2018 Air Quality Annual Status Report (ASR)

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

Date (June, 2018)

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Executive Summary: Air Quality in Our Area

Air Quality in Central Bedfordshire

Air pollution is associated with many 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].

Central Bedfordshire Council is a unitary authority in Bedfordshire with an estimated population of 278,900 (2016) in an area of 716 square kilometres. The district is predominantly rural but has several market towns the most populated of which are in the south (Dunstable, Houghton Regis and Leighton-Linslade) with several smaller towns in the north (Flitwick, Ampthill, Biggleswade and Sandy). The M1, A1 and A5 provide the major north-south routes with the A421, A505 and A507 providing east-west routes. Luton Airport is close to Central Bedfordshire Council's district boundary.

The main source of pollution in the district is from road transportation both within town centers' and the motorway/trunk roads which have significant daily traffic flows. Other sources include sources from outside the district (i.e. emissions from London & Eastern Europe, etc.), and within the district boundary (i.e. local industry). There are currently 74 industrial processes permitted by Central Bedfordshire Council.

The Dunstable AQMA was declared in 2005 with respect to the NO_2 annual mean air quality objective.

Currently nitrogen dioxide (NO_2) is the major pollutant of concern within Central Bedfordshire and is monitored throughout the district utilizing 36 diffusion tubes. Results of which will be discussed later in this document, however it can be noted that after applying the bias adjustment factor and distance correction calculation (where appropriate) only sites within the declared AQMAs showed an exceedance of the Air Quality Objective(s) - namely N20 and N30 (Sandy); SB37 (Dunstable) and N23 (Ampthill).

Diffusion tubes results from 2017 show both an increase/decrease across the sites when compared with those from 2016, it is likely that this was due to meteorological conditions, which varies from year to year across the region and more local factors such as traffic flow.

[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

The realtime analyser in Sandy recorded an NO_2 annual mean of 34µg/m^3 and 4 exceedances of the NO_2 hourly mean (35 exceedances of this objective are permitted) and so the results show compliance with both Air Quality Objectives.

The council also monitors particulate matter; however, no exceedance of either the annual or 24hour mean objectives for PM_{10} has either been monitored or modelled.

Given the health impacts of smaller particles, focus has been directed on $PM_{2.5}$. Central Bedfordshire Council has been monitoring this at the automatic realtime monitoring station in Sandy (adjacent to the A1) since 2013. As can be seen by the results discussed later in this document – levels of $PM_{2.5}$ monitored have slightly dropped year on year since monitoring began in 2013. However, the 2017 result of 11.62 (annualised) µg/m^3, showed a slight decrease from last year. The $PM_{2.5}$ proposed EU Emission Limit Value of 25 µg/m^3 has not been exceeded.

The majority of Central Bedfordshire Council's district meets the UK Governments Air Quality Objectives (AQOs) for several pollutants including nitrogen dioxide (NO_2) and particulate matter (PM_{10}). However, three locations within the district continue to have concentrations of NO_2 which exceed the objective(s) levels.

Therefore, Central Bedfordshire Council declared a further two Air Quality Management Areas (AQMAs) in Ampthill and Sandy, adding to the existing one in Dunstable – the AQMAs in Ampthill and Dunstable were declared with respect to the annual objective for nitrogen dioxide (40 µg/m^3) and the Sandy AQMA for both the annual and hourly (200 µg/m^3 not to be exceeded more than 18 times per year). The Air Quality Action Plan for Ampthill and Sandy will be subject to a Public Consultation which is due to start imminently.

The AQAP regarding the Dunstable AQMA was produced in 2006 and therefore requires updating. Work on this will take place as soon as possible. Meanwhile monitoring continues and will provide information as to the impact of the opening of the new A5-M1 and Woodside Connection roads on air pollution in Dunstable and the AQMA.

Work has commenced to de-trunk the A5 through Dunstable town and to introduce/reinforce HGV restrictions. Thereby re-directing traffic away from the congested town centre and reducing the traffic flow, thereby reducing pollutant emissions and congestion. Air quality issues are continuing to be considered in plans surrounding the development of the town centre.

To maintain and improve air quality within Central Bedfordshire, Public Protection are consulted on planning applications in order to assess the likely impact on air pollution concentrations and/or if the development is likely to result in people being exposed to poor air quality. Public Protection officers may request that a further assessment be carried out by developers to determine any appropriate mitigation for the

development given its location/size and subsequent impact of the development on the local environment. Alternatively, Public Protection officers may recommend refusal of the development should there be no suitable mitigation measures.

Actions to Improve Air Quality

The new A5-M1 link road and the Woodside Link roads opened on 11th May 2017 and 13th April 2017 respectively.

Work has commenced to de-trunk the A5 through Dunstable town and to introduce/reinforce HGV restrictions. Thereby re-directing traffic away from the congested town centre and reducing the traffic flow, thereby reducing pollutant emissions and congestion. Air quality issues are continuing to be considered in plans surrounding the development of the town centre. Meanwhile monitoring continues and the results of which will be reported in future reports, it will be interesting to see the extent of the impact from the new infrastructure developments.

Travel Choices is a continuing resource – a web based application to assist people planning journeys (walking/cycling) throughout Dunstable, Houghton Regis and Luton.

Further monitoring carried out in Sandy and Ampthill have assisted in providing more valuable information as to the extent of the exceedance of the objective(s) and to developing the AQAP which will be subject to a Public Consultation which is due to start imminently.

Surveys and reports are being drafted for options to improve Ampthill town centre – potential schemes include re-prioritising routes through the town centre to manage the traffic more effectively thus reducing congestion and improving air quality and the public realm. Other options for consideration are to work alongside relevant colleagues within Central Bedfordshire Council (Sustainable Transport, Public Health, etc.) and external bodies (i.e. local businesses and schools) to increase the number of journeys undertaken by walking, cycling and using public transport; this would reduce the number of journeys by car, improving air quality and levels of physical exercise thereby reducing obesity.

Highways England is continuing to work alongside Central Bedfordshire Council to try to identify actions to improve the air quality within the Sandy AQMA which exceeds both the hourly and annual NO_2 Air Quality Objective levels.

Conclusions and Priorities

In monitoring locations outside the AQMAs there were no recorded exceedences of the NO_2 air quality objectives (AQOs). However, there continues to be sites within the three AQMAs that are recording exceedences of the NO_2 AQOs.

Although, generally year on year, concentrations of nitrogen dioxide recorded at the monitoring sites are falling. Results in 2017 showed that whilst concentrations continued to decline at most of the sites, at a small number of sites concentrations

increased given the small number of such sites the increases are likely to be because of local factors (traffic flows, etc).

The A5-M1 and Woodside link (providing a direct link to the A5-M1 and junction 11a of the M1) roads opened to the public in May and April 2017 respectively, providing routes to these major road network without traversing through Dunstable and the AQMA. Monitoring will continue within Dunstable to establish the effects on air pollution and compare levels to those prior to the new road infrastructure, this may take a few years to establish a trend and consider variables such as meteorological conditions.

The Air Quality Action Plan for Ampthill and Sandy will be subject to a Public Consultation which is due to start imminently.

The council's priorities for addressing air quality in the coming year are to complete a public consultation and publish the AQAPs for Ampthill & Sandy, monitoring the effectiveness of the actions and reviewing/amending as necessary. Meanwhile Central Bedfordshire Council plans to review and update the Dunstable Air Quality Action Plan as soon as practicable.

Local Engagement and How to get Involved

Emissions from road transportation are the major source of air pollution in the district and therefore the public can help reduce local air pollution concentrations by choosing to walk, cycle and/or use public transport and reduce reliance on cars for trips where possible.

When using a car for trips emissions can be minimised by ensuring that the vehicle is not over revved and that the engine is switched off when the vehicle is stationary (parked) or is likely to be stationary for a period of time. Emissions can be further reduced by removing unnecessary loads from boots and roof carriers to minimise the weight which improves fuel efficiency. The newer the vehicle the greater level of emission controls it will have and therefore produce less pollution than older cars.

The following websites provide information to assist with travel in Central Bedfordshire:

- Busway – https://www.cbtravelchoices.co.uk/busway which has information relating to busway routes and times.
- Travel line South East - http://www.travelinesoutheast.org.uk/se/XSLT_TRIP_REQUEST2?language=en&timeOffset=15 – where users can plan journeys using public transport throughout the region

- Travel choices - https://www.cbtravelchoices.co.uk/ - which has information regarding traffic and travel in/around Dunstable, Houghton Regis and Leighton Buzzard

More general information regarding transport issues in Central Bedfordshire can be found on the council's website:

- Transport, roads and parking - http://www.centralbedfordshire.gov.uk/transport/landing.aspx

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1 Local Air Quality Management

This report provides an overview of air quality in Central Bedfordshire 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 Central Bedfordshire 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 Central Bedfordshire 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=444. Alternatively, see Appendix D.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants & 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
AQMA 1 (Dunstable)	Dec 04	NO2 annual mean	Dunstable	An area encompassing the town centre & along the A505 (Luton Road) and A5 (Watling Street)	At time of declaration of the AQMA Yes. Now A5 through Dunstable has reverted to Local Authority control	2004 = 46	µg/m^3	40.7	µg/m^3	AQAP AQMA 1 (Dunstable)	2005	E.g. www.
AQMA 4 (Sandy)	Aug 15	NO2 annual mean	Sandy	10 metres either side of the A1 from Bedford Road to the Georgetown exit.	YES	2014 = 74	µg/m^3	66.26	µg/m^3	Action Plan at public consultation	Consultation draft June 2018	

AQMA 4 (Sandy)	Aug 15	NO2 1 hour mean	Sandy	10 metres either side fo the A1 from Bedford Road to the Georgetown exit	YES	2014 = 74	µg/ m^3	66.26	µg/ m^3	Action Plan at public consultation	Consult ation draft June 2018	E.g. http://
AQMA 3 (Ampthill)	Aug 15	NO2 annual mean	Ampthill	The town centre and along Dunstable, Bedford and Church Streets.	NO	2014 = 42.01	µg/ m^3	44.11	µg/ m^3	Action Plan at public consultation	Consult ation draft June 2018	

☒ **Central Bedfordshire Council confirm the information on UK-Air regarding their AQMA(s) is up to date (confirm by selecting in box)**

2.2 Progress and Impact of Measures to address Air Quality in Central Bedfordshire

Defra's appraisal of last year's ASR *concluded "on the basis of the evidence provided by the Local Authority the conclusions reached are acceptable for all sources and pollutants".* The approval report detailed some comments to be addressed:

- *Define magnitude of hotspots in Dunstable Street, Ampthill and Luton Road, Dunstable, so the extent of areas involved can be clearly understood and feed future discussions on how hotspots should be addressed.*

  Central Bedfordshire Council have been monitoring in these areas for some time and it is my intention to review the monitoring locations in Ampthill and Dunstable and close sites that are showing consistent compliance with the Air Quality Objectives and open new sites closer to areas of exceedance to identify extent and magnitude of hotspot locations.

