2019 Air Quality Annual Status Report (ASR)

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

June 2019

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Executive Summary: Air Quality in Our Area

Air Quality in Luton Borough Council

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].

Luton Borough Council (LBC) is a unitary authority in Bedfordshire with an estimated population of 214,700 (ONS mid-year figure for 2017) in an area of 4,336 hectares. The borough is dominated by the population centre of Luton town, with the M1 motorway running north/south on its western side, and London Luton Airport at the south east of the borough.

Road traffic is the main source of pollution in the borough with both the town and the motorway providing significant traffic volumes. Other sources include London Luton Airport and local industry, which is distributed in pockets around the borough. As of 2018, 43 industrial processes permitted by Luton Borough Council were operational within the borough.

At present the main pollutant of concern is nitrogen dioxide (NO_2). The council monitors this pollutant as well as particulate matter; however, no exceedance of the objective for particulate matter (PM_{10}) has been either measured or modelled to date.

Recent focus on particulate matter has changed to the smaller $PM_{2.5}$ fraction. Responding to growing concerns about the health effects of this pollutant, Luton Borough Council started measuring $PM_{2.5}$ levels at its town centre automatic monitoring station (situated on Dunstable Road East) at the end of 2014. Over the four years for which monitoring has been ongoing the mean annual $PM_{2.5}$ concentration has

[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

remained essentially constant at ~10µg/m^3; compliant with both the EU limit and WHO guideline values of 25µg/m^3 and 10µg/m^3 respectively.

During 2018, LBC monitored NO_2 levels within the borough using both an automatic analyser located at its Dunstable Road East monitoring site (CRAQM 2) and a total of 44 diffusion tubes positioned at 42 different locations across the town. Changed and analysed on a monthly basis, the data from these tubes provides a measure of how NO_2 levels vary over time and is used to calculate an annual mean concentration at each monitoring location. Once corrected for measurement bias and adjusted to take into account the location of the tubes relative to any likely human exposure, these annual values should not exceed the national air quality objective level of 40µg/m^3. In the event that this level is, or is likely, to be exceeded on a consistent basis Local Authorities are under a duty to declare an Air Quality Management Area (AQMA) encompassing the relevant locations. Both nationally and locally the main source of high levels of nitrogen dioxide is road transport.

To date, LBC has identified two main areas where NO_2 concentrations either are, or are likely to, exceed the annual mean objective level:

- along the length of the M1 Motorway; and
- along the A505 (Dunstable Road) in part of Bury Park and the Town Centre.

Both areas have been declared as Air Quality Management Areas (AQMA). For further information please see the Council's website (https://tinyurl.com/y9zegeyj) or its page on the UK Air web portal (https://tinyurl.com/yd8t7ma2).

As a result of the most recent Air Quality Management Area Declaration (Luton Air Quality Management Area No. 3), Luton Borough Council has developed a new Air Quality Action Plan (AQAP) to address the concentrations found. Having been approved by the Council Executive on 4th June 2018, the AQAP was submitted to Defra for appraisal on 8th April 2019.

During 2018, across all LBC NO_2 passive monitoring sites that have been in the same place for more than one year, three recorded a higher annual mean concentration than in 2017 when rounded to the nearest integer:

- *LN72 – Hucklesby Way* (+0.6µg/m^3, +2.1%)
- *LN79 – Castle Street 2* (+4.4µg/m^3, +13.4%)
- *LN80 – Windsor Street* (+2.4µg/m3, +7.0%)

Of the remaining sites, levels decreased at 33 locations and remained unchanged at a further seven. Across the borough the average decrease at LBC diffusion tube sites was -2.3µg/m^3, with the single biggest decrease (-7.1µg/m^3, -21.0%) occurring at *LN54 – M1 Corner Bagshawe Court F.F.*

Out of the Council's 42 unique monitoring locations, following bias correction three were found to have NO_2 concentrations in excess of the annual mean objective level (*LN28 – Caddington Road*; *LN62/LN63 – CRAQM 2*; and *LN67 – Castle Street*). However, with two of the three locations not being representative of relevant exposure, after distance correction the final number of exceedances decreases to a single site, *LN67 – Castle Street* with an annual mean NO_2 concentration of 41.1µg/m^3.

