2020 Air Quality Annual Status Report (ASR)

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

July 2020

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Executive Summary: Air Quality in Our Area

Overview of Air Quality in Milton Keynes

The main findings and conclusions of this report are that in 2019 air quality objectives were achieved at all monitoring locations throughout the Borough. The annual mean nitrogen dioxide objective has not been exceeded in the Air Quality Management Area (AQMA) in Olney since 2015. It was intended to revoke the AQMA in 2019, however it is prudent to await the results of a complete year of automatic data from the new analysers and diffusion tubes. Expected revocation date will now be early 2021.

In February 2019 the council purchased replacement analysers and communication systems for the automatic monitoring stations. The analysers were supplied by Air Monitors, part of the ACOEM Group. A new addition at the Civic Offices monitoring station was a Palas Fidas 200E particle analyser that measures both PM_{10} and $PM_{2.5}$ simultaneously.

Electric Vehicles and Charging

In June 2019 the Milton Keynes Electric Vehicle Experience Centre (EVEC) welcomed its 100,000th visitor since it opened in July 2017 and has arranged more than 4000 test drives.

Milton Keynes has over 400 public charge points, the largest electric vehicle charging point networks in the country; full statistics of UK charge points are provided by Zap-Map and show how provision has increased markedly in the last year. Following the success of the Coachway charging hub, innovative charging trials are planned in 2020.

Launch of ViaVan on-demand electric fleet

ViaVan is an efficient on-demand service that transports passengers heading in the same direction in a shared vehicle (Mercedes-Benz Vito) reducing emissions and congestion. Trips are booked using a phone app and the service operates mainly within Milton Keynes picking up and dropping passengers off close to their destination.

ViaVan is introducing up to 30 all electric minibuses (Mercedes Vito eTourer) throughout the MK service area during 2020. The service is designed to deliver

public transport in areas where traditional larger buses are not commercially viable and require subsidy.

Figure 1 ViaVan Electric Fleet Vehicles

Expansion of Starship Robot delivery service

Following a successful trial period, delivery of food and small supermarket orders by electric powered Starship Technologies robots are becoming more common throughout Milton Keynes and surrounding areas. There are currently 98 robots in the fleet undertaking small shopping trips saving vehicle miles and reducing carbon dioxide emissions. Orders are placed with participating businesses using the Starship app and are securely delivered for a small charge (approx. £2).

Figure 2 Starship Robots outside Great Linford Co-op

Smart Parking

The Milton Keynes Business Improvement District (MK BID) has developed an app called MySpace that uses real time parking data and an interactive map to direct drivers to available car parking spaces. This reduces idling and driving around to find spaces saving on fuel and time. The app can also track the location of the free employee shuttle bus.

Cycling

The Council's "Get Cycling" program has a wealth of information on cycle routes and Redways, training (including adults), local groups and clubs, parking and changing facilities, and cycle hire including adapted bikes. The get smarter travel in MK website is packed full with up to date information on travel and transport in MK.

Milton Keynes is fortunate in having two public cycle hire schemes operating in Milton Keynes; Santander cycle hire and Lime-E bikes. Santander replaced the existing fleet with new cycles in 2019 and are picked up and dropped off at docking stations. Lime-E bikes are electric motor-assisted and can be left anywhere for the next person to use or for Lime engineers to locate by using GPS tracking. Both hire schemes work via a mobile phone app and can be used as pay as you go rental or by longer term subscription.

Mobility Strategy and Sustainability

In October 2019 the Transport Infrastructure Delivery Plan (TIDP) was published. The TIDP builds on the Mobility Strategy and sets out the transport vision for Milton Keynes, highlighting the challenges and opportunities. It addresses the transport infrastructure that needs to be delivered within the short and medium term to enable growth to come forward sustainably as well as supporting the existing local communities.

Sustainability Strategy 2019-2050 sets out the council's intention of being the Greenest City in the World; striving to be carbon neutral by 2030 and carbon negative by 2050. The strategy will mainly contribute towards improving air quality by reducing emissions from transport.

Air Quality in Milton Keynes

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].

The main source of oxides of nitrogen and particles is from road traffic emissions. An Air Quality Management Area (AQMA) was declared in 2008 in High Street South and Bridge Street, Olney because the annual mean nitrogen dioxide objective was being exceeded. There is a slight downward trend in the annual mean nitrogen dioxide (NO_2) and particulate matter (PM_{10}) concentrations measured over the last 15 years at the Civic Offices automatic monitoring station. This improvement is mirrored at the two other automatic monitoring stations located in Newport Pagnell and in Olney. Since 2015 the annual mean objective for NO_2 has not been exceeded at any monitoring location throughout the Borough, including within the AQMA.

In Milton Keynes Council (a unitary authority) air quality is managed jointly by Environmental Health, Transport Policy, Development Control, Public Health and Sustainability Departments. The Council also works in partnership with other local authorities in Buckinghamshire as a member of the Buckinghamshire Air Quality Management Group (BAQMG) and with the Environment Agency (East of England Region).

Actions to Improve Air Quality

Work has progressed well in 2019 converting the A421 into dual carriageway from Eagle Farm roundabout to junction 13 of the M1. It will ease congestion on this busy stretch of road (30,000 vehicles/day) and will include a cycleway and footway along its length.

[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

East West Rail is a scheme to re-establish a rail link between Oxford and Cambridge. The Western Section of the route (Oxford to Bedford) will be upgraded and disused sections reinstated. The scheme is being funded by the Department for Transport, with contributions from local councils. It is being delivered by Network Rail and could be operational in the early 2020s. Phase 2, Bicester to Bedford is being delivered by the East West Rail Alliance. Network Rail's Transport and Works Act Order application was approved in February 2020 allowing the major construction works to take place.

Conclusions and Priorities

All air quality objectives have been achieved throughout the Borough even though the city continues to grow rapidly. Priorities for the coming year are to continue promoting the use of ultra-low emission vehicles (ULEVs) and the initiatives in the MK Go Ultra Low City scheme. The public will also be encouraged to use public transport and to cycle and walk making full use of the extensive (325 km) Milton Keynes Redway system. The H6 Super Redway Route has been completed and work is in progress on the V8 route. The Redway map, including other cycling routes in Milton Keynes, has been enhanced, updated and delivered to every household in the Borough.

Actions and initiatives detailed in the governments' Clean Air Strategy 2019 (published January 2019) are designed to reduce emissions and air pollution leading to improved health and quality of life.

The new Local Plan for Milton Keynes, Plan:MK, covering the period up to 2031 was adopted by Milton Keynes Council on 20 March 2019. Details of the council's major developments, including a location map of sites can be found on the Planning Hub.

All applications for new developments that may have an impact on air quality have been assessed against the guidance documents produced by the Institute of Air Quality Management (IAQM).

Local Engagement How to Get Involved

The public can get involved by reducing their car usage; signing up to the Car Share scheme, changing to a car with lower emissions, walking and cycling and by using public transport.

There are lots of biking opportunities for all abilities and ages in Milton Keynes, including guided cycle rides, training for children and adults and the widely available Santander and Lime-E hire bikes. A new initiative funded jointly by MK Council and the Arts Council England, the Pedalling Culture project, is designed to increase cultural tourism by providing new trails and routes for walkers, runners and cyclists to ensure sustainable access to our cultural venues.

Milton Keynes Council's Highways and Transport Hub website has links to all the services provided by the council in this area, including parking, public transport, road safety, maintenance, new roads and smarter travel.

More information on sustainable forms of travel can be found on the interactive Get Smarter Travel MK website; plan a journey, find a bus stop, track a bus, join a bike ride, discover upcoming events.

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1 Local Air Quality Management

This report provides an overview of air quality in the Borough of Milton Keynes during 2019. 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 Milton Keynes 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 C.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 the objectives.

A summary of AQMAs declared by Milton Keynes 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=165.

Alternatively, see Appendix D: Maps of Monitoring Locations and AQMAs which provides a map of air quality monitoring locations in relation to the AQMA.

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		
						At Declaration		Now		Name	Date of Publication	Link
Olney AQMA	Declared December 2008	NO_2 Annual Mean	Olney	An area in Olney encompassing all properties fronting Bridge Street and High Street South, and also including part of Market Place.	No	43.2	µg/m^3	36.4	µg/m^3	Olney Action Plan	2012	http://www.milton-keynes.gov.uk/assets/attach/12676/Olney_Action_Plan_Oct12.pdf

☒ **Milton Keynes Council confirm the information on UK-Air regarding their AQMA is up to date**

2.2 Progress and Impact of Measures to address Air Quality in Milton Keynes

After 20 years of automatic monitoring using Horiba analysers ACOEM Air Monitors won the contract to supply new equipment into the existing monitoring stations. The opportunity was taken to purchase a Palas Fidas particle analyser to enable simultaneous monitoring of PM_{10} and $PM_{2.5}$ and to upgrade dial up modem communications with web loggers that send data directly to the cloud.

A new monitoring site was added to the diffusion tube network commencing in October 2019. The location is Miles Close, Blakelands and it is sited on a lamp post at the bottom on the M1 embankment, close to the M1 bridge over Wolverton Road. The main purpose is to measure the change brought about by Highways England "all-lane running" Smart Motorways, which effectively brings traffic closer to receptors. For bias adjustment, the National Bias Adjustment Factor Spreadsheet results have been used that are calculated with reference to Bias Factor A and B for multiple co-location studies.

All objectives were achieved throughout the Borough in 2019. The Olney AQMA is likely to be revoked in early 2021 once a full year of data has been collected from the new analysers.

Environmental Impact Assessments (EIAs) for major developments have been appraised to ensure that air quality concerns have been properly considered and will not significantly affect air quality.

Milton Keynes Council has taken forward a number of measures during the current reporting year of 2019 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:

- New air quality monitoring analysers and communication system have been installed in February 2019.
- MK Coachway electric vehicle charging hub installed.
- Santander cycle hire fleet reintroduced.

Milton Keynes Council expects the following measures to be completed over the course of the next reporting year:

- Section of A421 made into dual carriageway to M1 Junction 13.
- E-cargo bikes fully used in Milton Keynes.
- ViaVan electric fleet vehicles operational.

Milton Keynes Council's priorities for the coming year are:

- Encouraging the continued uptake of ULEVs following the MK Go Ultra-Low City scheme and the expansion of the electric vehicle charging network.
- Promoting the Get Smarter Travel MK initiative.
- Progressing the measures in the Mobility Strategy, the First and Last Mile Strategy and the Transport Infrastructure Delivery Plan.
- Progressing the measures in the Sustainability Strategy.
- To revoke the Olney AQMA (early 2021).