- *The Sandy AQMA has two points of exceedances at Carter Street (N20 & N30) but it's not clear whether other monitoring points in vicinity of positions of relevant exposure close to the A1 have been considered in monitoring programme. AQMA boundary not clear.*

  Central Bedfordshire Council introduced 2 additional monitoring locations in/near Carter Street – one on a street sign close to the A1 (N30), in a more open position that the site on the downpipe on one of the cottages immediately adjacent to the A1; the other on a lamppost some distance down Carter Street (N28) to ascertain levels of pollution fall off at this location. This was done in conjunction with Highways England to try to ascertain more data to assist in Action Planning. There is limited access to the side of the A1 as pavements are not in place for much of the AQMA area. However, it is my intention to close the site in Carter Street (N28) as it is consistently below the Air Quality Objective and open a site between site N25 (the Akbar/A1) and the N20 (cottages adjacent to the A1) on a lamppost near or a downpipe of another house alongside the A1. The maps of the AQMAs can be found in Appendix D.

The next steps for Central Bedfordshire Council are to await the results from the public consultation regarding the Air Quality Action Plan for Ampthill and Sandy making any amendments required prior to its adoption. Then Central Bedfordshire Council will review and revise their action plan for Dunstable. The next Annual Status Report is due for submission in 2019.

The principal challenges and barriers to implementation that Central Bedfordshire Council anticipates facing are identifying measures that can be practicably applied to improve the air quality in the AQMAs given that there is limited scope for hard engineering works both in Sandy and Ampthill. Improvements will then rely on working to reducing emissions through strategic measures (integrating air quality into all relevant areas of decision making within Central Bedfordshire Council) and by promoting more sustainable travel choices and reducing traffic related emissions

Central Bedfordshire Council has taken forward many direct measures during the current reporting year of 2018 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in their respective Action Plan (for Dunstable) as the AQAP for Ampthill and Sandy is at the public consultation stage.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Central Bedfordshire Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of AQMA 1 (Dunstable).

The Council's Local Plan was submitted to Government on 30th April 2018 and will now be subject to an independent examination by a Planning Inspector. This document will replace both the Adopted North Local Development Framework and the Adopted South Local Development Framework which sets out how Central Bedfordshire will develop over the next 20 years.

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	Increase use of mixed developments	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	CBC	2004	Ongoing	No of such developments	<1%	<1% of all planning apps relate to this type of development. The number of such development is likely to increase as the Government has stated 26,000 new homes to be built in this area.	Ongoing	Lengthy Timescale of adoption of Local Plan -
3	Encourage adoption of travel plans	Promoting Travel Alternatives	Workplace Travel Planning	CBC	2004	Ongoing	No of travel plans	<1%	Green travel initiatives enhanced by Travel Choices programme promoting sustainable travel and reducing impact of journeys	ongoing	
4	CBC Green Travel Plan	Promoting Travel Alternatives	Workplace Travel Planning	CBC	2004	ongoing	Changes of modes of staff travel	Reduced vehicle emissions	Implementation on-going	ongoing	
6	Encourage walking / cycling & public transport	Promoting Travel Alternatives	Promotion of cycling	CBC	2004	Ongoing	passenger numbers / travel survey / time comparison	<1%	publicising bus, walking & cycling routes has helped to raise the profile of these transport methods.	ongoing	Draft Local Plan
8	Improve/extend cycle path network	Promoting Travel Alternatives	Promotion of cycling	CBC	2004	ongoing	additions to network / no of users / no & length of cycle paths improved/created.	<1%	Since AQAP there has been a 74% increase in on/off road cycle paths	ongoing	An off road cycle path was created alongside the busway route from Dunstable to Luton

10	Encourage use & benefits of public transport	Promoting Travel Alternatives	Other	CBC	2004	ongoing	number of passengers / travel survey / time comparisons	<1%	Green travel initiatives enhanced by Travel Choices programme promoting sustainable travel and reducing impact of journeys	ongoing	
16 & 33	Improvements to road network	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	CBC / Highways England	2004	Ongoing	congestion / road capacity / density statistics	<1%	Dunstable bypass & woodside link opened to the public in Apr/may 2017	ongoing	Draft Local Plan now out for public consultation & Dunstable town development plans being developed
12	provisions of incentives to use public transport	Promoting Travel Alternatives	Other	CBC	2004	Ongoing	number of passengers / travel survey / time comparisons	<0.5%	Austerity measures have resulted in some reductions in subsidised routes. Bus passes continue but will no longer auto-renew.	ongoing	Austerity measures have resulted in some reductions in subsidised routes. Bus passes continue but will no longer auto-renew.
15	encourage car sharing / walking /cycling	Promoting Travel Alternatives	Other	CBC	2004	Ongoing	numbers of walkers /cyclists and car sharers registered on Travel Choice website	<0.5%	Green travel initiatives enhanced by Travel Choices programme promoting sustainable travel and reducing impact of journeys	ongoing	Review council policies/strategies on altermative travel and target actions appropriately
23 & 24	promote use & availability of alternative fuels / more efficient vehicles	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	CBC	2004	Ongoing	availability of alternative fuels	<0.5%	Growing network of EV charging points within the district and locations publisised	ongoing	limited options to influence petrol stations to increase types of alternative fuels.

28	local development framework adopting policies improving AQ	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	CBC	2004	Ongoing	review & implement changes as required	<0.5%	Draft Local Plan now in consultation - will review and submit comments re AQ	2017	Draft Local Plan is out for consultation - to review & comment re AQ issues.
30	Develop/ maintain partnerships to improve services/planning/access	Other	Other	CBC	2004	Ongoing	Inter-agency communications	<0.5%	ongoing / new partnerships to develop Local Transport Plans, AQAPs etc continue	2020	Competing priorities of agencies
31	Review provisionof alternative transportation priority measures	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	CBC	2004	Ongoing	Road capacity / journey times	<0.5%	No room for dedicated bus lanes to network	ongoing	Review of bus strategy has removed subsidy on some routes outside of peak hours resulting in change to bus services
33	Road network improvements	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	CBC	2004	Ongoing	congestion / road capacity / density statistics	<1%	New roads opened to provide A5-M1 route and link to M1 from industrial area to avoid Dunstable AQMA	2023	Funding / managing agencies different priorities to meet the best outcome / public expectations

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.

Central Bedfordshire Council is taking the following measures to address $PM_{2.5}$:

- To continue to monitor at the realtime monitoring station in Sandy (adjacent to the A1) and ensure that the proposed EU Emission Limit Value of 25 µg/m^3 is not exceeded.
- To monitor results of the $PM_{2.5}$ Public Outcomes Framework indicator

The results monitored to date fall well below the $PM_{2.5}$ proposed EU Emission Limit Value of 25 µg/m^3.

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.

Central Bedfordshire Council undertook automatic (continuous) monitoring at 1 site during 2017. Table A.1 in Appendix A shows the details of the sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available at https://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.

3.1.2 Non-Automatic Monitoring Sites

Central Bedfordshire Council undertook non- automatic (passive) monitoring of NO_2 at 36 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.

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.

There is one site that has an annual mean greater than 60µg/m^3, indicating an exceedance of the NO_2 1-hour mean objective at these locations, an additional site in the vicinity showed an annual mean just below 60µg/m^3, both are within the AQMA in Sandy (which was declared in respect of both the hourly and annual objectives).

No monitoring sites outside the current 3 AQMAs showed an exceedance with the annual NO_2 air quality objective.

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 exceedances of the air quality objectives in 2017.

3.2.3 Particulate Matter ($PM_{2.5}$)

Although not covered by Local Air Quality Regulations, Central Bedfordshire Council carries out monitoring of $PM_{2.5}$ at the Sandy automatic monitoring station. The Public Health Outcomes Framework (PHOF) indicator is based on $PM_{2.5}$.

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

Levels of $PM_{2.5}$ monitored have slightly dropped year on year since monitoring began in 2013. However the 2017 result of 11.62µg/m^3, showed a negligible decrease of 0.38µg/m^3 from last year, however due to a low data capture rate (57%), the result has been annualised in accordance with Defra guidance. The $PM_{2.5}$ proposed EU Emission Limit Value of 25µg/m^3 has not been exceeded.

