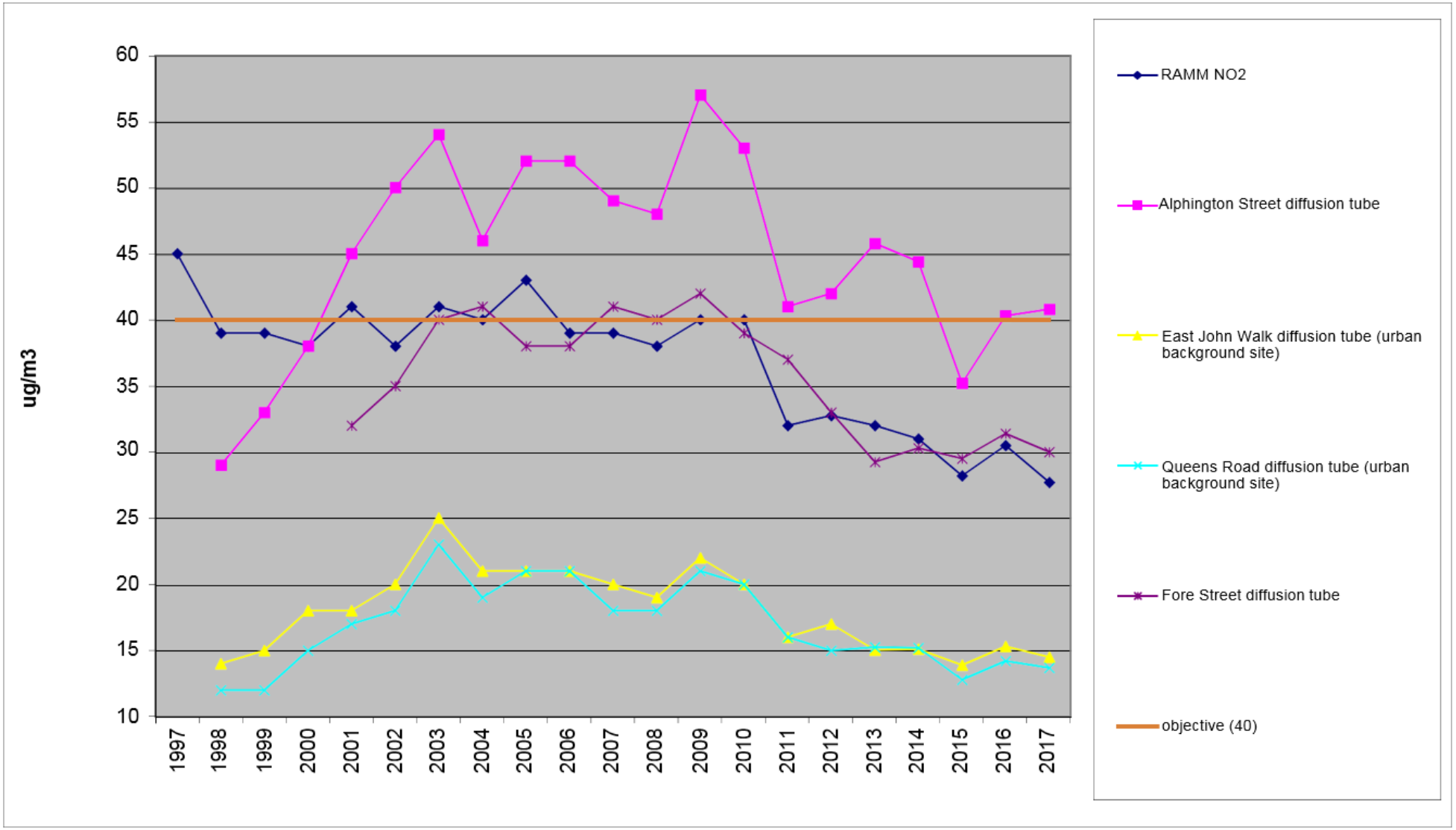


Figure A.1 – Trends in Annual Mean NO_2 Concentrations

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2013	2014	2015	2016	2017
CM1	Kerbside	Automatic		95%	0	0(109)	0	0	0

Notes:

Exceedances 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) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} Annual Mean Concentration (µg/m³) (3)				
				2013	2014	2015	2016	2017
CM1	Kerbside		94	22	20	19	15	18
CM2	Roadside		94	21	20	19	15	19