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations Involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to Implementation
1	Go Ultra Low City Scheme	Promoting Low Emission Transport	Other	2017	MK Council	Office for Low Emission Vehicles (OLEV)	ULEV ownership per capita	n/a	EV Centre opened in July 2017 and by June 2019 had welcomed 100,000 visitors and arraned 4000 test drives.	Ongoing	Trialling of driverless cars on highways and pods on shared footpaths https://www.gov.uk/government/news/40-million-to-drive-green-car-revolution-across-uk-cities
2	Expansion of Electric Vehicle charging network	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2015	MK Council	MK Council/OLEV	Number of recharging events No of charge points	n/a	New charging hub at MK Coachway with 8 rapid and 4 ultra-rapid charge points. More than 400 public charge points installed.	Ongoing	15 min hub sites identified to act as multi charger sites to support residential charging
3	Vivacity - a sensor network providing real-time transport information; volume, classification, speed, turning counts, parking availability.	Traffic Management	UTC, Congestion management, traffic reduction	2017/2018	MK Council/ Vivacity	MK Council/ Vivacity		n/a	Approx 400 sensors on highways and 1300 on parking areas.	2018	Parking data purchased by MyMK for use in parking app. Traffic junction sensors are currently turned off.
4	Urban Traffic Management Control (UTMC) system	Traffic Management	UTC, Congestion management, traffic reduction	2018	MK Council/DfT	National Productivity Infrastructure Fund. Planning tariff/section 106 agreement			First tranche of CMK signals upgraded, more to follow. CCTV and more of system to be delivered in next 2 years.	2022	Installing an urban traffic management control system, inc bus priority measures.

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations Involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to Implementation
5	UK Auto Drive programme	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2015	MK Council, Government, industries	MK Council, Government, industries £19.4M			Trialing of driverless pods on shared footpaths ongoing. Trialing of driverless cars on public highways in MK started March 2018	2018	Research, development and integration of automated and connected vehicles http://www.ukautodrive.com/the-uk-autodrive-project/
6	Free ULEV green car parking permit. Cheaper permits for low emission vehicles	Promoting Low Emission Transport	Priority parking for LEV's	2016	MK Council	MK Council	Number of permits issued	n/a	Introduced July 2016	ongoing	https://www.milton-keynes.gov.uk/highways-and-transport-hub/smarter-choices/electric-vehicle-charge-points
7	Smarter travel choices	Promoting travel alternatives	Intensive active travel campaign & infrastructure	2012	MK Council	ongoing	Number of visits to website per month, currently 5000 per month	n/a	ongoing	ongoing	New website developed https://www.getsmartertravelmk.org/
8	Love to Ride - website encouraging cycling – cycle September June bike week. Prizes	Promoting Travel Alternatives	Promotion of cycling	2017	MK Council	MK Council	Number of new rides and miles ridden per 12 months		All time participation stats up to April 2019: 134 organisations, 1858 people, 434 new riders, 1,147,712 miles 95,929 trips	ongoing	Cycle incentives website https://www.lovetoride.net/miltonkeynes
9	Super Redway Routes	Transport Planning and Infrastructure	Cycle network	2017	MK Council	MK Council			H6 super route completed. Works have been undertaken on other Redway routes e.g. H8 Marlborough St.	ongoing	Awaiting funding for further routes

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations Involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to Implementation
10	Cycling information, events and opportunities	Public Information	Via the Internet	2011	MK Council	MK Council		n/a	ongoing	ongoing	Pedalling Culture Website developed http://www.pedallingculture.com/
11	Santander bike hire	Transport Planning and Infrastructure	Public cycle hire scheme	2017	Santander/Nextbike	Santander/Nextbike	Number of hires	n/a	300 bikes 42 docking stations	2020	Scheme relaunched in Dec 2019 with new cycle fleet and docking stations.
12	Lime-E Bikes	Transport Planning and Infrastructure	Public cycle hire scheme	2018	Lime	Lime	Number of hires	n/a	50 bikes supplied (dockless GPS tracked)	ongoing	Bikes are unlocked using phone app
13	Public Health support for healthy schools	Promoting Travel Alternatives	Promotion of walking	2019	MK Council	MK Council	No. of schools engaged	n/a	MoreLife UK commissioned to deliver- due to start schools element in Sept 2019	2024	Working to improve the whole school environment to reduce childhood obesity- from physical activity policies to staff training and will include active travel
14	Modeshift STARS – national schools awards scheme	Promoting Travel Alternatives	School Travel Plans	2017	MK Council/DfT	DfT	Number of schools registered		40 schools registered. 19% light green modes (bus, park&stride, car sharing) 41% green modes (walking, cycling, scooting) 40% car	ongoing	Walk to school, bike school and scooter training https://modeshiftstars.org/#
15	East West Rail	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	2019	East West Railway Company / Network Rail	EWR Consortium		n/a	Phase 1 complete. Phase 2 construction started early 2020	2024 (estimated for western section). Central section route corridor chosen (estimated late 2020's)	https://www.eastwestrail.org.uk/

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations Involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to Implementation
16	A421 Dualling to M1 J13	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2018	Central Beds Council/MK Council	DfT £28.5m project			Carriageway approx. 80% complete.	Winter 2020	http://www.centralbedfordshire.gov.uk/transport/a421/overview.aspx
17	Highways England All-Lane Running (ALR) Smart Motorway	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2018	Highways England	Highways England £373m project		Environmental report found NO2 emissions not significant and scheme will ease congestion	Significant works completed in 2019 on schedule.	2022	https://highwaysengland.co.uk/projects/m1-junction-13-to-junction-16-smart-motorway/
18	Real time passenger information (RTPI) – bus routes	Transport planning and infrastructure	Bus route improvements	2014	MK Council	MK Council		n/a	Most key routes now have RTPI	ongoing	https://www.milton-keynes.gov.uk/highways-and-transport-hub/bus-and-taxi/real-time-passenger-information
19	E-cargo bikes project	Promoting Travel Alternatives	Promotion of cycling	2020	MK Council	Govt grant £220K	Mileage undertaken using electric bikes		21 bikes ordered, expected Sep 2020	Dec-2020	Level of take up for lease - will promote this for businesses

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

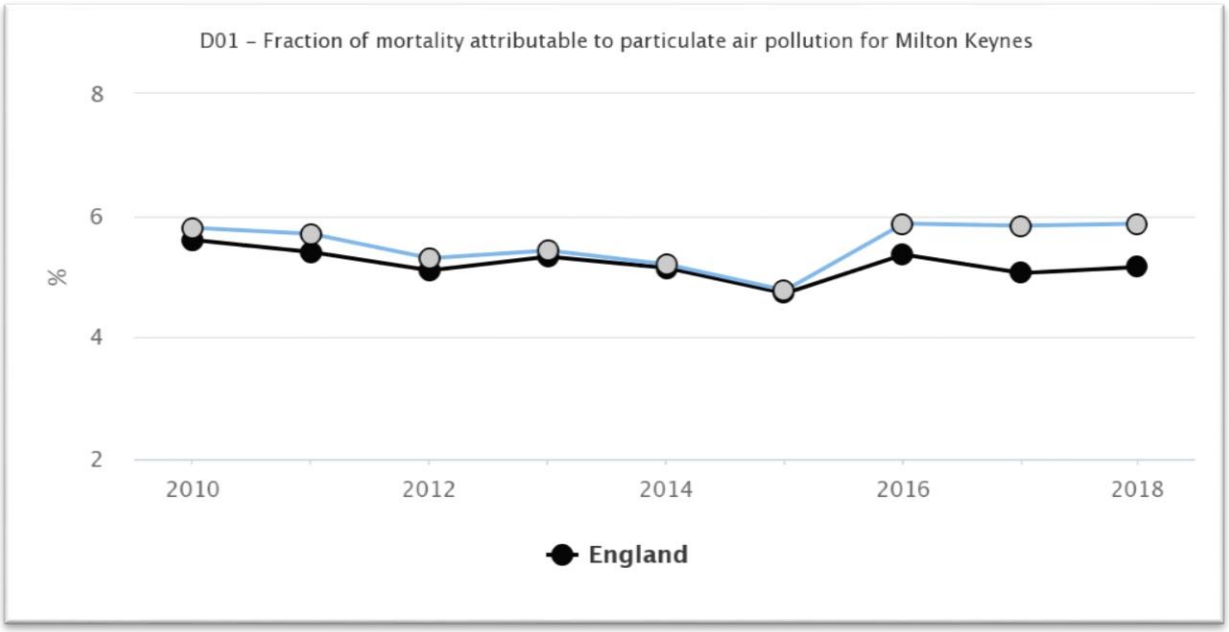
As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health,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

The national air quality objective for $PM_{2.5}$ is an annual mean concentration of 25 µg/m^3, to be achieved by 31-Dec-2010. There is a target to reduce concentrations at urban background locations by 15%, to be achieved between 2010 and 2020.

The Public Health Outcomes Framework (PHOF) includes an indicator relating to anthropogenic particulate air pollution, measured as fine particulate matter, $PM_{2.5}$. The indicator is known as D01 (previously 3.01) and the latest value for Milton Keynes is 5.9%, calculated from modelled 2018 data. This is the fraction of annual all-cause adult mortality attributable to $PM_{2.5.}$ As a comparison, the value for Central Beds is 5.5%, Luton 6.1% and Northampton 5.6%. In general levels become lower heading west across England, however there is not much change over the last 10 years as can be seen in **Figure 3** below.

It is estimated that UK emissions contribute about 50% of total annual average $PM_{2.5}$, the rest is mainly from European countries, the proportion varying from year to year depending on meteorology; many episodes of high concentration occur on easterly winds. Emissions from diesel engines are a major source of fine particles. In January 2019 the government published the national Clean Air Strategy 2019. This identifies domestic wood and solid fuel burning as a major source of locally derived $PM_{2.5}$ emissions (up to 38%).

Figure 3 Fraction of Mortality Attributable to $PM_{2.5}$ for Milton Keynes



The health effects of $PM_{2.5}$ are recognised in Milton Keynes and the Joint Strategic Needs Assessment (JSNA) contains a section on this pollutant and its effect on the local population.

Milton Keynes Council is taking the following measures to address $PM_{2.5}$ primarily by reducing emissions from transport and by promoting a more active lifestyle:

- Partnership working to address pollution and health concerns takes place between Environmental Health, Transport Policy, Public Health and Sustainability Departments within the Council. Public health evidence will be implemented to prevent and minimise impacts of air pollution, including NICE Guideline NG70: Air pollution:outdoor air quality and health (2017) and the Public Health England: Review of interventions to improve outdoor air quality and public health (2019).
- By promoting active travel plans - the "Get Smarter Travel in MK" campaign encourages more sustainable forms of travel such as walking and cycling, moving away from single occupancy vehicles.

- Raising awareness of the effect of air pollution on public health and of the health benefits of more active travel.
- Promoting the use of electric and other low emission vehicles and providing charge points throughout the Borough.
- Improving bus services and providing real time bus passenger information to encourage the use of public transport; Get on Board is a promotional initiative funded by the Department of Transport's Better Bus Area (BBA) fund.
- Procuring electric buses for major routes through the city.
- By adopting a low carbon, more sustainable approach to living in Milton Keynes. By implementing the Sustainability Strategy 2019-2050
- Promoting the use of Ecodesign Ready domestic wood burning stoves and distributing leaflets advising how to operate and maintain stoves and the importance of using dry logs.

