2017 Air Quality Annual Status Report (ASR)

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

Date (July, 2017)

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Executive Summary: Air Quality in Our Area

Air Quality in Central Bedfordshire

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].

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.

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); 1, 18 and 37 (Dunstable) and N23 (Ampthill).

[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

Diffusion tubes results from 2016 show an increase in the majority of sites when compared with those from 2015 it is likely that this was due to meteorological conditions, which varies from year to year across the region.

The realtime analyser in Sandy recorded an NO_2 annual mean of 33µg/m^3 and 1 exceedance 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 2016 result of 12µg/m^3, showed an increase of 1µg/m^3 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 (NO2) 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).

Currently Central Bedfordshire Council are working with external partners such as Highways England and by inter-departmental representation to produce an Air Quality Action Plan for Ampthill and Sandy following declaration of Air Quality Management Areas in both locations, to work towards reducing the levels of pollution and meet the Air Quality Objectives. Ampthill was declared with respect to the annual nitrogen dioxide (NO_2) Air Quality Objective (40 µg/m^3 – micrograms per cubic metre); whereas the Sandy AQMA was declared for both the annual and hourly (200 µg/m^3 not to be exceeded more than 18 times per annum) NO_2 objectives.

The Air Quality Action Plan regarding the AMQA in Dunstable was produced in 2006 and therefore requires updating. Work on this will take place as soon as possible. In the meantime 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.

In order 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 in order 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 work is continuing to develop an Action Plan (in conjunction with the Highways England and inter-departmental co-operation) before it will go out for consultation.

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 working alongside Central Bedfordshire Council in order 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. Currently a review of congestion data and traffic flow and comparing to measured levels of NO_2 is taking place. Once this review is completed and the impact of congestion on air pollution on the cottages fronting the A1, near Carter Street (the location of the breach of the hourly objective), is known, then actions may be identified to work to alleviate it.

Limiting queuing traffic in this location would benefit air quality, however in non-peak hours traffic regularly passes the facades of the cottages in very close proximity; despite a speed limit of 50mph in this location, traffic regularly exceeds this. In addition the presence of a safety camera results in traffic breaking to ensure compliance with the speed restriction and then accelerates off whilst passing the cottages; accelerating traffic produces higher emissions of pollutants.

Potential measures therefore relate to traffic management – ie reducing congestion; by looking at the impact of reducing the speed restriction to 40mph on emissions from vehicles; and/or more effective enforcement of speed restrictions to mitigate the braking/accelerating traffic at safety camera.

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 2016 showed an increase in the majority of locations. As this affected most sites, it is likely that this was due to meteorological conditions, which varies from year to year across the region.

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 take into account variables such as meteorological conditions.

Currently Central Bedfordshire Council are working with partners (Public Health, Highways, Planning and Highways England, etc.) to develop and produce Air Quality Action Plans for the Ampthill and Sandy AQMAs.

The council's priorities for addressing air quality in the coming year are to produce, carry out 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 – http://www.busway.net/ 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 - http://www.cbtravelchoices.co.uk/home - 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 2016. 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 and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (inc. date of publication)
						At Declaration	Now	
AQMA 1 (Dunstable)	Dec-04	NO2 annual mean	Dunstable	An area encompassing the town centre & along the A505 (Luton Road) and A5 (Watling Street).	YES	2004 = 46	46 (different location to at declaration figure) 41.53 is the annual mean at the same location as the at declaration figure.	To be reviewed and updated
AQMA 4 (Sandy)	Aug-15	NO2 Annual Mean	Sandy	10 metres either side of A1 from Bedford Rd to the Georgetown exit encompassing some residential properties.	YES	2014 = 44.56 (with distance correction = 38.6)	2016 = 44.8 (different site than the at declaration figure) At same site as for the at declaration 2016 = 34.6 (with distance correction)	AQAP in development
AQMA 4 (Sandy)	Aug-15	NO2 1 Hour Mean	Sandy	10 metres either side of A1 from Bedford Rd to the Georgetown exit encompassing some residential properties.	YES	2014 = 74.15	2016 = 69.77	AQAP in development
AQMA 3 (Ampthill)	Aug-15	NO2 Annual Mean	Ampthill	An area encompassing residential properties near the town centre. It extends to adjacent properties in Dunstable St & Church St.	NO	2014 = 42.01	2016 = 46.37	AQAP in development

☒ **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 that on the basis of the evidence provided by the local authority the conclusions reached are acceptable for all sources and pollutants.

The next steps for Central Bedfordshire Council are to produce and consult on draft action plans for Ampthill and Sandy and revise their action plan for Dunstable. The next Annual Status Report is due for submission in in 2017.

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

The council's priorities for addressing air quality in the coming year are to produce, carry out 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.

Additionally the council's Local Plan is currently out for consultation which 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. The aim is to comment on the Local Plan to ensure that air quality is considered and relevant policies incorporated to protect and improve it.

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.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance in the Dunstable AQMA, changes to the road infrastructure (the opening of the A5-M1 link road and the Woodside Connection road – linking the Woodside Industrial Estate with Junction 11a of the M1 and a route to the A5 without traversing through Dunstable town centre - providing then continuing northwards) and the

proposed de-trunking of the A5 through the town centre, will positively impact on the air quality in the AQMA in Dunstable. The Air Quality Action Plan was published in 2005 and therefore requires reviewing and updating. It may result in further additional measures, not yet prescribed being required in subsequent years to achieve compliance and enable the revocation of the Dunstable AQMA.

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 mix 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 26,00 new homes to be built in this area.	Ongoing	Lengthy Timescale of adoption of Local Plan - draft Local Plan now at public consultation
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

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 one site during 2016. Table A.1 in Appendix A shows the details of the sites. 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 2016. 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 2016 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 2016.

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.

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 2016 result of 12µg/m^3, showed an increase of 1µg/m^3 from last year. 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; $PM_{10;}$ PM2.5	YES	Chemiluminescent; FDMS TEOM	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	Kerbside	516485	249202	NO_2	YES	3	1	NO	1.5
N4	A1 Beeston	Kerbside	517160	248190	NO_2	NO	2	1	NO	1.5
N6	Bedford Rd Sandy	Kerbside	516621	249100	NO_2	YES	4	1	NO	1.5
N20	A1 Carter Street Sandy	Kerbside	516534	249974	NO_2	YES	0	1	NO	1.5
N16	Bedford Rd Sandy	Kerbside	516593	249083	NO_2	YES	3	1	NO	1.5
N17	Bedford Rd Sandy	Kerbside	516569	249074	NO_2	YES	6	1	NO	1.5
N18	Eddie's Cottage Sandy	Kerbside	516579	249070	NO_2	YES	0	5	NO	0.75
N21	Ampthill 1	Kerbside	503444	238197	NO_2	YES	3	2	NO	1.5
N22	Ampthill 2	Kerbside	503466	238141	NO_2	YES	8	1	NO	1.5
N23	Ampthill 3	Kerbside	503458	283039	NO_2	YES	2	1	NO	1.5
N25	The Akbar A1 Sandy	Kerbside	516568	250174	NO_2	YES	-	1	NO	1.5
N26	Woburn	Kerbside	494900	233230	NO_2	NO	2	1	NO	1.5
N28	Carter St Sandy	Kerbside	516551	249967	NO_2	YES	1.5	1	NO	0.75
N29	Bus Hub Biggleswade	Kerbside	518977	244544	NO_2	NO	0	1	NO	1.5
N30	A1/Carter St Sandy	Kerbside	516261	244544	NO_2	YES		1	NO	0.75
N31	Bedford Rd Sandy	Kerbside	516690	249108	NO_2	NO	4	1	NO	1.5
N32	Chandos Rd Ampthill	Kerbside	503399	237912	NO_2	NO		1	NO	0.75
N27	Church St Ampthill	Kerbside	503576	238167	NO_2	YES	1	1	NO	0.75

1	High St South D'ble	Kerbside	501936	221833	NO_2	YES	-	1	NO	0.75
3	Mardale D'ble	Kerbside	502029	220688	NO_2	NO	3	1	NO	1.5
10	Houghton Regis	Kerbside	501991	223965	NO_2	NO	-	1	NO	0.75
14	Sallowsprings	Kerbside	500525	218840	NO_2	NO	-	8	NO	0.75
17	London/Mayfield D'ble	Kerbside	502848	220829	NO_2	NO	5	2	NO	1.5
18	Argos D'ble	Kerbside	501705	222089	NO_2	YES	-	1	NO	0.75
27	Luton Rd D'ble	Kerbside	503195	222119	NO_2	YES	1	4	NO	1.5
33	Church St D'ble	Kerbside	501962	221884	NO_2	YES	0	8	NO	1.5
34	High St South D'ble	Kerbside	501911	221853	NO_2	YES	4	1	NO	1.5
36	Luton Rd D'ble	Kerbside	503849	222326	NO_2	YES	2	1	NO	1.5
37	Luton Rd D'ble	Kerbside	502838	222071	NO_2	YES	3	1	NO	0.75
39	Houghton Rd	Kerbside	501151	222821	NO_2	NO	3	1	NO	1.5
48	Poynters/Katherine D'ble	Kerbside	503745	222914	NO_2	NO	4	1	NO	0.75
49	Poynters/Hadrian D'ble	Kerbside	503569	223034	NO_2	NO	6	1	NO	0.75
50	Luton Rd D'ble	Kerbside	502813	222065	NO_2	YES	6	1	NO	0.75
52	Hockliffe St Leighton	Kerbside	492512	225235	NO_2	NO	2	1	NO	0.75
54	Vauxhall / High St North	Kerbside	500938	222899	NO_2	NO	4	1	NO	1.5
55	West St D'ble	Kerbside	501662	221768	NO_2	NO		1	NO	1.5
56	West St Leighton	Kerbside	491800	225043	NO_2	NO	10	1	NO	1.5
57	Church St D'ble	Kerbside	502456	222023	NO_2	NO	4	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 2016 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2012	2013	2014	2015	2016
MD3	Roadside	Automatic		99	35	31	27.94	30.6	**33**
N1	Roadside	Diffusion Tube		100	35.5	32.4	33.7	33.7	36.4
N2	Roadside	Diffusion Tube		0	29.78	25.6	27.31	27.01	NA
N3	Roadside	Diffusion Tube		0	38.45	37.1	34.98	32.55	NA
N4	Roadside	Diffusion Tube		100	38.27	31.5	35.47	33.88	33.8
N6	Roadside	Diffusion Tube		100	36.56	35.54	35.38	33.29	34.25
N7	Roadside	Diffusion Tube		0	26.76	26.93	26.15	33.62	NA
N20	Roadside	Diffusion Tube		100	**80.45**	**80.39**	**74.15**	**67.32**	**69.77**
N9	Roadside	Diffusion Tube		0	33.8	31.1	39.46	37.55	NA
N10	Roadside	Diffusion Tube		0	27.1	27.78	24.59	23.44	NA
N12	Roadside	Diffusion Tube		0	35.8	32.6	31.41	30.89	NA
N13	Roadside	Diffusion Tube		0	33.44	33	32.92	31.7	NA
N14	Roadside	Diffusion Tube		0	33.15	32.9	33.3	32.02	NA
N16	Roadside	Diffusion Tube		83	34.4	35.49	31.5	33.7	34.6