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)
MD3	Sandy (Roadside)	Roadside	516436	249600	NO_2; PM10 & PM2.5	YES	Chemiluminescent; FDMS	N/A	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 collocated with a Continuous Analyser?	Height (m)
N1	A1 Sandy	Roadside	516485	249202	NO_2	YES	3	1	NO	1.5
N4	A1 Beeston	Roadside	517160	248190	NO_2	NO	2	1	NO	1.5
N6	Bedford Rd Sandy	Roadside	516621	249100	NO_2	YES	4	1	NO	1.5
N20	A1 Carter St Sandy	Roadside	516534	249974	NO_2	YES	0	1	NO	1.5
N16	Bedford Rd Sandy	Roadside	516593	249083	NO_2	YES	3	1	NO	1.5
N17	Bedford Rd Sandy	Roadside	516569	249074	NO_2	YES	6	1	NO	1.5
N18	Eddie's Cottage Sandy	Roadside	516579	249070	NO_2	YES	0	5	NO	0.75
N21	Ampthill 1	Roadside	503444	238197	NO_2	YES	3	2	NO	1.5
N22	Ampthill 2	Roadside	503466	238141	NO_2	YES	8	1	NO	1.5
N23	Ampthill 3	Roadside	503458	283039	NO_2	YES	2	1	NO	1.5
N25	Akbar A1 Sandy	Roadside	516568	250174	NO_2	YES	-	1	NO	1.5
N26	Woburn	Roadside	494900	233230	NO_2	NO	2	1	NO	1.5
N28	Carter St Sandy	Roadside	516551	249967	NO_2	YES	1.5	1	NO	1.5
N30	A1/Carter St Sandy	Roadside	516261	244544	NO_2	YES	-	1	NO	0.75
N31	Bedford Rd Sandy	Roadside	516690	249108	NO_2	NO	4	1	NO	1.5
N32	Chandos Ampthill	Roadside	503399	237912	NO_2	NO	-	1	NO	0.75
N27	Church St Ampthill	Roadside	503576	238167	NO_2	YES	1	1	NO	0.75

1	High St South Dunstable	Roadside	501936	221837	NO_2	YES	-	1	NO	0.75
10	Houghton Regis	Roadside	501991	223965	NO_2	NO	-	3	NO	0.75
17	Mayfield/London Rd Dunstable	Roadside	502848	220688	NO_2	NO	5	2	NO	1.5
18	Argos High St North Dunstable	Roadside	501705	222089	NO_2	YES	-	1	NO	0.75
27	Luton Rd Dunstable	Roadside	503195	222119	NO_2	YES	1	4	NO	1.5
33	Church St Dunstable	Roadside	501962	221884	NO_2	YES	0	8	NO	1.5
34	High St South Dunstable	Roadside	501911	221853	NO_2	YES	4	1	NO	1.5
36	Luton Rd Dunstable	Roadside	503849	222326	NO_2	YES	2	1	NO	1.5
37	Luton Rd Dunstable	Roadside	502838	222071	NO_2	YES	3	2	NO	0.75
39	Houghton Rd Dunstable	Roadside	501151	222821	NO_2	NO	3	1	NO	1.5
48	Poynters/Katherine Dunstable	Roadside	503745	222914	NO_2	NO	4	1	NO	0.75
49	Poynters/Hadrian Dunstable	Roadside	503569	223034	NO_2	NO	6	1	NO	0.75
50	Luton Rd Dunstable	Roadside	502815	222065	NO_2	NO	6	1	NO	0.75
52	Hockliffe St Leighton Buzzard	Roadside	492512	225235	NO_2	NO	2	1	NO	0.75
54	High St North/Vauxhall Dunstable	Roadside	500938	222899	NO_2	NO	4	1	NO	0.75

55	West St Dunstable	Roadside	501662	221768	NO_2	NO	-	1	NO	1.5
56	West St Leighton Buzzard	Roadside	491800	225041	NO_2	NO	10	1	NO	1.5
57	Church St Dunstable	Roadside	502456	222023	NO_2	NO	4	1	NO	1.5
58	Moggerhanger	Roadside	514233	249189	NO_2	NO	3	1	NO	1.5

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
MD3	Roadside	Automatic		97.8	31	27.94	30.6	33	34
N1	Roadside	Diffusion Tube		83	39.28	39.05	**43.21**	**43.01**	**44**
N4	Roadside	Diffusion Tube		100	36.64	33.52	37.23	37.15	33.9
N6	Roadside	Diffusion Tube		100	35.54	33.43	36.58	34.25	33.5
N20	Roadside	Diffusion Tube		100	80.29	70.08	73.98	69.77	66.26
N16	Roadside	Diffusion Tube		100	35.49	34.42	43.21	40.61	40.77
N17	Roadside	Diffusion Tube		100	49.07	42.11	50.18	48.26	53.97
N18	Roadside	Diffusion Tube		100	28.58	28.28	30.51	29.94	30.18
N21	Roadside	Diffusion Tube		100	27.14	25.48	25.81	25.94	24.47
N22	Roadside	Diffusion Tube		100	41.03	39.93	43.68	41.97	39.73
N23	Roadside	Diffusion Tube		100	43.34	45.09	46.24	46.37	44.11
N25	Roadside	Diffusion Tube		100			37.64	38.13	36.77
N26	Roadside	Diffusion Tube		100			39.23	40.73	34.81
N27	Roadside	Diffusion Tube		100			31.49	34.44	33.81
N28	Roadside	Diffusion Tube		100			21.77	24.62	25.14

N30	Roadside	Diffusion Tube		100				59.91	57.09
N31	Roadside	Diffusion Tube		92				27.93	27.39
1	Roadside	Diffusion Tube		83	44.8	38.75	38.66	41.53	35.61
10	Roadside	Diffusion Tube		100	33.25	39.1	31.44	35.49	33.82
17	Roadside	Diffusion Tube		83	32.13	32.31	29.91	33.5	29.16
18	Roadside	Diffusion Tube		100	43.73	55.18	38.36	40.14	35.13
27	Roadside	Diffusion Tube		100	36.4	32.16	31.21	33.23	29.84
33	Roadside	Diffusion Tube		83	35.01	39.03	36.82	39.54	37.39
34	Roadside	Diffusion Tube		83	45.86	48.99	44.98	48.2	40.58
36	Roadside	Diffusion Tube		100	39.85	45.96	30.76	35.62	33.46
37	Roadside	Diffusion Tube		75	45.33	40.92	44.74	54.57	48.01
39	Roadside	Diffusion Tube		92	36.83	32.91	32.32	35.26	31.55
48	Roadside	Diffusion Tube		100	32.43	34.45	36.07	37.14	33.41
49	Roadside	Diffusion Tube		100	32.48	36.56	32.02	32.84	29.91
50	Roadside	Diffusion Tube		100	43.01	48.41	45.67	52.24	50.78
52	Roadside	Diffusion Tube		66			33.23	38.86	38.39
54	Roadside	Diffusion Tube		92				28.16	23.5
55	Roadside	Diffusion Tube		100				44.26	41.89

56	Roadside	Diffusion Tube		83					26.18
57	Roadside	Diffusion Tube	100						26.23
N32	Roadside	Diffusion Tube		83				27.9	27.48
N33	Roadside	Diffusion Tube		92					29.73

☒ **Diffusion tube data has been bias corrected (confirm by selecting in box)**

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

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.

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
MD3	Roadside	Automatic		98	**0**	**0 (113)**	**0 (130)**	1	**4**

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 ($\mu g/m^3$) (3)				
				2013	2014	2015	2016	2017
MD3	Roadside		60	**20**	**17.21 (annualised)**	**10.3 (annualised)**	**19**	**18.23 (annualised)**

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

Notes:

Exceedances of the PM_{10} annual mean objective of 40$\mu g/m^3$ 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.

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/m^3 [3]				
				2013	2014	2015	2016	2017
MD3	Roadside		60	6	**1(27)**	**1(26.4)**	**1(32)**	**3(29)**

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	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
				2013	2014	2015	2016	2017
MD3	Roadside		57	13	12	11	12	11.62 annualised

☒ **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 2017

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

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (factor) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
N1	62.06	53.77	48.56	55.31			45.31	41.18	34.05	44.88	59.34	49.93	49.44	**44**	36.7
N4	61	41.89	37.94	39.83	24.14	31.71	33.05	36.42	38.84	31.61	40.69	39.94	38.09	33.9	
N6	60.25	43.29	41.59	37.52	27.5	38.23	30.57	31.92	36.36	18.78	43.92	41.75	37.64	33.5	
N20	113.98	60.6	73.74	78.96	72.76	72.79	65.69	67.33	64.16	61.79	82.16	79.44	74.45	**66.3**	**no drop off**
N16	63.99	52.22	46.37	44.57	32.2	46.67	38.85	42.93	39.52	41.16	47.33	53.94	45.81	**40.8**	34.2
N17	69.47	53.29	55.11	63.47	47.24	58.21	54.48	62.93	58.59	56.4	79.03	69.45	60.64	**54.0**	37.1
N18	47.85	33.57	30.25	36.28	27.3	31	29.13	32.5	32.42	30.93	39.56	36.13	33.91	30.2	
N21	41.9	35.17	40.54	24.04	23.91	21.45	20.62	18.73	27.58	22.25	27.41	26.31	27.49	24.5	
N22	45.74	55.18	28.27	44.73	34.04	39.04	40.12	35.17	43.27	41.66	79.21	49.27	44.64	**39.7**	28.0
N23	64.74	60.94	48.94	48.55	41.09	39.71	45.85	34.17	43.87	42.71	79.58	44.63	49.57	**44.1**	**no drop off**
N25	73.95	43.72	37.75	40.42	32.68	34.69	33.11	35.59	40.19	39.25	44.32	40.13	41.32	36.8	
N26	58.91	47.07	40.13	40.27	32.32	38.64	33.33	35.45	31.92	33.03	40.48	37.82	39.11	34.8	
N27	45.74	45.54	49.36	39.59	30.89	31.65	34.09	29.47	36.51	31.14	43.05	38.84	37.99	33.8	
N28	44.77	29.34	29.09	27.33	18.95	19.82		20.37	24.33		34.94	33.57	28.25	25.1	
N30	96.16	83.48	59.09	71.08	42.44	44.45	54.45	57.35	56.13	57.24	81.73	66.13	64.14	**57.1**	**42.2**
N31	46.18	37.56	34.5	32.77	23.81	25.64	21.47	26.61	25.33	27.53		37.11	30.77	27.4	
N32	56.33	38.84	28.25	25.46	24.69			20.3	26.7	23.89	28.02	29.02	30.15	26.8	
N33	56.96	37.25	35.42	31.53		25.33	22.43	26.96	32.69	27.63	37.55	33.75	33.41	29.7	
SB01			51.67	44.22	41.18	37.92	40.8	35.62	39.28	33.03	39	37.34	40.01	35.6	