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

3.1 Summary of Monitoring Undertaken

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

3.1.1 Automatic Monitoring Sites

Milton Keynes Council undertook automatic (continuous) monitoring at 3 sites during 2019. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at http://uk-air.defra.gov.uk/data/

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.

ACOEM Air Monitors installed new analysers and web logger communication systems in February 2019. The two roadboxes each have a Serinus 40 NOx analyser and the Civic Offices station has a Serinus 40 NOx analyser, a Serinus 10 Ozone analyser and a Pallas Fidas 200E Particle Analyser. The Fidas analyser simultaneously records PM_{10} and $PM_{2.5}$ concentrations. Recorded data is automatically uploaded to the web.

Changing to a new monitoring network brought unexpected problems. The Fidas particle analyser was found to be reading abnormally high for the period of installation until 7th October 2019 by approximately 25%. The problem was identified as an incorrectly input calibration figure.

Rectifying the data for this period was challenging and was undertaken by Jim Mills (ACOEM) and Professor Roderic Jones of Cambridge University using the technique known as “scale separation”, as applied in the Breathe London network. Data recorded from Fidas instruments at Cambridge University and at the Alphasense premises near Stansted airport were compared over the period Feb 2019 to June 2020 to derive an offset and slope adjustment with which to “scale” Civic Offices data. The correction was then applied to the data for the period up to 7th October for both PM_{10} and $PM_{2.5}$ and the annual mean calculated for the adjusted dataset.

MK Council also queried a significant increase in NO_2 annual mean at the Civic Offices in 2019 and smaller increases at the roadbox locations in Olney and Newport Pagnell. Jim Mills studied calibration records and couldn't find any evidence that the analysers were at fault and the reason may not be traceable. One possibility is that the analyser may have been partly sampling air within the enclosure because of a sampling line problem and this cannot be corrected retrospectively.

Problems have also been experienced with web loggers "locking out" and not sending data to the web until reset, affecting data capture rates. These issues have now been mostly resolved, all analysers tested and checked to ensure data quality going forward.

Jim Mills provided a report to MK Council (22-Jul-2020) discussing the above-mentioned issues in more detail and this will be uploaded to the Defra Report Submission Website with this ASR.

3.1.2 Non-Automatic Monitoring Sites

Milton Keynes Council undertook non-automatic (passive) monitoring of nitrogen dioxide (NO_2) at 40 sites during 2019. All tubes are deployed in duplicate or triplicate. Table A.2 in Appendix A shows the details of the sites. Diffusion tubes are prepared 'in-house' using 20% triethanolamine (TEA) in water and are analysed following the procedures set out in the AEA Practical Guidance document. MKC participates in the proficiency testing scheme, AIR PT, provided by LGC Standards for quality assurance of diffusion tube analysis. MKC also participates in the monthly NO_2 Network Field Inter-comparison Exercise managed by the National Physical Laboratory (NPL).

A map showing the location of the monitoring sites is provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes including bias adjustments and any other adjustments applied, are included in Appendix C. The new tube location at Miles Close was the only site requiring annualisation. The latest Excel-based annualisation tool was used with data from four AURN automatic monitoring stations.

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 40 µg/m^3.

For diffusion tubes, the full 2019 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 200 µg/m^3, not to be exceeded more than 18 times per year.

There were no exceedences of either the annual or hourly objectives at any monitored location throughout the Borough. For the fifth year running all diffusion tube locations within the Olney AQMA recorded annual means below the objective. The highest value was 36.4 µg/m^3 recorded at the façade of 10 High Street South, Olney. The automatic analyser in Olney recorded an annual mean of 23.9 µg/m^3.

Figure A.1 shows a graph of the annual mean data from the automatic air quality stations. The slightly downward trend at all three monitoring stations since 2000 has taken an upward turn in 2019, which is most pronounced at the Civic Offices monitoring station. This may be because of new analysers; diffusion tube raw data is similar to that monitored in 2018. It will be interesting to compare with 2020 monitoring results available early 2021.

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 40 µg/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 50 µg/m^3, not to be exceeded more than 35 times per year.

Automatic monitoring results have been adjusted using the Volatile Correction Method (VCM) as developed by ERG at King's College, London for TEOM analysers up to February 2019 when the TEOM was replaced with a Fidas analyser.

As detailed in section 3.1.1 recorded data from installation of the Fidas until 7th October 2019 was too high and a scaling factor was applied to adjust the data for this period; results were divided by 1.277 and offset by +0.06 µg/m^3 as recommended by ACOEM.

There were no exceedences of either the annual mean or daily mean objectives. The Civic Offices station recorded an annual mean concentration of 16.1 µg/m^3, an increase of 1.4 µg/m^3 over 2018 mean, well within the objective. Figure A.2 shows there is a slight downward trend at the stations over the last 10 years that flattens out from 2014 rising again in 2019, with 10 exceedences of the 24-hour mean. As with NO2 data, the 2020 dataset may reverse this apparent shift.

3.2.3 Particulate Matter ($PM_{2.5}$)

The Pallas Fidas 200E Particle Analyser measures both $PM_{2.5}$ and PM_{10}. Recorded $PM_{2.5}$ data was also affected by the incorrect calibration value and the same scaling factor was applied to the data.

The $PM_{2.5}$ annual mean concentration at the Civic Offices in 2019 was 11.2 µg/m^3.

3.2.4 Sulphur Dioxide (SO_2)

Automatic monitoring was undertaken between 1999 and 2012. Sulphur dioxide is no longer monitored in Milton Keynes because levels are very low and there are no risks of exceeding air quality objectives.

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)
Fixed	Civic Offices, CMK	Urban Centre	485070	239131	NO_2; PM_{10}; $PM_{2.5}$; O_3	No	FIDAS 200E; Chemiluminescence; UV absorption	113 (to residential)	4.8	3.2
Roadbox 1	Wolverton Road, Newport Pagnell	Roadside	486290	243344	NO_2	No	Chemiluminescence	25 (to residential)	3.4	1.5
Roadbox 2	High Street South, Olney	Roadside	488922	251157	NO_2	Yes	Chemiluminescence	11 (to residential)	2	1.5

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 co-located with a Continuous Analyser?	Height (m)
B1 B2	Northampton Rd, Lavendon (Horseshoe PH)	Roadside	491769	253542	NO_2	No	0.6	3	No	2.1
C1 C2 C3	10 High St South, Olney (Cowper School House)	Roadside	488914	251173	NO_2	Yes	0	2	No	2.3
D1 D2 D3	9 High St South, Olney (Olney Wine Bar)	Roadside	488904	251177	NO_2	Yes	0	1.7	No	2.2
E1 E2 E3	20 High St, Olney	Roadside	488926	251455	NO_2	No	3.3	7.6	No	2.2
F1 F2 F3	17 High St, Olney (Opp. No.20 High St)	Roadside	488905	251456	NO_2	No	0	7.2	No	2.1
G1 G2 G3	Corner of Coneygere and Palmers Rd, Olney	Suburban	489108	251213	NO_2	No	10.4	1.7	No	2.2
H1 H2	76 High St, Newport Pagnell	Roadside	487514	243901	NO_2	No	2.3	2.2	No	2.4
I1 I2	63 High St, Newport Pagnell	Kerbside	487588	243912	NO_2	No	2	0.4	No	2.4
J1 J2	57 High St, Newport Pagnell (The Plough PH)	Kerbside	487620	243922	NO_2	No	2	0.4	No	2.4
K1 K2	16-17 Greenlands, Newport Pagnell	Suburban	486296	243208	NO_2	No	10.1	1.6	No	2.1
L1 L2	5-7 Greenlands, Newport Pagnell	Suburban	486345	243230	NO_2	No	5.4	1.4	No	2.5

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 co-located with a Continuous Analyser?	Height (m)
M1 M2	42-44 Walnut Close, Newport Pagnell	Suburban	486495	243345	NO_2	No	7.6	1.5	No	2
N1 N2	222 Wolverton Rd, Blakelands	Suburban	486069	243148	NO_2	No	25	1.6	No	2.2
O1 O2	64 Nicholas Mead, Great Linford	Urban Background	486039	241484	NO_2	No	2.4	4	No	1.9
R1 R2 R3	Static Air Quality Station (Civic Offices)	Urban Centre	485070	239131	NO_2	No	113	4.8	Yes	3.5
S1 S2 S3	Roadbox 1 (Newport Pagnell)	Roadside	486290	243344	NO_2	No	25.8	1.8	Yes	2.4
T1 T2	Silbury Boulevard, CMK (corner of North Tenth St)	Kerbside	485298	239126	NO_2	No	28.2	0.9	No	2.5
V1 V2	63 Windsor St, Wolverton	Suburban	481412	240860	NO_2	No	2.3	1.1	No	2.3
W1 W2	130 Newport Rd, New Bradwell	Roadside	482965	241515	NO_2	No	6.1	1.6	No	2.4
AA1 AA2	Brook Farm, Broughton Rd, Middleton	Suburban	489237	239016	NO_2	No	23	1	No	2.1
BB1 BB2	14-16 Newport Rd, Wavendon	Roadside	491498	237284	NO_2	No	9.7	7.2	No	1.9
DD1 DD2	Aylesbury St, Fenny Stratford (Bracknell House)	Roadside	488118	233814	NO_2	No	11.1	4.5	No	2.4
EE1 EE2	6 Atherstone Court, Two Mile Ash	Suburban	481331	238825	NO_2	No	9.5	0.4	No	1.9

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 co-located with a Continuous Analyser?	Height (m)
FF1 FF2 FF3	Cross Keys Office, High St South, Olney	Roadside	488898	251186	NO_2	Yes	0.2	1.6	No	2
HH1 HH2 HH3	33 High Street South, Olney (Art Mart)	Roadside	488891	251248	NO_2	Yes	0.6	2	No	2.1
JJ1 JJ2 JJ3	Roadbox 2 (Olney)	Roadside	488922	251157	NO_2	Yes	10.1	2	Yes	2.1
KK1 KK2 KK3	18/20 Bridge St, Olney	Roadside	488917	251068	NO_2	Yes	0.4	2.2	No	2.2
LL1 LL2 LL3	Courtney House, Bridge St, Olney	Roadside	488909	251077	NO_2	Yes	0.4	1.7	No	2.1
MM1 MM2	18 Wheatcroft Close, Beanhill	Urban Background	486332	236228	NO_2	No	10.1	0.3	No	2.2
OO1 OO2	Watling Street, Fullers Slade	Roadside	480015	239400	NO_2	No	43	7.6	No	2.5
PP1 PP2	1 Tudor Gardens, Stony Stratford	Suburban	479459	239536	NO_2	No	17	2.3	No	2.2
QQ1 QQ2	Silver Street, Stony Stratford	Suburban	478740	240217	NO_2	No	3	0.9	No	2
RR1 RR2	Horsefair Green, Stony Stratford	Suburban	478882	240265	NO_2	No	3.5	2.6	No	2
TT1 TT2	62 High Street, Newport Pagnell (Co-Op North)	Roadside	487589	243923	NO_2	No	n/a	4.2	No	2
WER1 WER2	97 Water Eaton Road, Bletchley	Roadside	487395	233174	NO_2	No	12	2.5	No	2.4
AAA1 AAA2	4 Mary Rose, Brooklands	Suburban	489835	240351	NO_2	No	4.2	4.8	No	2
BBB1 BBB2	267 Fen Street, Brooklands	Roadside	490299	239695	NO_2	No	6	0.5	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 co-located with a Continuous Analyser?	Height (m)
CCC1 CCC2	Grovesbrook, Station Road, Bow Brickhill	Roadside	490529	234611	NO_2	No	12.2	2.9	No	2
DDD1 DDD2	Chapel Street/Station Road, Woburn Sands	Roadside	492923	235716	NO_2	No	5.7	2.8	No	2
EEE1 EEE2	Miles Close, Blakelands	Suburban	486164	243168	NO_2	No	17.3	1.6	No	2