N17	Roadside	Diffusion Tube		100	35.6	36.1	37.8	38.6	34.6
N18	Roadside	Diffusion Tube		100	35.61	28.58	29.92	27.76	29.94
N21	Roadside	Diffusion Tube		100	26.57	27.14	26.97	23.49	25.94
N22	Roadside	Diffusion Tube		100	**40.69**	**41.03**	**42.25**	36.2	30.1
N23	Roadside	Diffusion Tube		100	**47.07**	**43.34**	**47.71**	**42.08**	**46.37**
N25	Roadside	Diffusion Tube		100	NA	NA	NA	34.25	38.13
N26	Roadside	Diffusion Tube		92	NA	NA	NA	35.7	36.7
N27	Roadside	Diffusion Tube		83	NA	NA	NA	NA	34.44
N28	Roadside	Diffusion Tube		100	NA	NA	NA	NA	24.62
N29	Roadside	Diffusion Tube		83	NA	NA	NA	NA	23.84
N30	Roadside	Diffusion Tube		100	NA	NA	NA	NA	**59.91**
N31	Roadside	Diffusion Tube		100	NA	NA	NA	NA	27.93
1	Roadside	Diffusion Tube		83	**43.32**	**44.8**	38.75	38.66	**41.53**
3	Urban Background	Diffusion Tube		100	14.87	15.14	14.5	12.69	14.68
5	Urban Background	Diffusion Tube		NA	12.82	13.87	14.65	13.13	NA
6	Roadside	Diffusion Tube		NA	22.56	24.28	20.42	21.27	NA

7	Urban Background	Diffusion Tube		NA	16.38	18.62	17.72	15.52	NA
10	Roadside	Diffusion Tube		83	33.38	33.25	33.9	31.44	35.49
14	Rural	Diffusion Tube		100	11.17	10.79	11.99	11.65	11.28
17	Roadside	Diffusion Tube		100	33.2	32.13	32.31	22.91	33.5
18	Roadside	Diffusion Tube		92	38.91	**43.73**	**55.18**	38.36	**40.14**
21	Roadside	Diffusion Tube		NA	30.94	27.68	27.11	28.78	NA
26	Roadside	Diffusion Tube		NA	26.29	28.25	27.47	29.87	NA
27	Roadside	Diffusion Tube		100	32.84	33.5	32.16	31.21	33.23
28	Roadside	Diffusion Tube		NA	**53.72**	**49.31**	**48.39**	30.95	NA
33	Roadside	Diffusion Tube		100	39.2	35.01	39.03	36.82	38.7
34	Roadside	Diffusion Tube		92	36.7	36.1	30.4	35.3	38.8
35	Roadside	Diffusion Tube		NA	34.97	32.81	33.22	31.46	NA
36	Roadside	Diffusion Tube		100	35.52	36.4	**41.2**	30.76	35.62
37	Roadside	Diffusion Tube		92	38.3	**41.4**	35.2	38.8	**46.3**
39	Roadside	Diffusion Tube		92	38.33	31.3	32.91	32.32	35.26
41	Roadside	Diffusion Tube		NA	**40.8**	37.32	37.2	24.83	NA
48	Roadside	Diffusion Tube		92	NA	32.43	34.45	30.8	31.3

49	Roadside	Diffusion Tube		100	NA	32.48	36.56	32.02	32.84
50	Roadside	Diffusion Tube		100	NA	35.8	37.2	35.6	36
51	Roadside	Diffusion Tube		NA	NA	NA	24.89	15.89	NA
52	Roadside	Diffusion Tube		100	NA	NA	NA	33.23	35.4
53	Roadside	Diffusion Tube		83	NA	NA	NA	NA	20.85
54	Roadside	Diffusion Tube		100	NA	NA	NA	NA	28.16
55	Roadside	Diffusion Tube		100	NA	NA	NA	NA	34.6

☒ **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)**

☒ **If applicable, all 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) 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 2016 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2012	2013	2014	2015	2016
MD3	Roadside	Automatic		93	**0**	0	**0 (113)**	**0 (130)**	**1**

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 2016 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2012	2013	2014	2015	2016
MD3	Roadside		79	**19**	**20**	**17.21**	**10.3**	**19**

☒ **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 2016 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2012	2013	2014	2015	2016
MD3	Roadside		79	**8**	6	**1(27)**	**1(26.4)**	**1(32)**

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 2016 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
				2012	2013	2014	2015	2016
MD3	Roadside		93		13	12	11	12

☒ **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 2016

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2016

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.94) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
N1 - Sandy (A1)	50.6	39.86	44.58	51.12	40.94	39.19	45.59	42.41	50.22	39.89	47.92	56.79	**45.76**	**43.01**	36.4
N4 - Beeston	31.50	37.56	44.82	44.30	37.61	37.36	31.76	35.59	40.72	42.37	45.21	45.45	39.52	37.15	33.8
N6 - Bedford Rd Sandy	34.08	36.32	35.13	37.14	33.61	27.05	35.25	31.52	36.18	32.13	46.35	52.48	36.4	34.3	
N20 - Sandy A1	45.01	**64.06**	**73.29**	**90.44**	**80.7**	**70.01**	**67.72**	48.53	**87.58**	**80.61**	**91.48**	**94.2**	**74.2**	**69.8**	**no drop off**
N16 - Bedford Rd Sandy	40.21	42.32	35.54	47.9	36.93			42.03	50.65	42.55	42.8	51.11	43.2	**40.6**	34.6
N17 - Bedford Rd Sandy	40.96	51.06	48.93	49.33	45.84	22.19	96.18	48.83	48.09	43.89	59.51	61.31	51.3	**48.3**	34.6
N18 - Eddies Cott Sandy	30.78	35.33	33.63	31.72	29.26	24.01	29.24	29.87	34.09	28.98	38.74	36.6	31.9	29.9	
N21 - Ampthill	26.77	30	30.78	31.02	23.46	23.16	19.52	18.32	27.46	29.85	31.16	39.65	27.6	25.9	
N22 - Ampthill	46.84	44.63	46.24	47.77	43.04	37.12	37.95	34.73	44.01	39.48	52.34	61.69	44.7	**42.0**	30.1
N23 - Ampthill	38.66	44.1	54.53	58.49	53.2	49.92	43.49	26.52	53.43	49.02	45.37	65.18	49.3	**46.4**	**no drop off**
N25 Sandy A1	35.69	37.19	45.15	41.1	34.55	34.14	31.94	32.74	42.21	41.34	52.21	58.56	40.6	38.1	
N26 - Woburn	38.59	47.55	44.18	44.55	45.54		42.97	39.05	41.73	37.91	46.51	48.09	43.3	**40.7**	36.7

N27 - Ampthill	31.93	35.17			40.9	33.03	30.66	29.06	36.59	41.55	40.4	47.06	36.6	34.4	
N28 - Carter St Sandy	26.62	30.17	27.4	26.04	22.04	19.56	21.17	20.51	28.31	23.87	31.88	36.74	26.2	24.6	
N29 - Biggleswade	31.52			26.05	22.86	20.32	17.54	18.84	25.77	27.57	29.81	33.29	25.4	23.8	
N30 - Sandy A1	55.66	**73.13**	**70.67**	**60.64**	55.34	47.45	56.26	**65.28**	**73.61**	55.47	**77.66**	**70.62**	**63.7**	**59.9**	**44.8**
N31 - Bedford Rd Sandy	32.97	32.13	36	32.58	23.79	22.41	24.88	22.67	28.65	28.92	33.52	38.06	29.7	27.9	
N32 - Ampthill	31.75	31.52	29.19	29.6			19.92	18.84	32.27	28.21	32.27	43.28	29.7	27.9	
1 - High St South, Dunstable	27.42	46.47	54.22	51.2	52.44	41.7	31.05	34.21	45.28	57.86			44.2	**41.5**	**no rel exposure**
3 - Mardale Ave, Dunstable	19.07	17.96	16.55	13.62	11.39	12.16	8.43	7.9	13.5	19.16	19.55	28.1	15.6	14.7	
10 - Houghton Regis	39.74	36.79	31.65	35.72	36.66	29.4	25.9		37.76	31.95	40.06		37.8	35.5	
14 - Sallowsprings	16.25	14.38	10.72	9.17	8.56	6.55	7.53	7.26	12.75	11.94	15.92	23	12.0	11.3	
17 - Mayfield/London Rd	36	32.47	34.86	35.69	37.86	25.52	29.9	28.73	39.74	40.15	40.44	46.3	35.6	33.5	
18 - Argos, Dunstable	37.74	40.55	44.56	48.89	44.95	40.72	31.89	36.19	43.41	53.79	47.08		42.7	**40.1**	**no rel exposure**
27 - Luton Rd (89)	31.7	33.5	40.44	38.05	32.42	29.36	24.22	27.3	35.3	43.44	41.05	47.4	35.4	33.2	
33 - Church St, Dunstable	43.31	40.68	41	47.11	48.55	32.97	39.85	39.07	40.75	41.41	44.59	45.4	42.1	39.5	38.7
34 - High St South (5), Dunstable	44.62	41.09	49.02	60.63	60.35	45.67	45.08	46.13	58.04	58.16	55.21		51.3	**48.2**	38.8
36 - Luton Rd (247), Dunstable	36.26	35.93	38.46	40.53	40.52	28.71	28.88	32.33	36.92	44.57	42.49	49.1	37.9	35.6	
37 - Luton Rd (Bramley Ct), Dunstable	45.54	52.43	70.07	68.98	61.53	55.74	43.59	44.68		62.06	64.96	69	58.1	**54.6**	**46.3**
39 - Houghton Rd, Dunstable	38.14	38.89	36.72		36.62	29.7	33.94	24.44	41.05	41.54	44.03	47.5	37.5	35.3	