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the PM_{10} annual mean objective of 40µg/m³ are shown in **bold.**

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

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

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

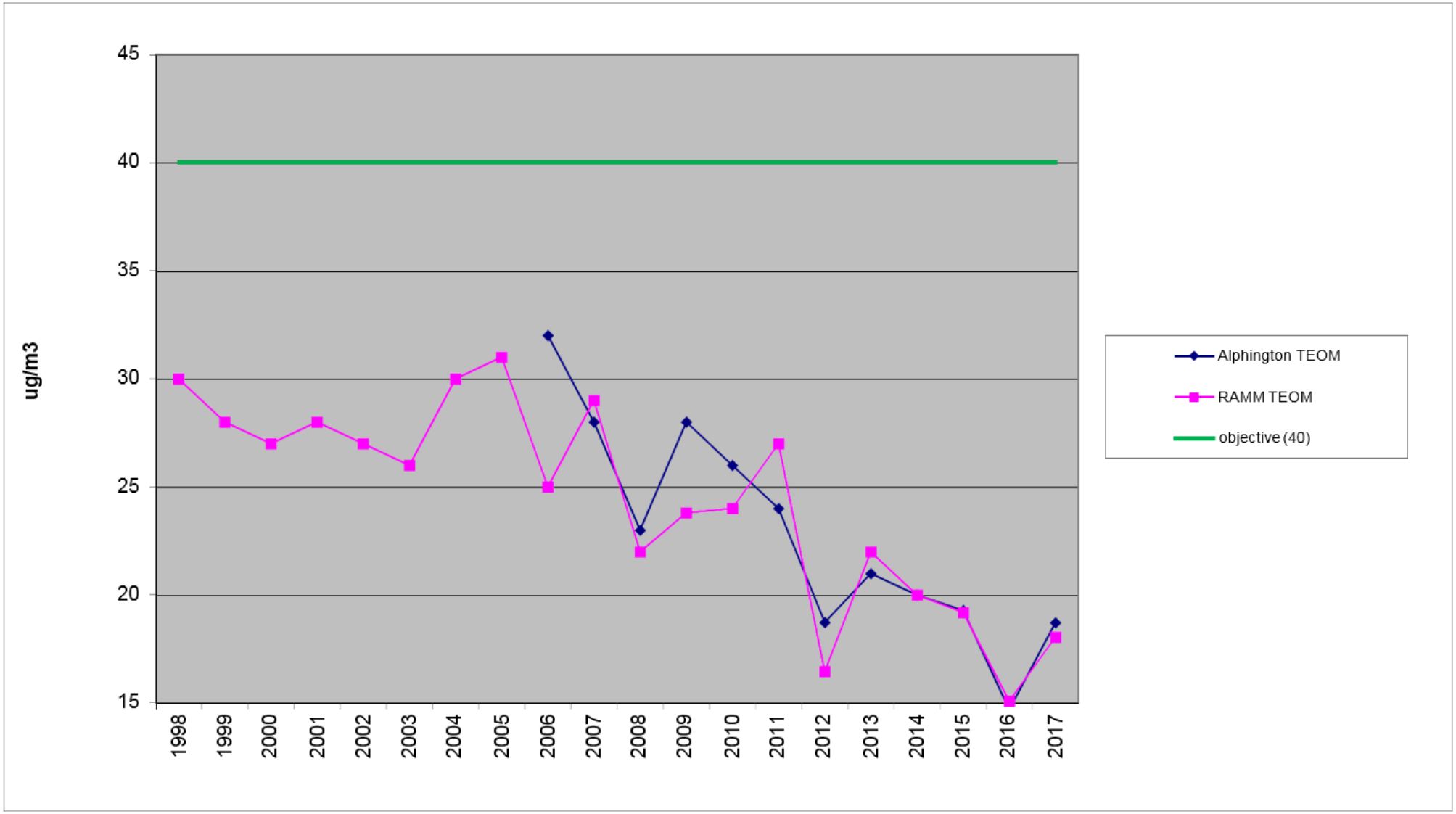


Figure A.2 – Trends in Annual Mean PM_{10} Concentrations

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} 24-Hour Means > 50µg/m³ (3)				
				2013	2014	2015	2016	2017
CM1	Kerbside		94	8	2	6	0	1
CM2	Roadside		94	3	2	6 (29.5)	0 (23.7)	2

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times/year) are shown in **bold.**

