2016 Air Quality Annual Status Report (ASR)

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

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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 274,000 (2015) 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 37 diffusion tubes. Results of which will be discussed later in this document, however it can be noted that after applying the annualisation (where required), bias adjustment factor and distance correction calculation (where appropriate) only sites within the declared AQMAs showed an exceedance of the Air Quality Objective (namely N20 and N23).

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.

[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

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.

The majority of Central Bedfordshire Council's district meets the Air Quality Objectives (AQOs) (set by the UK Government) for several air pollutants including nitrogen dioxide (NO_2) and particulate matter (PM_{10}). However in three locations within the district, concentrations of NO_2 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 $\mu g/m^3$) and the Sandy AQMA for both the annual and hourly (200 $\mu g/m^3$ 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 Air Quality Action Plans 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 $\mu g/m^3$ – micrograms per cubic metre); whereas the Sandy AQMA was declared for both the annual and hourly (200 $\mu g/m^3$ 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 after the new A5-M1 link road and Woodside Link road and the new M1 Junction (11a at Chalton) opens in 2017, as this is likely to result in the de-trunking of the A5 through Dunstable town, re-directing traffic away from the congested town centre and reducing the traffic flow, thereby reducing pollutant emissions and congestion. However 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

Work is continuing on the construction of the A5 – M1 link road (Dunstable northern bypass) which will provide a direct link between the two major road networks, removing non-local (through) traffic from the local infrastructure. This road will direct traffic away from traversing through Dunstable, which currently experiences high levels of congestion, especially in rush hour periods. In addition to this, work has commenced on constructing the Woodside Link road which will provide a direct link to traffic from a large industrial estate and other local traffic to the south/east of the town to the A5 north of Dunstable and to a new junction 11a on the M1 and will also form part of the new east-west corridor across the district. Completion of the scheme is expected in the summer of 2017.

Central Bedfordshire Council also has developed a number of policies to continue to develop sustainable transport, through walking & cycling policies throughout the district and additionally provision of Travel Choices –a web based application to assist people planning journeys (walking/cycling) throughout Dunstable – Houghton Regis and Luton.

Local Priorities and Challenges

Central Bedfordshire Council is committed to improving air quality in the district, particularly within the three AQMAs (Ampthill, Dunstable and Sandy).

However there are many local challenges which must be overcome to achieve these goals. In particular the Local challenges facing the formulation of the Action Plan include identifying any potential actions that would be possible to work towards the reduction of NO_2 concentrations within the AQMAs.

In the case of Ampthill, the major source of the high concentration of NO_2 is from local road transport. The roads are congested at peak hours and are narrow in places, often with buildings close to the kerb and of a height to give a “canyon effect”. This results in little opportunity for hard engineering options (i.e. widening of roads, etc.) but likely will rely more on reducing the traffic on the road network and by promoting other travel options such as walking; cycling and utilising public transport.

In Sandy the major source of the high concentration of NO_2 is from road transport emissions from the A1, affecting the area immediately adjacent to residential properties. Again there is little opportunity for hard engineering solutions on the road network (i.e. road re-alignment; barriers, etc.)

The particularly high concentration of NO_2 is located and affects a stretch of the A1, incorporating nine residential properties which are within 1-5 metres of the kerb. The row of cottages closest to the kerb act to prevent the emissions to dissipate.

Additional monitoring sites were located in the vicinity, which indicate that concentrations at nearby monitoring sites show reduced concentrations (N25 & N28 - which is set back from the A1), a further monitoring site was introduced to the network in January 2016 – results will be reported in future reports; (N30) was located within a metre of the A1 but has no obstructions to prevent dissipation of emissions. Results, so far, indicate that this site has a considerably lower concentration of $NO_{2,}$ than the site located on the façade of the cottages immediately adjacent to the A1 (N20), but still is likely to exceed the hourly objective concentration. These results indicate that the hourly AQO exceedance is likely to affect only the properties immediately adjacent to the A1 (within 10metres), however the annual objective is still being exceeded within the current Sandy AQMA boundary.

There is already a speed restriction in place on the A1 in this location (50mph) which helps reduce emissions of pollutants from vehicles. Central Bedfordshire Council are looking to work with both Highways England, as the A1 is managed by them, and the council's Highways department, who manage the local road network; to work towards reducing air pollution concentrations in the area.

The priorities for the next 12 months are to produce the finalised Action Plans for the AQMAs in Ampthill and Sandy and implement the actions identified. Meanwhile monitoring will continue in these areas to identify the effectiveness of actions on reducing the NO_2 concentrations within the AQMAs. In addition Central Bedfordshire Council will continue to monitor air quality in other locations in the district to ensure that the AQOs continue to be met.

The Action Plan relating to the Dunstable AQMA needs reviewing and updating to take in to account the opening of the new A5-M1 road and the Woodside Link and the subsequent effect on local air quality. This work will be addressed as soon as practicable.

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 2015. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an 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 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 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 but are also so shown in Appendix F.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	Town	One Line Description	Action Plan
AQMA 1 Dunstable	NO_2 annual mean	Dunstable	An area encompassing the town centre & along the A505 (Luton Rd) & A5 (Watling St).	Action plan produced in 2005 – to be reviewed (following opening of new road (A5-M1& Woodside link) in 2017)
AQMA 2 Sandy	NO_2 annual & hourly mean	Sandy	10 metres either side of A1 road from Bedford Rd to the Girtford exit, encompassing some residential properties	Action Plan currently being developed
AQMA 3 Ampthill	NO_2 annual mean	Ampthill	An area encompassing residential properties near the town centre. The AQMA extends to adjacent properties in Dunstable St & Church St	Action Plan currently being developed

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

Central Bedfordshire Council has taken forward a number of measures during the current reporting year of 2015 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. More detail on these measures can be found in their respective Action Plans.

Key completed measures are:

- Measure 13 - Luton – Dunstable Busway (guided busway): was completed in the autumn of 2013, usage of the busway has increased the service provision and speed of routes between Dunstable/Houghton Regis and Luton.
- the new A5-M1 link road and Woodside Link road and the new M1 Junction (11a at Chalton) is due to open in 2017, this is likely to have a significant impact on air quality in Dunstable (due to the potential of de-trunking of the A5 through Dunstable town, re-directing traffic away from the congested town centre and reducing the traffic flow, thereby reducing pollutant emissions and congestion). The situation will be monitored and the existing Air Quality Action Plan updated to reflect changes.

Central Bedfordshire Council's priorities for the coming year are to:

- Produce Action Plans in consultation with all partners in order to address air quality in the Ampthill and Sandy AQMAs.
- Review and update the Dunstable AQMA and the associated Action Plan subsequent to the opening of the M1-A5 (Dunstable bypass) road and the Woodside Connection link and the proposed de-trunking of the A5 in Dunstable.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
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% of all planning apps relate to this type of development	The number of such developments is likely to increase as the Government has stated 26,000 new homes to be built in this area.	ongoing	
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	<1%	Travel choices programme and Local Transport Plan	ongoing	

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
6	Encourage walking / cycling & public transport	Promoting Travel Alternatives	Promotion of cycling/walking/other	CBC	2004	ongoing	passengers nos & travel survey / time comparison	<1%	Publicising bus, walking and cycling routes has helped to raise the profile of these methods of transport	ongoing	
8	Improve/extend cycle path network	Promoting Travel Alternatives	Promotion of cycling	CBC	2004	ongoing	Additions to nework / no of users /work done	<1%	Since AQAP there has been a 74% increase in on/off road cycle paths	Ongoing	
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 impacts of journeys.	ongoing	
12	Provision of incentives to use public transport	Promoting Travel Alternatives	Other	CBC	2004	ongoing	Number of passengers, travel survey, time comparisons	<0.5%	Rural bus routes and free bus passes for senior citizens continued to be financially supported by CBC		
13	Improvements in public transport infrastructure	Transport planning & infrastructure	Bus route improvements	CBC	2004	Completed	Congestion data, journey time comparison, etc	<0.5%	Guided busway now open	Completed	

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
15	Encourage car sharing / walking / cycling	Promoting travel alternatives	Promotion of cycling Promotion of walking Personalised travel planning	CBC	2004	ongoing	Numbers of walkers /cyclists - travel survey	<0.5%	Green travel initiatives enhanced by Travel Choices programme promoting sustainable travel and reducing impact of journeys.		
16	Improvements to road network	Traffic Management	Strategic highway improvements.. etc	CBC	2004	ongoing	Congestion / road capacity/density statistics	<1%	Dunstable Bypass construction work commenced and due for completion in 2017		
23	Promote use & availability of alternative fuels / more efficient vehicles	Promoting low emission transport	Procuring alternative refuelling	CBC	2004	ongoing	Availabilty and amount sold. % of these fuels in overall sales	<0.5%	Increasing number of petrol stations providing alternative fuels & electric charging points within more car parks.		
24	Develop availability of alternative fuels	Promoting low emission transport	Procuring alternative refuelling	CBC	2004	ongoing	Local availability	<0.5%	Increasing availability of alternative fuels		
28	Local development framework adopting policies improving AQ	Policy guidance & development	Air quality planning & policy guidance	CBC	2004	ongoing	Review and implement changes as required	<0.5%	CBC developed strategies& review		
30	Develop/maintain partnerships to improve services/planning/access	Other policy	Other measure	CBC	2004	ongoing	Inter-agency communications	<0.5%	Ongoing / new partnerships to develop Local Transport Plans, AQAPs etc continue		

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
31	Review provision of alternative transportation priority measures	Traffic management	Strategic highway improvements … etc	CBC	2004	ongoing	Road capacity, Journey times	<0.5%	No room to add dedicated bus lanes to the road network. New bus routes added		
33	Road network improvements	Traffic management	Strategic highway improvements … etc	CBC	2004	ongoing	Congestion / traffic counts	<1%	Dunstable bypass construction commenced and due completion in 2017		

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. However $PM_{2.5}$ does not currently have any objectives set out within the Air Quality Objectives.

Central Bedfordshire Council has taken the following measures to address $PM_{2.5}$:

- The Public Health function is incorporated within the unitary authority and a working partnership with Public Protection is being created following:
  - Increased evidence and awareness of harm from exposure to $PM_{2.5}$
  - A public Health Outcomes Framework Indicator “Fraction of all-cause mortality attributable to anthropogenic particulate air pollution (measured as fine particulate matter, $PM_{2.5}$)”
- $PM_{2.5}$ concentrations are being monitored at the AURN realtime analyser sited adjacent to the A1 in Sandy and have been since 2013.
  - In 2013 the annual mean was 13 µg/m^3
  - In 2014 the annual mean was 12 µg/m^3; and
  - In 2015 the annual mean was 11 µg/m^3.
- These results are well within the proposed EU Emission Limit Value of 25 µg/m^3.
- Therefore concentrations of $PM_{2.5}$ will continue to be monitored at this site to ensure that the proposed EU Emission Limit Value continues to be met and to provide long-term trend data.
- However there is no evidence for a threshold below which effects would not be expected (COMEAP2009). This means that current levels of particulate air pollution in the UK and elsewhere in Europe have a significant impact on the life expectancy of the population. As a result, EU member states are required to achieve a reduction in population exposure to $PM_{2.5}$ as indicated by concentrations monitored at background locations in major urban areas, averaged over a period of 3 years. In the UK a 15% reduction in this average exposure indicator (AEI) is required over a period of 10 years from 2010. (PHE2014)
- Local authorities have no direct responsibility to control $PM_{2.5}$ concentrations – although many measures utilised to reduce levels of PM_{10} & NO_2 will also reduce emissions/concentrations of $PM_{2.5}$.

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 of nitrogen dioxide (NO_2) and particulate matter (both PM_{10} and $PM_{2.5}$) at one site during 2015. Table A.8 in Appendix A shows the details of the sites. National monitoring results are available at http://uk-air.defra.gov.uk/networks/network-info?view=aurn

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 37 sites during 2015. Table A.9 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) and bias adjustment for the diffusion tubes are included in Appendix C.

Use of the NO_2 fall-off with distance calculator was used to calculate the likely concentration at the nearest receptor at those monitoring sites located some way from appropriate receptors). This was only required for sites with results exceeding or near to breaching the NO_2 annual objective. The calculator is available on the LAQM Support website http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

The calculations can be seen in Appendix C

After applying the annualisation (where required), bias adjustment factor and distance correction calculation (where appropriate) only sites within the declared AQMAs showed an exceedance of the Air Quality Objective (namely N20 and N23).

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

Table A.10 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix B.

Table A.11 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.

Figue B1 in Appendix B, highlights the 5 year trend in NO2 diffusion tube results. The majority of the sites show that results in 2015 are lower that that recorded in 2011.

In 2015 exceedences of the annual mean NO_2 objective was measured at 6 diffusion tube locations – all of which are located within declared AQMAs (N20 and N17 within Sandy; N23 within Ampthill and 34, 37 & 50 within Dunstable AQMAs).

A distance correction calculation was undertaken (Tables C7 –C15 in Appendix C). This calculated that the annual mean calculation at the façade of the nearest property, this resulted in only sites N23 and N20 remaining above the annual AQO for NO_2 (and in addition the hourly AQO for N20).

The tube site known as N20 (A1 – Sandy) has recorded concentrations greater than 60µg/m^3 annually, which indicates that the hourly objective for nitrogen dioxide has been exceeded in this location. The AQMA in Sandy was declared for both the hourly and annual NO_2 objectives.

No monitoring sites outside of current AQMAs show an exceedence of the air quality objectives (hourly or annual) and as such there is no need to progress to declare further AQMAs. However there are a number of sites which show borderline levels (above 36 µg/m3) of NO_2, monitoring will continue at these locations to ensure that concentrations remain below the objective levels. Should exceedences occur then work towards declaring further AQMA(s) will be pursued.

3.2.2 Particulate Matter (PM_{10})

Table A.12 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.13 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.

The annual mean concentration of PM_{10} measured at the Sandy continuous monitoring site was 10.30 µg/$m^{3\ (annualised)}$ in 2015, with 1 excedence of the 24 hour mean.

Results from monitoring PM_{10} in previous years have not shown any exceedences of either the annual or 24 hour mean objectives.

All measurements were considerably less than the objectives set and show that this location does not need any further action in relation to PM_{10}. However monitoring of PM_{10} will continue at this location.

Modelling carried out during previous rounds of Review and Assessment indicated that no locations within Central Bedfordshire exceed the PM_{10} objectives. No changes have occurred in the district to alter this situation.

3.2.3 Particulate Matter ($PM_{2.5}$)

Particulate matter $PM_{2.5}$ has been monitored at the Sandy continuous monitioring site since 2013.

Table A.14 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations since 2013.

In 2015 the annual mean concentration was 11µg/m^3 – there has been a slight reduction in the concentration measured year on year. The results are well within the proposed EU Emission Limit Value of 25 µg/m^3.

Concentrations of $PM_{2.5}$ will continue to be monitored at this site to ensure that the proposed EU Emission Limit Value continues to be met and to provide long-term trend data.