SB03	30.46	21.94	15.09	11.47	11.42	10.62	9.52	9.89	13.89	10.84	19.68	15.73	15.05	13.4	
SB10	56.27	53.95	47.89	31.38	29.07	32.47	34.25	30.65	36.94	34.07	35.86	33.25	38.00	33.8	
SB17	49.05		35.48		31.92	29.99	31.99	26.44	35.15	28.82	31.42	32.32	33.26	29.6	
SB18	53.59	50.41	45.98	39.56	41.16	33.96	34.78	27.47	37.6	32.91	38.83	37.39	39.47	35.1	
SB27	53.73	41.87	36.17	30.9	27.87	29.06	27.95	22.36	31.74	28.95	41.04	30.63	33.52	29.8	
SB33		72.42	47.1	40.53	34.64		38.49	33.31	36.68	34.78	46.24	42.43	42.66	38.0	36.9
SB34	71.58		44.51		56.17	40.71	41.44	33.79	42.72	31.81	48.62	44.65	45.60	**40.58**	32.50
SB36	57.4	43.78	45.23	38.72	29.01	32.17	28.4	26.49	34.86	30.04	44.11	40.3	37.54	33.4	
SB37		60.23			55.91	48	46.73	48.96	47.64	47.15	79.4	51.43	53.94	**48.0**	**40.7**
SB39	56.37	43.31	37.44	37.42	27.36	29.18	27.69	25.89		31.88	39.38	34.03	35.45	31.6	
SB48	55.97	44.09	36.16	37.2	36.67	31.2	32.49	27.93	33.69	30.47	43.66	40.97	37.54	33.4	
SB49	54.63	44.47	35.37	33.13	30.35	28.61	26.63	23.24	31.07	27.74	32.46	35.59	33.61	29.9	
SB50	86.25	63.41	51.82	47.91	55.11	46.3	49.04	46.03	49.33	44.18	79.78	65.5	57.06	**50.8**	34.2
SB52	60.68	46.3	46.77		31.59	35.6	31.56		39.3	34.78			40.82	38.4	34.6
SB54	39.75		30.15	26.84	26.13	23.48	21.53	18.42	27.39	20.76	30.16	25.78	26.40	23.5	
SB55	63.01	51.02	49.36	43.8	42.33	40.1	41.55	35.83	38.04	34.52	79.83	45.46	47.07	**41.9**	32.1
SB56		39.39	34.98	26.6	27.91		20.27	22.86	31.52	27.34	29.32	33.99	29.42	26.2	
SB57								18.74	26.38	22.93	36.65	36.48	28.24	26.2	

☐ **Local bias adjustment factor used (confirm by selecting in box)**

☒ **National bias adjustment factor used (confirm by selecting in box)**

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

☒ **Where applicable, data has been distance corrected for relevant exposure (confirm by selecting in box)**

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

There have been no significant changes, nor new sources of pollution within the district (or adjacent to the district boundary) and therefore no screening assessments have been required in the last year. Should any changes or new sources of pollution be identified in the future then the appropriate screening tools will be utilised and the results reported.

No further AQMAs need to be declared, nor existing AQMA boundaries amended or revoked.

Currently monitoring of NO_2 is continuing throughout the district by diffusion tubes to monitor levels to ensure that no further areas are exceeding the Air Quality Objectives with regard to nitrogen dioxide. Additional tubes have been placed within and in the vicinity of the new AQMAs (in Ampthill and Sandy) to gather more information as to the location of exceedences to assist in understanding where actions may be implemented to assist with producing effective Action Plans to work towards reducing levels of NO_2.

QA/QC of Diffusion Tube Monitoring

Diffusion tubes are supplied by Gradko and prepared using 20% TEA (Triethanolamine) in water methodology.

The latest diffusion tube precision studies for Gradko 20% TEA in water methodology show good precision in 32 out of 32 tests carried out during 2016. This information was obtained from http://laqm.defra.gov.uk/diffusion-tubes/precision.html

The lastest WASP/AIR NO_2 PT results showed that Gradko's results scored 100% satisfactory.

One of the NO_2 diffusion sites had less than a 75% data capture during 2017, Hockliffe Street, Leighton Buzzard (SB52) and one site, Priory View, Church Street, Dunstable (SB57), commenced monitoring part way through the year and therefore there was a requirement to "annualise" the data set for these sites.

Figure C1 – Annualisation calculations for NO_2 diffusion tube sites with less than 75% data capture

2017 µg/m3 data source H&B network														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	data %
Dacorum - Northchurch High Street (roadside)	49	32	29	29	24	20	21	22	27	25	37	31	29	100
North Herts - Hitchin Stevenage Road (roadside)	73	56	55	48	40	37	40	41	44	41	48	48	48	97
Period Mean	Jan-Mar		May-Jul		Sept-Oct									
Dacorum - Northchurch High Street (roadside)	37		22		26									
North Herts - Hitchin Stevenage Road (roadside)	61		39		43									
Ann mean : period mean (ratio)														
Dacorum - Northchurch High Street (roadside)	0.786364		1.330769		1.108974									
North Herts - Hitchin Stevenage Road (roadside)	0.775815		1.220085		1.119608									
Ave	**0.781089**		**1.275427**		**1.114291**		**1.056936**							
	AM	Ra												
	40.82	**1.056936**												
Hockliffe St Leighton Buzzard (52) annualised tube ave AM*Ra			**43.14**											

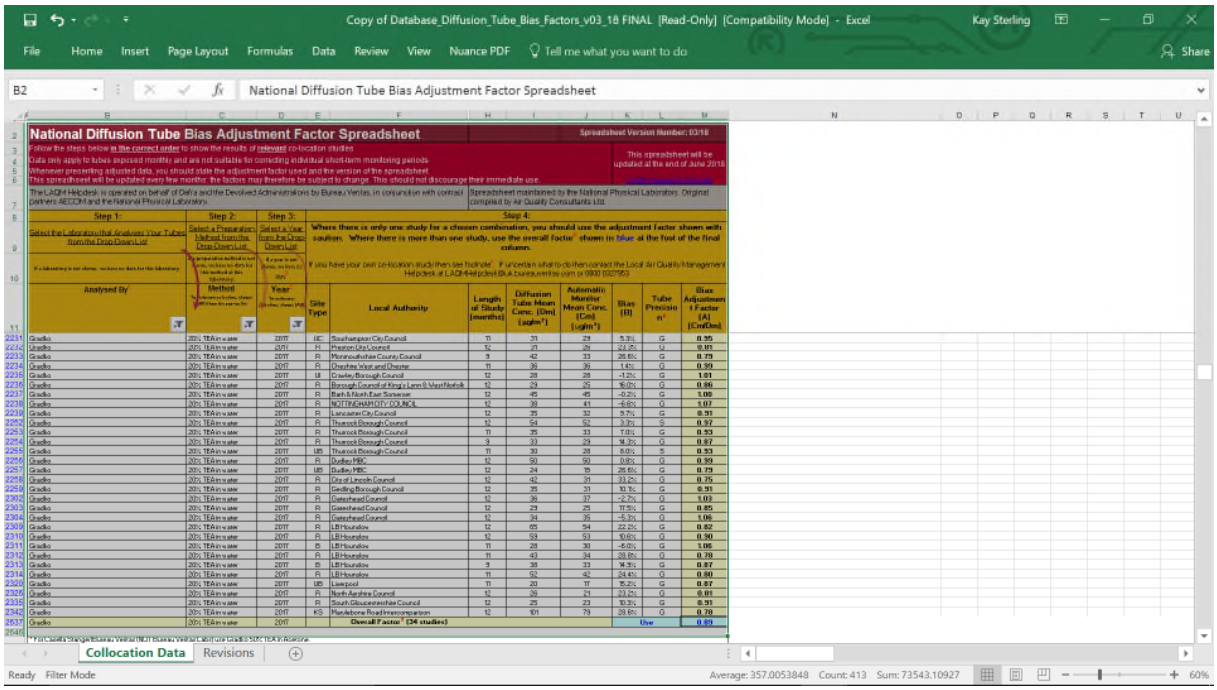
2017 µg/m3 data source H&B network														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	data %
Dacorum - Northchurch High Street (roadside)	49	32	29	29	24	20	21	22	27	25	37	31	29	100
North Herts - Hitchin Stevenage Road (roadside)	73	56	55	48	40	37	40	41	44	41	48	48	48	97
Period Mean	Aug-Dec													
Dacorum - Northchurch High Street (roadside)	28													
North Herts - Hitchin Stevenage Road (roadside)	44													
Ann mean : period mean (ratio)														
Dacorum - Northchurch High Street (roadside)	1.015258													
North Herts - Hitchin Stevenage Road (roadside)	1.071697													
Ave	**1.043477**													
	AM	Ra												
	28.24	**1.043477**												
Priory View Chuch St Dunstable			**29.47**											

National Bias Adjustment Factor (NO_2 diffusion tube data)

The national bias adjustment factor for 2017 is 0.89

The national bias adjustment factor is available for Gradko 20% TEA in water tubes from http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html and was obtained in April 2018 (version 3/18_final). See below.

Figure C2 – National Bias adjustment factor



Distance Correction (fall off)

In addition sites have had a distance correction factor applied where appropriate to calculate the drop off in pollution from the source to the receptor. This has been done in accordance with the methodology in Defra's Local Air Quality Management Technical Guidance (LAQM TG.09) published in February 2009.

Sites that were exceeding, or near to breaching, the NO_2 annual objective concentration, but were not in locations of relevant exposure required that a distance correction factor to be applied to calculate the likely concentration at the nearest receptor using the NO_2 fall-off with distance calculator available on the LAQM Support website http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

The calculations for each site can be found overleaf

Figure C3 – distance correction for site 33

Distance correction calculation for site 33 - Church Street, Dunstable

BUREAU VERITAS

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	8	metres
Step 2	How far from the KERB is your receptor (in metres)?	9	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.55656	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	37.97	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	*36.9*	µg/m^3

Figure C4 – distance correction for site 34

Distance correction calculation for site 34 - High Street South, Dunstable

BUREAU VERITAS

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	4	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.55656	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	40.58	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	32.5	µg/m^3

Figure C5 – distance correction for site 37

Distance correction calculation for site 37 - 32 Luton Road, Dunstable

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	3	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	15.10704	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	48.01	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	40.7	µg/m^3

Figure C6 – distance correction for site 50

Distance correction calculation for site 50 - 24 Luton Road, Dunstable

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	10	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	15.10704	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	50.78	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	34.2	µg/m^3

Figure C7 – distance correction for site 52

Distance correction calculation for site 52 - Hockliffe Street, Leighton Buzzard

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	2	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.44049	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	38.39	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	34.6	µg/m^3

Figure C8 – distance correction for site 55

Distance correction calculation for site 55 - Jonquil, West Street, Dunstable

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	5	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.55656	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	41.89	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	32.1	µg/m^3

Figure C9 – distance correction for site N1; N16 & N17

Distance correction calculation for site N1 - A1, Sandy

BUREAU VERITAS

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	3	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.0258	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	44	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	*36.7*	µg/m^3

Distance correction calculation for site N16 - Bedford Street, Sandy

BUREAU VERITAS

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	3	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.0258	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	40.77	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	34.2	µg/m^3

Distance correction calculation for site N17 - Bedford Street, Sandy

BUREAU VERITAS

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	7	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.0258	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	53.97	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	*37.1*	µg/m^3

C10 – distance correction for site N22 & N30

Distance correction calculation for site N22 - Ampthill 2

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	8	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.78753	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	39.73	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	28.0	µg/m^3

Distance correction calculation for site N30 - A1, Sandy

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	5	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.0528	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	57.09	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	42.2	µg/m^3

Realtime (continuous) data adjustment

In 2017 the Sandy AURN automatic monitoring station data capture of NO_2 was 98%; PM_{10} was 60% and $PM_{2.5}$ was 57.1%, both PM_{10} and $PM_{2.5}$ fell below the 75% threshold and annualization was required.