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

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

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2017

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.85) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
DT1	47.81	29.37	33.51	32.19	33.15	30.17	28.66	30.04	26.81	31.07	35.76	37.32	33.0	28.0	17
DT2	40.53	34.58	32.45	27.05	28.82	19.16	25.31	27.86	25.47	29.44	33.84	41.23	30.5	25.9	n/a
DT3	41.03	38.40		27.03	27.58	27.10	24.86	26.76	28.39	33.14		37.91	31.2	26.5	n/a
DT4	41.35	32.63	26.91	24.21	27.51	22.22		21.85		25.98	32.63	30.51	28.6	24.3	n/a
DT5	46.50	37.36	31.66	29.17	29.50	25.90	18.90	28.38	31.75	35.41	37.59	39.15	32.6	27.7	n/a
DT6	45.78	38.51	29.75	32.72	31.30	22.39	25.36	27.88	31.63	33.02	39.15	36.06	32.8	27.9	n/a
DT7	38.33	24.26	29.67	26.52	31.96	26.02	24.73	25.74	25.03	30.17	30.10	31.39	28.7	24.4	n/a
DT8	42.41	42.53	39.34	40.31	37.50	36.57	37.16	39.79	42.93	42.08	52.31	51.44	42.0	35.7	n/a
DT9	49.66	41.43	33.91	33.95	31.03	27.55	31.59	35.38	35.96	36.15	43.20	45.55	37.1	31.5	27.4
DT10	44.40	40.99	35.09	33.26	33.53	31.04	34.82	30.77	31.29	37.40	39.90	45.74	36.5	31.0	n/a
DT11	47.09	38.32	35.45	32.92	27.99	26.65	26.46	29.17	34.17	33.57	37.36	43.02	34.3	29.2	22.7
DT12	50.40	40.37	40.75	37.05	31.80	27.38	28.23	31.18	28.71		46.68	48.38	37.4	31.8	n/a
DT13	37.78	28.16	26.08	22.46	22.88	16.75	14.83	17.59	20.50	23.51	30.20	32.79	24.5	20.8	n/a
DT14	35.67	25.99	23.91	23.18	21.83	17.27	15.80	18.33	18.63	20.51	27.72	28.17	23.1	19.6	n/a
DT15	52.88	42.33	43.91	39.76	41.77	30.79	33.94	34.78	35.74	34.96	42.64	47.21	40.1	34.1	n/a
DT16	49.01	39.70	36.58	36.66	33.02	25.34	27.66	34.92	36.23	36.78	44.66	41.74	36.9	31.3	n/a
DT17	34.22	27.07	25.18	24.96	18.34	19.71	19.36	24.62	24.86	25.22	32.75	33.75	25.8	22.0	n/a