48 - Poynters/Katherine, Dunstable	34.18	33.98	40.88	45.07	45.85	36.45	37.17	36.45	43.35	39.27	42.06		39.5	37.1	31.3
49 - Poynters/Hadrian, Dunstable	31.7	33.14	35.45	38.56	38.41	30.45	23.69	25.79	41.83	37.6	36.14	46.4	34.9	32.8	
50 - Luton Rd (24), Dunstable	60.56	49.64	53.57	49.39	59.46	56.94	55.26	41.96	61.92	64.03	66.9	47.2	55.6	**52.2**	36.0
52 - Hockliffe St, Leighton Buzzard	39.65	41.24	42.34	43.76	41.08	33.53	39.35	36.01	44.84	38.57	48.28	47.4	41.3	38.9	35.4
53 - Church Sq, Leighton Buzzard	21.3	22.44	23.53	19.45	18.59	16.34			20.45	23.55	25.77	30.4	22.2	20.9	
54 - Vauxhall/A5, Dunstable	26.88	32.16	31	30.66	28.28	24.15	20.61	20.48	30.62	37.34	34.57	42.8	30.0	28.2	
55 - West St (Jonquils), Dunstable	37.03	43.09	54.3	49.92	49.29	41.65	38.26	39.88	52.91	58.18	49.13	51.3	47.1	**44.3**	34.6

☒ **National bias adjustment factor used (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) 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 27 out of 27 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.

Short-term to Long-term Data Adjustment

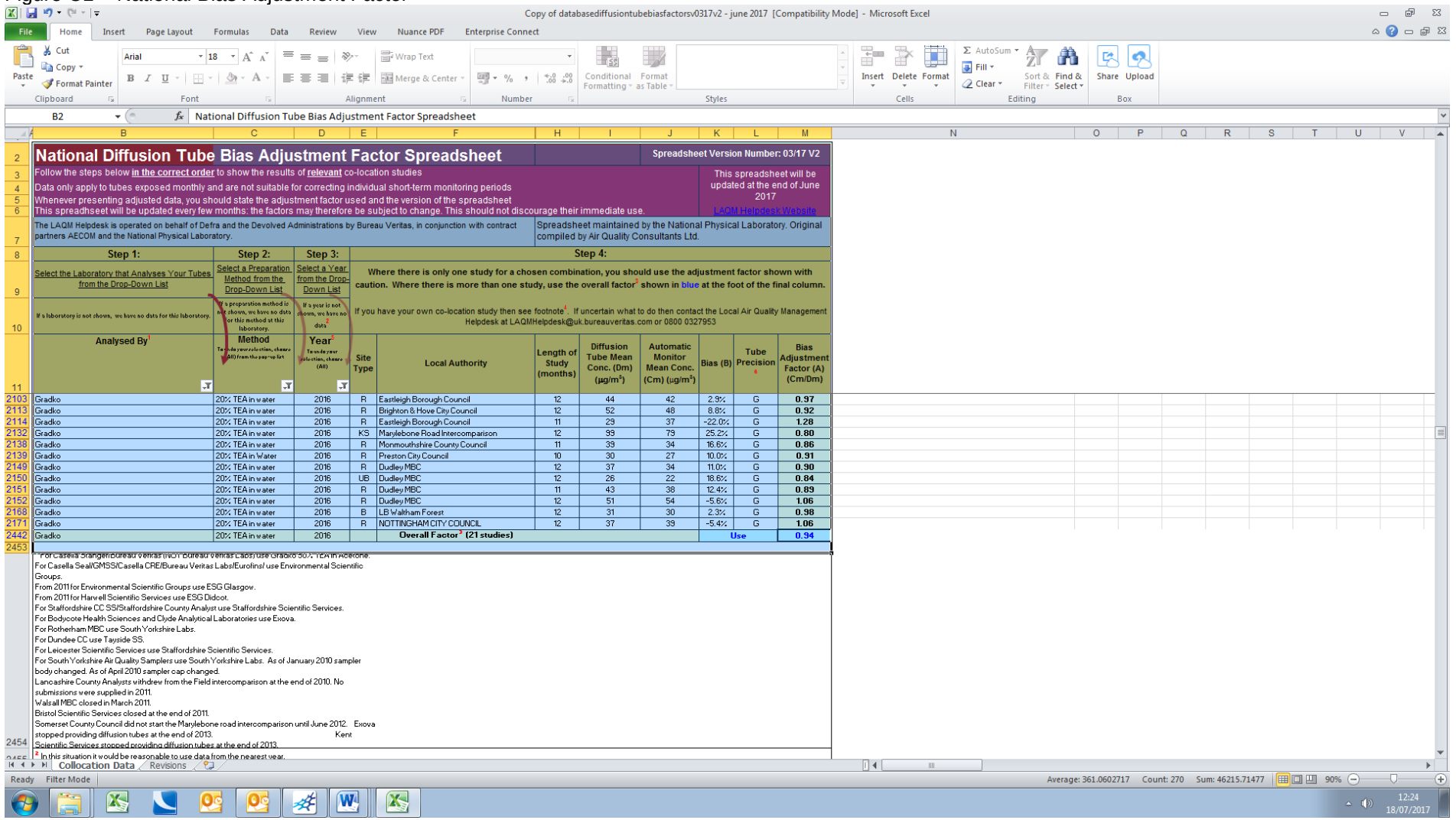
None of the NO_2 diffusion sites had less than a 75% data capture during 2016, therefore there was no requirement to "annualise" the data sets.

National Bias Adjustment Factor (NO_2 diffusion tube data)

The national bias adjustment factor for 2016 is 0.94

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 June 2017 (version 3/17v2). See overleaf

Figure C1 – National Bias Adjustment Factor



Copy of databasediffusiontubebiasfactorsv0317v2 - june 2017 [Compatibility Mode] - Microsoft Excel

B2: National Diffusion Tube Bias Adjustment Factor Spreadsheet

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 03/17 V2

Follow the steps below in the correct order to show the results of relevant co-location studies

Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods

Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet

This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2017

LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data[2]

Step 4:

Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

	Analysed By[1]	Method	Year[5]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision	Bias Adjustment Factor (A) (Cm/Dm)
2103	Gradko	20% TEA in water	2016	R	Eastleigh Borough Council	12	44	42	2.3%	G	**0.97**
2113	Gradko	20% TEA in water	2016	R	Brighton & Hove City Council	12	52	48	8.8%	G	**0.92**
2114	Gradko	20% TEA in water	2016	R	Eastleigh Borough Council	11	29	37	-22.0%	G	**1.28**
2132	Gradko	20% TEA in water	2016	KS	Marylebone Road Intercomparison	12	99	79	25.2%	G	**0.80**
2138	Gradko	20% TEA in water	2016	R	Monmouthshire County Council	11	39	34	16.6%	G	**0.86**
2139	Gradko	20% TEA in Water	2016	R	Preston City Council	10	30	27	10.0%	G	**0.91**
2149	Gradko	20% TEA in water	2016	R	Dudley MBC	12	37	34	11.0%	G	**0.90**
2150	Gradko	20% TEA in water	2016	UB	Dudley MBC	12	26	22	18.6%	G	**0.84**
2151	Gradko	20% TEA in water	2016	R	Dudley MBC	11	43	38	12.4%	G	**0.89**
2152	Gradko	20% TEA in water	2016	R	Dudley MBC	12	51	54	-5.6%	G	**1.06**
2168	Gradko	20% TEA in water	2016	B	LB Waltham Forest	12	31	30	2.3%	G	**0.98**
2171	Gradko	20% TEA in water	2016	R	NOTTINGHAM CITY COUNCIL	12	37	39	-5.4%	G	**1.06**
2442	Gradko	20% TEA in water	2016		**Overall Factor[3] (21 studies)**				**Use**		**0.94**

2453

For Casella Stanger/Bureau Veritas (NCT Bureau Veritas Labs) use Gradko 50% TEA in Acetone.
For Casella Seal/GMSS/Casella CRE/Bureau Veritas Labs/Eurofins/ use Environmental Scientific Groups.
From 2011 for Environmental Scientific Groups use ESG Glasgow.
From 2011 for Harwell Scientific Services use ESG Didcot.
For Staffordshire CC SSI/Staffordshire County Analyst use Staffordshire Scientific Services.
For Bodycote Health Sciences and Clyde Analytical Laboratories use Exova.
For Rotherham MBC use South Yorkshire Labs.
For Dundee CC use Tayside SS.
For Leicester Scientific Services use Staffordshire Scientific Services.
For South Yorkshire Air Quality Samplers use South Yorkshire Labs. As of January 2010 sampler body changed. As of April 2010 sampler cap changed.
Lancashire County Analysts withdrew from the Field intercomparison at the end of 2010. No submissions were supplied in 2011.
Walsall MBC closed in March 2011.
Bristol Scientific Services closed at the end of 2011.
Somerset County Council did not start the Marylebone road intercomparison until June 2012. Exova stopped providing diffusion tubes at the end of 2013. Kent Scientific Services stopped providing diffusion tubes at the end of 2013.