C11 – Sandy $PM_{2.5}$ annualisation (2017)

2017 ug/m3 PM2.5 data							
	Ann ave	% data capture					
Northchurch	8	99.95					
Hitchin	12	86.63					
Period mean	1/1/17-8/1/17		9/3/17-21/5/17		30/9/17-31/12/17		
Northchurch	9		7.45		8.8		
Hitchin	11.08		15.34		10.84		
Ann mean : Period mean (ratio)							
Northchurch	0.88		1.07		0.91		
Hitchin	1.08		0.78		1.11		
ave	0.98		0.925		1.01		0.9435
Sandy annualised PM10 ave AM*Ra		AM	Ra				
		12.32	0.9435		11.62392		

C12 – sandy PM10 annualisation (2017)

2017 ug/m3 PM10 data										
	Ann ave	% data capture								
Northchurch	12	99.95								
Watford	15	82.91								
Period mean	1/1/17-21/1/17		26/1/17-5/2/17		17/2/17-21/5/17		30/9/17-31/12/17			
Northchurch	11.8		14.1		11.4		12.6			
Watford	17.9		18.3		13.9		14			
Ann mean : Period mean (ratio)										
Northchurch	1.02		0.851		1.052		0.952			
Watford	0.838		0.82		1.08		1.071			
ave	0.929		0.8355		1.066		1.0115		0.9605	
Sandy annualised PM10 ave AM*Ra		AM	Ra							
		19	0.9605		18.2495					

QA/QC of Automatic Monitoring

The Sandy site became an affiliated site in the AURN National Network in January 2009, which resulted in an FDMS upgrade to the PM_{10} TEOM and the installation of a $PM_{2.5}$ FDMS TEOM.

NO_2 is measured using an API chemiluminescent NO_x analyser which is housed in an air-conditioned cabin. Data is collected remotely using a GSM modem link. The analyser is serviced every six months by ESU1 and is visited every two weeks by a council officer who calibrates it using bottled gas of a known concentration and the results are logged. Since the affiliation of the Sandy site with Defra's national network, an audit is to be undertaken every 6 months.

The data from the AQMS site at Sandy roadside is ratified by ERG to the AURN standard and QA/QC visits are carried out by AEA Ricardo on a regular basis.

PM Monitoring Adjustment

The Sandy site has been affiliated to the AURN network and so data does not require to be adjusted by the VCM method. As with the NO_2 analyser, the location is representative of public exposure at certain locations along the A1, however, some residential properties are closer to the road (although standing traffic doesn't occur as much at these locations) and some are more distant. This section of the A1 was the subject of a Detailed Assessment in 2008 which included PM_{10}. It was found that PM_{10} levels did not threaten either of the objectives, which were backed up by 2008 monitoring data.

Validation

This process operates on data during the data collection stage. All data are continually screened algorithmically and manually for anomalies. There are several techniques designed to discover spurious and unusual measurements within a very large dataset. These anomalies may be due to equipment failure, human error, power failures, interference or other disturbances automatic screening can only safely identify spurious results that need further manual investigation.

Raw data from the gaseous instruments (e.g. NOx, O3, SO2 and CO) are scaled into concentrations using the latest values derived from the manual and automatic calibrations. These instruments are not absolute and suffer drifts. Both the zero baseline (background) and the sensitivity change with time. Regular calibrations with certified gas standards are used to measure zero and sensitivity. However, these are only valid for the moment of the calibration since the instrument will continue to drift. Raw measurements from particulate instruments (e.g. PM10 an PM2.5) generally do not require scaling into concentrations. The original raw data are always preserved intact while the processed data are dynamically scaled and edited.

Ratification

This is the process that finalises the data to produce the measurements suitable for reporting. All available information is critically assessed so that the best data scaling

is applied and all anomalies are appropriately edited. Generally, this operates at three, six or twelve-month intervals. However, unexpected faults can be identified during the instrument routine services or independent audits which are often at 6 monthly intervals. In practice, therefore, the data can only be fully ratified in 12 month or annual periods. The data processing performed during the three and six-monthly cycles helps build a reliable dataset that is finalised at the end of the year.

There is a diverse range of additional information that can be essential to the correct understanding and editing of data anomalies. These may include:

- The correct scaling of data
- Ignoring calibrations that were poor e.g. a spent zero scrubber
- Closely tracking rapid drifts or eliminating the data
- Comparing the measurements with other pollutants and nearby sites
- Corrections due to span cylinder drift
- Corrections due to flow drifts for the particulate instruments
- Corrections for ozone instrument sensitivity drifts
- Eliminating measurements for NO_2 conversion inefficiencies
- Eliminating periods where calibration gas is in the ambient dataset
- Identifying periods where instruments are warming up after a power cut
- Identification of anomalies due to mains power spikes
- Correcting problems with the date and time stamp
- Observations made during the sites visits and services

The identification of data anomalies, the proper understanding of the effects and the application of appropriate corrections requires expertise gained over many years of operational experience. Instruments and infrastructure can fail in numerous ways that significantly and visually affect the quality of the measurements. There are rarely simple faults that can be discovered by computer algorithms or that can be understood without previous experience