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 2019 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2015	2016	2017	2018	2019
Fixed	Urban Centre	Automatic	96.0	96.0	18.8	18.1	17.0	16.2	23.5
Roadbox 1	Roadside	Automatic	95.5	95.5	27.0	32.8	30.5	25.6	27.1
Roadbox 2	Roadside	Automatic	86.7	86.7	22.3	22.8	22.4	19.9	23.9
B1 B2	Roadside	Diffusion Tube	100	100	17.0	17.6	18.8	17.4	19.3
C1 C2 C3	Roadside	Diffusion Tube	100	100	32.9	36.9	33.4	33.9	36.4
D1 D2 D3	Roadside	Diffusion Tube	100	100	29.5	32.3	31.7	30.2	30.9
E1 E2 E3	Roadside	Diffusion Tube	100	100	21.6	23.5	21.4	21.3	21.3
F1 F2 F3	Roadside	Diffusion Tube	100	100	23.6	24.9	25.0	23.1	25.1
G1 G2 G3	Suburban	Diffusion Tube	75	75	10.5	11.5	11.5	10.8	12.3
H1 H2	Roadside	Diffusion Tube	100	100	22.8	25.5	26.6	23.8	23.1
I1 I2	Kerbside	Diffusion Tube	100	100	27.7	30.6	29.5	26.7	28.6
J1 J2	Kerbside	Diffusion Tube	100	100	30.1	31.4	31.1	30.0	30.3
K1 K2	Suburban	Diffusion Tube	100	100	25.6	23.4	24.8	22.2	22.3
L1 L2	Suburban	Diffusion Tube	100	100	22.3	21.8	24.4	20.7	22.0
M1 M2	Suburban	Diffusion Tube	100	100	18.0	18.1	19.2	16.9	16.4

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2019 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2015	2016	2017	2018	2019
N1 N2	Suburban	Diffusion Tube	100	100	20.1	23.2	21.0	21.5	19.4
O1 O2	Urban Background	Diffusion Tube	100	100	15.1	17.4	17.1	15.2	16.6
R1 R2 R3	Urban Centre	Diffusion Tube	100	100	17.1	18.9	18.2	18.4	18.2
S1 S2 S3	Roadside	Diffusion Tube	100	100	29.6	29.0	30.3	27.4	26.8
T1 T2	Kerbside	Diffusion Tube	100	100	21.1	23.5	23.1	21.6	22.1
V1 V2	Suburban	Diffusion Tube	100	100	14.7	15.8	14.3	15.0	15.5
W1 W2	Roadside	Diffusion Tube	91.7	91.7	17.8	19.9	19.2	17.7	21.0
AA1 AA2	Suburban	Diffusion Tube	100	100	13.3	15.9	14.9	14.4	14.3
BB1 BB2	Roadside	Diffusion Tube	100	100	19.4	21.1	19.3	18.4	18.4
DD1 DD2	Roadside	Diffusion Tube	100	100	20.1	22.6	20.7	22.8	23.3
EE1 EE2	Suburban	Diffusion Tube	100	100	10.8	11.9	11.9	12.2	12.3
FF1 FF2 FF3	Roadside	Diffusion Tube	100	100	32.9	34.0	34.5	30.6	34.6
HH1 HH2 HH3	Roadside	Diffusion Tube	100	100	28.5	30.5	30.9	26.6	29.1
JJ1 JJ2 JJ3	Roadside	Diffusion Tube	100	100	22.7	24.5	25.2	23.5	24.8
KK1 KK2 KK3	Roadside	Diffusion Tube	100	100	34.2	36.3	36.1	32.9	35.8
LL1 LL2 LL3	Roadside	Diffusion Tube	100	100	31.6	33.5	32.1	28.1	30.6

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2019 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2015	2016	2017	2018	2019
MM1 MM2	Urban Background	Diffusion Tube	100	100	22.0	24.1	25.7	22.6	25.1
OO1 OO2	Roadside	Diffusion Tube	100	100	17.6	20.8	18.6	19.9	15.9
PP1 PP2	Suburban	Diffusion Tube	100	100	9.2	11.1	9.9	10.6	10.6
QQ1 QQ2	Suburban	Diffusion Tube	100	100	18.6	18.0	16.9	17.7	16.8
RR1 RR2	Suburban	Diffusion Tube	100	100	20.2	22.1	21.2	21.2	21.6
TT1 TT2	Roadside	Diffusion Tube	83.3	83.3	27.6	27.1	27.5	26.8	26.5
WER1 WER2	Roadside	Diffusion Tube	100	100	_	_	20.9	20.0	22.6
AAA1 AAA2	Suburban	Diffusion Tube	100	100	_	_	_	19.4	18.5
BBB1 BBB2	Roadside	Diffusion Tube	100	100	_	_	_	19.7	22.5
CCC1 CCC2	Roadside	Diffusion Tube	100	100	_	_	_	14.5	15.1
DDD1 DDD2	Roadside	Diffusion Tube	100	100	_	_	_	14.9	16.6
EEE1 EEE2	Suburban	Diffusion Tube	100	25					18.2

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

☒ **Annualisation has been conducted where data capture is <75% using the latest version of the annualisation tool**

Notes:

Exceedances 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 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

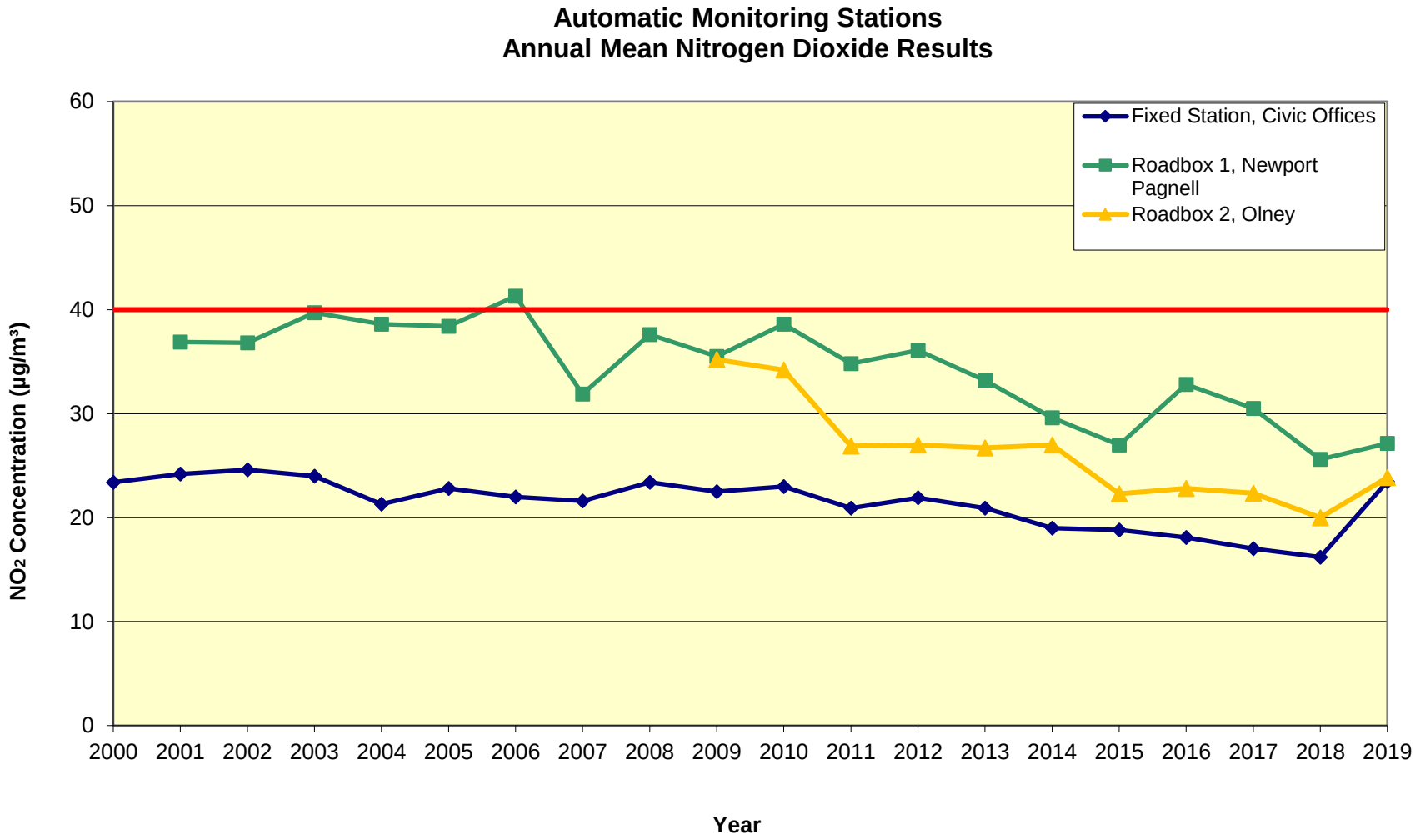


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2015	2016	2017	2018	2019
Fixed	Urban Centre	Automatic	96.0	96.0	0	0 (99.1)	0	0	0
Roadbox 1	Roadside	Automatic	95.5	95.5	0	0 (110.3)	0	0	0
Roadbox 2	Roadside	Automatic	86.7	86.7	0	0	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 2019 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2015	2016	2017	2018	2019
Fixed	Urban Centre	93.9	93.9	14.8	14.2	14.5	14.7	16.1
Roadbox 1	Roadside	n/a	n/a	-	-	-	-	-
Roadbox 2	Roadside	n/a	n/a	16.7	17.4	16.5	-	-

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

Notes:

Exceedances of the PM_{10} annual mean objective of 40µg/m^3 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