2454 [2] In this situation it would be reasonable to use data from the nearest year.

Collocation Data | Revisions

Ready | Filter Mode | Average: 361.0602717 | Count: 270 | Sum: 46215.71477 | 90% | 12:24 18/07/2017

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 C.2 - Distance correction for site 33

Enter data into the red 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)?**	**14.54357**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	**39.5**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	**38.5**	µg/m^3

Figure C.3 - Distance correction for site 34

Enter data into the red cells

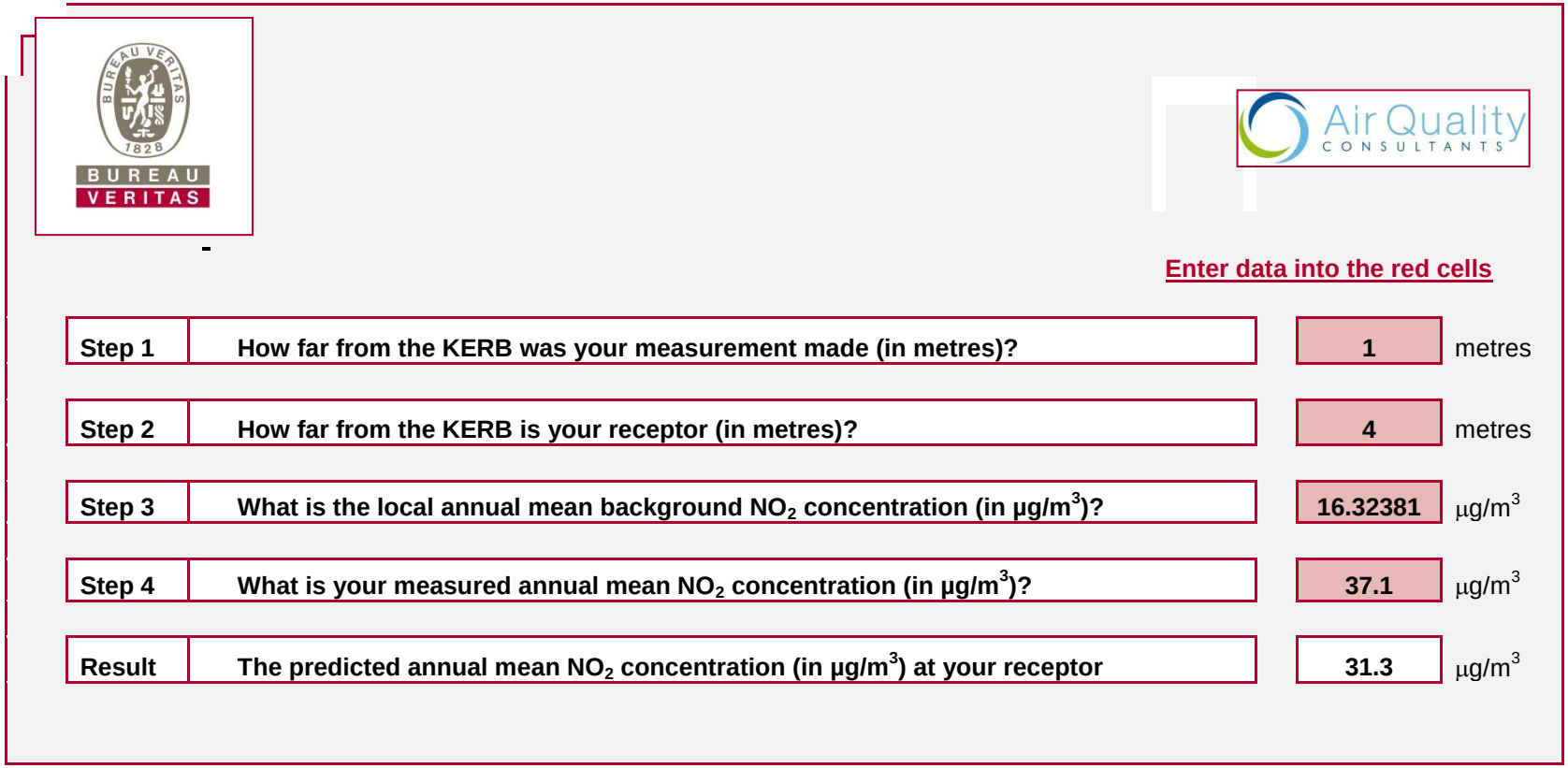
Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	4	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	14.54357	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	48.2	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	38.8	µg/m^3

Figure C.4 - Distance correction for site 37

Enter data into the red 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)?	17.1961	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	56.31	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	47.6	µg/m^3

Figure C.5 - Distance correction for site 48



Enter data into the red 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)?	16.32381	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	37.1	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	31.3	µg/m^3

Figure C.6 - Distance correction for site 50

Enter data into the red 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)?	17.1961	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	52.2	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	36.0	µg/m^3

Figure C.7 - Distance correction for site 52

Enter data into the red 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)?	14.00963	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	38.9	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	35.4	µg/m^3

Figure C.8 - Distance correction for site 55

Enter data into the red 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)?	14.54357	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	44.3	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	34.6	µg/m^3

Figure C.9 - Distance correction for site N1

Enter data into the red 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)?	13.34887	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	43.01	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	36.4	µg/m^3

Figure C.10 - Distance correction for site N4

Enter data into the red 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)?	12.97754	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	37.15	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	33.8	µg/m^3

Figure C.11 - Distance correction for site N16

Enter data into the red cells

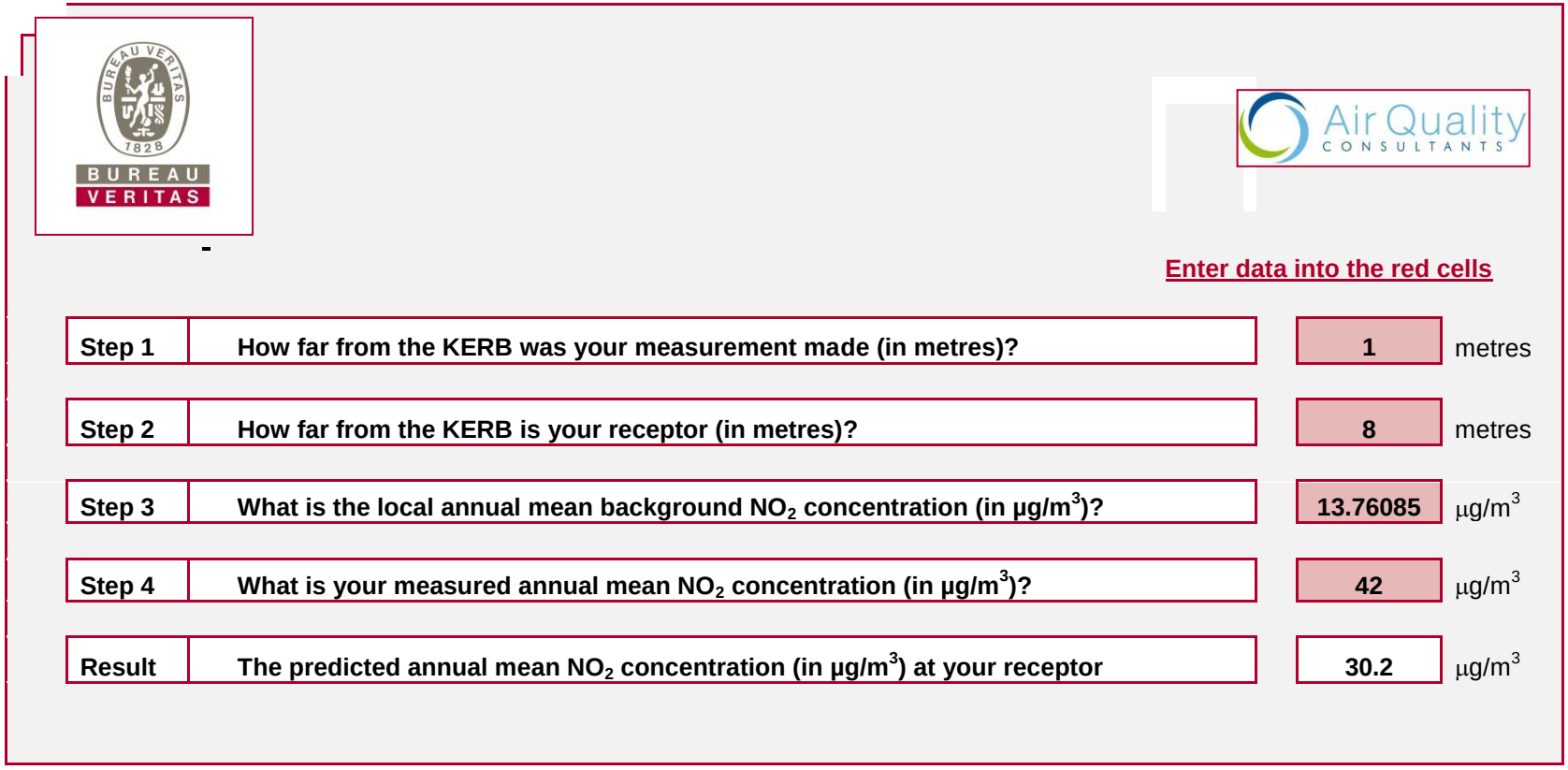
Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	3	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	13.34887	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	40.6	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	34.6	µg/m^3

Figure C.12 - Distance correction for site N17

Enter data into the red 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)?	13.34887	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	48.3	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	34.6	µg/m^3