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

Figure D1 - Houghton Regis (10) NO2 diffusion tube site

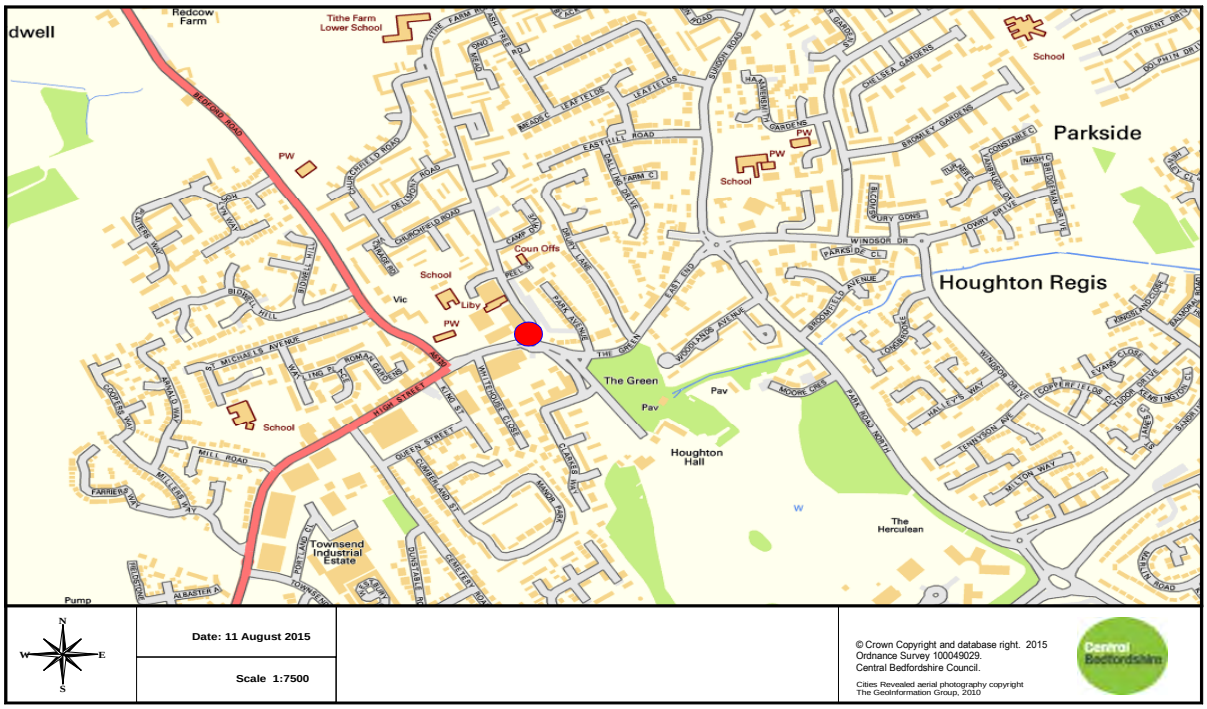


Figure D2 – Ampthill NO2 monitoring sites

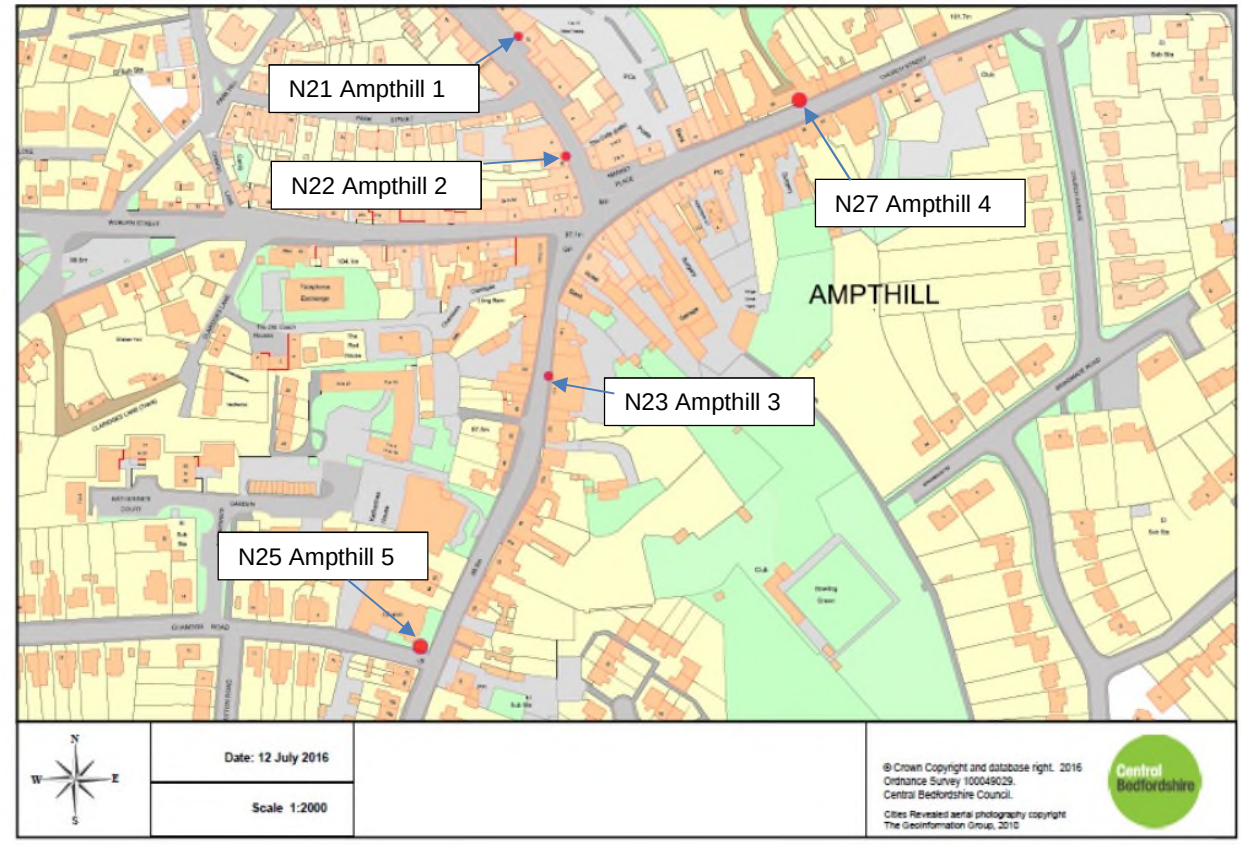


Figure D3 - Beeston (N4) NO2 diffusion tube site

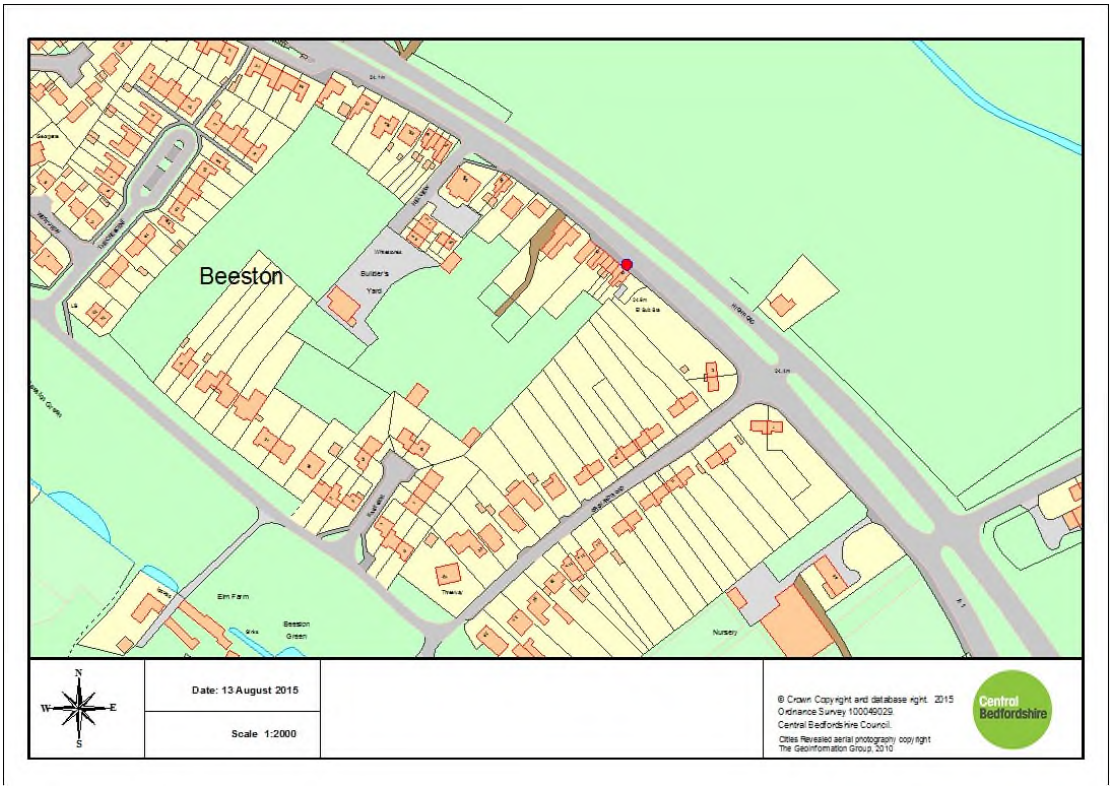


Figure D4 - Hockliffe Street, Leighton Buzzard (52)