Appendix A: Monitoring Results

Table A.8 – 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	516436	249600	NO_2; PM_{10}; $PM_{2.5}$	Y	Chemiluminescent; FDMS TEOM	-	2m	1.5

(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.9 – 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	Y	3	1	Y	1.5
N2	Rose Lane B'wade	Kerbside	519163	244654	NO_2	N	4	1	N	1.5
N3	High St B'wade	Kerbside	518995	244594	NO_2	N	-	1	N	1.5
N4	A1 Beeston	Kerbside	517160	248190	NO_2	N	2	1	N	1.5
N6	Bedford Rd Sandy	Kerbside	516621	249100	NO_2	Y	4	1	N	1.5
N7	Highfield Cres Brogborough	Kerbside	496334	238297	NO_2	N	10	3	N	1.5
N20	A1 Carter Lane Sandy	Kerbside	516534	249974	NO_2	Y	0	1	N	1.5
N9	A1 Hunts Car Co 1 Sandy	Kerbside	516451	249692	NO_2	Y	-	1	N	1.5
N10	A1 Hunts Car Co 2 Sandy	Kerbside	516480	249695	NO_2	N	4	2	N	1.5
N12	NOx Co loc 1	Kerbside	516434	249603	NO_2	Y	-	3	Y	1.2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N13	NOx Co loc 2	Kerbside	516434	249603	NO_2	Y	-	3	Y	1.2
N14	NOx Co loc 3	Kerbside	516434	249603	NO_2	Y	-	3	Y	1.2
N16	Bedford Rd Sandy	Kerbside	516593	249083	NO_2	Y	3	1	N	1.5
N17	Bedford Rd Sandy	Kerbside	516569	249074	NO_2	Y	6	1	N	1.5
N18	Eddie's Cottage Sandy	Kerbside	516579	249070	NO_2	Y	0	5	N	0.75
N19	McMurdo Ct Sandy	Kerbside	516524	249139	NO_2	N	0	11	N	1.5
N21	Ampthill 1	Kerbside	503444	238197	NO_2	Y	3	2	N	1.5
N22	Ampthill 2	Kerbside	503466	238141	NO_2	Y	8	1	N	1.5
N23	Ampthill 3	Kerbside	503458	283039	NO_2	Y	2	1	N	1.5
N25	The Akbar A1 Sandy	Kerbside	516568	250174	NO_2	Y	-	1	N	1.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N26	Woburn	Kerbside	494900	233230	NO_2	N	2	1	N	1.5
N28	Sandy	Kerbside	516551	249967 249967	NO_2	N	1.5	1	N	0.75
1	High St South D'ble	Kerbside	501936	221833	NO_2	Y	-	1	N	0.75
3	Mardale D'ble	Kerbside	502029	220688	NO_2	N	3	1	N	1.5
5	Rowley Linslade	Kerbside	491000	225788	NO_2	N	3	1	N	0.75
6	Barton	Kerbside	508062	230874	NO_2	N	5	1	N	1.5
7	Slip End	Kerbside	507698	218376	NO_2	N	3	1	N	1.5
10	Houghton Regis	Kerbside	501991	223965	NO_2	N	-	1	N	0.75
14	Sallowsprings	Kerbside	500525	218840	NO_2	N	-	8	N	0.75
17	London/Mayfield D'ble	Kerbside	502848	220829	NO_2	N	5	2	N	1.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
18	Argos D’ble	Kerbside	501705	222089	NO_2	N	-	1	N	0.75
21	Frenchs Ave D’ble	Kerbside	500790	223047	NO_2	N	4	2	N	1.5
26	West St D’ble	Kerbside	501571	221742	NO_2	N	5	1	N	1.5
28	Chalton	Kerbside	503763	226103	NO_2	N	-	1	N	0.75
33	Church St D’ble	Kerbside	501962	221884	NO_2	Y	1	8	N	1.5
34	High St South D’ble	Kerbside	501911	221853	NO_2	Y	4	1	N	0.75
35	Flint Ct D’ble	Kerbside	501504	222278	NO_2	N	0	3	N	0.75
36	Luton Rd D’ble	Kerbside	503849	222326	NO_2	Y	2	1	N	1.5
37	Luton Rd D‘ble	Kerbside	502838	222071	NO_2	Y	3	1	N	1.5
39	Houghton Rd D’ble	Kerbside	501151	222821	NO_2	N	3	1	N	1.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
41	Chalton X	Kerbside	503925	225855	NO_2	N	0	6	N	0.75
48	Poynters Rd D'ble	Kerbside	503745	222914	NO_2	N	4	1	N	0.75
49	Poynters Rd D'ble	Kerbside	503569	223034	NO_2	N	6	1	N	1.5
50	Luton Rd D'ble	Kerbside	502813	222065	NO_2	Y	6	1	N	0.75
51	Busway D'ble	Kerbside	503481	221866	NO_2	N	8	2	N	0.75
52	Hockliffe St L/Buzzard	Kerbside	492512	225235	NO_2	N	2	1	N	0.75

(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.10 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2011	2012	2013	2014	2015
MD3	Roadside	Automatic	-	98	35	35	31	27.94 (annualised)	30.6

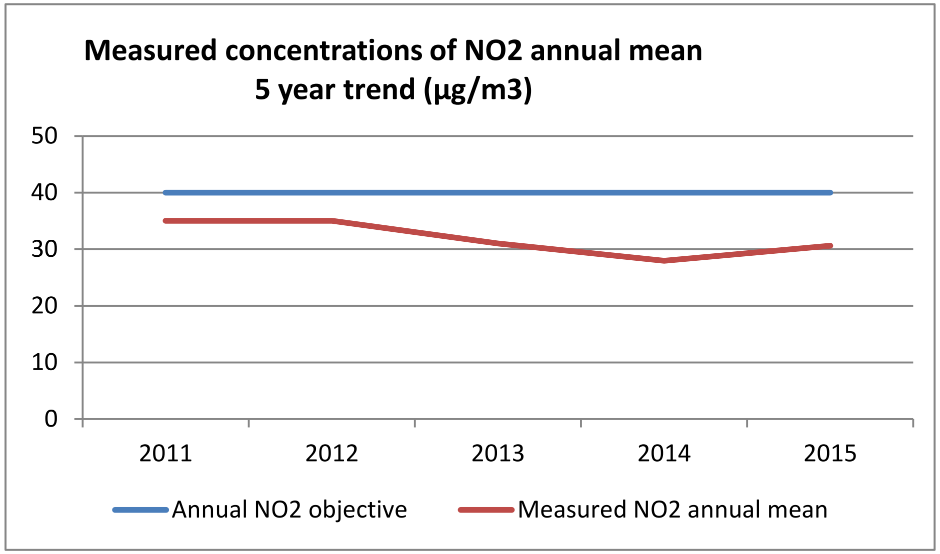
Notes: Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

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 Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.



As can be seen from the figure (left) the NO_2 annual objective has not been exceeded. Overall levels of measured annual mean concentrations have reduced since 2011, the lowest annual mean concentration was achieved in 2014. However there was a slight increase in the annual mean concentration in 2015. However levels of air pollution can be affected by factors such as meteorological conditions

The trend of declining measured annual NO_2 concentrations has ceased in 2015, where the concentration increased. This situation will be monitored to ascertain if the rise was a one off, of if levels will continue to rise or if levels will decrease in 2016.

Table A.11 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 1-Hour Means > 200µg/m³ (3)				
					2011	2012	2013	2014	2015
MD3	Roadside	Automatic	-	98	0	0	0	0 (113)	0 (130)

Notes: Exceedances of the NO_2 1-hour mean objective (200µg/m³ 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 90%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.12 – Annual Mean PM_{10} Monitoring Results

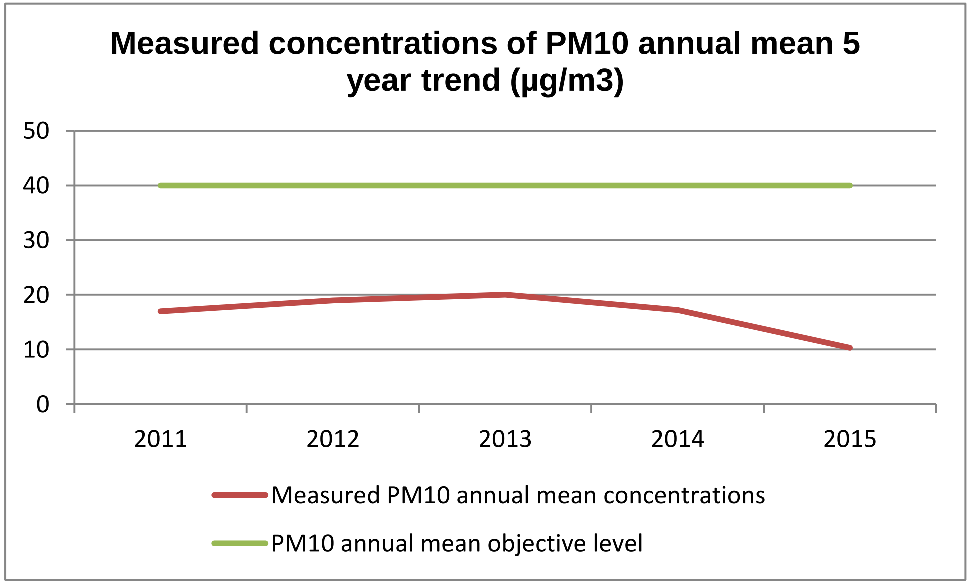
Site ID	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2015 (%) [2]	PM_{10} Annual Mean Concentration ($\mu g/m^3$) [3]				
				2011	2012	2013	2014	**2015**
MD3	Roadside	-	58	17	19	20	17.21 (annualised)	10.30 (annualised)

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 Technical Guidance LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.



As can be seen from the figure (left) the PM_{10} annual objective has not been exceeded. Despite a slight increase in measured concentrations in 2012 and 2013, levels have decreased in subsequent years to reach the lowest concentration in 2015.

The trend is one of declining concentrations of annual PM_{10}

Table A.13 – 24-Hour Mean PM_{10} Monitoring Results

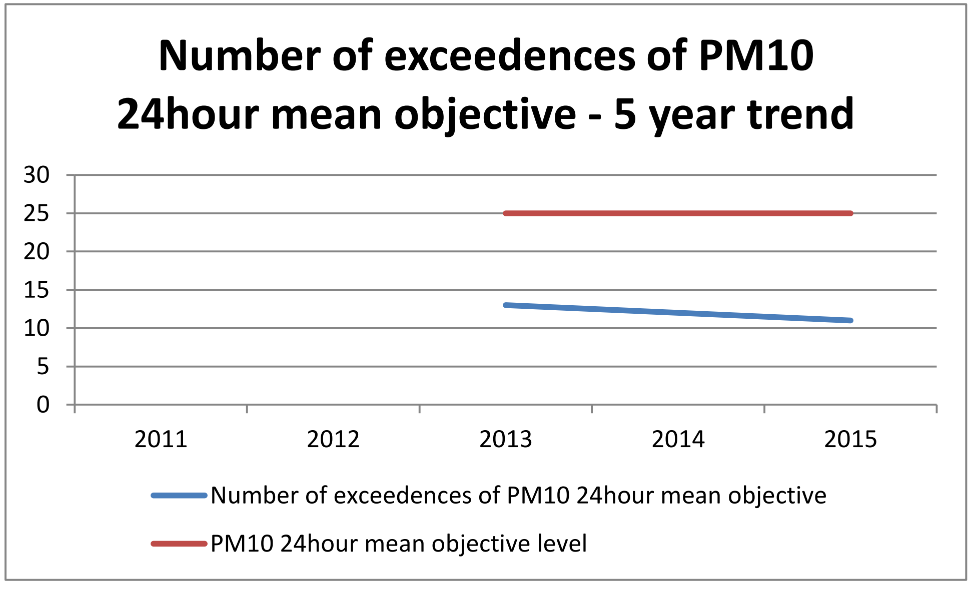
Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM_{10} 24-Hour Means > 50µg/m³ (3)				
				2011	2012	2013	2014	2015
MD3	Roadside		58	4	8	6	**1** (27)	**1** (26.4)

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

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

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

(3) If the period of valid data is less than 90%, the 90.4th percentile of 24-hour means is provided in brackets.



As can be seen from the figure (left) the PM_{10} 24hour mean objective has not been exceeded.

The five year trend shows that the number of exceedences measured has reduced from the 2011 level. In 2012 there was a slight increase in the number of exceedences, which then educed in 2013 and 2014. 2015 numbers remained at the same level as 2014.

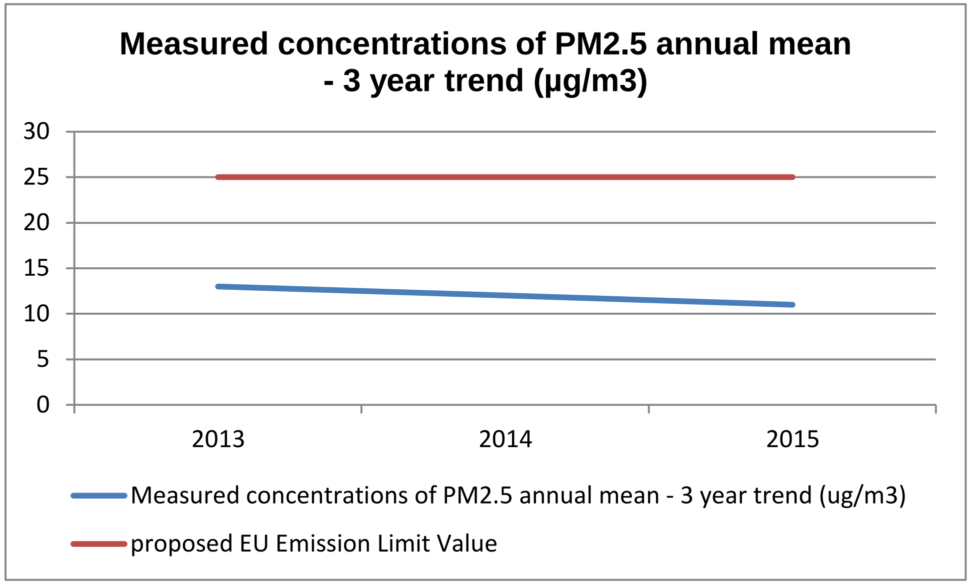
Table A.14 – $PM_{2.5}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
				2011	2012	2013	2014	2015
MD3	Roadside		94	-	-	13	12	11

(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 Technical Guidance LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.



As can be seen from the figure (left) the $PM_{2.5}$ proposed EU Emission Limit Value of 25 µg/m^3 has not been exceeded.

Three years of monitoring have shown a decline in the annual concentration year on year.

Monitoring of $PM_{2.5}$ will continue.

Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.2 – NO_2 Monthly Diffusion Tube Results – 2015 (figures in bold show concentrations higher than the annual NO_2 air quality objective and those in bold & underscored indicate concentrations which may exceed the hourly NO_2 air quality objective)

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 (0.91)	Distance corrected
N1	56.82	41.1	38.99	40.11	42.87	47.39	-	42.57	47.27	38.64	37.31	42.24	**43.21**	39.32	33.7
N2	36.4	33.84	27.33	25.77	-	51.33	27.86	24.13	24.51	25.98	23.31	26.11	29.68	27.01	-
N3	45.8	38.71	36.84	41.33	20.87	38.31	-	33.68	40.08	38.3	-	23.77	35.77	32.55	-
N4	42.72	40.9	38.21	39.62	32.46	39.94	33.97	35.66	41.44	42.26	32.51	27.05	37.23	32.88	-
N6	44.75	36.71	39.66	26.29	33.32	32.63	35.72	34.5	37.81	32.14	40.86	34.6	36.58	33.29	-
N7	36.79	30.33	31.84	25.28	23.82	23.51	23.62	-	-	-	-	-	27.88	33.62a	-
N20	**85.2**	**91.11**	**75.49**	**79.93**	52.78	**76.53**	**73.63**	**68.87**	**88.35**	**77.06**	55.83	**63.02**	<u>**73.98**</u>	<u>**67.32**</u>	<u>**No fall off**</u>
N9	54.16	46.43	40.72	37.4	33.27	42.57	40.17	40.36	39.32	42.82	43.24	34.77	**41.27**	37.55	No relevant exposure
N10	36.88	31.88	30.72	20.95	21.24	20.91	21.63	24.57	23.83	23.91	26.46	26.12	25.76	23.44	-
N12	45.74	40.14	31.94	28.1	31.32	29.23	33.57	32.57	40.15	33.42	34.88	26.25	33.94	30.89	-
N13	48.53	38.6	34	30.65	33.96	32.64	35.67	31	37.14	30.62	34.29	30.94	34.84	31.70	-
N14	50.81	41.04	34.87	31.24	31.67	32.79	37.46	32.16	37.6	31	33.9	27.7	35.19	32.02	-
N16	49.39	47.58	42	45.12	41.98	41.53	40.52	40.19	43.37	40	47.34	39.52	**43.21**	39.32	33.7
N17	**71.89**	52.18	49.26	44.45	82.91	52.52	46.86	45.92	47.31	38.3	56.97	43.58	**50.18**	**45.66**	33.2