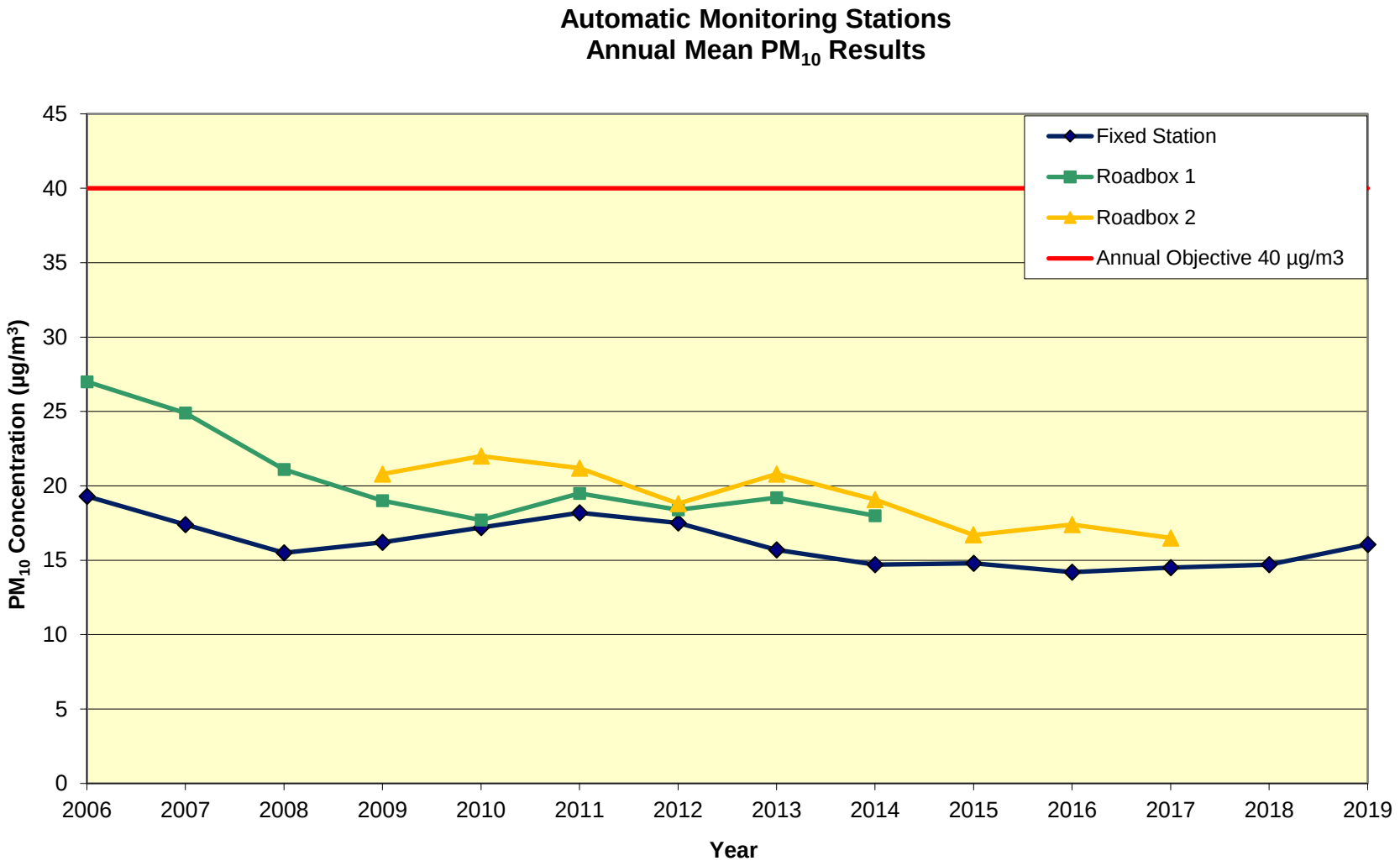


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2015	2016	2017	2018	2019
Fixed	Urban Centre	93.9	93.9	1	1	2	1	10
Roadbox 1	Roadside	n/a	n/a	-	-	-	-	-
Roadbox 2	Roadside	n/a	n/a	0	1	2 (29.3)	-	-

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 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.

Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
						2015	2016	2017	2018	2019
Fixed	485070	239131	Urban Centre	89	89					11.2

☒ **Annualisation has been conducted where data capture is <75% (confirm by selecting in box)**

Notes:

(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.

Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 – NO_2 Monthly Diffusion Tube Results – 2019

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	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 (0.84) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
B1 B2	491769	253542	36.6	31.5	19.2	23.4	13.6	16.4	17.6	16.3	18.5	25.5	33.5	24.3	**23.0**	19.3	18.8
C1 C2 C3	488914	251173	49.5	44.1	39.7	48.9	40.9	43.1	42.3	34.2	37.3	46.2	57.2	35.6	**43.3**	36.4	36.4
D1 D2 D3	488904	251177	49.2	38.6	38.7	37.8	35.5	32.8	32.5	27.8	34.2	35.2	45.5	34.3	**36.8**	30.9	30.9
E1 E2 E3	488926	251455	33.3	27.0	20.9	31.1	22.3	25.3	20.4	17.7	20.5	25.9	35.2	23.6	**25.3**	21.3	19.8
F1 F2 F3	488905	251456	41.5	36.7	32.9	20.8	24.5	25.8	25.3	27.1	27.4	33.9	31.4	31.3	**29.9**	25.1	25.1
G1 G2 G3	489108	251213	24.2	21.7	12.8	10.9	7.9	9.1	n/a	n/a	n/a	14.7	14.8	15.0	**14.6**	12.3	11.1
H1 H2	487514	243901	37.5	33.2	25.2	22.6	21.3	22.9	22.5	20.9	24.0	32.0	38.6	29.8	**27.5**	23.1	21.8
I1 I2	487588	243912	43.0	40.3	34.3	32.7	25.0	30.1	25.7	25.8	28.9	37.9	41.8	43.7	**34.1**	28.6	24.6
J1 J2	487620	243922	45.5	43.9	40.1	33.1	29.6	32.3	28.8	27.0	28.0	38.7	45.4	40.5	**36.1**	30.3	25.8
K1 K2	486296	243208	41.6	32.9	27.9	17.7	20.9	20.5	19.3	22.5	22.2	29.5	31.8	32.9	**26.6**	22.3	20.5
L1 L2	486345	243230	42.0	29.1	26.5	17.8	17.3	21.5	18.9	24.4	21.5	28.8	33.8	33.1	**26.2**	22.0	20.7
M1 M2	486495	243345	33.4	24.7	21.5	12.5	12.1	12.7	14.5	14.3	14.6	20.8	28.5	24.8	**19.5**	16.4	14.7
N1 N2	486069	243148	35.4	22.8	20.1	17.9	20.5	23.0	15.7	12.4	20.4	25.9	40.0	23.3	**23.1**	19.4	14.8

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	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 (0.84) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
O1 O2	486039	241484	30.5	27.0	18.5	19.4	11.5	14.8	13.0	16.2	16.2	20.4	28.0	22.4	**19.8**	16.6	16.3
R1 R2 R3	485070	239131	34.0	24.9	19.2	21.0	14.7	16.9	14.5	15.7	17.0	24.1	33.5	24.4	**21.7**	18.2	17.1
S1 S2 S3	486290	243344	45.0	35.8	35.8	28.9	24.1	26.8	22.3	30.4	28.2	34.2	39.0	32.5	**31.9**	26.8	21.4
T1 T2	485298	239126	37.5	28.1	22.6	27.3	18.4	19.0	20.0	17.4	20.3*	25.4*	40.7	32.2	**26.3**	22.1	18.3
V1 V2	481412	240860	28.0	20.2	15.1	22.8	14.0	13.8	11.2	10.9	15.5	19.5	31.7	18.8	**18.5**	15.5	15.0
W1 W2	482965	241515	36.6	28.6	26.1	21.4	n/a	16.6	18.9	17.6	18.0	24.1	42.6	24.9	**25.0**	21.0	17.9
AA1 AA2	489237	239016	28.4	21.9	14.6	18.8	11.2	10.4	11.6	10.7	13.3	18.4	26.3	18.6	**17.0**	14.3	13.7
BB1 BB2	491498	237284	31.8	26.5	21.5	22.3	19.1	16.7	16.4	14.1	17.4	21.6	33.2	22.1	**21.9**	18.4	16.5
DD1 DD2	488118	233814	38.4	33.3	24.9	31.4	20.9	18.8	20.1	20.5	22.9	29.2	41.5	30.1	**27.7**	23.3	19.8
EE1 EE2	481331	238825	26.2	18.3	12.6	15.1	10.0	10.5	8.7	9.5	11.6	15.7	21.8	14.7	**14.6**	12.3	10.6
FF1 FF2 FF3	488898	251186	51.9	52.1	40.1	33.9	36.3	34.2	37.1	40.1	37.8	41.2	47.3	42.7	**41.2**	34.6	34.0
HH1 HH2 HH3	488891	251248	48.4	40.1	37.6	39.1	29.0	28.4	29.5	28.0	31.5	35.3	37.6	31.6	**34.7**	29.1	27.9
JJ1 JJ2 JJ3	488922	251157	39.8	35.9	28.4	32.3	22.6	23.8	21.7	24.3	23.5	30.3	43.4	28.1	**29.5**	24.8	18.4
KK1 KK2 KK3	488917	251068	47.5	58.8	39.4	35.6	36.9	38.8	36.3	38.9	39.8	41.7	51.1	46.2	**42.6**	35.8	34.7
LL1 LL2 LL3	488909	251077	48.5	45.2	36.2	27.8	31.8	32.0	28.1	36.6	31.9	34.8	38.2	46.1	**36.4**	30.6	29.6
MM1 MM2	486332	236228	42.6	37.3	28.8	23.6	25.7	22.3	24.3	26.5	26.1	27.8	39.3	34.0	**29.9**	25.1	19.0

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	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 (0.84) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
OO1 OO2	480015	239400	28.4	21.7	16.6	24.1	16.8	15.7	12.7	8.7	15.0	19.2	31.0	16.8	**18.9**	15.9	12.1
PP1 PP2	479459	239536	20.2	16.1	8.6	15.4	7.0	8.0	7.9	6.6	8.3	13.9	25.2	14.1	**12.6**	10.6	10.3
QQ1 QQ2	478740	240217	32.1	20.7	21.0	16.5	18.7	17.9	16.2	13.9	15.2	19.6	30.3	18.2	**20.0**	16.8	14.9
RR1 RR2	478882	240265	32.9	31.5	21.8	31.2	21.9	20.9	18.6	18.7	21.0	27.4	36.3	26.4	**25.7**	21.6	19.2
TT1 TT2	487589	243923	46.6	n/a	34.9	35.3	27.3	31.4	n/a	16.0	28.4	23.2	42.9	30.1	**31.6**	26.5	25.3
WER1 WER2	487395	233174	38.0	30.6	26.4	27.1	20.7	20.6	21.4	22.4	20.8	29.4	35.0	30.7	**26.9**	22.6	17.9
AAA1 AAA2	489835	240351	32.2	23.7	20.2	26.9	17.9	16.4	13.3	13.1	17.5	24.3	34.2	23.7	**22.0**	18.5	17.8
BBB1 BBB2	490299	239695	42.5	33.2	26.1	26.0	19.6	19.6	17.0	17.6	21.5	29.9	41.2	27.9	**26.8**	22.5	19.1
CCC1 CCC2	490529	234611	30.0	21.9	16.2	20.5	10.7	14.4	10.4	10.8	14.9	19.0	27.9	19.4	**18.0**	15.1	13.4
DDD1 DDD2	492923	235716	27.6	22.9	18.7	21.1	11.5	13.7	16.7	15.4	19.2	20.8	30.8	18.9	**19.8**	16.6	15.1
EEE1 EEE2	486164	243168	_	_	_	_	_	_	_	_	_	24.7	38.8	21.2	**28.2**	18.2	14.8

☒ Local bias adjustment factor used

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

☒ Where applicable, data has been distance corrected for relevant exposure (no distance correction was required)

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

Diffusion Tube Bias Adjustment Factors

Nitrogen dioxide diffusion tubes are prepared 'in-house' by Milton Keynes Council using 20% triethanolamine (TEA) in water and are analysed following the procedures set out in the AEA Practical Guidance document produced by the Defra Working Group on Harmonisation of NO_2 Diffusion Tubes that was released early in 2008. The Council participates in the proficiency testing scheme, AIR PT, provided by LGC Standards for quality assurance of diffusion tube analysis and the monthly NO_2 Network Field Intercomparison Exercise managed by the National Physical Laboratory (NPL).