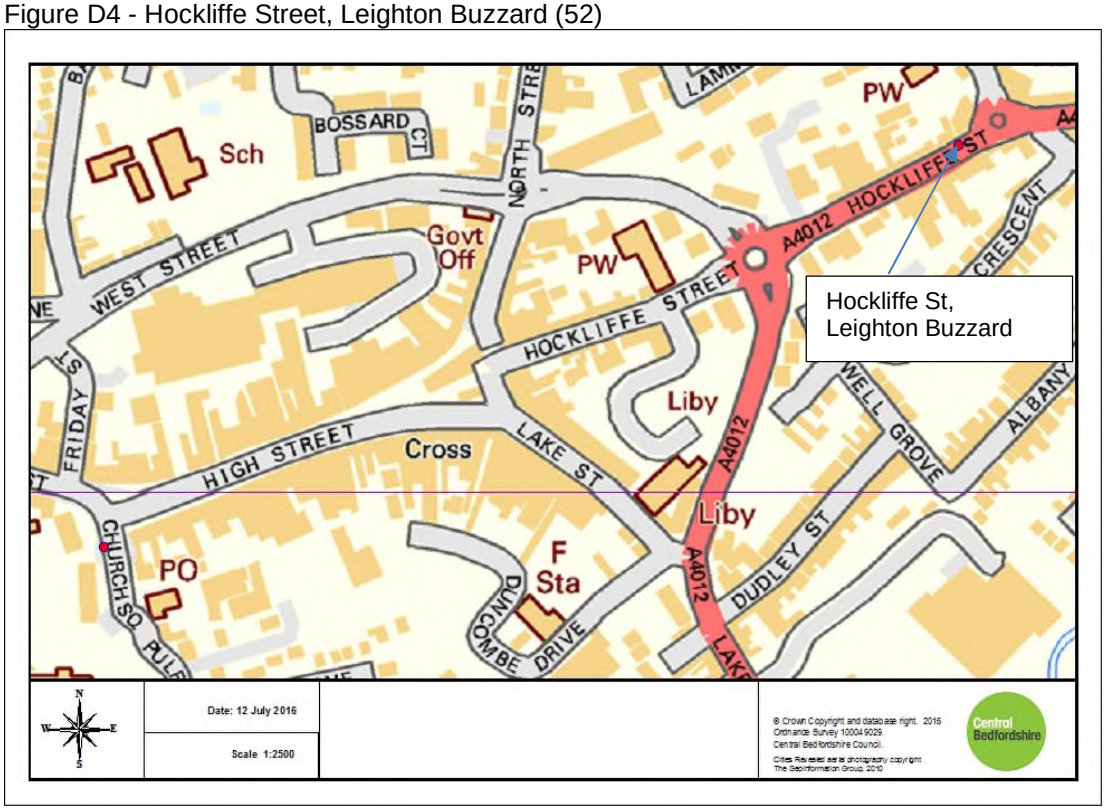


Figure D5 – NO2 monitoring sites Sandy 1

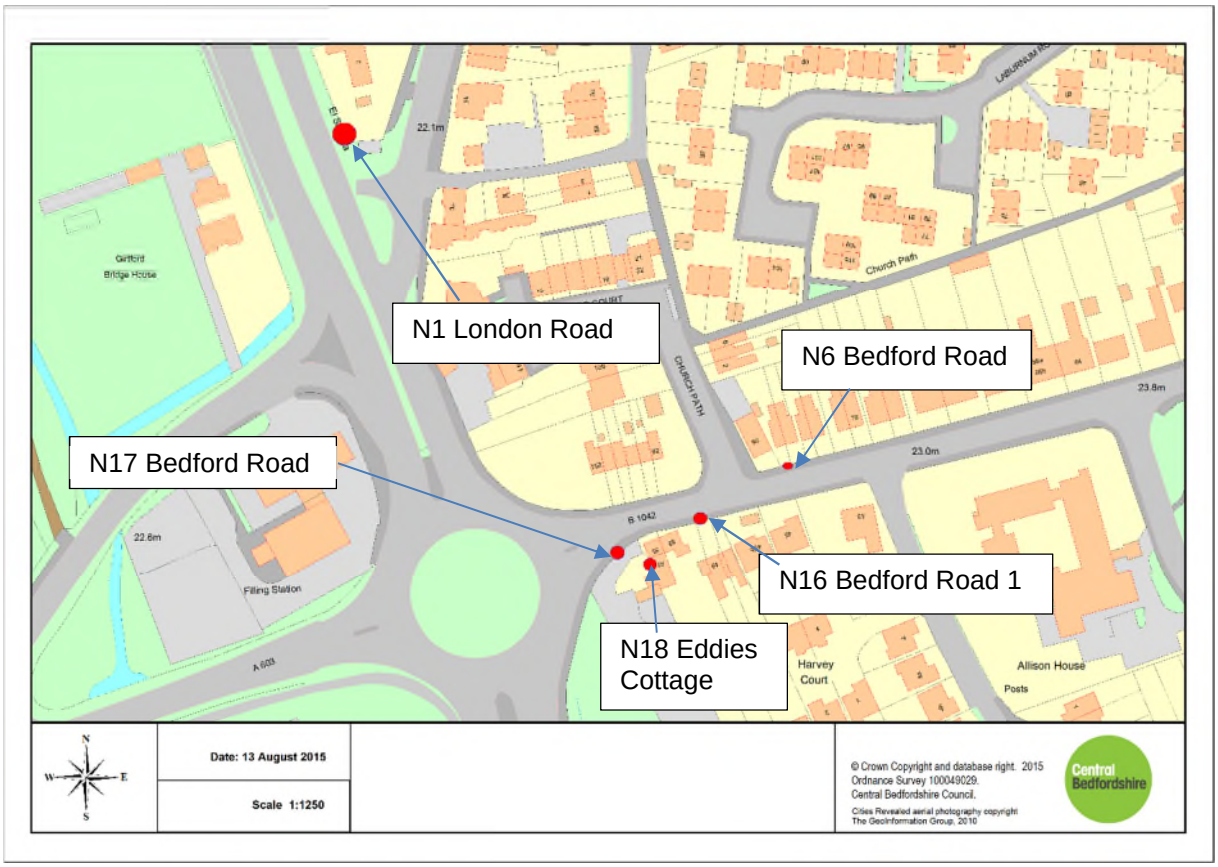
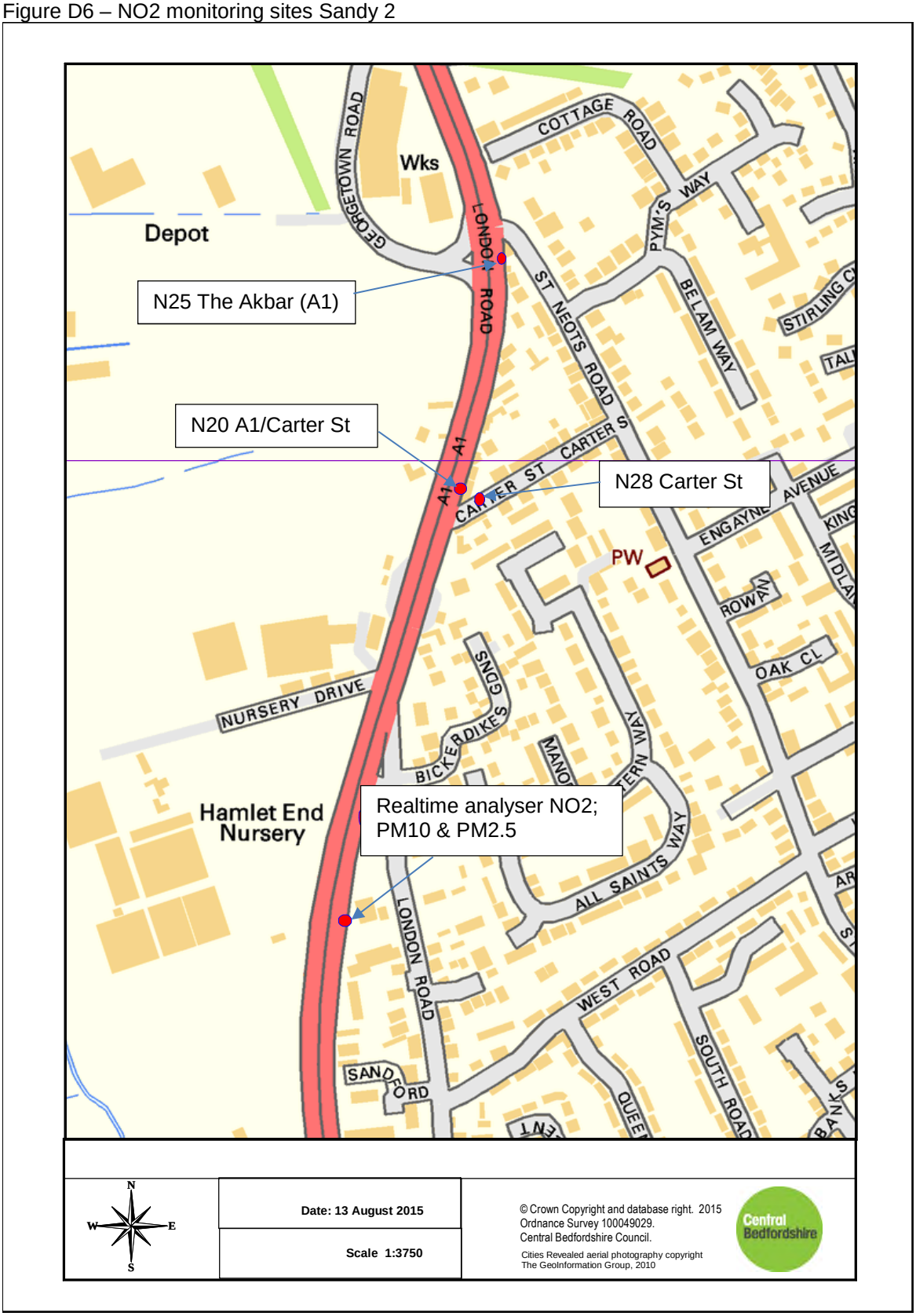
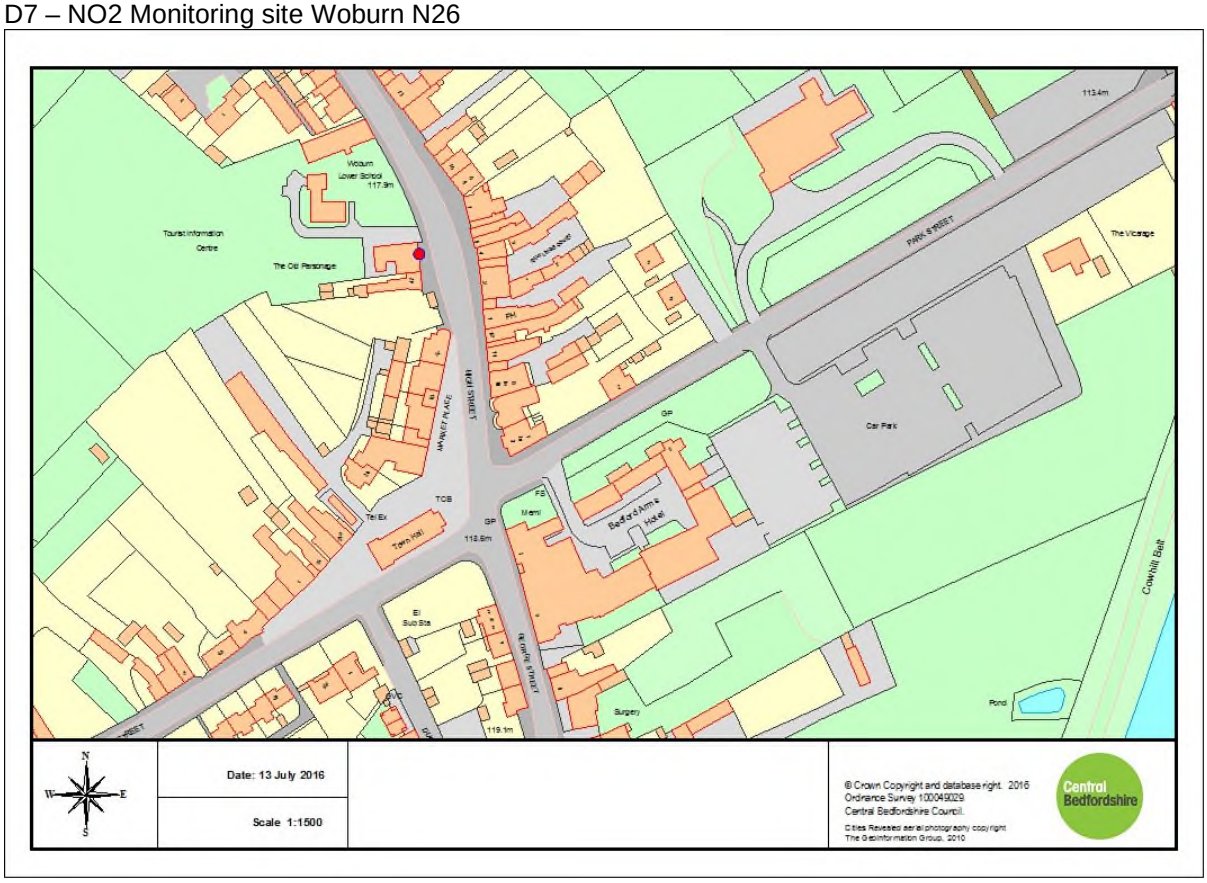