Site ID	NO_2 Mean Concentrations (μg/m³)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.91)	Distance corrected
N18	40.72	35.86	30.57	22.55	30.2	29.55	31.94	29.71	30.9	29.71	28.18	26.17	30.51	27.76	-
N19	33.98	28.95	24.71	25.03	27.3	24.34	29.54	27.37	26.76	27.35	31.48	26.01	27.74	25.24	-
N21	29.04	30.73	27.34	31.05	19	21.35	21.58	23.29	27.39	30.46	25.2	23.33	25.81	23.49	-
N22	56.17	46.65	38.27	42.95	36.87	42.94	42.03	41.36	39	43.72	47.27	46.89	**43.68**	39.75	29.1
N23	57.87	50.63	43.03	56.25	40.93	41.43	38.29	41.52	57.14	50.57	38.93	38.28	**46.24**	**42.08**	No fall off
N25	49.59	49.97	33.24	37.98	29.04	30.28	32.84	33.7	42.23	41.41	33.47	37.92	37.64	34.25	-
N26	-	43.39	43.05	42.6	37.36	34.24	43.88	43.96	43.15	41.82	35.46	22.63	39.23	35.70	-
N27	-	-	-	-	-	27	29.54	32.38	38.8	37.55	31.46	23.71	31.49	22.03a	-
N28	-	-	-	-	-	-	-	10.85	26.68	25.17	26.19	19.97	21.77	13.96a	-
1	40.62	44.81	42.82	49.43	38.59	32.94	-	61.78	44.77	50.63	33.86	27.03	**42.48**	38.66	No relevant exposure
3	15.66	22.15	17.14	15.69	10.06	8.45	8.72	10.71	12.06	18.28	16.79	11.6	13.94	12.64	-
5	19.39	20.43	16.14	14.19	8.23	8.88	10.2	11.06	-	21.71	15.92	12.59	14.43	13.13	-
6	8.54	32.95	27.7	27.53	20.71	18.9	18.53	21.8	26.65	29.38	25.2	22.56	23.37	21.27	-
7	20.61	24.48	18.02	21.37	12	9.8	10.77	15.1	18.52	22.62	14.54	16.89	17.06	15.52	-
10	39.58	40.23	36.66	37.85	30.14	24.18	30.17	37.46	37.46	36.76	35.13	28.91	34.54	31.44	-
14	15.39	40.17	14.01	3.43	7.38	7.09	7.91	9.78	12.36	12.06	12.65	11.42	12.80	11.65	-
17	35.38	43.72	33.62	33.36	26.18	19.15	34.52	35.06	35.36	39.99	28.74	29.36	32.87	29.91	-
18	4.48	40.29	43.84	52.17	41.39	35.44	38.26	38.95	51.67	51.95	33.46	32	**42.16**	38.36	No relevant exposure

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 (0.91)	Distance corrected
21	35.79	35.48	34	29.5	27	27.61	31.12	33.99	30.61	33.43	27.21	33.84	31.63	28.78	-
26	-	36.85	33.26	38.51	31.58	32.47	30.8	29.7	36.35	37.26	29.34	24.9	32.82	29.87	-
27	37.5	45.11	40.84	44.6	30.98	29.09	25.75	27.88	33.29	41.75	33.24	21.47	34.29	31.21	-
28	-	59.16	46.4	45.69	30.27	33.27	47.63	54.15	50.91	-	-	-	**45.94**	30.95a	-
33	50.83	44.14	39.9	44.1	36.39	31.38	42.5	39.54	42.55	41.88	39.87	32.19	**40.46**	36.82	35.9
34	54.67	49.19	49.98	-	-	-	47.15	48.37	58.78	58	48.55	30.12	**49.46**	**44.98**	36.7
35	44.11	40.03	40.35	36.99	32.92	25.79	32.24	33.02	34.43	36.25	31.16	27.58	34.57	31.46	-
36	52.08	48.16	-	33.47	24.95	-	-	26.72	32.94	38.46	23.91	23.54	33.80	30.76	-
37	**71.81**	43.38	49.3	51.72	43.43	35.42	-	48.85	**61.69**	-	-	36.85	**49.16**	**44.74**	38.8
39	46.99	40.05	36.81	34.99	34.46	27.85	35.49	32.87	34.27	37.74	29.17	-	35.52	32.32	-
41	53.69	39.5	41.71	39.11	36.96	37.5	-	-	-	-	-	-	**41.41**	24.83a	-
48	46.59	46.44	40.89	44.78	40.22	34.6	36.34	37.67	46.24	43.42	32.05	29.36	39.63	36.07	30.8
49	37.98	37.07	37.71	41.43	28.92	27.57	30.55	34.86	41.27	39.96	35.3	29.64	35.19	32.02	-
50	49	57.03	46.18	57.58	48.82	39.26	45.8	42.09	56.38	65.85	50.26	43.93	**50.18**	**45.67**	32.8
51	21.42	26.03	21.81	19.66	13.38	10.26	11.94	14.2	16.49	20.57	18.19	15.63	17.47	15.89	-
52	-	43.06	34.33	36.1	38.76	31.97	36.88	33.7	41.62	40.61	34	30.64	36.52	33.23	-

(1) See Appendix C for details on bias adjustment & distance correction.

(2) a = data has been annualised before applying bias adjustment factor to account for a period of less than 9 months data collection in the year.

Table B2 - Results of Nitrogen Dioxide Diffusion Tubes (2011 to 2015)
(figures in bold show concentrations higher than the annual NO_2 air quality objective and those in bold & underscored indicate concentrations which may exceed the hourly NO_2 air quality objective)

Site ID	Within AQMA?	Annual mean concentration (adjusted for bias & distance corrected where appropriate) $\mu g/m^3$				
		2011* (Bias Adjustment Factor = 0.89)	2012* (Bias Adjustment Factor = 0.97)	20123 (Bias Adjustment Factor = 0.95)	2014* (Bias Adjustment Factor = 0.91)	2015 (Bias Adjustment Factor = 0.91)
N1	Y	37.1	35.5	32.4	33.7	33.7
N2	N	27.09	29.78	25.60	27.31	27.01
N3	N	37.50	38.45	37.10	34.98	32.55
N4	N	35.28	38.27	31.5	35.47	33.88
N6	Y	38.13	36.56	35.54	35.38	33.29
N7	N	25.65	26.76	26.93	26.15	33.62
N20	Y	**<u>74.62</u>**	**<u>80.45</u>**	**<u>80.39</u>**	**<u>74.15</u>**	**<u>67.32</u>**
N9	Y	39.7	33.8	31.1	39.46	37.55
N10	Y	26.9	27.10	27.78	24.59	23.44
N12	Y	33.22	35.18	32.6	31.41	30.89
N13	Y	32.91	33.44	33	32.92	31.70
N14	Y	33.36	33.15	32.9	33.30	32.02
N16	Y	33.73	34.40	35.49	31.5	33.7
N17	Y	**41.65**	35.6	36.1	37.8	38.6
N18	Y	33.48	35.61	28.58	29.92	27.76
N19	Y	**43.14**	39.7	24.67	27.43	25.24
N21	Y	24.45	26.57	27.14	26.97	23.49
N22	Y	39.84	**40.69**	**41.03**	**42.25**	36.2
N23	Y	**47.35**	**47.07**	**43.34**	**47.71**	**42.08**
1	Y	**45**	**43.32**	**44.80**	38.75	38.66
3	N	13.70	14.87	15.14	14.50	12.69
5	N	12.78	12.82	13.87	14.65	13.13
6	N	22.86	22.56	24.28	20.42	21.27
7	N	17.84	16.38	18.62	17.72	15.52

Site ID	Within AQMA?	Annual mean concentration (adjusted for bias & distance corrected where appropriate) $\mu g/m^3$				
		2011* (Bias Adjustment Factor = 0.89)	2012* (Bias Adjustment Factor = 0.97)	20123 (Bias Adjustment Factor = 0.95)	2014* (Bias Adjustment Factor = 0.91)	2015 (Bias Adjustment Factor = 0.91)
10	N	31.66	33.38	33.25	33.9	31.44
14	N	10.41	11.17	10.79	11.99	11.65
17	N	31.80	33.20	32.13	32.31	22.91
18	Y	**40.58**	38.91	**43.73**	**55.18**	38.36
21	N	33.22	30.94	27.68	27.11	28.78
26	N	29.94	26.29	28.25	27.47	29.87
27	Y	31.98	32.84	33.5	32.16	31.21
28	N	**45.84**	**53.72**	**49.31**	**48.39**	30.95
33	Y	39.4	39.2	35.01	39.03	36.82
34	Y	32	36.7	36.1	30.4	35.3
35	N	35.24	34.97	32.81	33.22	31.46
36	Y	37.41	35.52	36.4	**41.2**	30.76
37	Y	36.7	38.3	**41.4**	35.2	38.8
39	N	35.76	38.33	31.3	32.91	32.32
41	N	**40.51**	**40.80**	37.32	37.20	24.83
48	N	-	-	32.43	34.45	30.8
49	N	-	-	32.48	36.56	32.02
50	Y	-	-	35.8a	37.2	35.6
51	N	-	-	-	24.89	15.89
52	N	-	-	-	-	33.23

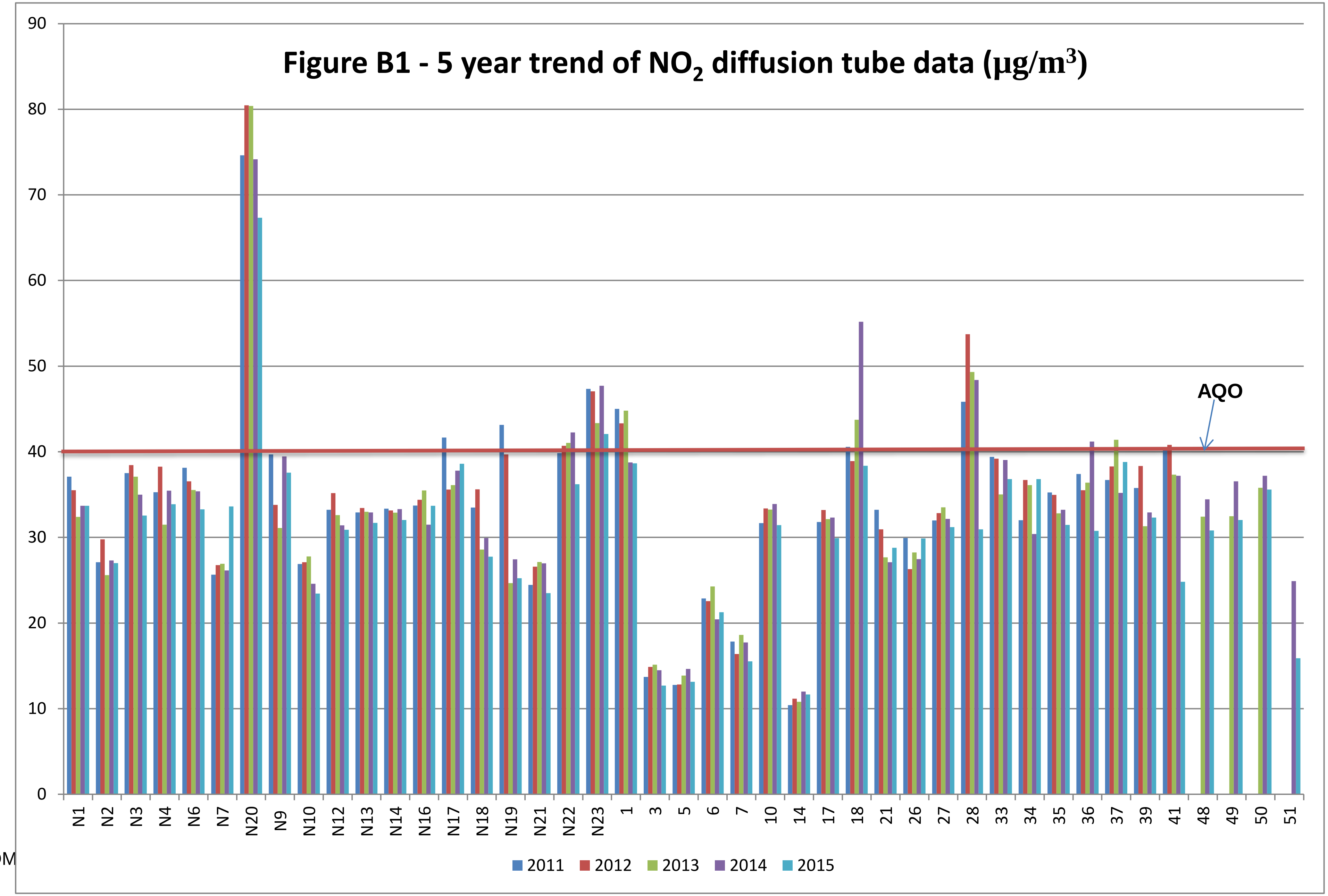


Figure B1 - 5 year trend of NO2 diffusion tube data (µg/m3)
AQO
90
80
70
60
50
40
30
20
10
0
N1
N2
N3
N4
N6
N7
N20
N9
N10
N12
N13
N14
N16
N17
N18
N19
N21
N22
N23
1
3
5
6
7
10
14
17
18
21
26
27
28
33
34
35
36
37
39
41
48
49
50
51
2011
2012
2013
2014
2015

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 26 out of 27 tests carried out during 2015. The remaining test resulted in a poor precision result. 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

Several NO_2 diffusion sites had less than 75% data capture during 201, due to tubes going missing – resulting in the need to "annualise" the data sets.

Two long term automatic monitoring sites from the Hertfordshire and Bedfordshire Monitoring Network were selected to provide data for this calculation. They were Hertsmere Borehamwood background and Watford Town Hall. Calculations can be found below:

Table C1 – NO_2 diffusion tube data annualisation calculation (Ampthill 4 – N27)

2015 ppb data source H&B network														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	data %
Hertsmere Borehamwood background	14	15	13	12	7	7	7	9	10	13	13	11	11	100
Watford Town Hall	24	24	19	18	14	13	13	15	18	20	17	13	17	99
2015 converted to ug/m3 (ppb*1.913)														
Hertsmere Borehamwood background	27	29	25	23	13	13	13	17	19	25	25	21	21	
Watford Town Hall	46	46	36	34	27	25	25	29	34	38	33	25	33	
Period Mean	Jun-Dec													
Hertsmere Borehamwood background	19													
Watford Town Hall	30													
Ann mean : period mean (ratio)														
Hertsmere Borehamwood background	0.731835													
Watford Town Hall	0.80569													
Ave	**0.768762**													
	AM	Ra												
	31.49	0.77												
Ampthill 4 (N27) annualised tube ave AM*Ra			**24.21**											

Table C2 – NO_2 diffusion tube data annualisation calculation (Chalton – 28)

2015 ppb data source H&B network														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	data %
Hertsmere Borehamwood background	14	15	13	12	7	7	7	9	10	13	13	11	11	100
Watford Town Hall	24	24	19	18	14	13	13	15	18	20	17	13	17	99
2015 converted to ug/m3 (ppb*1.913)														
Hertsmere Borehamwood background	27	29	25	23	13	13	13	17	19	25	25	21	21	
Watford Town Hall	46	46	36	34	27	25	25	29	34	38	33	25	33	
Period Mean	Feb-Sep													
Hertsmere Borehamwood background	19													
Watford Town Hall	32													
Ann mean : period mean (ratio)														
Hertsmere Borehamwood background	0.731835													
Watford Town Hall	0.748999													
Ave	**0.740417**													
	AM	Ra												
	45.94	0.74												
Chalton (28) annualised tube ave AM*Ra			**34.01**											

Table C3 – NO_2 diffusion tube data annualisation calculation (Sandy – N28)

2015 ppb data source H&B network														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	data %
Hertsmere Borehamwood background	14	15	13	12	7	7	7	9	10	13	13	11	11	100
Watford Town Hall	24	24	19	18	14	13	13	15	18	20	17	13	17	99
2015 converted to ug/m3 (ppb*1.913)														
Hertsmere Borehamwood background	27	29	25	23	13	13	13	17	19	25	25	21	21	
Watford Town Hall	46	46	36	34	27	25	25	29	34	38	33	25	33	
Period Mean	Aug-Dec													
Hertsmere Borehamwood background	21													
Watford Town Hall	32													
Ann mean : period mean (ratio)														
Hertsmere Borehamwood background	0.653424													
Watford Town Hall	0.755767													
Ave	**0.704596**													
	AM	Ra												
	21.77	0.70												
Sandy (N28) annualised tube ave AM*Ra			**15.34**											

Table C4 – NO_2 diffusion tube data annualisation calculation (Brogborough – N7)

2015 ppb data source H&B network														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	data %
Hertsmere Borehamwood background	14	15	13	12	7	7	7	9	10	13	13	11	11	100
Watford Town Hall	24	24	19	18	14	13	13	15	18	20	17	13	17	99
2015 converted to ug/m3 (ppb*1.913)														
Hertsmere Borehamwood background	27	29	25	23	13	13	13	17	19	25	25	21	21	
Watford Town Hall	46	46	36	34	27	25	25	29	34	38	33	25	33	
Period Mean	Jan-Jul													
Hertsmere Borehamwood background	11													
Watford Town Hall	18													
Ann mean : period mean (ratio)														
Hertsmere Borehamwood background	1.306667													
Watford Town Hall	1.344													
Ave	**1.325333**													
	AM	Ra												
	27.88	1.33												
Brogborough (N7) annualised tube ave AM*Ra			**36.95**											

Table C5 – NO_2 diffusion tube data annualisation calculation (Chalton – 41)

2015 ppb data source H&B network														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave	data %
Hertsmere Borehamwood background	14	15	13	12	7	7	7	9	10	13	13	11	11	100
Watford Town Hall	24	24	19	18	14	13	13	15	18	20	17	13	17	99
2015 converted to ug/m3 (ppb*1.913)														
Hertsmere Borehamwood background	27	29	25	23	13	13	13	17	19	25	25	21	21	
Watford Town Hall	46	46	36	34	27	25	25	29	34	38	33	25	33	
Period Mean	Jan-Jun													
Hertsmere Borehamwood background	22													
Watford Town Hall	36													
Ann mean : period mean (ratio)														
Hertsmere Borehamwood background	0.645737													
Watford Town Hall	0.672093													
Ave	**0.658915**													
	AM	Ra												
	41.41	0.66												
Chalton (41) annualised tube ave AM*Ra			**27.29**											

National Bias Adjustment Factor (NO_2 diffusion tube data)

The national bias adjustment factor for 2015 is 0.91

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 July 2016 (version 3/16). See overleaf.