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.85) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
DT18	33.83	29.47	27.64	24.95		21.45	22.58	24.05	26.34	26.63	32.84	33.13	27.5	23.4	21.4
DT19	63.54	47.35	49.69	49.37	44.71		42.14	45.52	41.84	44.98	48.12	50.96	48.0	40.8	n/a
DT20	51.52	41.11	47.62	36.71	35.46	36.57	29.51	37.35	32.64	39.17	44.15	46.10	39.8	33.9	n/a
DT21	29.31	22.30	16.08	12.49	13.86	11.65	9.96	11.94	11.75	15.41	19.88	18.16	16.1	13.7	13.7
DT22	44.19	34.84	35.43	31.24	28.95	28.33	27.57	27.05	26.10	31.14	33.77	29.95	31.5	26.8	n/a
DT23	40.94	30.57	27.82	25.36	33.18	26.46	22.56	21.61	20.13	29.27	27.28	25.22	27.5	23.4	18.5
DT24	42.37	38.14	39.44	30.58	30.59	28.53	22.83	31.35	32.99		40.02	40.02	34.3	29.1	n/a
DT25	44.45	34.30	29.79	28.08	26.17	22.40	26.57	25.51	24.63	29.24	35.46	34.43	30.1	25.6	n/a
DT26	45.91	40.75		38.52	34.40	32.26	31.55		36.28	35.49	43.70	45.60	38.4	32.7	n/a
DT27	55.28	48.27	45.21	36.87	44.48	45.03	33.39	39.54	38.97	48.88	41.81	45.04	43.6	37.0	n/a
DT28	35.07	26.94		24.24	24.44	20.45	19.24	20.47	20.79	24.49	24.31	27.57	24.4	20.7	n/a
DT29	48.84	44.00	42.08	39.31			38.12	35.55	34.72	30.09	37.95	44.20	39.5	33.6	n/a
DT30	49.90	41.11	38.09	40.46	31.28	31.71	31.29	36.33	33.27	33.85	42.67	42.03	37.7	32.0	n/a
DT31	39.09	32.18	29.82	26.77	27.13	24.22	23.30	25.84	26.41	29.15	31.51	32.34	29.0	24.6	n/a
DT32	37.99	34.28	33.05	27.80	35.21	28.75	26.89	27.47	27.85	32.15	33.86	36.94	31.9	27.1	n/a
DT33	46.67	37.86	37.31	35.14	26.57	25.19	27.65	30.68	30.96	33.55	39.95	33.48	33.8	28.7	n/a
DT34	54.78	48.36	47.59	43.47	43.34	43.08	40.42	40.20	40.58	43.97	46.17	45.10	44.8	38.0	n/a
DT35	48.75	40.04	40.44	39.46	32.23	28.91	30.73	32.64	36.23	36.54	42.40	41.67	37.5	31.9	n/a
DT36		43.29	43.63	37.68	36.08	36.56	31.87	33.14	35.52	35.22	43.54	42.04	38.1	32.3	n/a
DT37	45.76	40.25	34.94	26.32	31.15	23.77	24.73	24.61	24.72	33.09	34.69	33.50	31.5	26.7	n/a
DT38	42.12	32.98	34.94	31.62	28.54	27.40	28.37	30.24	30.53	32.26	41.82	40.12	33.4	28.4	25.4
DT39	67.20	48.46	44.52	40.32	42.06	30.95	36.07	35.77	40.09	40.04	55.80	49.64	44.2	37.6	29
DT40	45.61	34.50	32.19	24.96	26.75	23.54	21.46	22.10	20.73	26.69	30.40	29.30	28.2	24.0	n/a

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.85) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
DT41	48.32	42.32	38.11	28.91	33.37	28.09	28.69	32.51	29.18	35.89	39.84	41.44	35.6	30.2	n/a
DT42	70.27	53.09	56.55		27.59	46.68	46.92	40.92	37.53	48.71	52.54	52.39	48.5	**41.2**	n/a
DT43	45.15	38.18	34.89	34.00	28.55	24.85	23.65		37.54	30.63	38.40	41.87	34.3	29.2	n/a
DT44	33.96	27.10	24.12	20.71	18.72	16.03	17.10	17.81		24.64	27.13	28.23	23.2	19.7	17.2
DT45	34.14	25.23	22.34	18.66	18.48	16.70	16.53	18.27	17.93	21.71	26.36	25.44	21.8	18.5	16.1
DT46				24.79	21.15	22.16	22.72	24.92	24.96	29.81	36.67	39.80	27.4	23.3	20.5
DT47	25.82	24.04	20.43	12.49	18.81	15.03	14.03	15.79	13.90	19.55	20.77	21.58	18.5	15.7	14.8
DT48	34.61	31.28		16.76	16.03	13.90	12.16	15.25	16.20	19.01	23.05	24.01	20.2	17.2	16
DT49	33.07	27.55	22.88		19.88	15.78	13.39	19.40	16.77	20.71	28.80	25.80	22.2	18.9	n/a
DT50	31.91	22.70	17.37	13.59	13.51	11.41	10.75	13.33	12.17	16.77	22.25	19.47	17.1	14.5	14.5
DT51	71.16	50.85	52.39	40.42	41.59	31.85	32.72	31.63	31.81	37.05	55.03	48.16	43.7	37.2	n/a
DT52	70.79	63.39	65.71	55.23	51.15	38.35	52.46	49.60		65.79	67.73	65.72	58.7	**49.9**	n/a
DT53	62.59	49.10	50.76	49.12	44.89	51.70	40.42	39.53	42.46	62.51	71.66	49.82	51.2	**43.5**	n/a
DT54	74.45	63.10	54.25	49.80		67.40	51.94		55.97	70.18	66.24	66.41	62.0	**52.7**	**41.1**
DT55	51.83	40.73	35.47	36.33	32.45	28.14	25.69	32.10	34.90	32.66	43.00	30.87	35.3	30.0	25.2
DT56	58.64	55.02	53.63	39.73	45.15	44.16	43.06	41.30	41.06	56.98	46.45	51.54	48.1	**40.9**	n/a
DT57	87.25	73.04	77.80	63.69	66.77	51.55	63.17	71.28	58.59	66.21	77.97	76.32	69.5	**59.0**	n/a
DT58	72.82	56.09	68.43	51.13	53.44	49.66	53.82	45.16	50.54	64.74	64.11	66.55	58.0	**49.3**	32
DT59	34.64	25.58	22.33	21.24	22.37	18.47	16.17	20.28	19.36	21.42	27.53	28.30	23.1	19.7	n/a
DT60	59.03	45.96	47.72	35.85	41.38	32.34	35.27	41.28		38.62	42.94	43.34	42.2	35.8	28.3
DT61	41.29	31.25	26.89	25.31	25.83	21.55	21.66	23.36	23.94	25.97	32.05	29.41	27.4	23.3	n/a
DT62	37.17	24.01	21.66	20.63	19.25		16.93	19.65	24.68	22.10	29.85	25.40	23.8	20.2	16.9
DT63	39.06	34.17	30.27	26.78	25.41	25.87	25.63	27.24	19.37	29.00	34.54	36.19	29.5	25.0	n/a