Figure C.13 - Distance correction for site N22



Enter data into the red cells

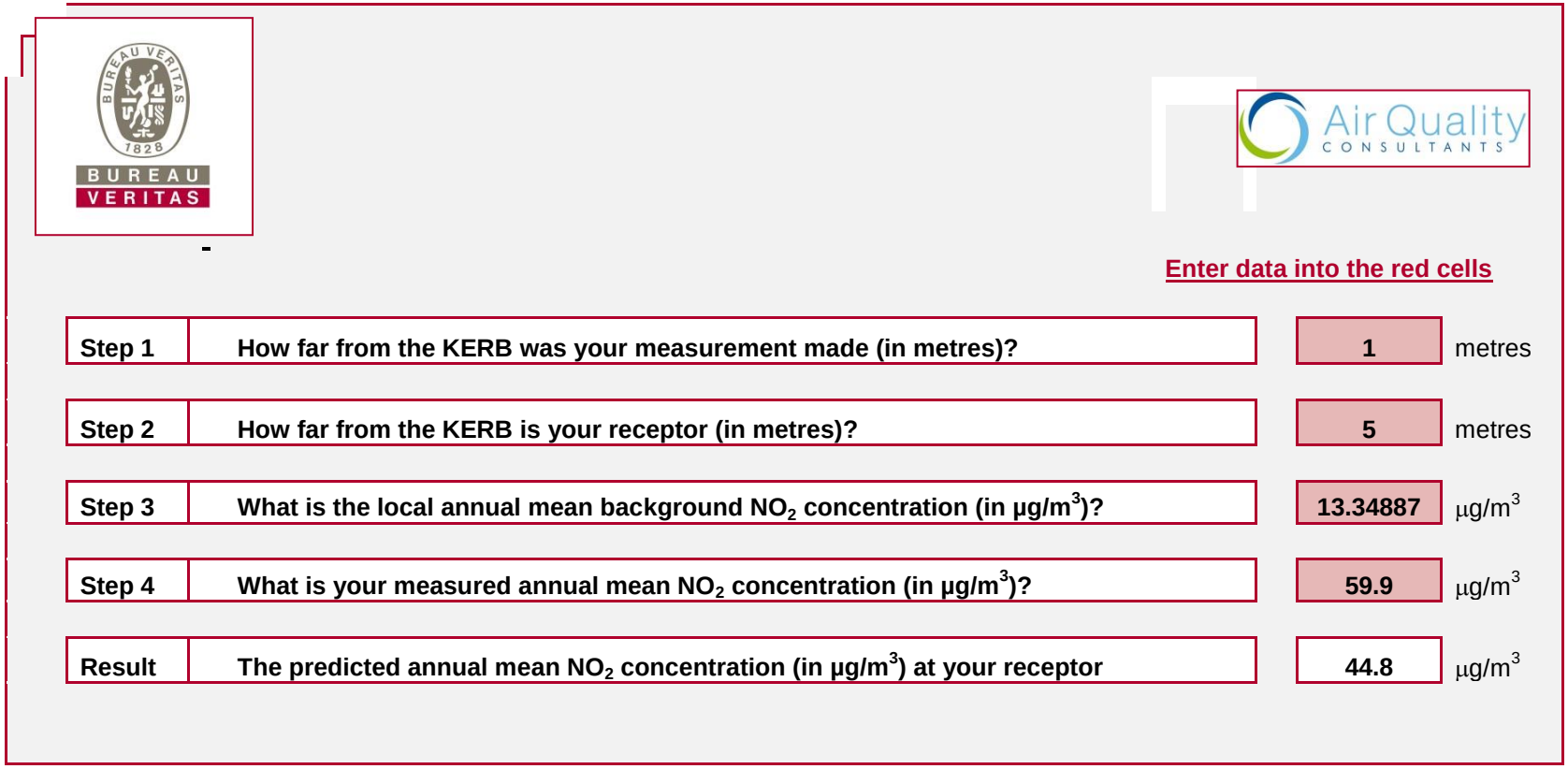
Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	8	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	13.76085	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	42	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	30.2	µg/m^3

Figure C.14 - Distance correction for site N26

Enter data into the red 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)?	11.84682	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	40.7	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	36.7	µg/m^3

Figure C.15 - Distance correction for site N30



Enter data into the red 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 $\mu g/m^3$)?	13.34887	$\mu g/m^3$
Step 4	What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?	59.9	$\mu g/m^3$
Result	The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor	44.8	$\mu g/m^3$

Realtime (continuous) data adjustment

In 2016 the Sandy AURN automatic monitoring station data capture of NO_2 was 93%; PM_{10} was 79% and 93% for $PM_{2.5}$, therefore no data capture rate fell below the 75% threshold and no annualisation was required.

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 also 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 NO2 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 and AQMAs