Table C6 – National bias adjustment factor

Database_Diffusion_Tube_Bias_Factors_v03_16_Final_v2 [Read-Only] [Compatibility Mode] - Microsoft Excel

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/16

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 2016

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

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

Row	Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[5] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) ($\mu g/m^3$)	Automatic Monitor Mean Conc. (Cm) ($\mu g/m^3$)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
1898	Gradko	20% TEA in water	2015	R	Ards and North Down Borough Council	12	38	26	48.6%	G	0.67
1900	Gradko	20% TEA in water	2015	UC	Breckland Council	12	30	29	1.5%	G	0.99
1901	Gradko	20% TEA in water	2015	R	Cheltenham Borough Council	12	35	35	2.7%	G	0.97
1909	Gradko	20% TEA in water	2015	R	Lisburn & Castlereagh City Council	10	36	29	24.8%	G	0.80
1910	Gradko	20% TEA in water	2015	R	Luton Borough Council	12	46	44	6.0%	G	0.94
1914	Gradko	20% TEA in water	2015	R	Monmouthshire County Council	12	41	37	11.0%	G	0.90
1917	Gradko	20% TEA in water	2015	B	Pembrokeshire Council	10	4	3	36.7%	G	0.73
1928	Gradko	20% TEA in water	2015	R	City of Lincoln Council	12	39	33	17.9%	G	0.85
1930	Gradko	20% TEA in water	2015	R	Borough Council of King's Lynn and West No	12	29	22	32.5%	G	0.75
1932	Gradko	20% TEA in water	2015	R	Cheshire West and Chester	10	38	40	-5.2%	G	1.06
1933	Gradko	20% TEA in water	2015	R	Dudley MBC	12	47	50	-5.9%	G	1.06
1934	Gradko	20% TEA in water	2015	R	Dudley MBC	12	40	35	14.0%	G	0.88
1935	Gradko	20% TEA in water	2015	R	Dudley MBC	12	34	31	10.0%	G	0.91
1936	Gradko	20% TEA in water	2015	UB	Dudley MBC	11	23	19	20.9%	G	0.83
1938	Gradko	20% TEA in water	2015	KS	Glasgow City Council	12	60	61	-0.9%	P	1.01
1939	Gradko	20% TEA in water	2015	UB	Glasgow City Council	10	25	25	3.3%	P	0.97
1940	Gradko	20% TEA in water	2015	R	Glasgow City Council	9	30	31	-2.8%	P	1.03
1941	Gradko	20% TEA in water	2015	R	Glasgow City Council	12	43	38	14.0%	P	0.88
1956	Gradko	20% TEA in water	2015	KS	Marylebone Road Intercomparison	12	102	81	26.2%	G	0.79
1977	Gradko	20% TEA in water	2015	UB	Liverpool	12	20	22	-9.0%	G	1.10
1981	Gradko	20% TEA in water	2015	R	Preston City Council	12	29	27	8.9%	G	0.92
1987	Gradko	20% TEA in water	2015	R	Thurrock Borough Council	12	28	45	-37.1%	G	1.59
1988	Gradko	20% TEA in water	2015	R	Gateshead Council	11	33	33	-0.8%	G	1.01
1989	Gradko	20% TEA in water	2015	R	Gateshead Council	10	36	33	11.2%	G	0.90
1990	Gradko	20% TEA in water	2015	R	Gateshead Council	12	28	25	9.2%	G	0.92
1997	Gradko	20% TEA in water	2015	KS	New Forest DC	11	47	36	31.1%	P	0.76
1998	Gradko	20% TEA in water	2015	R	New Forest DC	11	33	25	31.7%	G	0.76
2008	Gradko	20% TEA in water	2015	R	Wokingham Borough Council	11	36	33	-69.0%	G	0.93
2009	Gradko	20% TEA in water	2015	UC	Southampton City Council	12	28	29	-3.5%	G	1.04
2267	Gradko	20% TEA in water	2015		Overall Factor[3] (29 studies)				Use		0.91

For Casella Stanger/Bureau Veritas (NOT Bureau Veritas Labs) use Gradko 50% TEA in Acetone.
For Casella Seal/GMSS/Casella CRE/Bureau Veritas Labs/Eurofins/ use Environmental Scientific

Collocation Data | Revisions

Ready 30 of 2266 records found

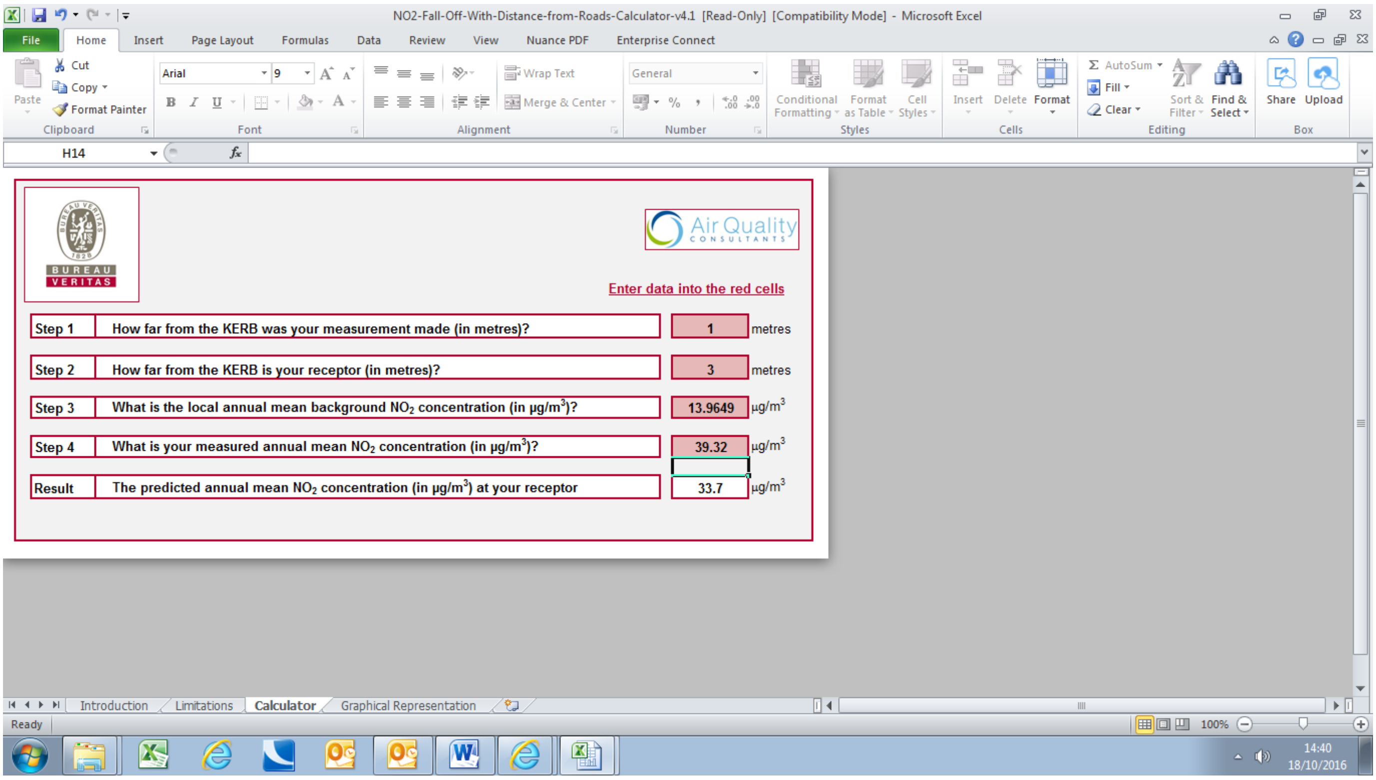
Distance Correction (fall off)

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

Table C7 - Distance correction for site N1



NO2-Fall-Off-With-Distance-from-Roads-Calculator-v4.1 [Read-Only] [Compatibility Mode] - Microsoft Excel

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)?	13.9649	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	39.32	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	33.7	µg/m^3