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.85) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
DT64	34.32	26.58	21.92	22.43	19.42	16.78	15.49	13.30	29.56	20.09	33.17	27.25	23.4	19.9	n/a
DT65	40.33	36.24		29.34	30.45	22.30	22.31	26.18	41.91	28.33	38.32	32.89	31.7	26.9	n/a
DT66	56.52	49.22	41.03	38.46	38.32		30.68	41.67	21.56	41.45	51.05	47.91	41.6	35.4	n/a
DT67	37.96	34.78	28.40	26.38	27.86	24.75	20.41	23.78	17.86	27.22	31.55	28.84	27.5	23.4	n/a

☒ **Local bias adjustment factor used**

☐ **National bias adjustment factor used**

Annualisation has been conducted where data capture is <75%

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

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

(2) Distance corrected to nearest relevant public exposure.

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

C.3 – Air Quality Monitoring Data QA/QC

Diffusion Tube Bias Adjustment Factors - National Factor

The national bias adjustment factor of 0.89 has been obtained from the spreadsheet version 03/18, for Gradko diffusion tubes (20% TEA in water).

Factor from Local Co-location Studies

The precision and local bias factor (0.85) for the co-located diffusion tubes at Exeter Roadside (RAMM Queen Street) has been calculated using the spreadsheet shown as Figure C.4.1 below.

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	04/01/2017	31/01/2017	46.50	45.78		46	0.5	1	4.6
2	31/01/2017	01/03/2017	37.36	38.51		38	0.8	2	7.3
3	01/03/2017	30/03/2017	31.66	29.75		31	1.4	4	12.1
4	30/03/2017	25/04/2017	29.17	32.72		31	2.5	8	22.6
5	25/04/2017	01/06/2017	29.50	31.30		30	1.3	4	11.4
6	01/06/2017	29/06/2017	25.90	22.39		24	2.5	10	22.3
7	29/06/2017	03/08/2017	18.90	25.36		22	4.6	21	41.0
8	03/08/2017	29/08/2017	28.38	27.88		28	0.4	1	3.2
9	29/08/2017	26/09/2017	31.75	31.63		32	0.1	0	0.8
10	26/09/2017	31/10/2017	35.41	33.02		34	1.7	5	15.2
11	31/10/2017	05/12/2017	37.59	39.15		38	1.1	3	9.9
12	05/12/2017	03/01/2018	39.15	36.06		38	2.2	6	19.6
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
41.20	100.00	Good	Good
32.70	99.70	Good	Good
27.40	99.40	Good	Good
28.10	99.50	Good	Good
29.40	99.70	Good	Good
17.80	99.70	Good	Good
19.20	96.90	Poor Precision	Good
19.60	99.80	Good	Good
21.90	99.60	Good	Good
26.50	99.80	Good	Good
39.00	99.30	Good	Good
32.00	99.60	Good	Good
	Overall survey -->	Good precision	Good Overall DC

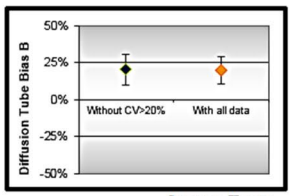
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: RAMM (Exeter Roadside)