Factors from Local Co-location Studies

Local co-location studies are carried out at all the automatic monitoring stations. Tubes are sited in triplicate near the air intake. In 2019, 2 co-location studies were used to determine the bias adjustment factor; Marylebone Road in London and Wolverton Road Newport Pagnell. The Olney study could not be included as there were only 8 periods of data capture for the automatic analyser >=75%; the minimum requirement is 9 periods. The Civic Offices co-location results were not submitted to NPL because of issues with the automatic analyser discussed above.

The combined co-location bias adjustment factor for the studies, provided by NPL (June 2020 revision) for 2019 was 0.84. The study results are presented in Figure 4 and Figure 5.

Figure 4 – Co-location Study at Roadbox Station 1, Wolverton Road

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	09/01/2019	06/02/2019	44.0	48.2	42.9	45	2.8	6	7.0	33.57	98	Good	Good
2	06/02/2019	06/03/2019	38.3	33.3	35.6	36	2.5	7	6.2	34.66	100	Good	Good
3	06/03/2019	03/04/2019	35.7	36.3	35.4	36	0.4	1	1.1	29.04	100	Good	Good
4	03/04/2019	01/05/2019	32.1	27.4	27.2	29	2.8	10	7.0	22.50	99	Good	Good
5	01/05/2019	05/06/2019	22.6	24.2	25.6	24	1.5	6	3.8	23.90	98	Good	Good
6	05/06/2019	03/07/2019	31.9	25.6	22.8	27	4.7	17	11.6	20.61	98	Good	Good
7	03/07/2019	07/08/2019	24.2	19.9	22.7	22	2.2	10	5.4	20.95	100	Good	Good
8	07/08/2019	04/09/2019	27.9	28.8	34.4	30	3.5	12	8.8	22.52	74	Good	or Data Capture
9	04/09/2019	02/10/2019	27.8	29.6	27.1	28	1.3	5	3.2	22.94	100	Good	Good
10	02/10/2019	06/11/2019	34.3	34.5	34.0	34	0.3	1	0.7	29.41	77	Good	Good
11	06/11/2019	04/12/2019	39.4	37.8	39.9	39	1.1	3	2.6	36.95	88	Good	Good
12	04/12/2019	08/01/2020	29.4	36.5	31.8	33	3.6	11	9.0	29.64	97	Good	Good
13													
										Overall survey -->		Good precision	Good Overall DC

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

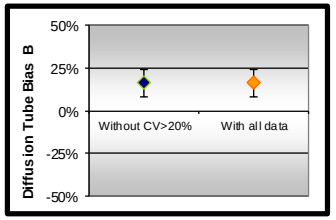
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	

Precision	12 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	0.86 (0.81 - 0.93)
Bias B	16% (8% - 24%)
Diffusion Tubes Mean:	32 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	28 µgm^{-3}
Data Capture for periods used:	96%
Adjusted Tubes Mean:	28 (26 - 30) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.86 (0.81 - 0.93)
Bias B	16% (8% - 24%)
Diffusion Tubes Mean:	32 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	28 µgm^{-3}
Data Capture for periods used:	96%
Adjusted Tubes Mean:	28 (26 - 30) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Figure 5 Co-location study at Marylebone Road London

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	95% CI of mean
1	09/01/2019	06/02/2019	74.9	84.0	93.9	84	9.5	11	23.7
2	06/02/2019	06/03/2019	98.1	97.0	90.7	95	4.0	4	9.9
3	03/03/2019	03/04/2019	80.0	82.1	81.3	81	1.0	1	2.6
4	03/04/2019	01/05/2019	72.7	71.5	72.5	72	0.6	1	1.5
5	01/05/2019	05/06/2019	76.4	70.2	75.4	74	3.3	4	8.2
6	05/06/2019	03/07/2019	74.2	76.9	76.1	76	1.4	2	3.4
7	03/07/2019	07/08/2019	69.5	73.1	68.4	70	2.5	3	6.1
8	07/08/2019	04/09/2019	85.0	85.9	80.3	84	3.0	4	7.4
9	04/09/2019	02/10/2019	70.2	76.2	74.9	74	3.1	4	7.8
10	02/10/2019	06/11/2019	75.5	78.8	77.3	77	1.6	2	4.1
11	06/11/2019	04/12/2019	78.1	82.0	78.4	79	2.2	3	5.4
12	04/12/2019	08/01/2019	80.8	83.3	85.0	83	2.1	3	5.3
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
68.0	90.4	Good	Good
84.4	94.2	Good	Good
70.0	93.4	Good	Good
57.6	96.2	Good	Good
57.7	79.2	Good	Good
64.8	84.9	Good	Good
59.5	93.9	Good	Good
58.3	82.6	Good	Good
55.2	97.4	Good	Good
63.3	97.1	Good	Good
62.9	97.5	Good	Good
61.6	97.4	Good	Good
Overall survey -->		Good precision	Good Overall DC

(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Marylebone Road

Precision 12 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 12 periods of data
Bias factor A 0.8 (0.77 - 0.84)
Bias B 24% (19% - 30%)

Diffusion Tubes Mean: 79 μgm^{-3}
Mean CV (Precision): 4

Automatic Mean: 64 μgm^{-3}
Data Capture for periods used: 92%

Adjusted Tubes Mean: 63 (61 - 67) μgm^{-3}

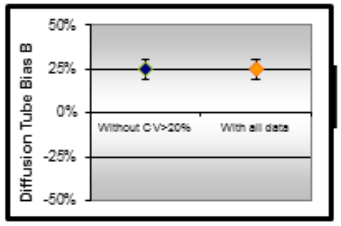
Accuracy (with 95% confidence interval) WITH ALL DATA

Bias calculated using 12 periods of data
Bias factor A 0.8 (0.77 - 0.84)
Bias B 24% (19% - 30%)

Diffusion Tubes Mean: 79 μgm^{-3}
Mean CV (Precision): 4

Automatic Mean: 64 μgm^{-3}
Data Capture for periods used: 92%

Adjusted Tubes Mean: 63 (61 - 67) μgm^{-3}



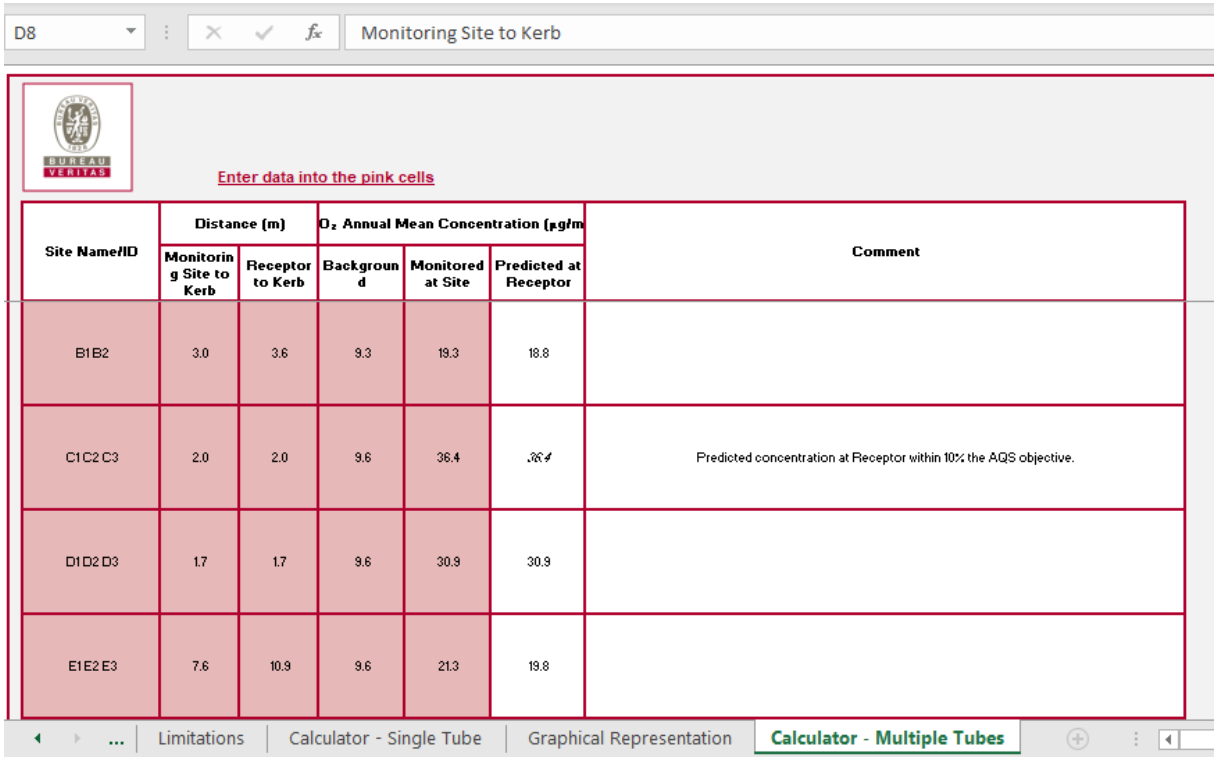
Jaume Targa, for AEA
Version 04 - February 2011

If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at: LAQMHelpdesk@uk.bureauveritas.com

NO_2 Fall off with distance calculator

Bias adjusted diffusion tube annual mean results have been distance corrected to the nearest relevant exposure location using the latest version of the "NO_2 Fall off with distance calculator" downloaded from the LAQM Support Website. Results are reported in the last column of Table B1 above. The calculator is used to estimate the annual mean NO_2 concentration at one distance from a road, using measurements made at a different distance from the same road. Figure 6 shows a screenshot of data input for multiple tubes. Background data was obtained from 2019 NO_2 background maps for Milton Keynes using the most appropriate grid square. The completed Excel spreadsheet has been uploaded to the Report Submission Website (RSW).