Table C8 -Distance correction for site N16

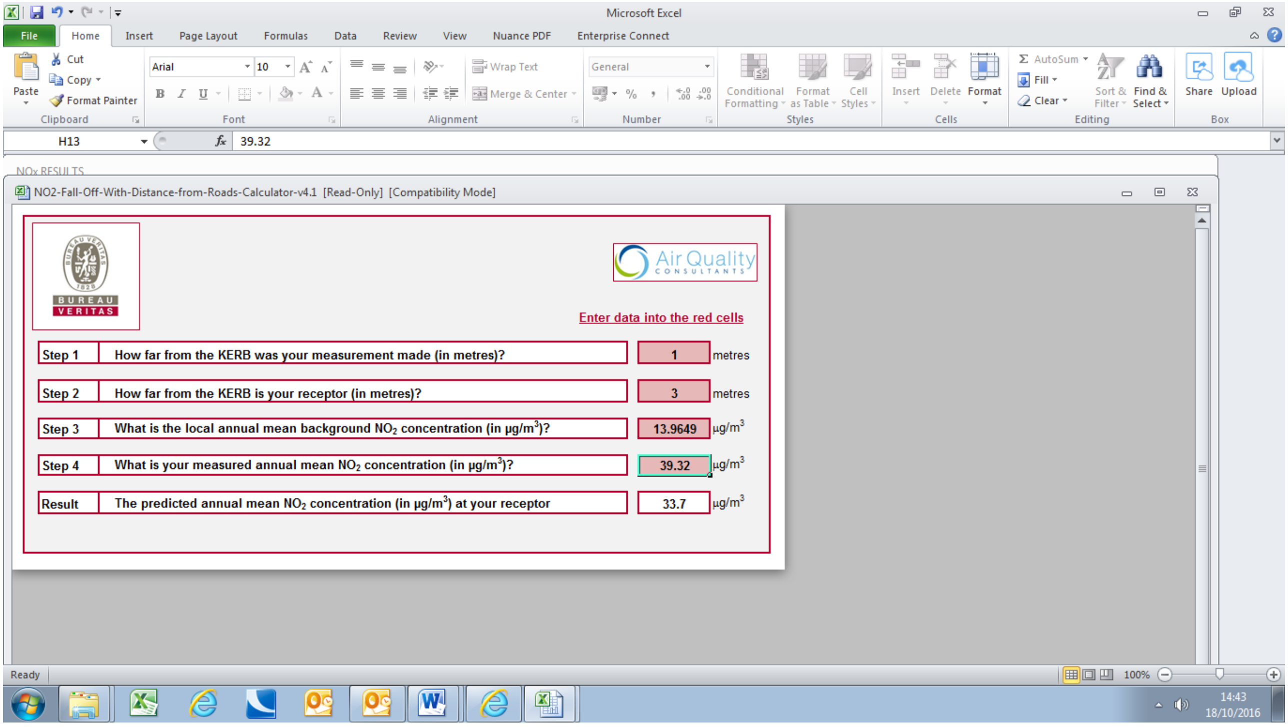


Table C9 - Distance correction for site N17

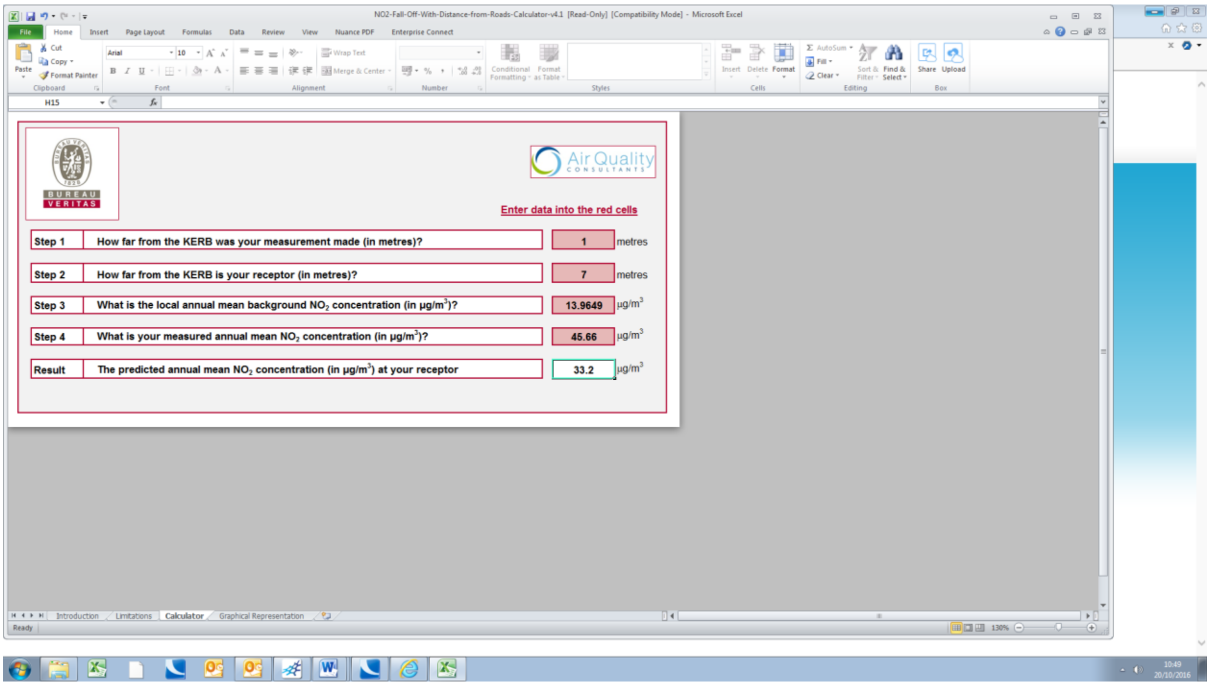


Table C10 - Distance correction for N22

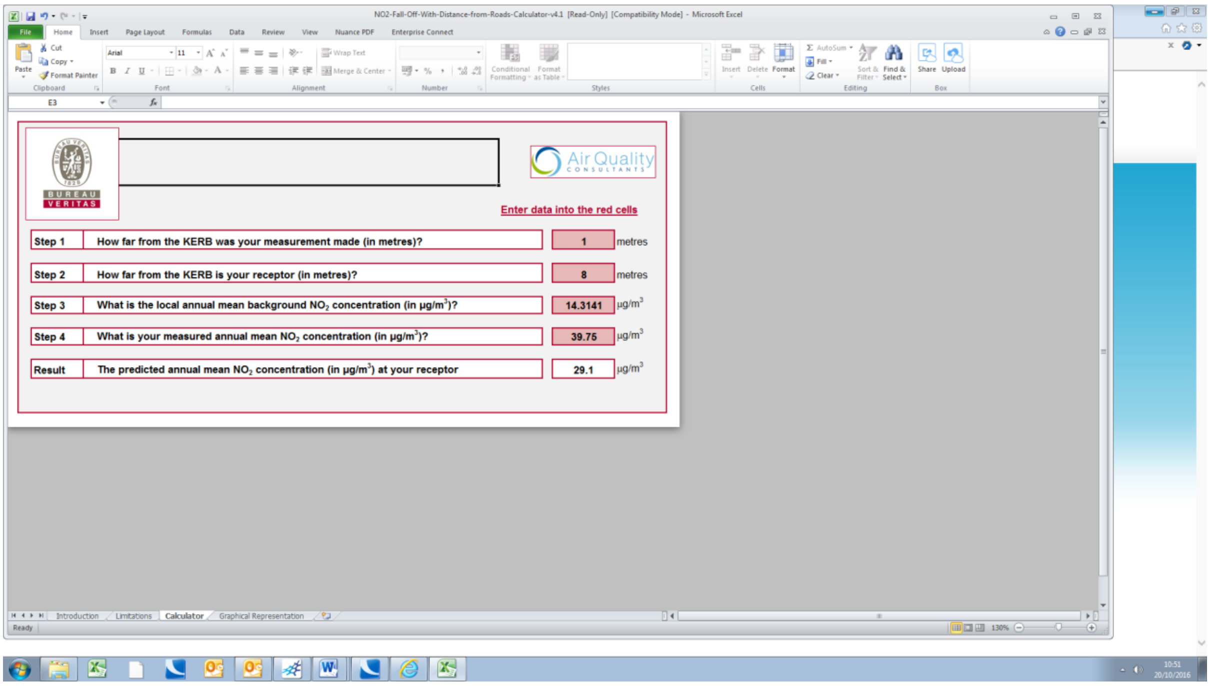


Table C11 - Distance correction for site 33

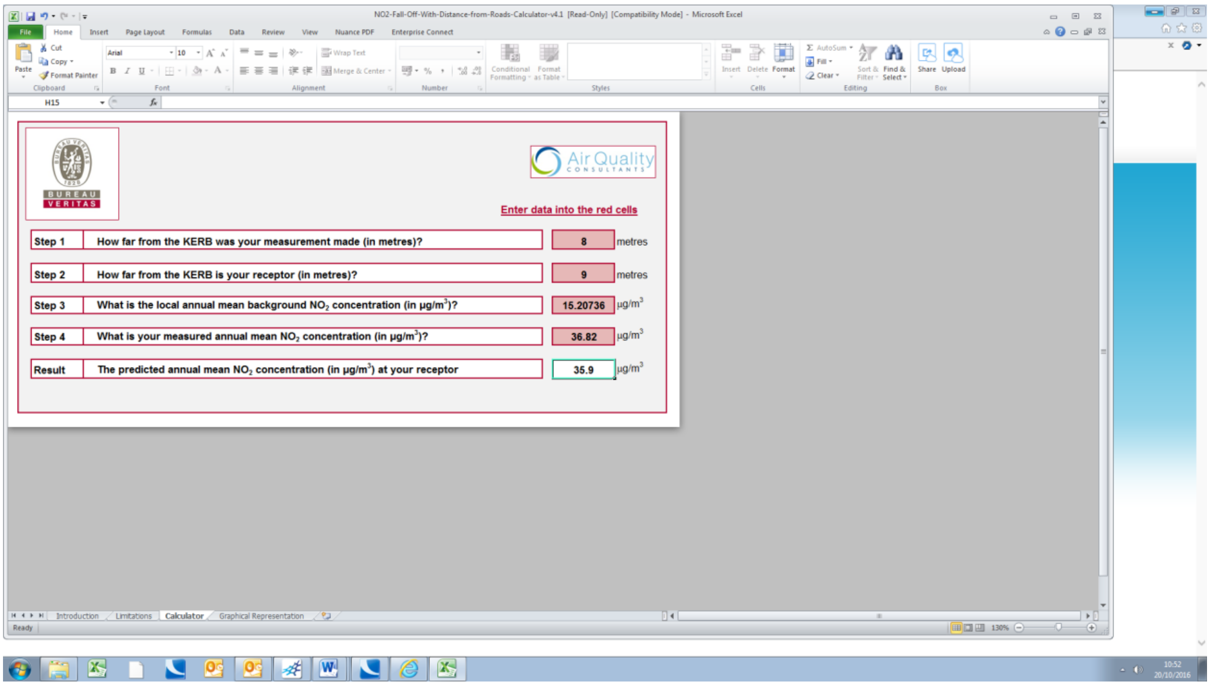


Table C12 - Distance correction for site 34

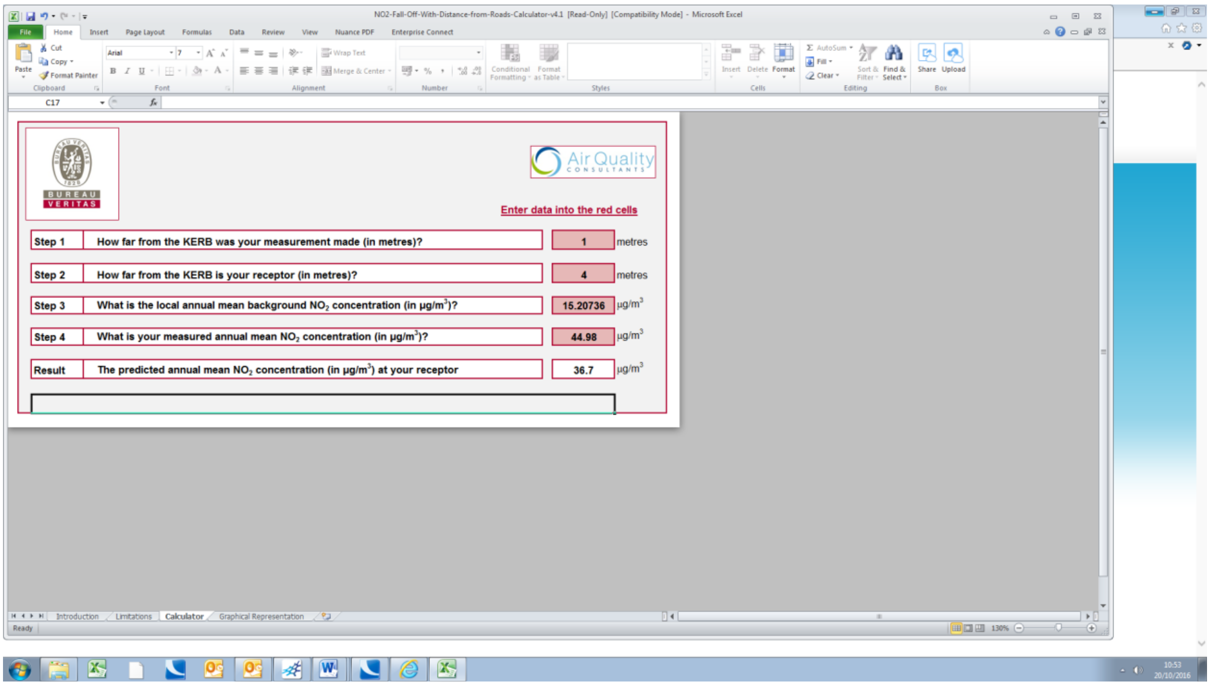


Table C13 - Distance correction for site 37

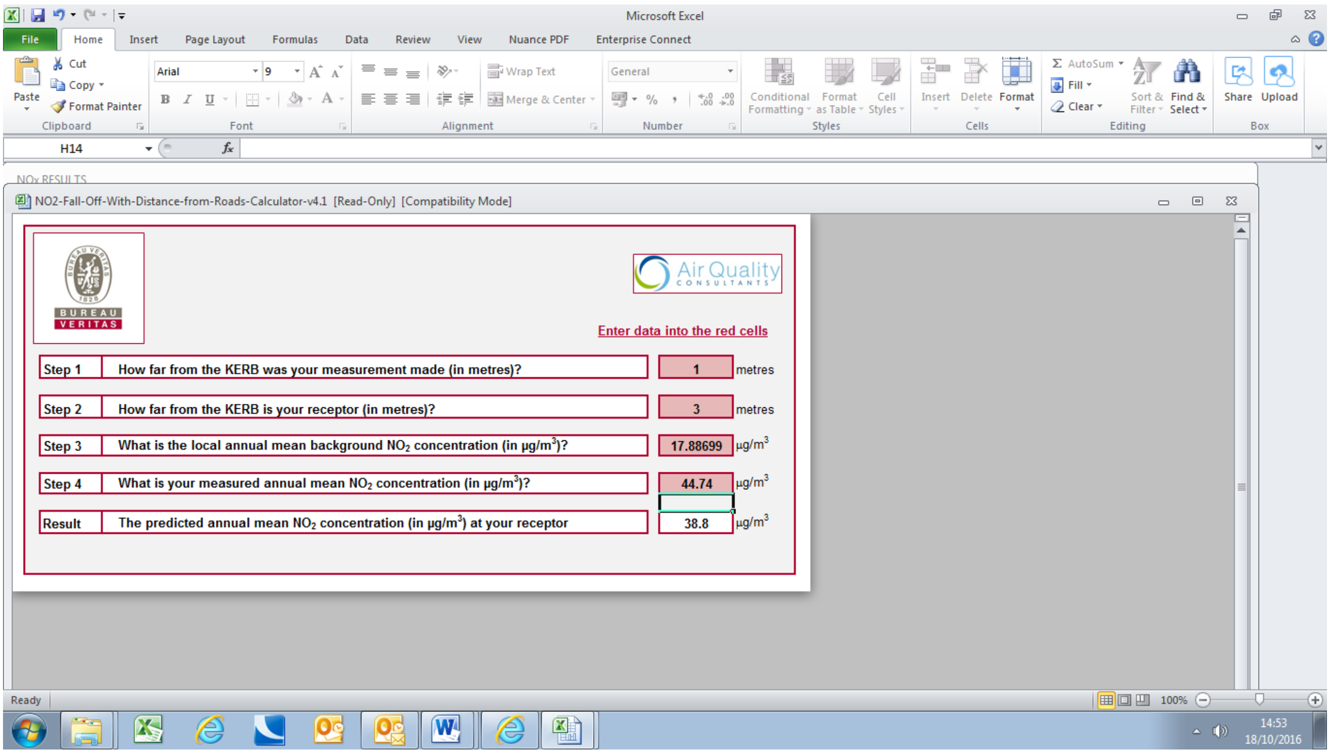


Table C14 - Distance correction for site 50

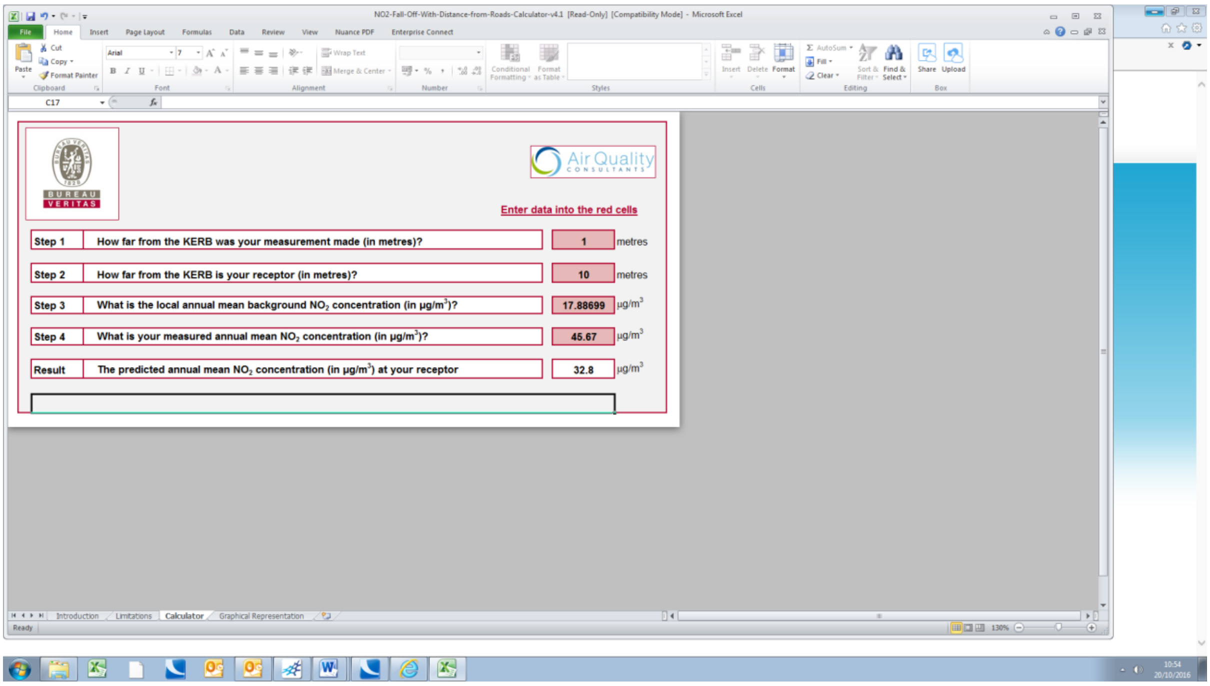
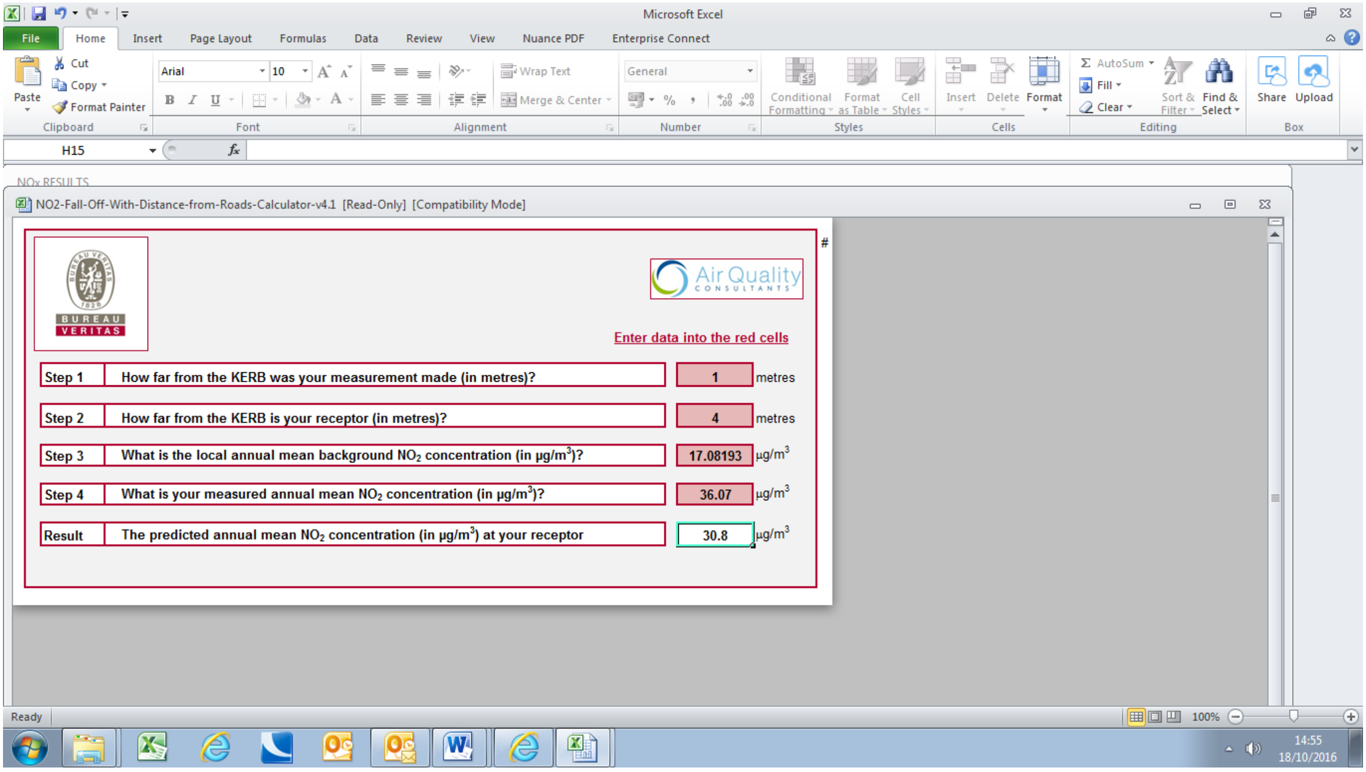


Table C15 - Distance correction for site 48



Realtime (continuous) data adjustment

The Sandy AURN automatic monitoring station data capture of NO_2 was 98% and 94% for $PM_{2.5}$. However the data capture of PM_{10} was only 58% (due to issues with the monitoring equipment) and so the 2015 PM_{10} data set has been annualised as detailed below:

Table C16 – PM10 continuous data annualisation calculation

2015 Ug/m3 PM10 data (grav equivalent)						data capture%															
	Ann ave																				
Hertsmere Borehamwood background	14					97															
Watford Town Hall	18					100															
Period Mean	1/5/15-2/2/15		5/2/15-26/2/15		19/3/15-31/3/15		22/4/15-4/6/15		10/6/15-24/6/15		27/6/15-6/7/15		22/7/15-5/8/15		1/10/15-5/11/15		14/11/15-16/12/15		23/12/15-31/12/15		
Hertsmere Borehamwood background	22		17		29		21		23		25		18		20		16		20		
Watford Town Hall	23		27		26		19		21		21		17		25		20		30		
Ann mean : period mean (ratio)																					
Hertsmere Borehamwood background	0.636364		0.823529		0.482759		0.666667		0.608696		0.56		0.777778		0.7		0.875		0.7		
Watford Town Hall	0.782609		0.666667		0.692308		0.947368		0.857143		0.857143		1.058824		0.72		0.9		0.6		
Ave	**0.709486**		**0.745098**		**0.587533**		**0.709486**		**0.732919**		**0.708571**		**0.918301**		**0.71**		**0.8875**		**0.65**		0.735889
	AM	Ra																			
	14	0.735889																			
Sandy annualised PM10 ave AM*Ra			**10.30**																		

Two long term automatic monitoring sites from Hertfordshire and Bedfordshire Monitoring Network were selected to provide data for this calculation. They were Watford Town Hall and Hertsmere Borehamwood background.