In addition to the monitoring undertaken by LBC, London Luton Airport (LLA) also operates its own air quality monitoring programme. During 2018, this consisted of a PM_{10} automatic analyser located on the airport site and diffusion tubes at 18 unique sites both in the vicinity of the airport and along the flightpath leading to and from it. Across the 11 LLA diffusion tube sites in operation for more than one year, when rounded to the nearest integer annual mean NO_2 concentrations remained unchanged at seven of them. Out of the remaining sites, the level decreased at one (*LLA 4 – Runway Threshold Eastern;* -0.2µg/m^3, -1.0%), whilst the other three all experienced increases:

- *LLA 3 – Runway Threshold Western* (+2.1µg/m^3, +9.1%)
- *LLA 10 – Grove Farm Slip End* (+1.3µg/m^3, +11.6%)
- *LLA 13 – Eaton Green Road* (+0.4µg/m^3, +1.7%)

Out of the 18 sites, six had annual mean NO_2 concentrations in excess of 40µg/m^3, with the highest being *LLA1 – Outside Zone 2* at 45.8g/m^3. However, it should be noted that none of these exceedances constitute a breach of the air quality objective, as none of the sites are representative of relevant exposure (*i.e.* none of the measurements were made in close proximity to residential accommodation).

Finally, Defra also undertakes NO_2 monitoring in Luton, with an automatic analyser (*CM2*) located on the A505 Dunstable Road as part of its *Automatic Urban and Rural Network* (AURN). Located at roadside, like the LLA diffusion tube sites the Defra monitor's location is not representative of relevant exposure. During 2018, the annual mean NO_2 concentration at the site was 43µg/m^3, 1µg/m^3 lower than in the previous year.

Looking at the data obtained at all sites representative of relevant exposure, overall 2018 saw the continuation of a trend of modest reductions in annual mean NO_2 levels.

Luton is currently seeing an increased number of planning applications, including a number of substantial developments which have potential to impact upon air quality. Policies to control development and the associated travel implications are contained within the Luton Local Plan 2011-2031 and the third Local Transport Plan (LTP3).

Planning applications are referred to Environmental Health to determine if there is likely to be an impact on air pollution concentrations, or if the development is likely to result in people being exposed to poor air quality. Further assessment may be required by developers in order to determine appropriate mitigation for the development considering its location and its impact on the local environment. For smaller developments, mitigation may be agreed without providing further assessment of the air quality impacts.

As a member of the *Herts & Beds Air Quality Network*, Luton Borough Council works with colleagues in neighbouring authorities to ensure a consistent approach and raise the awareness of air quality in Luton and the surrounding area.

Where Air Quality Management Areas have been declared, appropriate actions are identified working in conjunction with partners both within the Council (Public Health, Highways, Sustainability, Licensing, Development Control) and externally (Environment Agency, Highways England, local transport providers). Regular contact

with these partners will ensure that steps identified are progressed with the aim of reducing concentrations of air pollutants.

Actions to Improve Air Quality

In addition to submitting the finalised town centre AQAP to Defra for appraisal, other significant air quality measures delivered by Luton Borough Council during the last year have included:

- The launch of the *Herts & Beds Air Pollution Alert System*, a free service to subscribers in Hertfordshire and Bedfordshire that sends registered users an alert message if air pollution in their area is forecast or measured to be moderate, high or very high (https://tinyurl.com/y3pb95j9);
- The installation of 15 variable message signs at locations across the borough displaying live updates on upcoming motorway delays, safety notices and parking availability to optimise car park use and reduce emissions through increased driver efficiency (https://tinyurl.com/y4bo4e8o);
- The commencement of a one month trial of timed traffic restrictions outside of the Hillborough Junior School, facilitated in partnership with Sustrains as part of their School Streets test programme that aims to ease the congestion, air quality and road safety concerns many schools experience during drop-off and pick-up times (https://tinyurl.com/yxfdjcff); and
- The construction by London Luton Airport Ltd. (the Luton Council Company that owns the airport) of a new air quality monitoring station in Wigmore Park to measure an aviation industry leading array of potential pollutants in the vicinity of the airport (https://tinyurl.com/y4w3vq9g).

Further information on other measures still being actively pursued can be found in Table 2.2 below.

Conclusions and Priorities

Relative to the previous year's results, 2018 saw improved annual mean NO_2 levels at most Luton Borough Council monitoring locations. Accordingly, the number of exceedances of the annual objective level also decreased from six to three, and ultimately to one when distance corrections were applied. Going forward, addressing the one remaining exceedance at *LN67 – Castle Street* must be a priority, as annual mean NO_2 levels have exceeded 40µg/m^3 at this location for the last four years. In addition to this, the Council's other key priority is to continue to work to ensure the timely implementation of the measures identified in the town centre AQAP.

Local Engagement and How to get Involved

The potential for the residents and businesses of Luton to have a positive impact on air quality is considerable. Poor air quality in the town has been shown to be as a result of busy and congested roads.

By choosing sustainable methods of travel, there will be less pollution in the local atmosphere. Recommended travel methods are:

- Walking
- Cycling
- Public Transport
- Use of Electric Vehicles

Where these are not feasible, the use of a newer vehicle that meets a higher emissions specification will produce less pollution than an older engine.

More information on journey planning, sustainable modes of travel and the local transport network can be found on the following websites:

- *Travel Luton* - https://tinyurl.com/yb3mmhxg
  Has sections on: Walking, Cycling, Bus, Train, Car, Busway, and the Airport.
- *Busway* - https://tinyurl.com/ybozek4g
  Information regarding Busway routes and times.
- Luton Borough Council *Transport and streets* - https://tinyurl.com/yd8du68t
  General and information regarding the transport network and advice on sustainable travel.

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1 Local Air Quality Management

This report provides an overview of air quality in Luton Borough Council during 2018. 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 Luton Borough 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 Luton Borough 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=150 – see full list at https://uk-air.defra.gov.uk/aqma/list. Alternatively, see Appendix D: Maps of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMAs.

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	
Luton AQMA No.1	Declared 03/11/2003	NO_2 Annual Mean	Luton	24 Residential properties on either side of the M1 Motorway, near Junction 11	YES	47.6µg/m^3	37.3µg/m^3	Within Local Transport Plan 3 2011-2026 (March 2011) [https://tinyurl.com/y9r4vhkf]
Luton AQMA No.2	Declared 31/03/2005	NO_2 Annual Mean	Luton	431 Residential properties on either side of the M1 Motorway, near Junction 11	YES	58.9µg/m^3	37.3µg/m^3	Within Local Transport Plan 3 2011-2026 (March 2011) [https://tinyurl.com/y9r4vhkf]
Luton AQMA No.3	Declared 01/05/2016	NO_2 Annual Mean	Luton	From Dunstable Road by Kenilworth Road through to Stuart Street and Chapel Viaduct by Latimer Road, including Castle Street to Holly Street and Telford Way	NO	54.6µg/m^3	41.8µg/m^3	AQAP approved by Council Executive on 4th June 2018 Submitted to Defra for appraisal 8th April 2019

☒ **Luton Borough Council confirm the information on UK-Air regarding their AQMAs is up to date**

2.2 Progress and Impact of Measures to address Air Quality in Luton Borough Council

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

Further information on these measures can be found in the Luton Local Transport Plan 3 (2011 - 2016; https://tinyurl.com/y9r4vhkf) as well as the soon to be published AQAP.