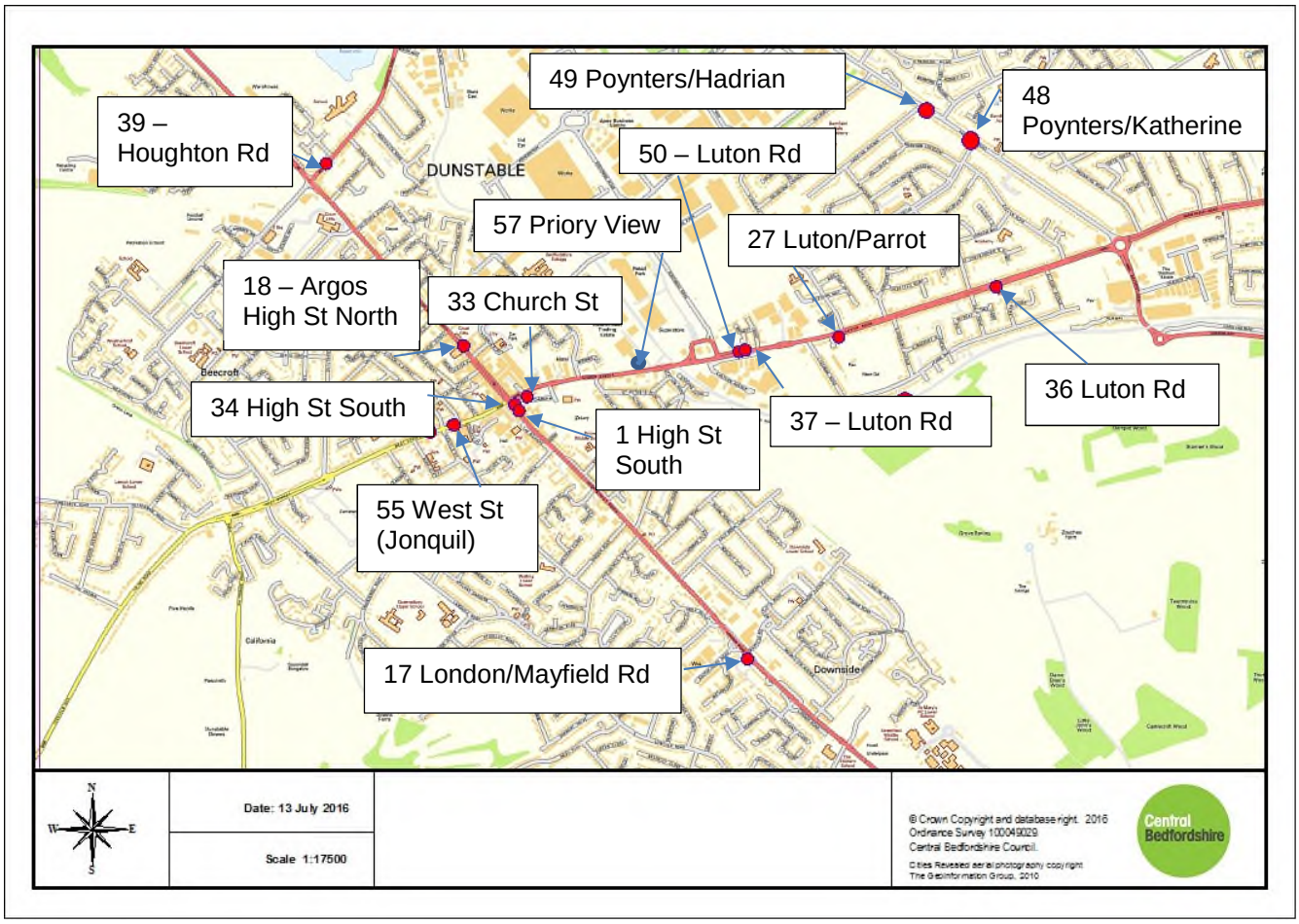
Figure D6 – NO2 monitoring sites Sandy 2



D7 – NO2 Monitoring site Woburn N26

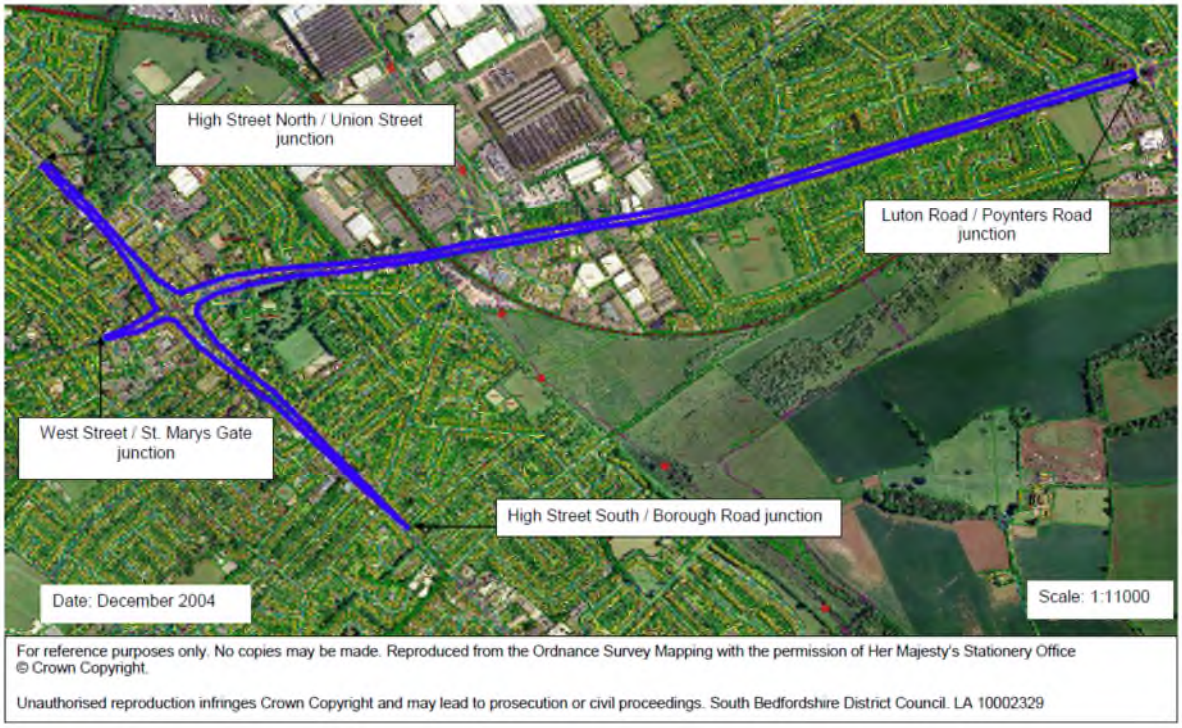


D8 – NO2 Monitoring sites in Dunstable

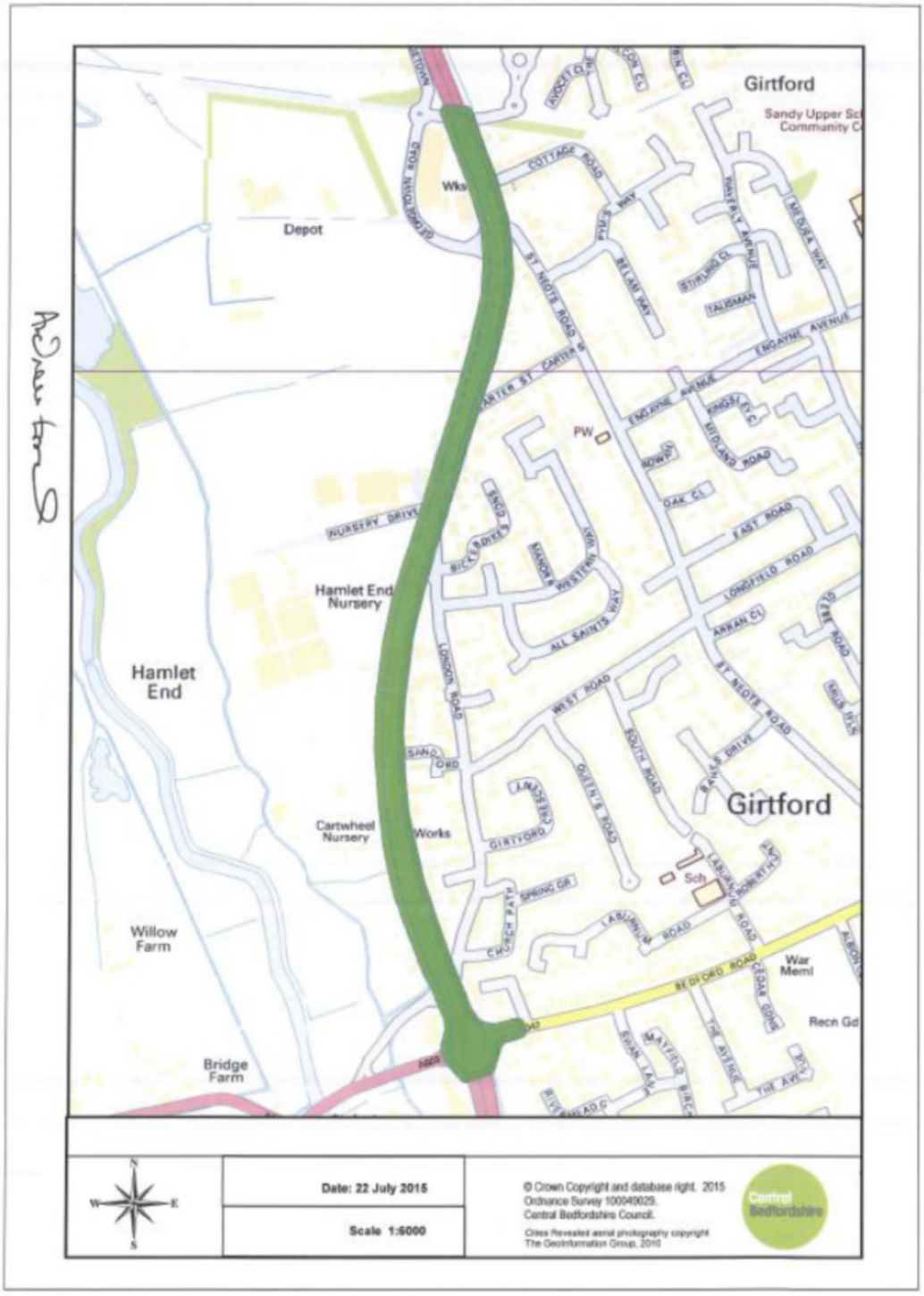


D9 – AQMA in Dunstable

Air Quality Management Area Boundary in Dunstable



D10 – AQMA in Sandy



D11 - AQMA in Ampthill

Appendix E: Summary of Air Quality Objectives in England

Table E.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 micrograms 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
Street canyon	where buildings on both sides of the road can lead to the formation of vortices and recirculation of air flow that can trap pollutants and restrict dispersion (often termed as the "canyon effect"). Street canyons can generally be defined as narrow streets where the height of buildings on both sides of the road is greater than the road width. However, broader streets may also be considered as street canyons where buildings result in reduced dispersion and elevated concentrations (which may be demonstrated by monitoring data). Therefore, canyon effects can occur both in small towns or large cities.

References

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- Central Bedfordshire Council
    - (2017) Annual Status Report available at http://www.centralbedfordshire.gov.uk/environment/types-pollution/air/quality.aspx
    - Central Bedfordshire Council Local Transport Plan 3
    - Development Plans for the north and south of the district

- Defra
    - Local Air Quality Management Technical Guidance (LAQM.TG(09))
    - Local Air Quality Management Technical Guidance (LAQM.TG (16))
    - Defra website NO_2 fall off with distance calculator accessed at http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html
    - Defra website National bias adjustment factor spreadsheet (version 3/16v2) accessed at http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html
    - Defra website Background maps accessed at
    - http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

- Hertfordshire and Bedfordshire Air Quality Monitoring Network accessed at http://www.airqualityengland.co.uk/local-authority/?la_id=408

- Office for National Statistics 2015 & 2016 mid year estimate accessed at *http://www.centralbedfordshire.gov.uk/council/census/figures.aspx*