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 We Care 4 Air 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.

Further information about air quality data management, expert data ratification and examples of bad practices are given on the Air Quality Data Management (AQDM) website http://www.aqdm.co.uk

Appendix D: Map(s) of Monitoring Locations

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

Figure D2 - Sallowsprings (14) NO2 diffusion tube site

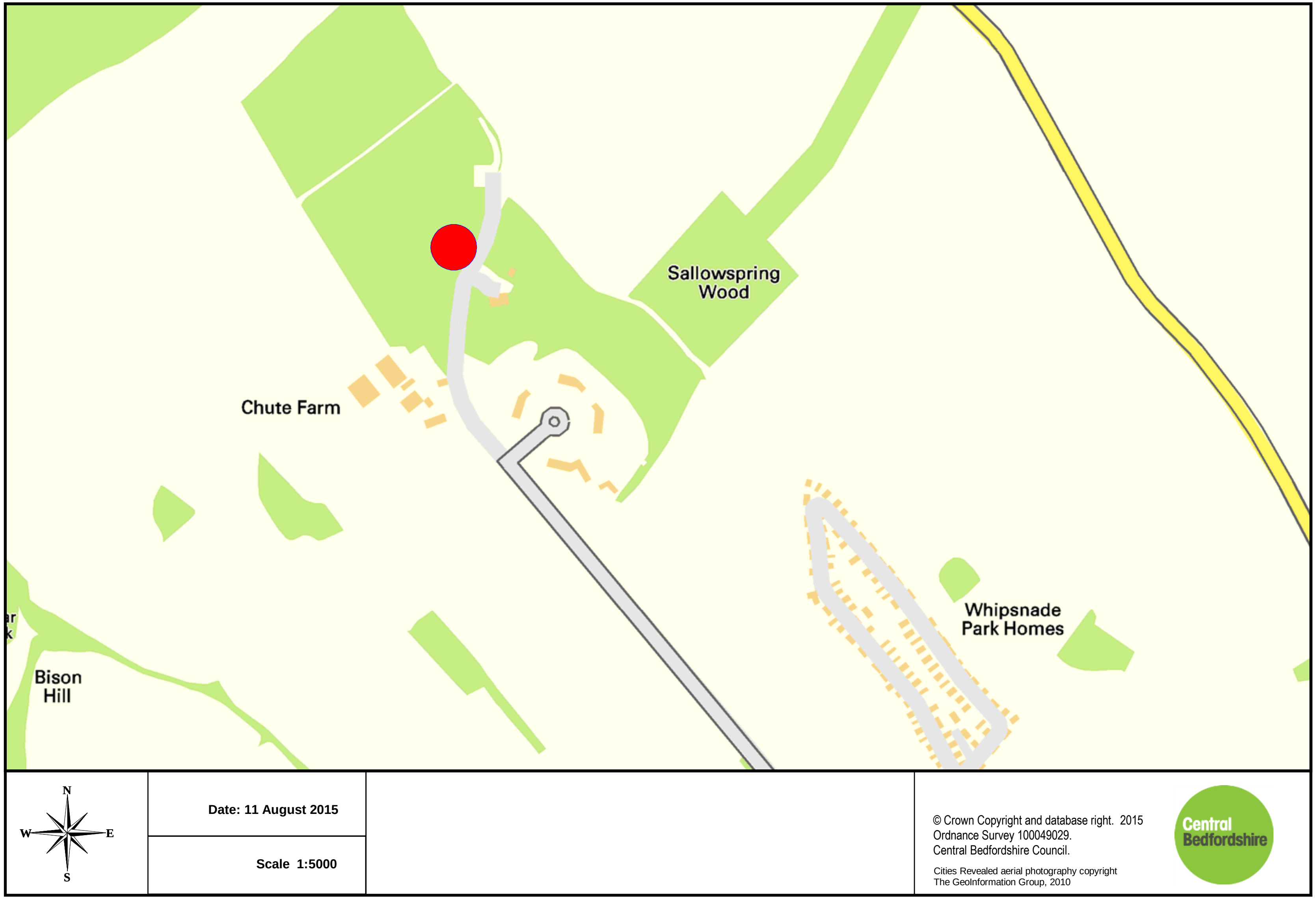


Figure D3 - Ampthill NO2 diffusion tube site

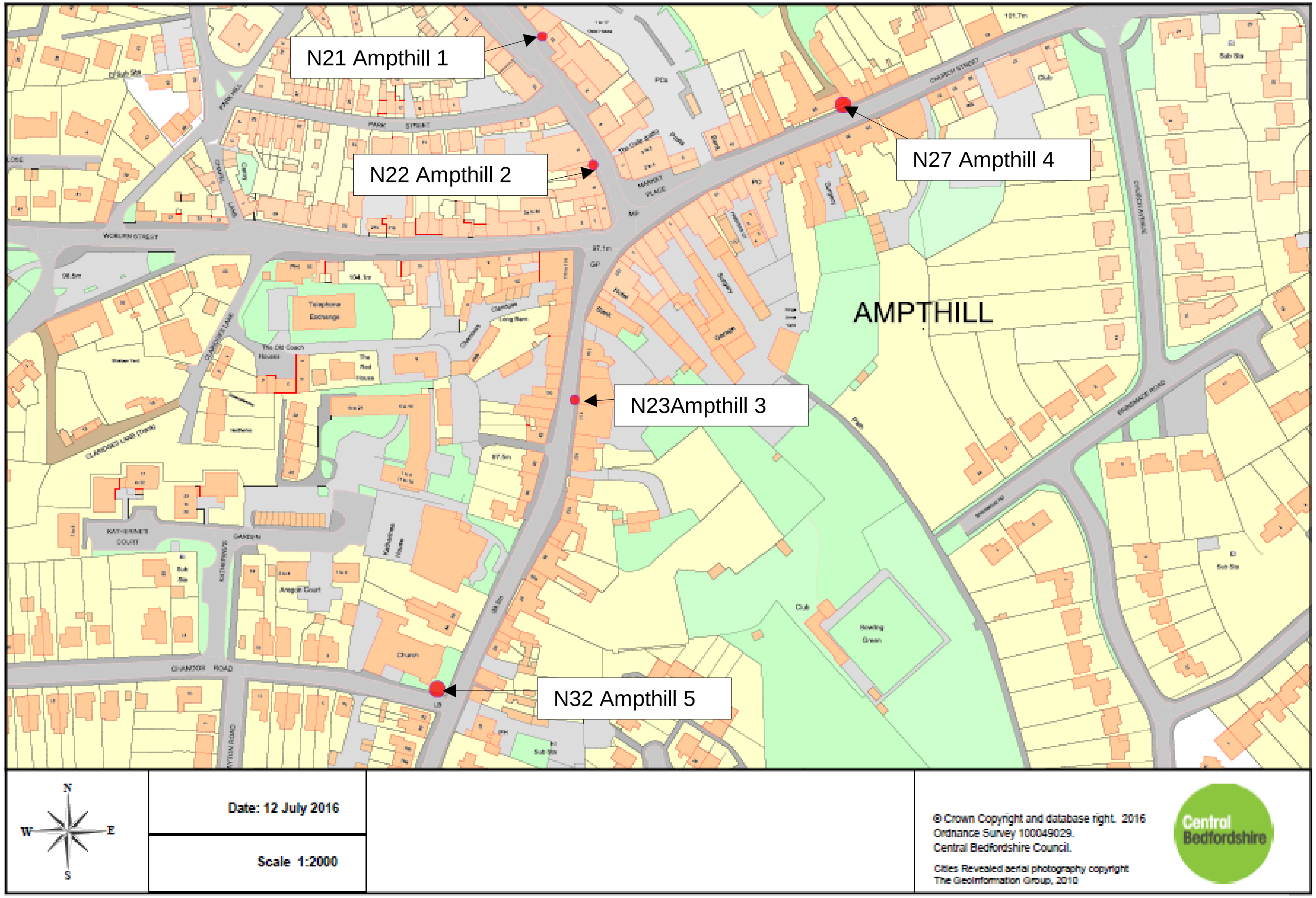
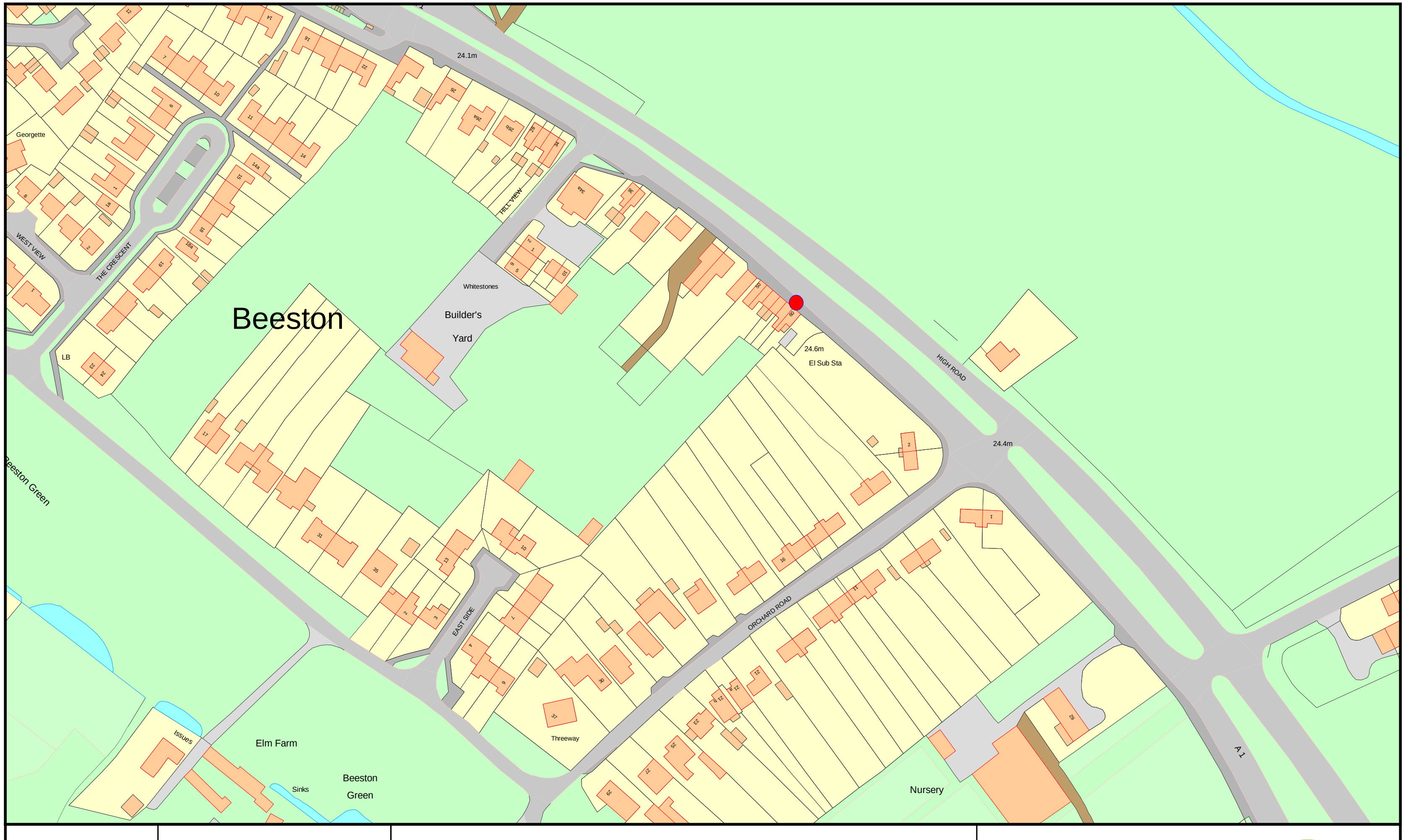