Over the past year, key completed measures have included:

- the launch of the *Herts & Beds Air Pollution Alert System*, a free service to subscribers in Hertfordshire and Bedfordshire that sends registered users an alert message if air pollution in their area is forecast or measured to be moderate, high or very high (https://tinyurl.com/y3pb95j9);
- the installation of 15 variable message signs at locations across the borough displaying live updates on upcoming motorway delays, safety notices and parking availability to optimise car park use and reduce emissions through increased driver efficiency (https://tinyurl.com/y4bo4e8o); and
- the construction by London Luton Airport Ltd. (the Luton Council Company that owns the airport) of a new air quality monitoring station in Wigmore Park to measure an aviation industry leading array of potential pollutants in the vicinity of the airport (https://tinyurl.com/y4w3vq9g).

Luton Borough Council expects the following measures to be completed over the course of the next reporting year:

- the evaluation of the School Streets Project pilot road closure outside of Hillborough Junior School; and
- the assessment of the benefit of the current town centre green infrastructure.

Luton Borough Council's priorities for the coming year are:

- to further investigate and address the persistent annual mean NO_2 exceedance at LN67 – Castle Street; and
- to continue to work to ensure the timely implementation of the measures identified in the town centre AQAP.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Luton Borough Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of all current AQMAs.

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	Implement a Luton Park & Ride by securing delivery at identified locations	Alternatives to private vehicle use	Bus based Park & Ride	LBC Transport	Initial scoping complete		Monitor use of Park & Ride once up and running	A Park & Ride would result in fewer cars driving into Luton Town Centre	Locations for Park & Ride sites have been identified. Next step is to secure delivery at these locations	By 2023	The emerging Luton Local Plan 2011 - 2031 provides policy support for Park & Ride schemes at M1 junction 10A and Butterfield Park Sources of funding to be identified
2	Reallocation of lanes, where possible to reduce start-stop traffic and congestion	Traffic Management	Other	LBC Transport	Complete	Summer 2017 https://tinyurl.com/yc27s9p8	Improved traffic flow Reduction in queuing traffic	Reducing start-stop traffic reduces acceleration and braking, resulting in reduced emissions	Dunstable Road scheme completed September 2017	September 2017	Initial report evaluating the impact of the improvements presented to the Overview and Scrutiny Board, 25 June 2019 https://tinyurl.com/yyn7eban
3	Improvement of Chapel viaduct / Castle Street roundabout	Traffic Management		LBC Transport	Ongoing	2019	Improved traffic flow	Less idling would result in reduced emissions	Various options currently being considered https://tinyurl.com/y52t2hr7	2020	

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
4	Review 20mph zones in and around AQMA #3 to encourage traffic calming and lower speeds	Traffic Management	Reduction of speed limits, 20mph zones	LBC Transport LBC Road Safety	2018		Increase number of vehicles adhering to 20mph within the zones	Vehicles travelling under 30mph generally emit less particulates and so improve air quality	20mph zones in place (Completed 2016 – 17)	2023	
5	Bedfordshire Sustainable Travel Access to Railway Stations (STARS)	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	LBC Transport in partnership with Central Bedfordshire Council and Bedford BC (£2.1 million funding secured from the DfT Access Fund for Sustainable Travel 2017 - 2020)	Ongoing	Ongoing	Increase in use of sustainable travel into Luton Town Centre	Increased use of sustainable travel will reduce car use and emissions	Ongoing	2020	https://tinyurl.com/y7jngxce
6	Connections to Luton - Dunstable cycle route to be improved and promoted	Transport Planning and Infrastructure	Cycle network	LBC Transport LBC Road Safety	2017	2017 - 2020	Increased number of people using cycle routes to access the town centre	Increase in cycling creates modal shift away from the car, resulting in reduced emissions	Ongoing Portfolio of suggested network amendments developed	2020	Work ongoing to incorporate proposed network into a wider Local Cycling & Walking Investment Plan