Figure 6 Example of "NO2 Fall off with distance calculator" spreadsheet



D8 | Monitoring Site to Kerb

Enter data into the pink cells

Site Name/ID	Distance (m)		O_x Annual Mean Concentration (µg/m			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
B1 B2	3.0	3.6	9.3	19.3	18.8	
C1 C2 C3	2.0	2.0	9.6	36.4	36.4	Predicted concentration at Receptor within 10% the AQS objective.
D1 D2 D3	1.7	1.7	9.6	30.9	30.9	
E1 E2 E3	7.6	10.9	9.6	21.3	19.8	

... | Limitations | Calculator - Single Tube | Graphical Representation | Calculator - Multiple Tubes

Annualisation tool

The Annualisation tool is used to estimate the annual mean NO_2 concentration at sites with less than 9 months' usable data. Monitoring on Miles Close, Newport Pagnell (Tube ID EEE1 and EEE2) commenced in October 2019 and so the tool was used to estimate the annual mean in 2019. Data from four AURN monitoring sites was used to provide data for the estimate and two screenshots of the tool are shown in Figure 7 below. The completed spreadsheet has been uploaded to the RSW.

Figure 7 Screenshots of "Annualisation tool" spreadsheet

Annualisation Summary

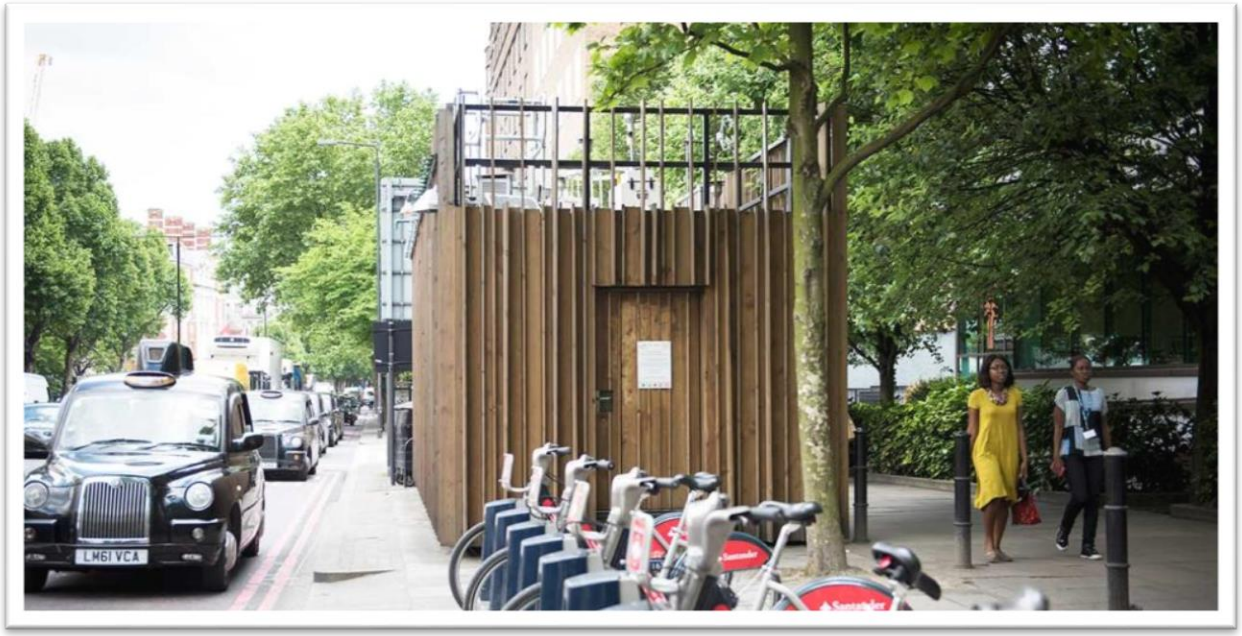
Diffusion Tube ID	Annualisation Factor Coventry Allesley	Annualisation Factor Leamington Spa	Annualisation Factor Leicester Univ	Annualisation Factor Northampton Spring	Average Annualisation Factor	Raw Data Simple Annual Mean (µg/m3)	Annualised Data Simple Annual Mean (µg/m3)	Comments
DT 1	0.8267	0.7850	0.8336	0.6292	0.7686	28.4	21.9	
DT 2	0.8267	0.7850	0.8336	0.6292	0.7686	28.0	21.5	
						-	-	
						-	-	
						-	-	
						-	-	

Annual Report Results Table

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Mean Concentrations (µg/m^3)												Simple Annual Mean (µg/m3)	
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted (0.84) and Annualised
DT 1	486164	243168										22.8	41.7	20.8	28.4	18.4
DT 2	486164	243168										26.6	35.9	21.6	28.0	18.1
DT 3																-
DT 4																-
DT 5																-
DT 6																-
DT 7																-
DT 8																-
DT 9																-
DT 10																-
DT 11																-
DT 12																-
DT 13																-

... | Diffusion Tube Calendar Inputs | Diffusion Tube Inputs | Continuous Monitor Inputs | Annualisation Summary | Annual Report Results Table

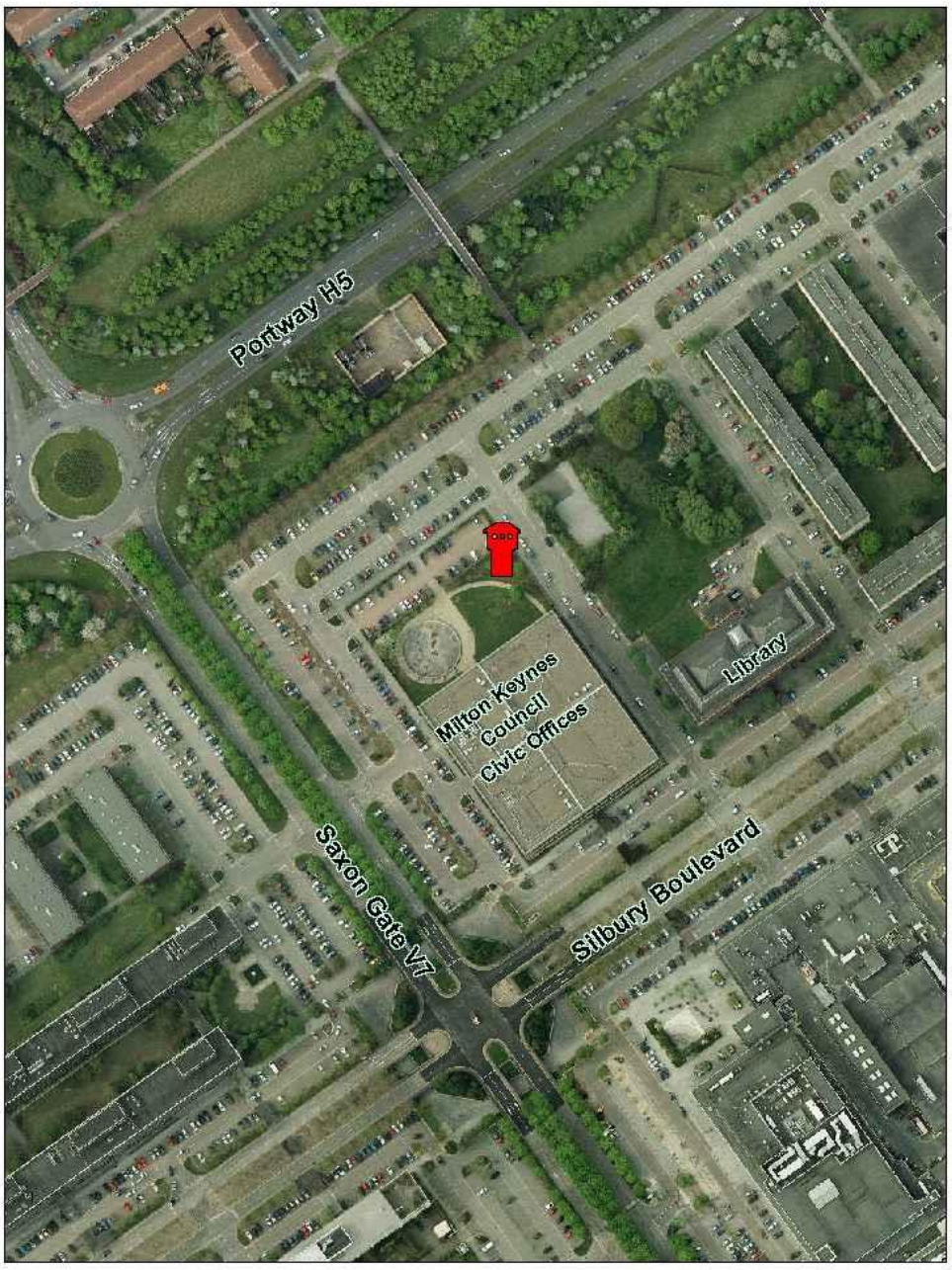
Figure 8 Marylebone Road London Air Quality Monitoring Site