Figure D4 - Beeston (N4) NO2 diffusion tube site



Date: 13 August 2015

Scale 1:2000

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

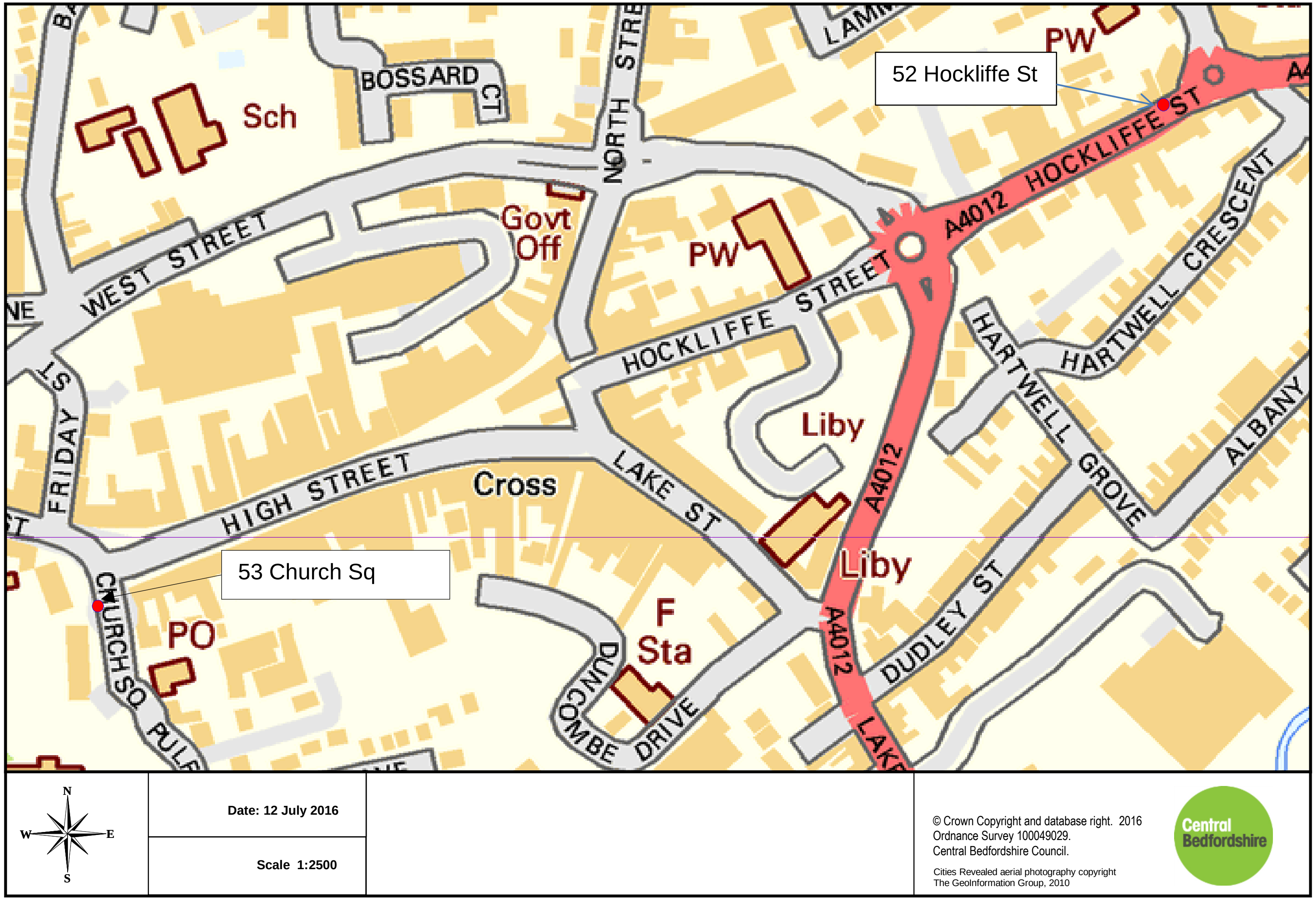


Figure D6 - Biggleswade (N29) NO2 diffusion tube site

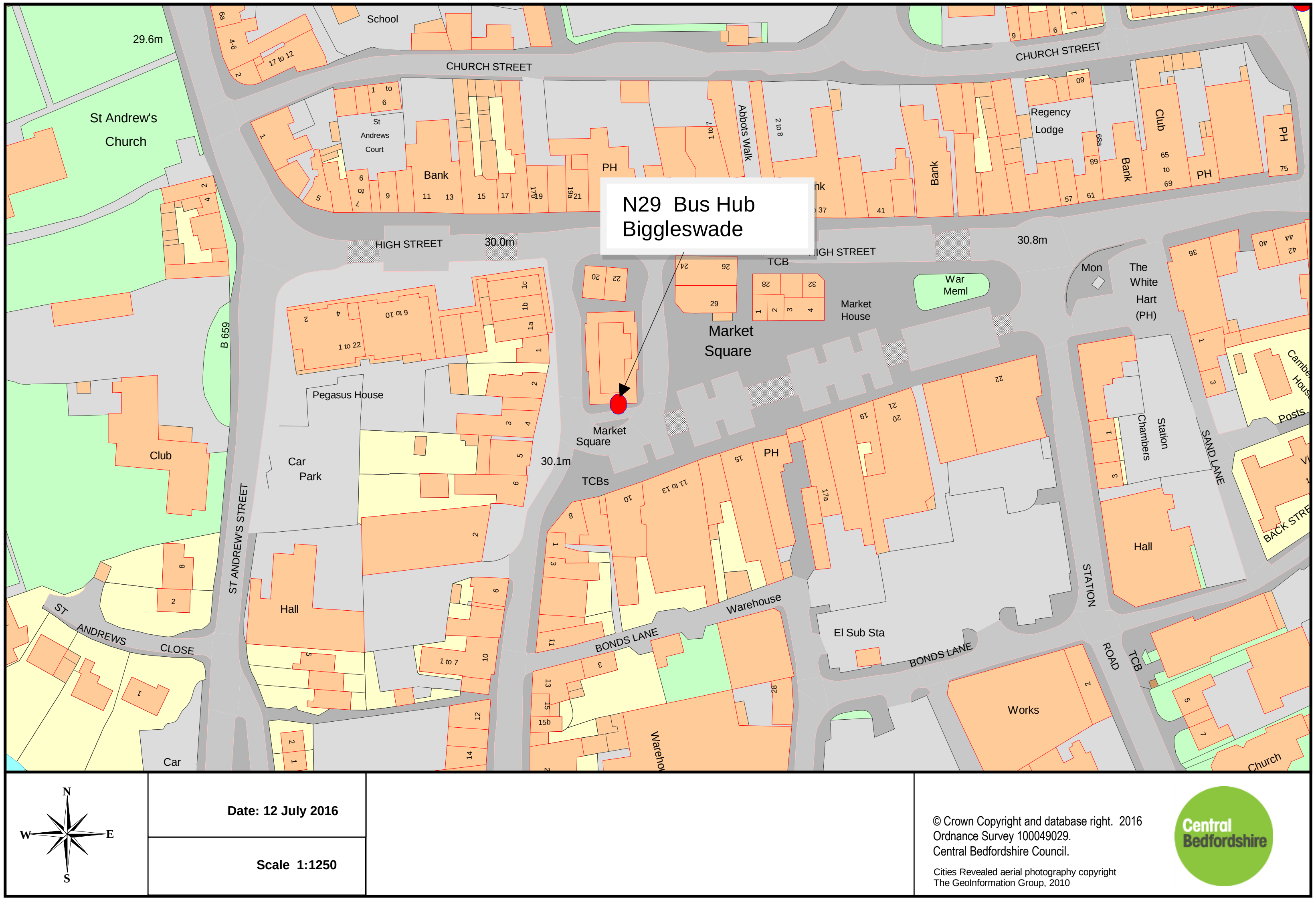


Figure D7 - Sandy NO2 diffusion tube site

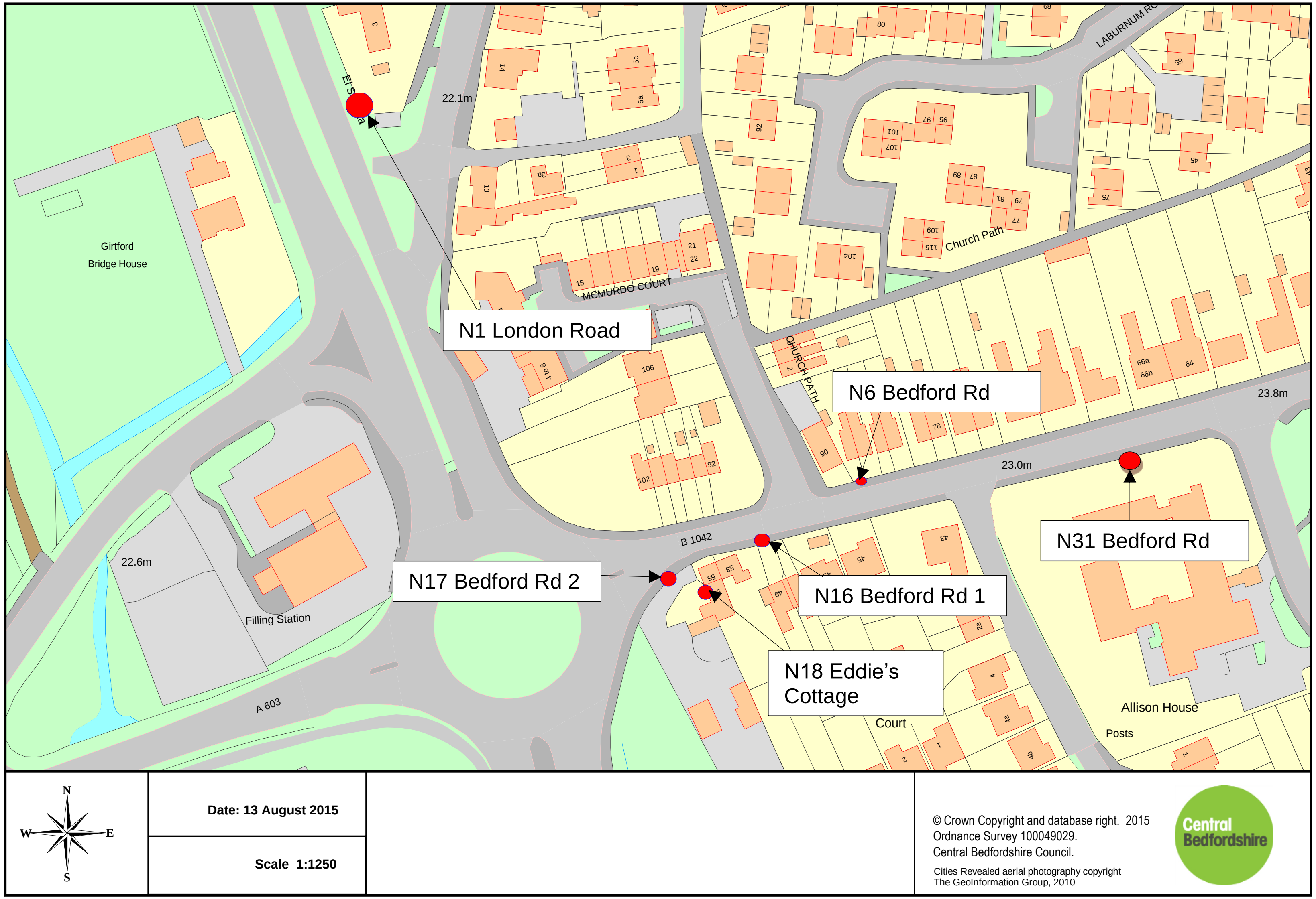


Figure D8 - Woburn (N26) NO2 diffusion tube site

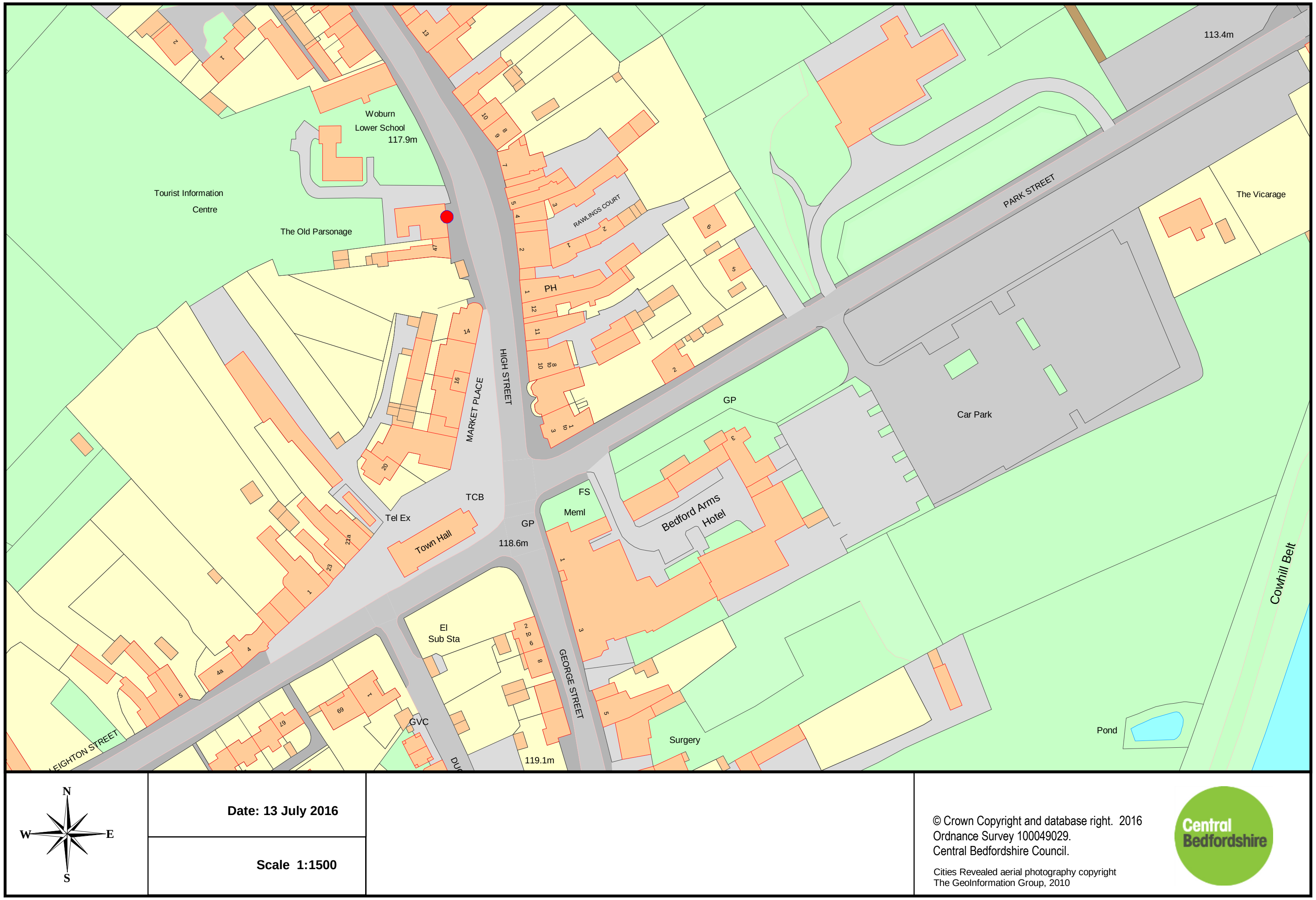


Figure D9 - Dunstable N02 diffusion tube sites

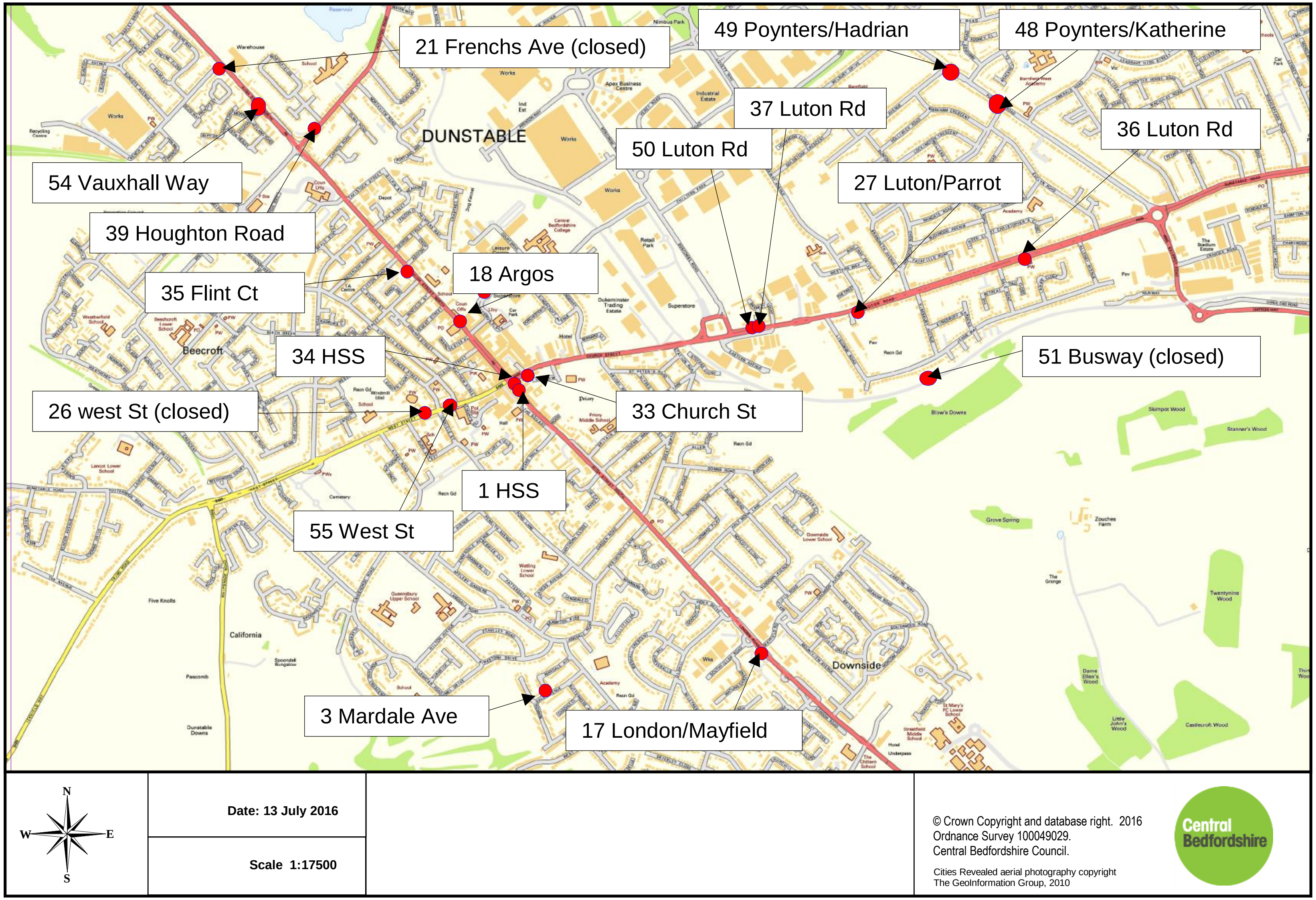
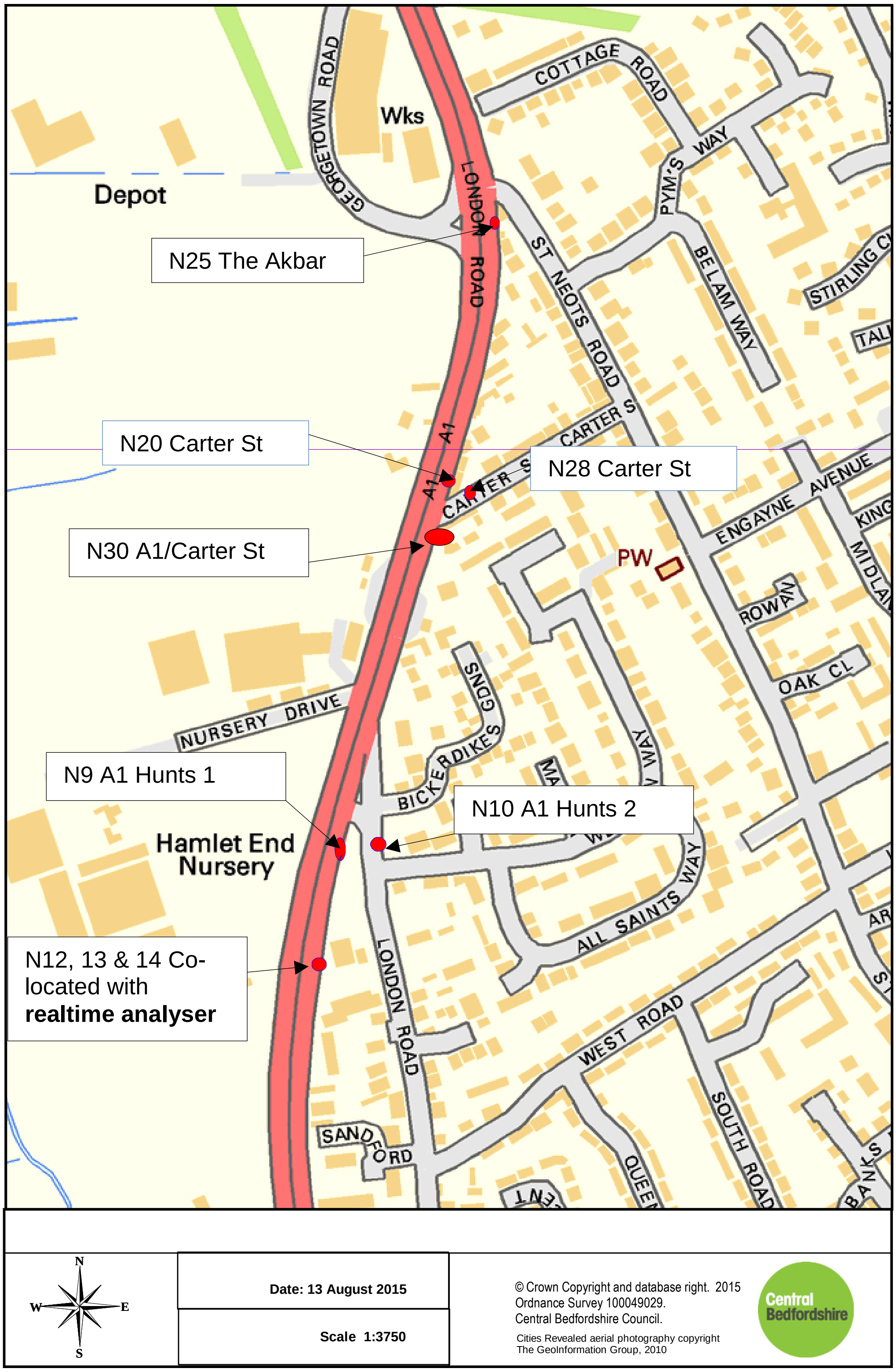


Figure D10 - Sandy NO2 diffusion tube site



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).

Appendix F: Location maps of Air Quality Management Areas

Figure F1 - Dunstable AQMA location