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

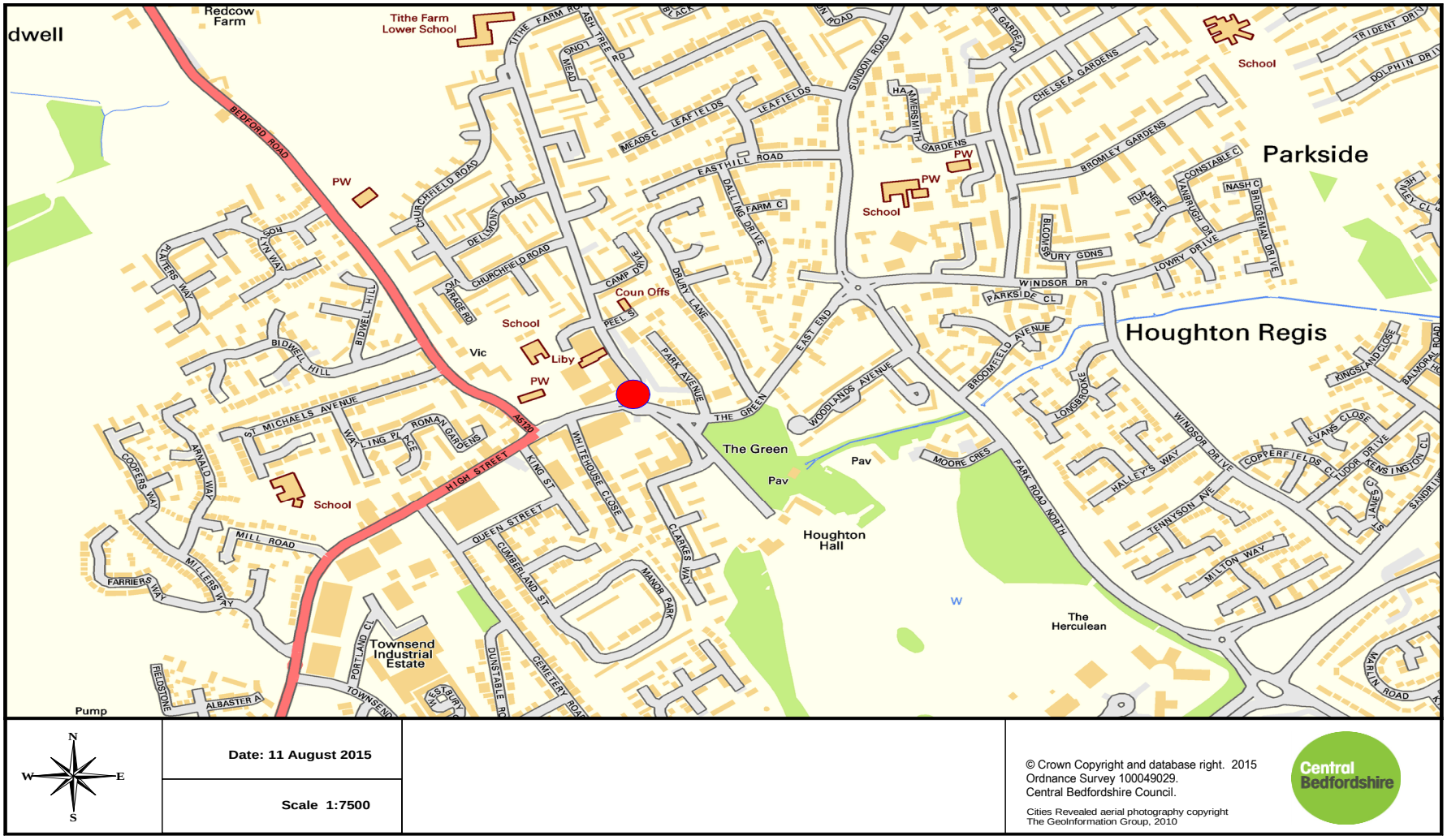


Figure D2 - Sallowsprings (14) NO2 diffusion tube site

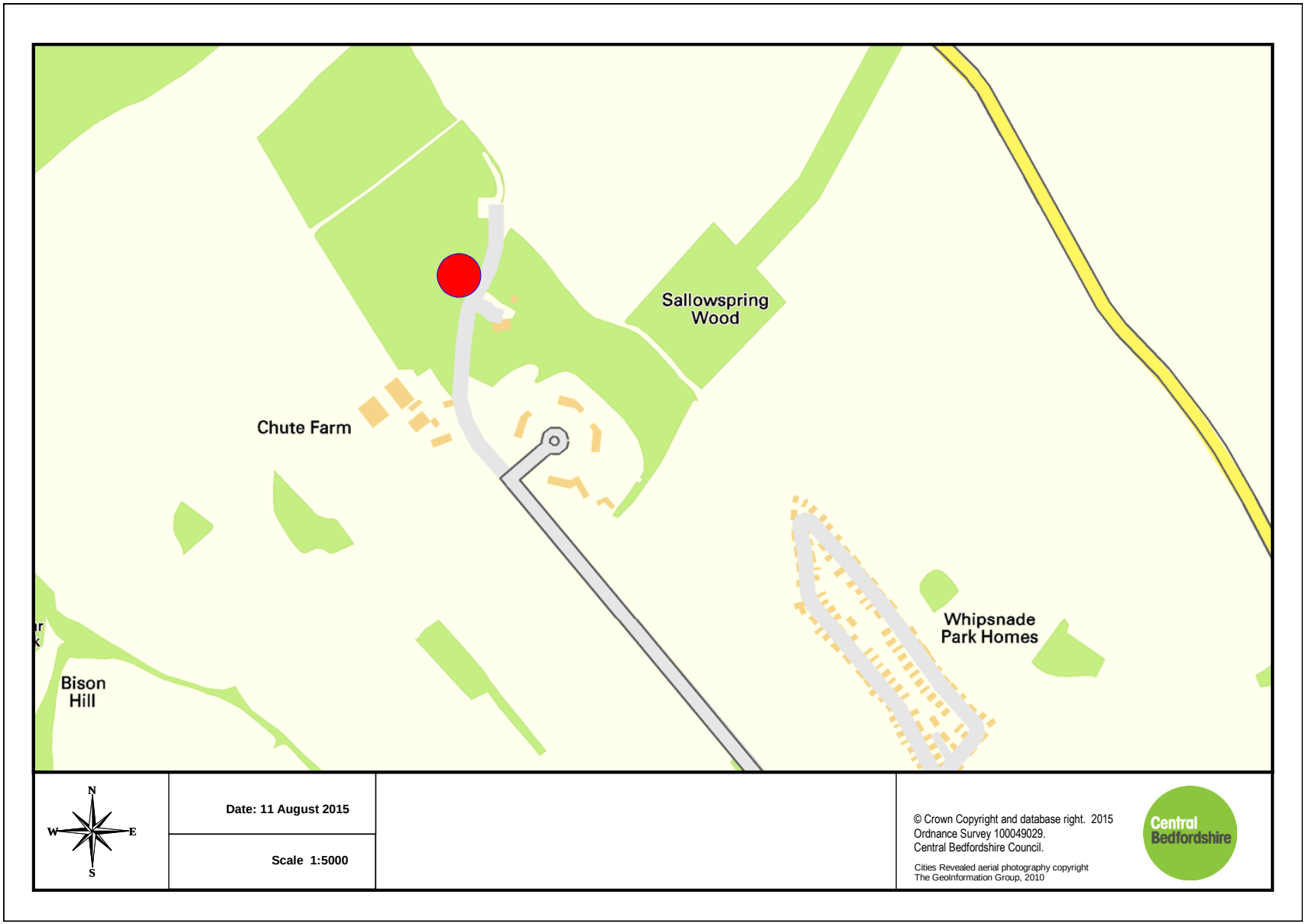


Figure D3 - Ampthill NO2 diffusion tube site

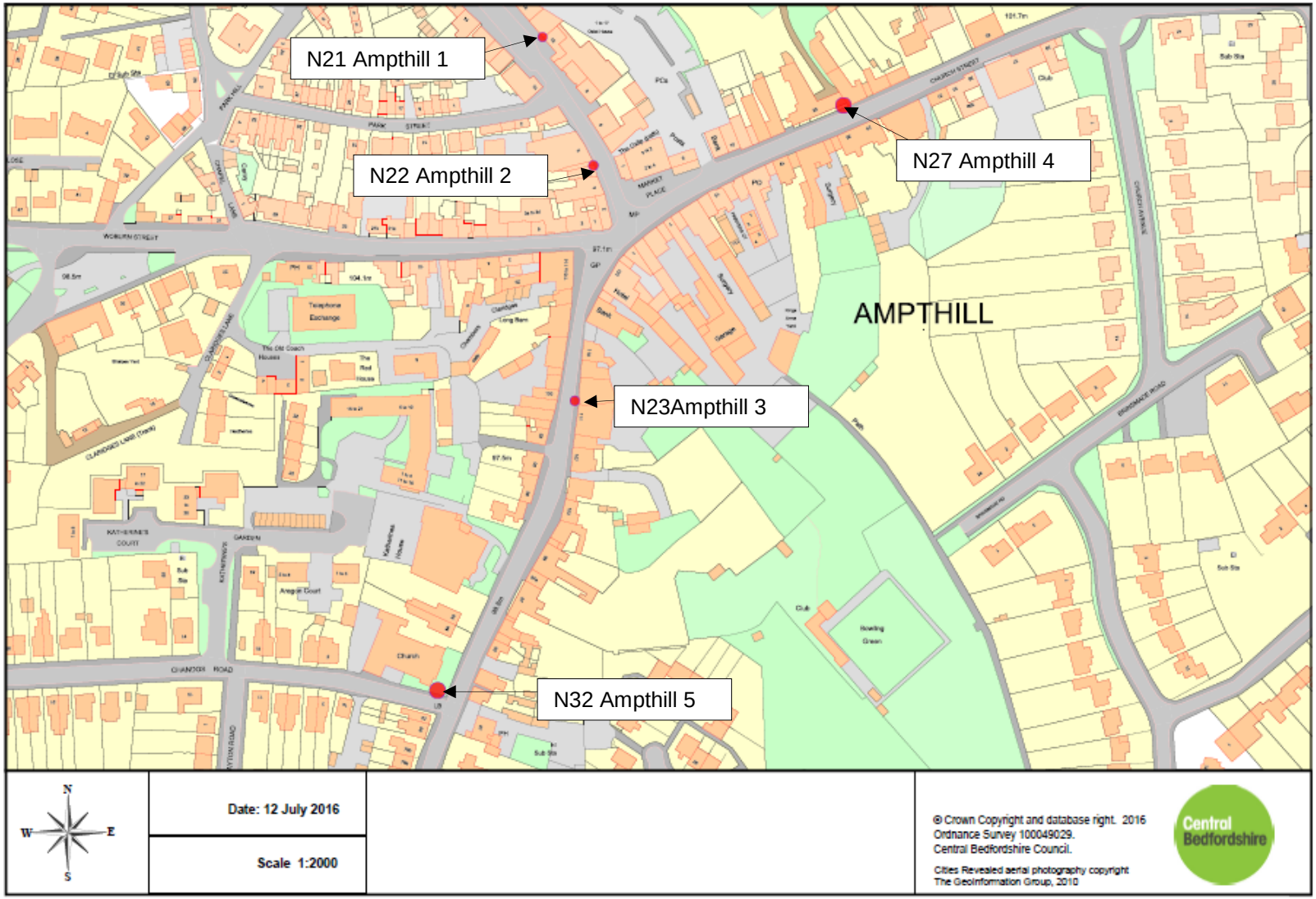


Figure D4 - Beeston (N4) NO2 diffusion tube site

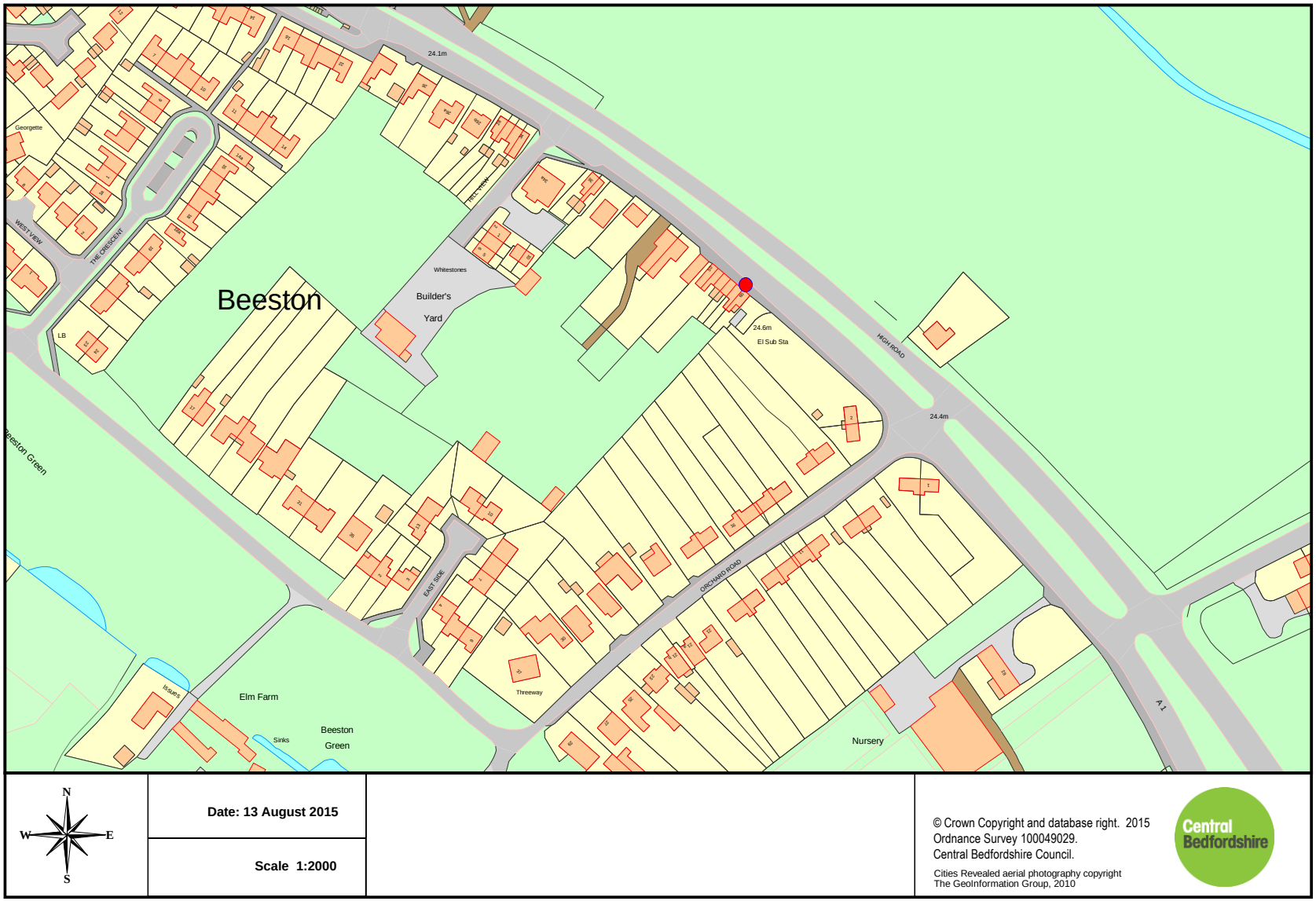


Figure D5 - Hockliffe Street, Leighton Buzzard (52) & Church Sq (53) NO2 diffusion tube site