Precision: 11 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A 0.85 (0.78 - 0.94)
Bias B 17% (7% - 28%)
Diffusion Tubes Mean: 34 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 29 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 29 (26 - 32) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 0.85 (0.79 - 0.93)
Bias B 17% (8% - 27%)
Diffusion Tubes Mean: 33 µgm^{-3}
Mean CV (Precision): 6
Automatic Mean: 28 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 28 (26 - 30) µgm^{-3}



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Version 03 - November 2006

Figure C.4.1 Diffusion Tube Precision and Accuracy

Discussion of Choice of Factor to Use

Data from the tubes are ratified and suspect data is rejected by Exeter City Council, following the procedure in the DEFRA practical guidance. Analysis of the data from the two tubes that are co-located with the continuous analyser shows that these have

overall good precision and a bias factor of 0.85 (Figure C.4.1). This means that the Exeter diffusion tubes over-estimate actual concentrations when compared to the reference method. The nationally collated bias adjustment factor is similar, at 0.89.

Results calculated using the Exeter factor are used in this report because the data capture at Exeter RAMM is over 90%, and it is thought to be more representative of local conditions.

QA/QC of Automatic Monitoring

Neither of the two TEOMs are part of the national network, however recommended QA/QC procedures from the AURN Local Site Operator's manual are followed, including the filter change frequency and methodology. Horiba also service each analyser every six months. Data capture at the RAMM site and Alphington Street site was over 94% in 2017.

The PM_{10} data is collected, validated and ratified by Exeter City Council. Validation involves checking the data daily for instrumentation errors etc. and then visually screening the data on a weekly basis to mark any obviously spurious or unusual measurements. The Council also undertakes data ratification on an approximately three monthly basis as well as following site services. This involves:

- Comparison of data with other pollutants and other appropriate AURN network sites (roadside sites and other sites in the south west),
- Final checking and deletion of data marked as possibly erroneous,
- Removal of data from unrepresentative periods of operation (e.g. road works in immediate vicinity of site etc where data is shown or believed to have been affected),
- Adjustment for issues identified during services etc.

Both the PM_{10} analysers are TEOMs. The TEOM method of measuring particulates has failed the EC equivalence test, however advice from DEFRA is that Local Authorities do not need to replace TEOMs unless PM_{10} concentrations are close to the objective level. In Exeter, previous reports have not found that the objective level for particulates is likely to be exceeded and therefore the two TEOMs are still being used. They are to be replaced in spring 2018. In the meantime, the data has been

adjusted for volatiles using the online Volatile Correction Model tool from Kings College, London.

The NO_2 data from Exeter Roadside is collected and ratified by the AURN. Network data from the site can be found at http://uk-air.defra.gov.uk/data/. It is ratified every 3 months by NETCEN, and is reported in the QA / QC Data Ratification Report for the Automatic Urban Network. Data capture from the NO_2 analyser was 95% in 2017.

Plots of hourly average values for nitrogen dioxide and particulate matter are shown below in figures C.4.2 and C.4.3.