Appendix D: Maps of Monitoring Locations and AQMAs

Automatic Monitoring Sites

Figure 9 Fixed Air Quality Station, Civic Offices, Central Milton Keynes



Air Quality Monitoring Station - Civic Offices, Central Milton Keynes

Figure 10 Roadbox Air Quality Station, Wolverton Road, Newport Pagnell

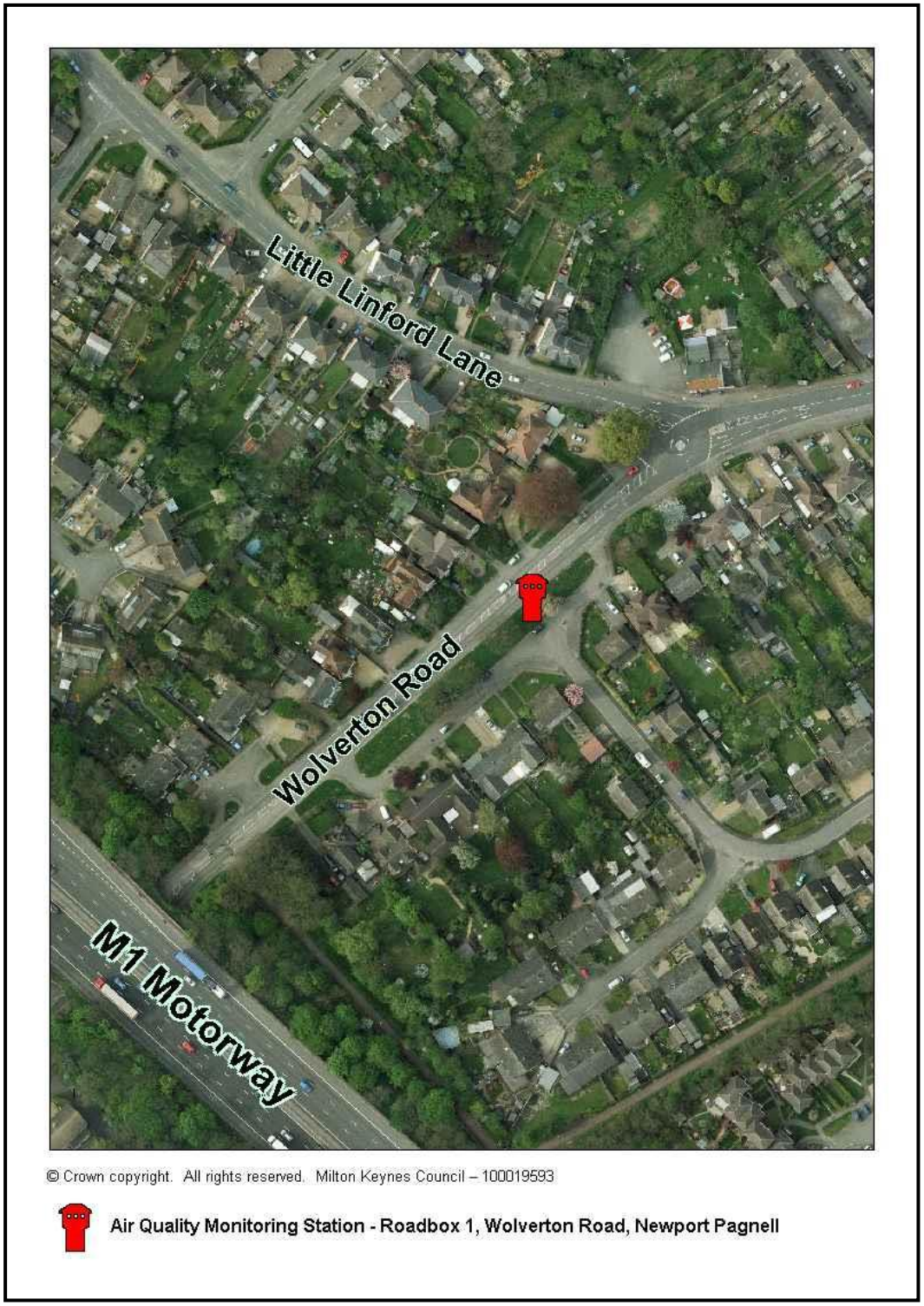
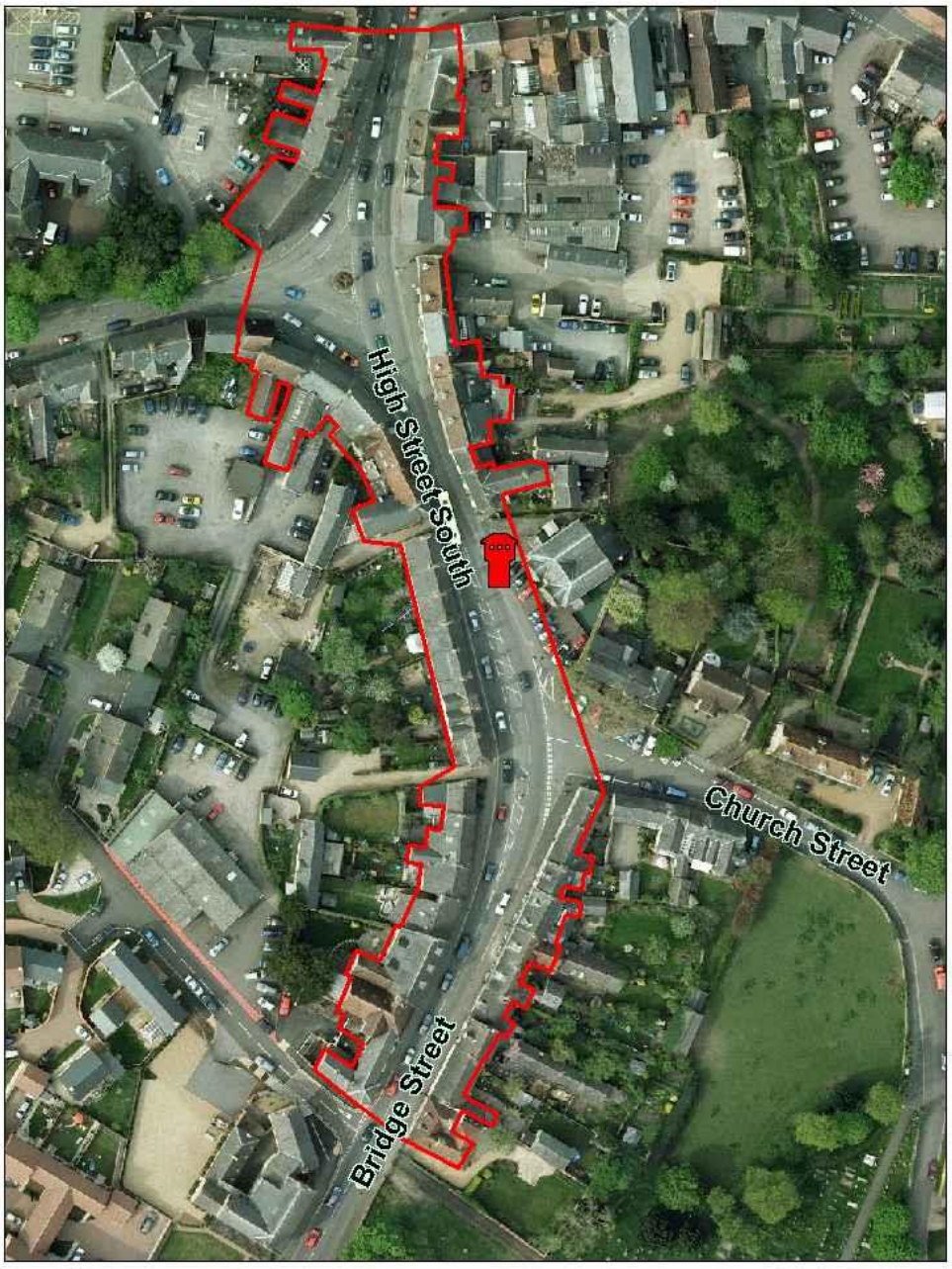


Figure 11 Roadbox Air Quality Station, High Street South, Olney (Within Designated Air Quality Management Area)



Air Quality Monitoring Station - Roadbox 2, High Street South, Olney
(Air Quality Management Area boundary in red)

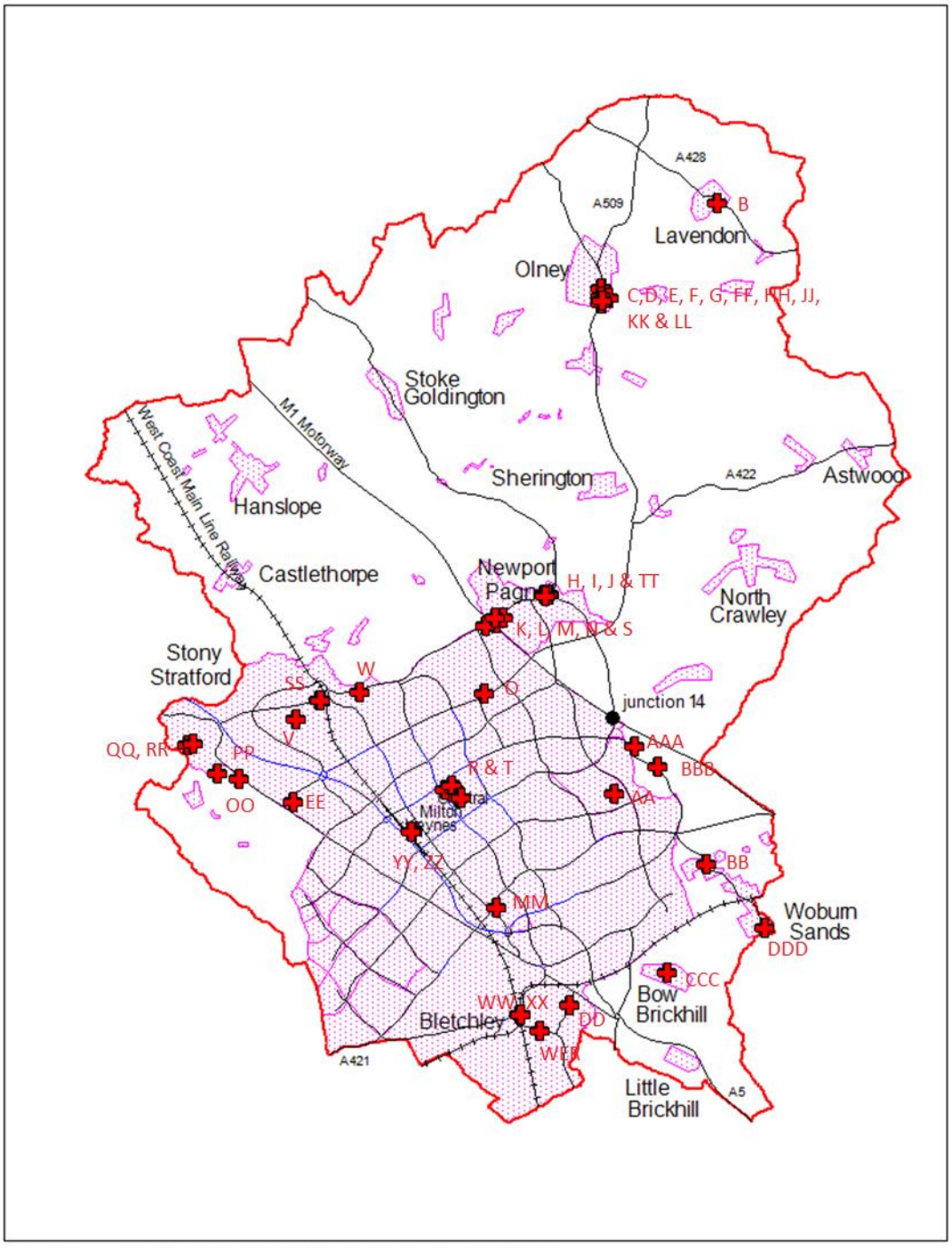
Figure 12 Automatic Air Quality Monitoring Station Photographs

Static Monitoring Station, Civic, CMK**.**

Roadbox 1 Monitoring Station Wolverton Road, Newport Pagnell (M1 bridge in background)

Roadbox 2 Monitoring Station High Street South, Olney

Figure 13 Map of Non-Automatic Monitoring Sites



Nitrogen Dioxide diffusion tube location

Appendix E: Summary of Air Quality Objectives in England

Table C.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	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

[4] 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
FDMS	Filter Dynamics Measurement System
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
SO_2	Sulphur Dioxide

References

1. Department of the Environment, Food and Rural Affairs, The Air Quality (England) Regulations 2000, The Stationery Office.

2. Department for Environment, Food and Rural Affairs, Local Air Quality Management, Technical Guidance TG16, DEFRA Publications.

3. Department for Environment, Food and Rural Affairs, Local Air Quality Management, Policy Guidance PG16, DEFRA Publications.

4. Milton Keynes Council, Annual Status Reports 2019.

5. Milton Keynes Council, Air Quality Action Plan, Jan 2012.

6. Local Air Quality Management Tools, NETCEN, on behalf of Department of the Environment, Food and Rural Affairs, available from web site: http://uk-air.defra.gov.uk/