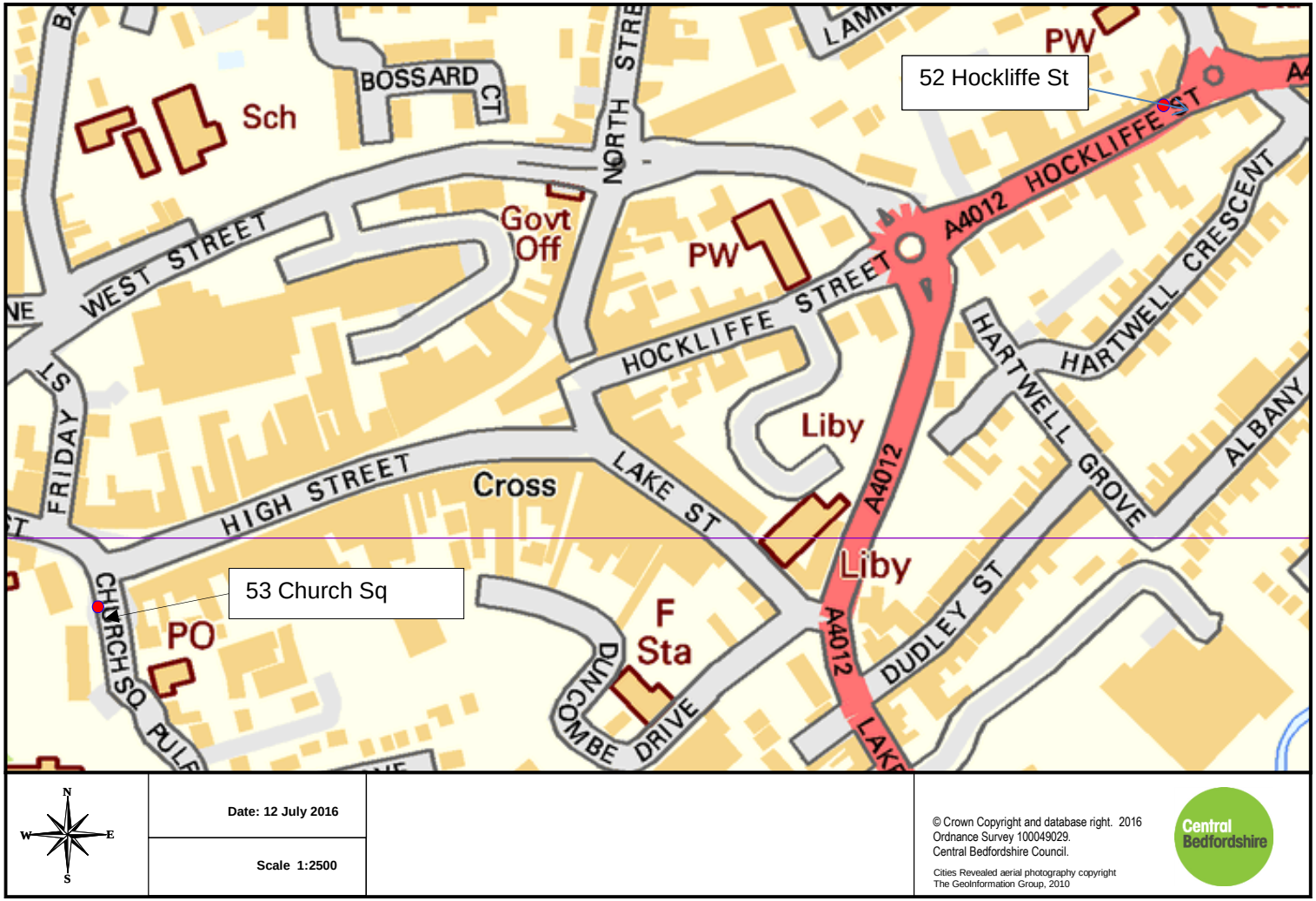


Figure D6 - Sandy NO2 diffusion tube site

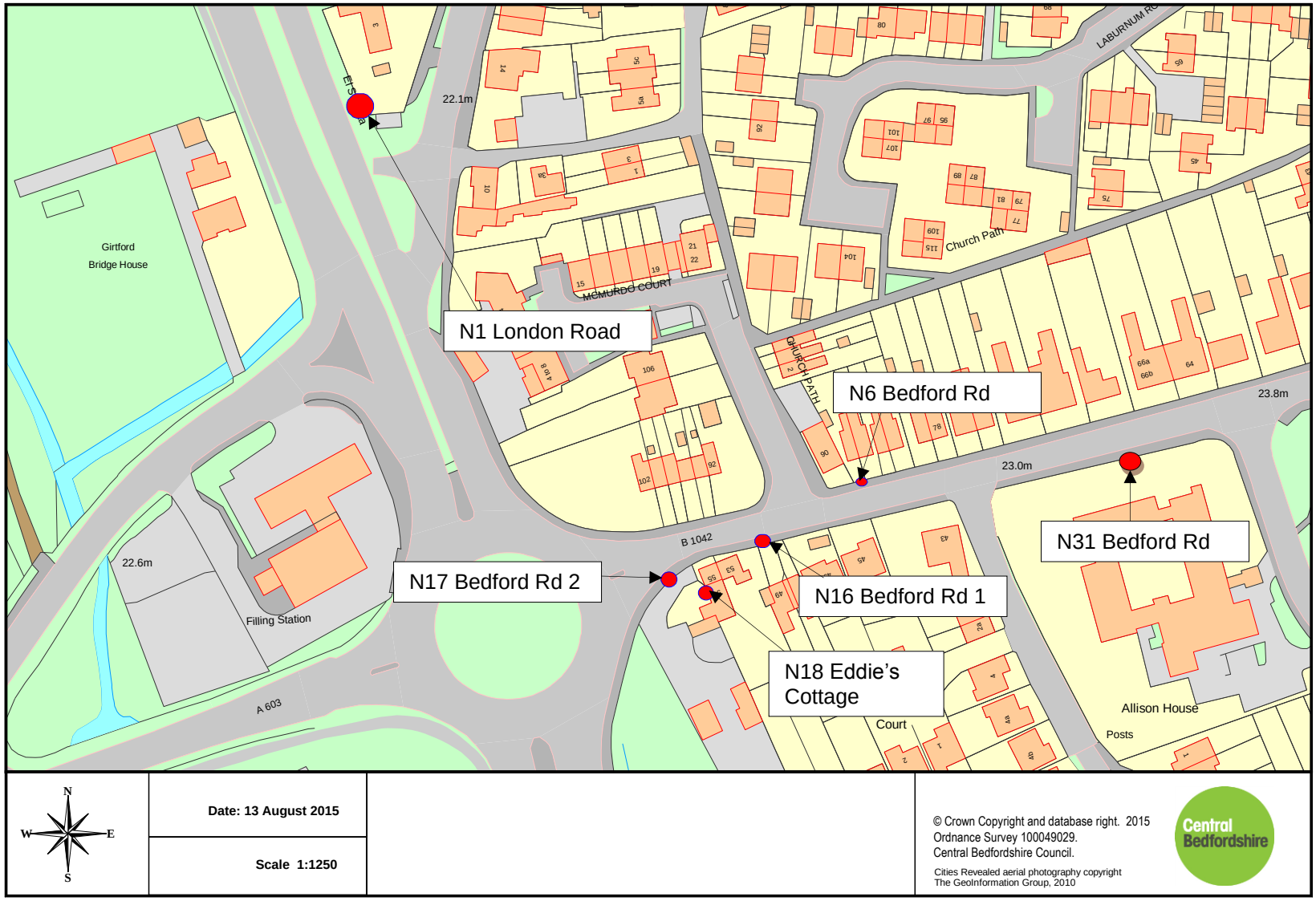


Figure D7 - Woburn (N26) NO2 diffusion tube site

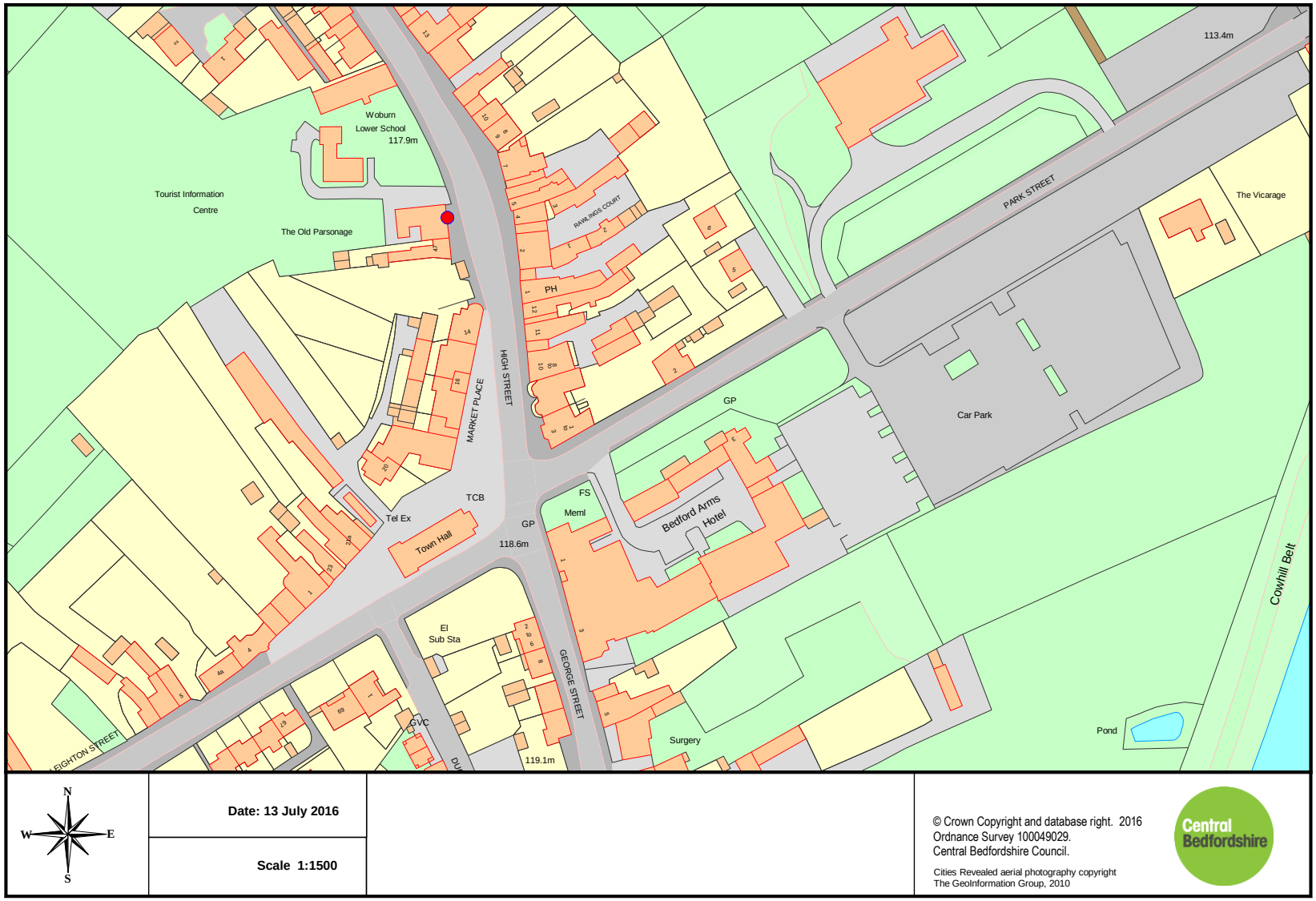


Figure D8 - Dunstable N02 diffusion tube sites

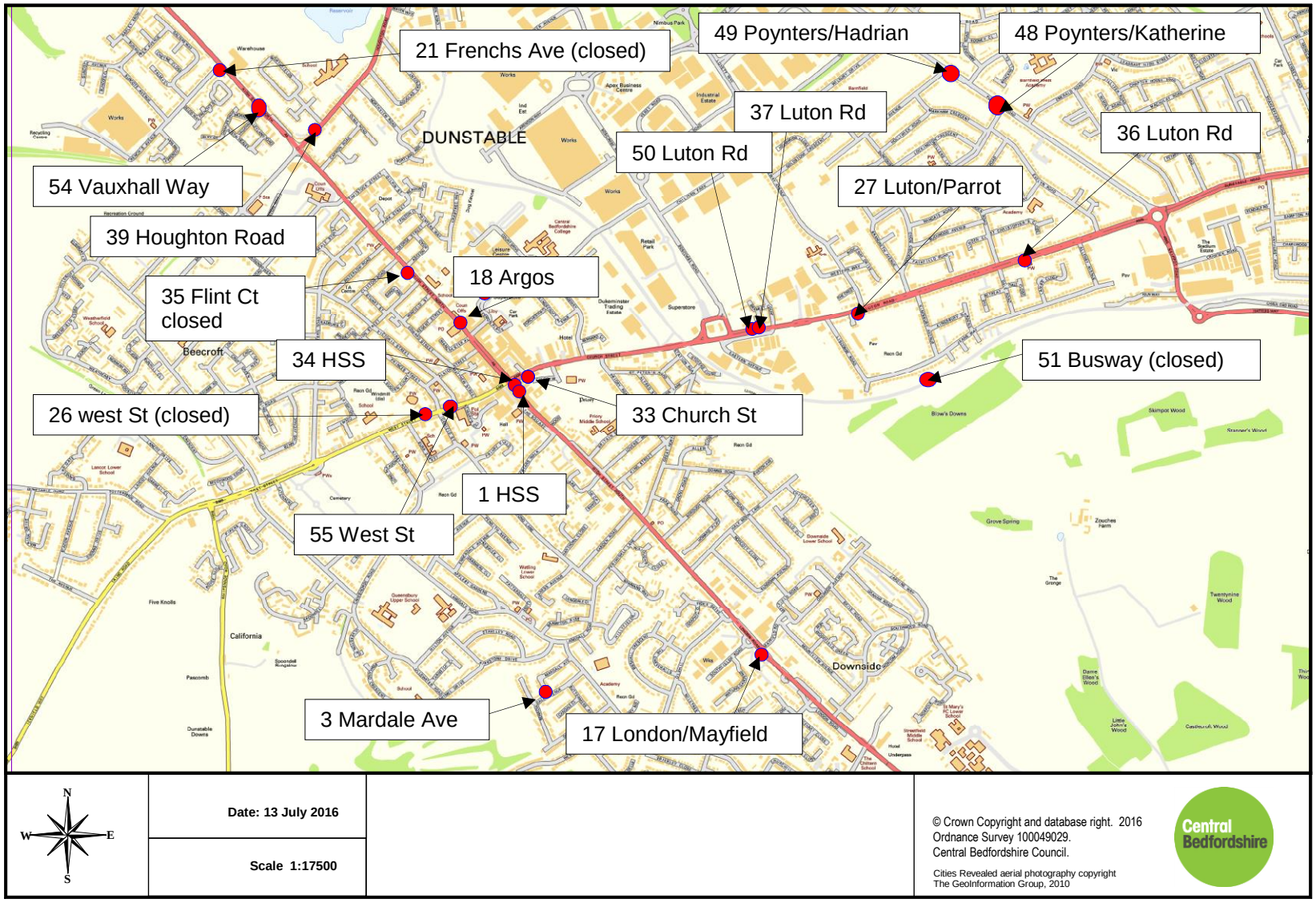
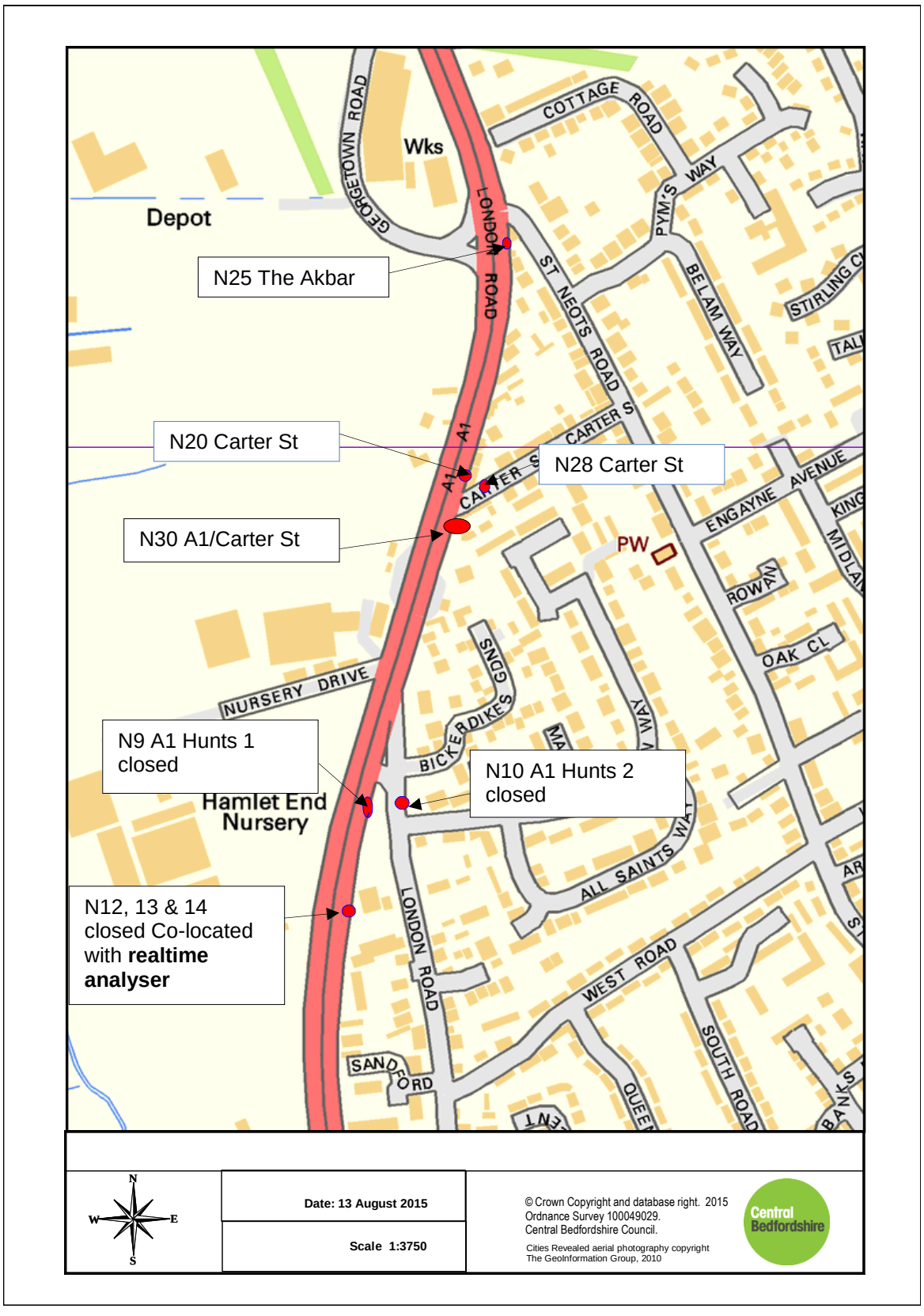


Figure D9 - Sandy NO2 diffusion tube site



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 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
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

- COMEAP (2009) Long-Term Exposure to Air Pollution: Effect on Mortality. Committee on the Medical Effects of Air Pollutants. Available at http://www.comeap.org.uk/documents/reports

- PHE(2014) Estimating Local Mortality Burdens associated with Particulate Air Pollution. AM Gowers, et al. Available at https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution

- Central Bedfordshire Council
    - (2016) 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))
    - 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*