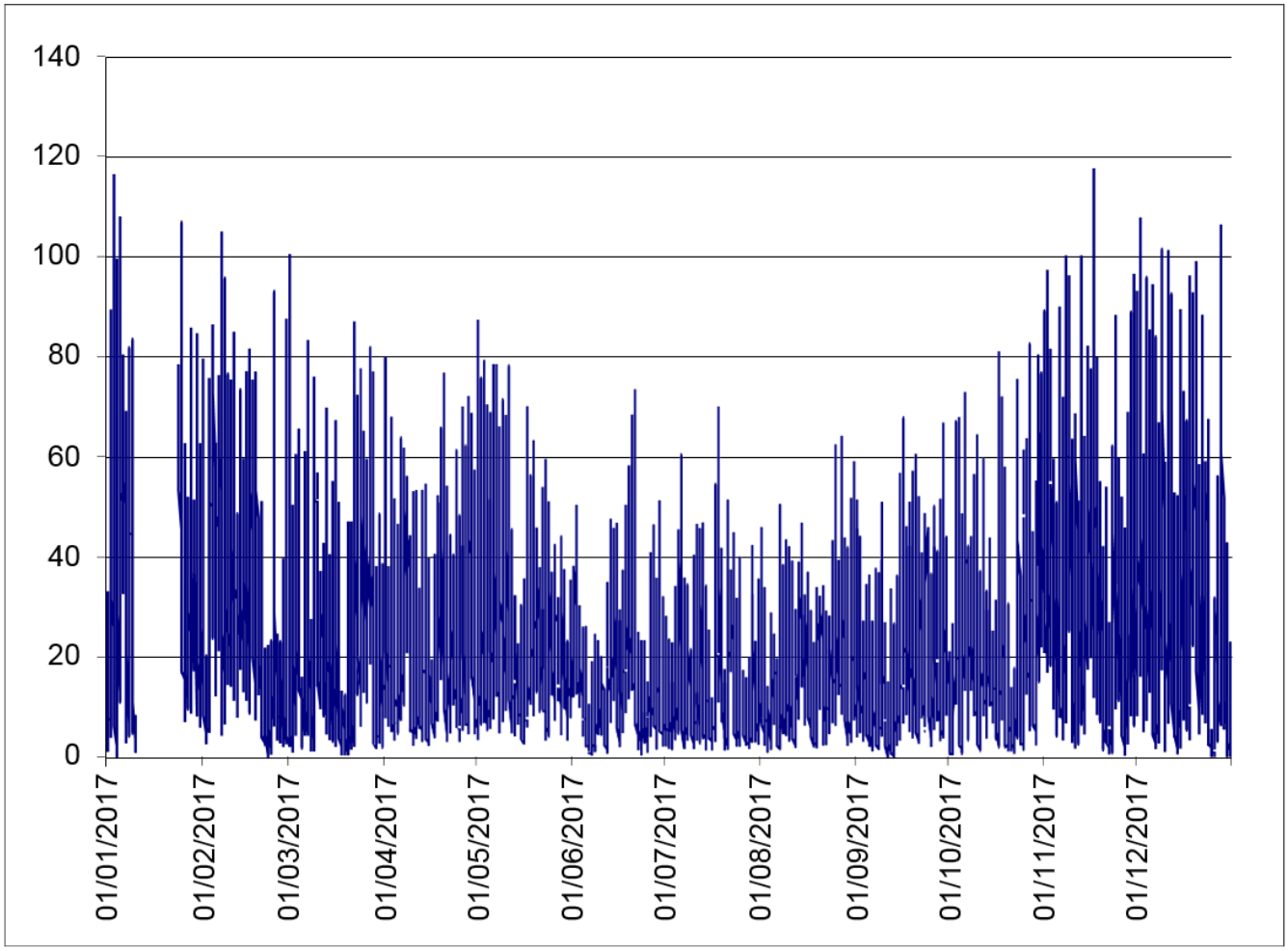

Figure C.4.2 Hourly NO_2 data from Exeter Roadside (RAMM) ($\mu g/m^3$)