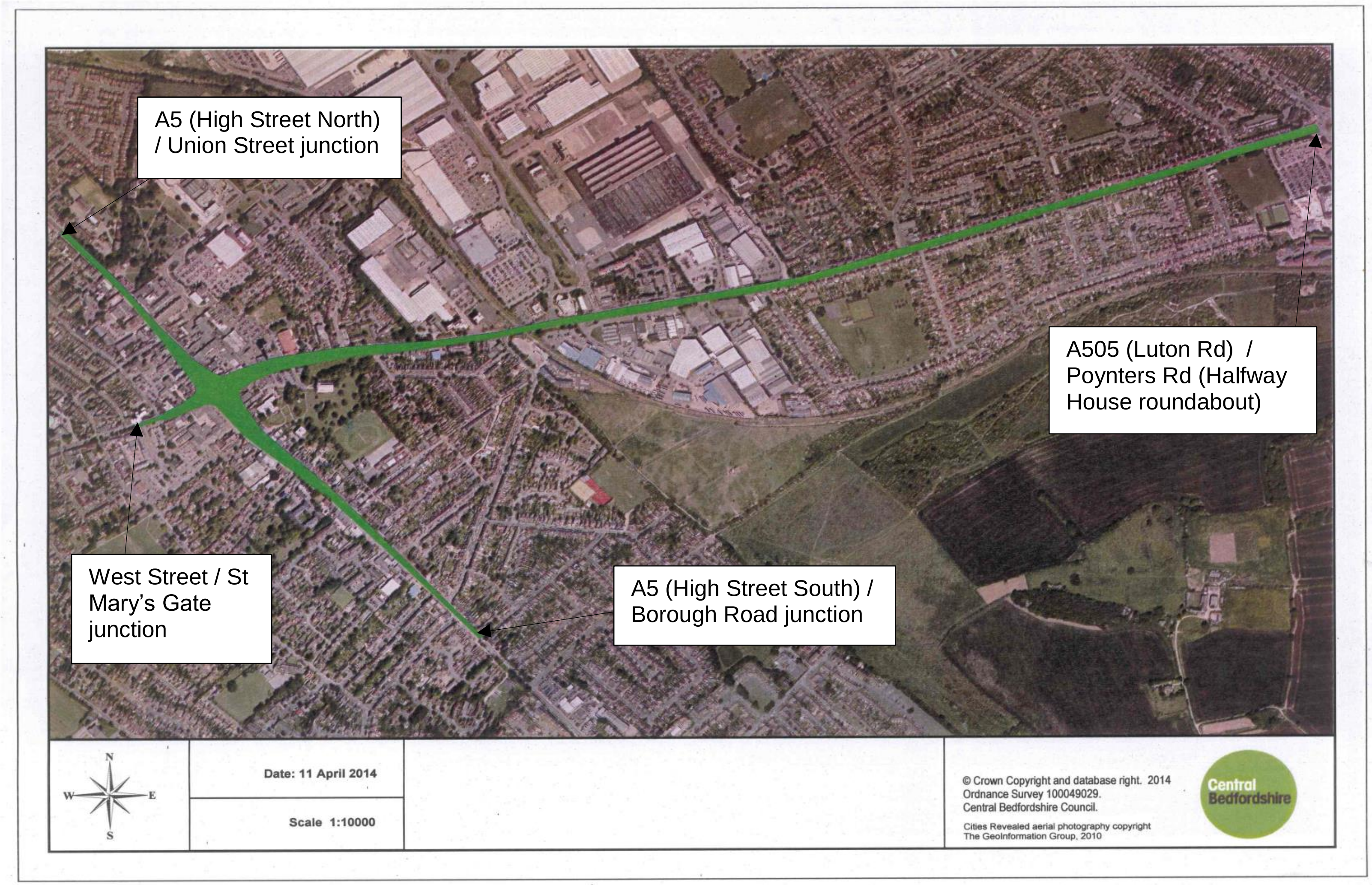
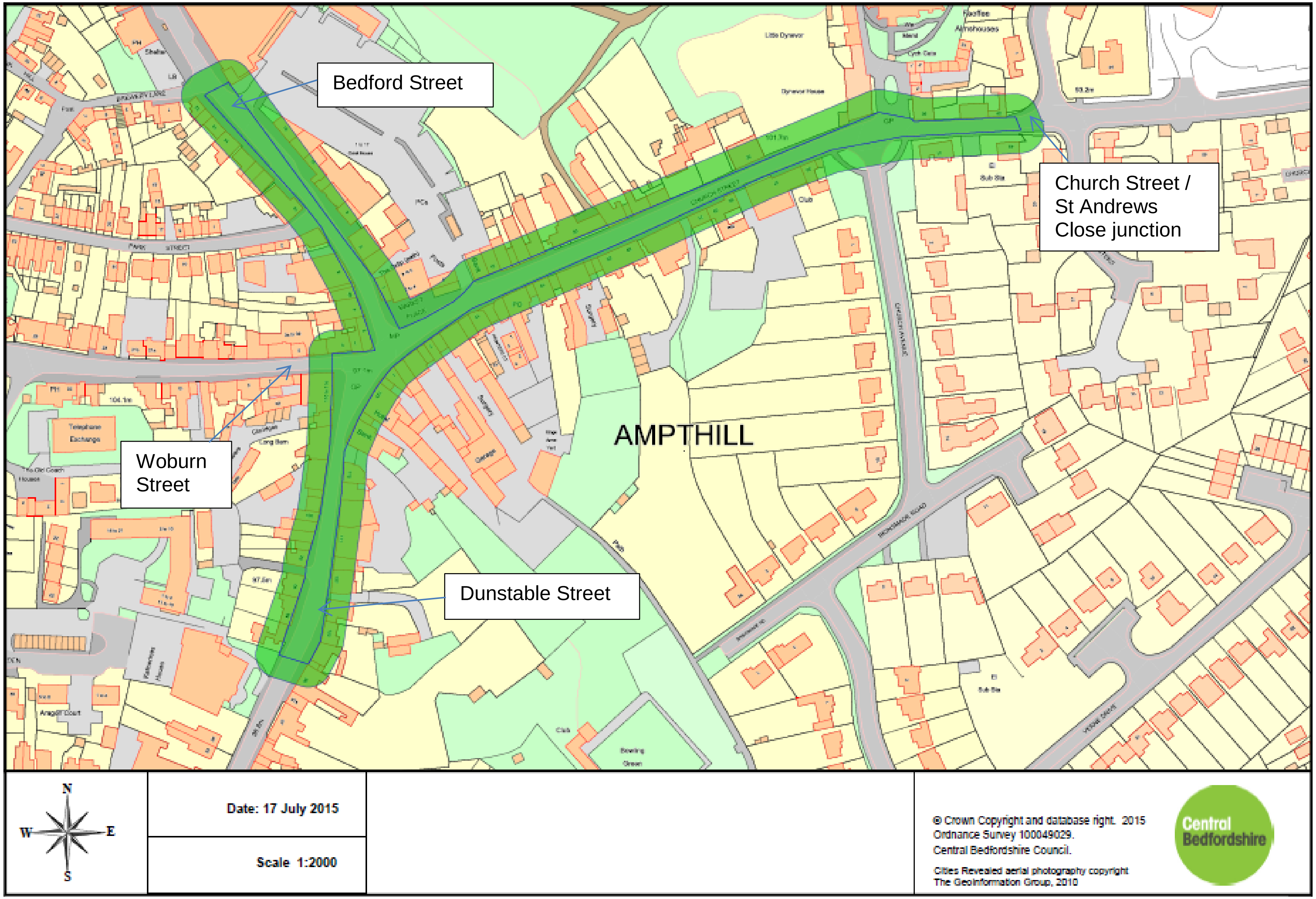
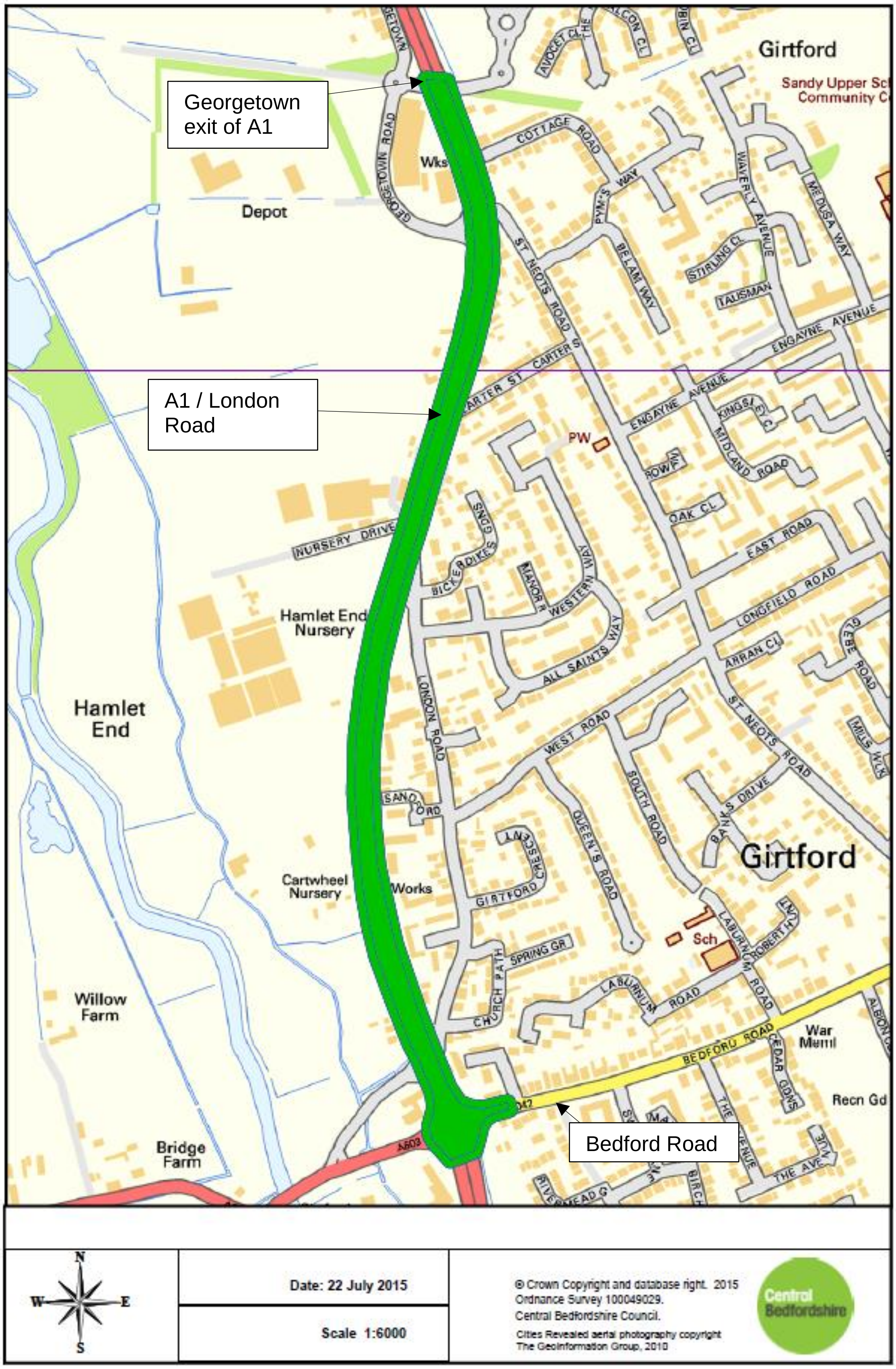


Figure F2 – Ampthill AQMA location



F3 – Sandy AQMA location



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.

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- Central Bedfordshire Council
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  - Central Bedfordshire Council Local Transport Plan 3

- 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 3/15) accessed at http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html
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- Hertfordshire and Bedfordshire Air Quality Monitoring Network accessed at www.HertsBedsAir.net

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