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
7	Implement variable message signs (VMS) linked to car parks in town centre, with direction varying dependent on congestion	Traffic Management	UTC, Congestion management, traffic reduction	LBC Transport Network Technology £76k Government grant awarded February 2017	2018	Installation of VMS completed Autumn 2018 https://tinyurl.com/y4bo4e8o	Improved traffic flow and information dissemination	Smoother traffic flow leading to lower emissions	Delivered	August 2018	
8	Proposed project to replace a number of small town centre surface car parks with intelligent parking system enabled multi storey on Crawley Road site	Traffic Management	Other	LBC Property & Construction	2018	2019	Improved parking information and organisation	Less engine idling and running time while drivers search for parking	Planning application permitted Options for delivery currently under review	2020	
9	School travel planning via Modeshift STARS	Promoting Travel Alternatives	School Travel Plans	LBC Transport	Ongoing	Ongoing	Number of new and updated school travel plans	Increased uptake of lift sharing or sustainable transport methods will reduce emissions	Ongoing	Ongoing	Accredited schools have to submit their travel plans annually to maintain accreditation https://tinyurl.com/y9uh65l3

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
10	Development of Workplace Travel Plans for town centre employers (including LBC)	Promoting Travel Alternatives	Workplace Travel Planning	LBC Transport LBC Road Safety	2018	2019	Increase modal shift of staff using more sustainable modes	Increased uptake of lift sharing or sustainable transport methods will result in reduced emissions	Planning phase	2020	Potential measures to encourage sustainable travel include promotion of cycling and walking, discounted bus and rail travel, and car sharing Modeshift STARS to be used to manage process
11	Provide improved EV charging infrastructure	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	LBC Transport	2018	Ongoing	Increase number of EV charge points	Increased EV use will result in a decrease in emissions	Ongoing	2023	Encourage greater ULEV uptake by providing charging points at Town Centre taxi ranks, car parks and on-street EV parking bays. Free / reduced parking during charging period . Encourage new developments to provide EV charging infrastructure

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
12	Promotion of car & lift sharing scheme via the Travel Luton website	Alternatives to private vehicle use	Car & lift sharing schemes	LBC Transport	2010 - 2011	Ongoing	Number of lift share scheme users	Lift sharing will result in fewer cars on the roads and hence reduced emissions		Ongoing	https://www.travel-luton.co.uk
13	Promote / encourage greater take-up of the Electric Vehicle Town Centre car club by residents and businesses	Alternatives to private vehicle use	Car Clubs	LBC Transport	2010 - 2011	Ongoing	Increase number of car club users	Use of the club's four electric cars rather than less sustainable transport will result in a reduction of emissions	49 users within LBC and 30 personal users	Ongoing	Extension to this scheme to be facilitated via planning conditions for certain developments to provide additional funding
14	Information to vulnerable groups – Air Pollution Alert service	Public Information	Via other mechanisms	LBC Environmental Health Herts & Beds Air Quality Network	2014 - 2018	2018	Service to recommence	By informing vulnerable groups of likely peaks in air pollution, they will have an opportunity to limit exposure / better manage their conditions	Service launched 1st March 2019	March 2019	https://tinyurl.com/y3pb95j9
15	Raise awareness of vehicle idling through no-idling campaigns and driver education	Traffic Management	Anti-idling enforcement	LBC Transport LBC Parking Enforcement LBC Licensing	2017	Ongoing	Fewer drivers idling as a result of receiving information	Reduced idling would result in lower emissions	Ongoing	2020	Prioritise the town centre and AQMA #3. Emphasis on licensed vehicles (850 licensed vehicles around Luton) and buses.