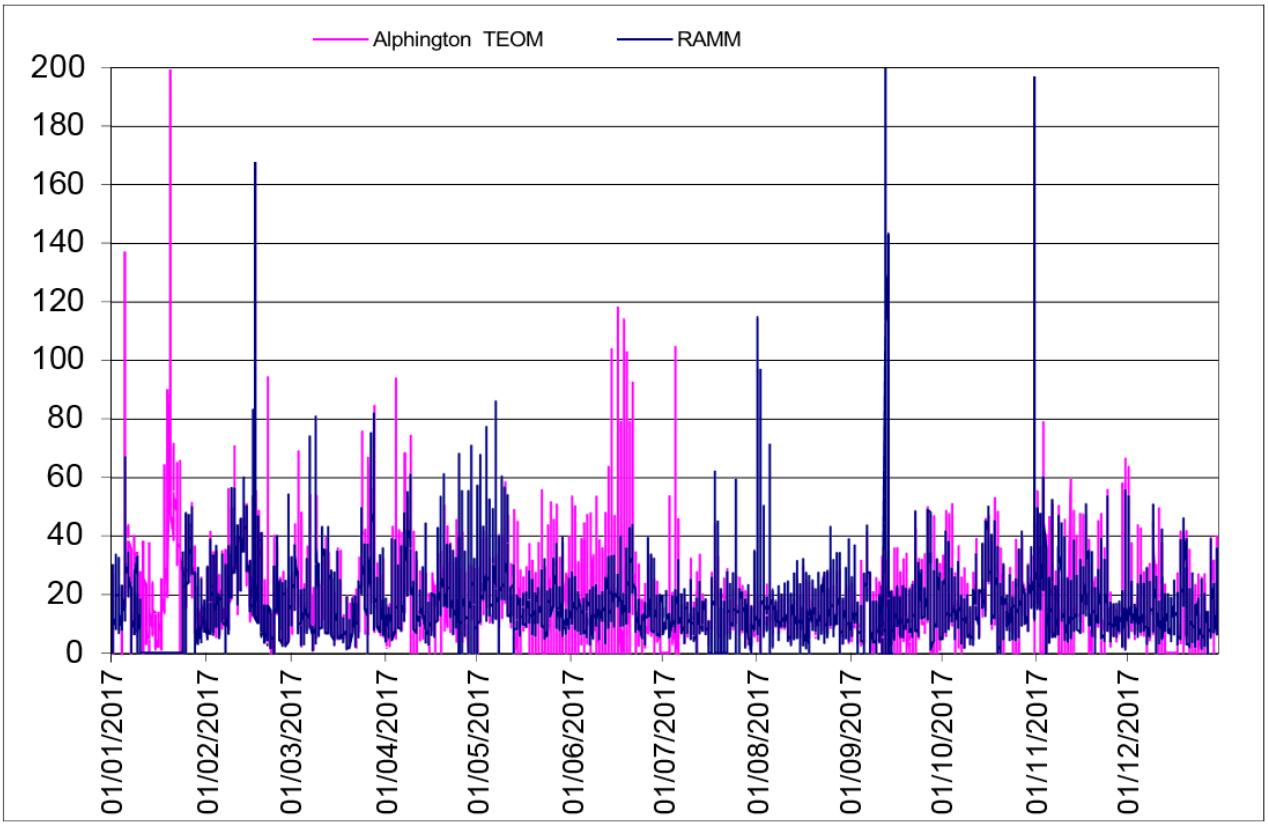

Figure C.4.3 Hourly PM_{10} data from Exeter Roadside (RAMM) and Alphington Street ($\mu g/m^3$)

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied by GRADKO[4] and are prepared using 20% TEA in water. The GRADKO lab follows the procedures set out in the Harmonisation Practical Guidance. The performance of the laboratory is rated as satisfactory in the centralised AIR NO_2 PT scheme for quality assurance and quality control.

The tube exposure period used follows the timetable provided by the Air Quality Support Helpdesk, i.e. an exposure time of 4 or 5 weeks, with an allowed variation in exposure time of $\pm$ 2 days. The tubes are stored in a fridge before they are exposed. Location sites and fixings follow the recommendations in the DEFRA practical guidance on the use of diffusion tubes for NO_2 monitoring, published in 2008. Two tubes are collocated with the continuous analyser at the Royal Albert Memorial Museum (RAMM), Queen Street (Exeter Roadside).

Data from the tubes are ratified and suspect data rejected by Exeter City Council, following the procedure in the DEFRA practical guidance. Analysis of the data from

[4] GRADKO International Ltd., St. Martins House, 77 Wales Street, Winchester, Hants. SO23 0RH

the two tubes that are co-located with the continuous analyser shows that these have overall good precision.

The full monthly dataset is shown in Table B.1 above.

Appendix D: Map(s) of Monitoring Locations and AQMAs

This is included as a separate document

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[5]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[5] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority 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
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
EV	Electric Vehicle
FDMS	Filter Dynamics Measurement System
GESP	Greater Exeter Strategic Plan
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
RTI	Real Time Information
SUMP	Sustainable Urban Mobility Plan
ULEV	Ultra Low Emission Vehicle
ZEV	Zero Emission Vehicle

References

Exeter City Council 2011. Exeter Air Quality Action Plan 2011-2016.
https://exeter.gov.uk/airpollution/

Exeter City Council 2017. Exeter Air Quality Annual Status Report.
https://exeter.gov.uk/airpollution/

Exeter City Council 2018. Draft Air Quality QAction Plan.
http://exeter.gov.uk/aqap

Local Air Quality Management Technical Guidance 2016 - LAQM.TG(16)

Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users 2008

National bias adjustment factor spreadsheet:
http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Tube precision spreadsheet:
www.airquality.co.uk/archive/laqm/tools/AEA_DifTPAB_v03.xls

Volatile Correction Model website:
http://www.volatile-correction-model.info/

Devon Local Transport Plans:
http://www.devon.gov.uk/index/transportroads/devon_local_transport_plan.htm

DEFRA 2015. DEFRA National Statistics Release; Emissions of air pollutants in the UK, 1970 to 2014