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
16	School Streets Project - Pilot road closure outside Hillborough Junior School	Promoting Travel Alternatives	Promotion of cycling Promotion of walking	LBC Road Safety Sustrains	2018	Summer 2019	Decrease in number of young people travelling to school by car Increase in number of children travelling actively Improved air quality at the school gate	Modal shift away from the car, resulting in reduced emissions	Ongoing	August 2019	https://tinyurl.com/yxfdjcff Project to be evaluated July/August 2019
17	In coordination with the Luton BID and local dealers, hold pop-up events in the town centre to showcase available EVs	Promoting Low Emission Transport	Other	LBC Environmental Health LBC Transport	2018	April 2018	Increased EV sales resulting from events	Increased EV uptake will result in reduced emissions	First event held in St. Georges Square on 27/28 April 2018	2023	
18	Work with operators to introduce hybrid/low emission buses on routes within AQMA #3	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	LBC Transport	2018 – 2021		Reduced emissions from buses	Improved Air Quality in AQMA #3		2021	Target introduction of Hybrid/low emission buses through Bury Park and on Dunstable Road DfT funding opportunities to be explored

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
19	Investigate implementing a Clean Air/Low Emissions Zone in the Town Centre	Promoting Low Emission Transport	Low Emission Zone (LEZ)	LBC Transport LBC Environmental Health	2018	Ongoing	Increased take up of clean energy vehicles / bikes by local businesses	Cleaner / greener transport options for staff and deliveries would reduce emissions in the town centre	Ongoing	2020	Research into possible funding options ongoing
20	Investigate expansion of pedestrianised area around Town Centre (either permanently or at peak times)	Traffic Management	Other	LBC Transport LBC Environmental Health	2019		Expansion of pedestrianised area will result in more people walking into the Town Centre	Wider pedestrianisation will reduce vehicle use in the Town Centre and hence result in improved air quality			
21	Assessment of benefit of current Town Centre green infrastructure to inform the development of new Town Centre planting schemes.			LBC Parks LBC Transport Sustainable Drainage	2018	Ongoing	Increase number of trees planted vs number of trees felled	In addition to absorbing CO_2, there is a growing body of evidence to shows that certain trees, shrubs and hedges can also help reduce levels of airborne pollutants	Ongoing	2019	

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.

Luton Borough Council is taking the following measures to address $PM_{2.5}$:

- Working in partnership with our Public Health Department, which has resulted from the following drivers:
    - Incorporation of the Public Health role within Unitary Authorities such as Luton Borough Council;
    - Increased evidence and awareness of harm from exposure to $PM_{2.5}$; and
    - Public Health Outcomes Framework indicator 3.01: *"Fraction of all-cause mortality attributable to anthropogenic particulate air pollution (measured as fine particulate matter, $PM_{2.5}$)"*
- Luton's Public Health Department funded the real time air quality monitoring station located on Dunstable Road East, to the south of the town centre (LN60). This station includes a FIDAS particulate analyser which monitors a range of particulate fractions including $PM_{2.5}$. This analyser enables the Council to monitor any changes in particulate concentrations and assists in determining the effectiveness of measures taken to improve air quality.
- Luton Borough Council has not identified any measures that will specifically tackle $PM_{2.5}$ concentrations however all measures that are aimed at reducing the numbers of road vehicles, and those that increase the uptake of sustainable transport methods, will have a positive impact on the reduction on $PM_{2.5}$ that is produced locally.

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.

Luton Borough Council undertook automatic (continuous) monitoring of nitrogen dioxide, PM_{10} and $PM_{2.5}$ at 1 site (LN60 - Dunstable Road East - https://tinyurl.com/ydga5dpp) during 2018. Located within AQMA No.3, this analyser is co-located with diffusion tubes LN61, LN62 and LN63.

In addition to the monitoring undertaken by Luton Borough Council during 2018:

- London Luton Airport continuously monitored PM_{10} at its site within the airport (https://tinyurl.com/y9fvrfrf); and
- Defra continuously monitored nitrogen dioxide at its Luton A505 Roadside AURN site (https://tinyurl.com/ybenfhl6).

Table A.1 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 how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Luton Borough Council undertook non- automatic (passive) monitoring of NO_2 at 42 unique sites during 2018. In addition to this, London Luton Airport undertook similar monitoring at a further 18 sites. 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 2018 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.

During 2018, the annual mean NO_2 level exceeded 40µg/m^3 at three of Luton Borough Council's 42 unique monitoring locations. Of these three exceedances (shown in bold on the tables in Appendix A & B and coloured red on the maps in Appendix D):

- one was located within AQMA No.3 (*LN62/LN63 - CRAQM 2*); and
- two fell outside of current AQMA boundaries (*LN28 – Caddington Road and LN67 – Castle Street*)

On the basis of previous years' results the occurrence of both non-AQMA exceedances is not surprising, as 2018 is the ninth and fourth year respectively that LN28 and LN67 have recorded annual mean NO_2 concentrations in excess of 40µg/m^3. As noted in previous ASRs, in the case of LN28 the location is not representative of relevant exposure and when distance corrected to estimate levels at the façade of the nearest residential property an annual mean level of 27.5µg/m^3 is obtained. With regard to LN67, again as noted in previous ASRs, in light of the continued occurrence of exceedances at this location steps must now be taken to incorporate the area around the Castle Street / Windsor Street / Hibbert Street junction into an AQMA.

During 2018, the annual mean NO_2 level exceeded 40µg/m^3 at six of London Luton Airport's 18 unique monitoring locations. Similarly, an annual mean NO_2 level of 43µg/m^3 was recorded by Defra's automatic monitor on the A505 Dunstable Road

(CM2). However, as none of these sites are in the vicinity of residential accomodation, none are representative of relevant exposure.

None of the annual mean NO_2 concentrations recorded during 2018 were greater than 60µg/m^3, which would suggest that the 1-hour mean objective was not exceeded anywhere within the borough. Furthermore, during 2018 no instances of the 1-hour mean exceeding 200µg/m^3 were observed at either of the NO_2 automatic monitoring sites within the borough (LN60 and CM2).

3.2.2 Particulate Matter (PM_{10})

Particulate Matter (PM_{10}) has been monitored at Luton Borough Council's roadside site on Dunstable Road East (*LN60*) since January 2015 and continues to be monitored at London Luton Airport (*LA08*).

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations 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 with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

During 2018, the annual mean PM_{10} concentration measured at LN60 was 16µg/m^3 (unchanged from 2017) and at LA08 was 17µg/m^3 (1µg/m^3 lower than the previous year). Over the same period the daily mean PM_{10} concentration exceeded 50µg/m^3 at both monitoring sites on a single occasion.

3.2.3 Particulate Matter ($PM_{2.5}$)

Particulate Matter ($PM_{2.5}$) has been monitored at Luton Borough Council's Dunstable Road East roadside site (*LN60*) since January 2015.

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 4 years.

During 2018, the annual mean PM2.5 concentration measured at LN60 was 10µg/m^3 (unchanged for the last three years). Currently the LAQM Regulations do not include a specific objective for annual mean $PM_{2.5}$, however the levels observed within the borough are compliant with both the EU limit and WHO guideline values of 25µg/m^3 and 10µg/m^3 respectively.

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)
LN60 *(HB007)*	Dunstable Road East	Roadside	508708	221352	NO_2; PM_{10}; PM_4; $PM_{2.5}$; PM_1	YES	Chemiluminescent; FIDAS	6.2	3.24	2.15
LA08 *(HB006)*	London Luton Airport	Urban Background	511871	221142	PM_{10}	NO	Beta Attenuation Monitor	N/A	N/A	1.7
CM2 *(LUTR; UKA00605)*	Luton A505 Roadside (AURN)	Roadside	505927	222644	NO_2	NO	Chemiluminescent	17.1	1.5	1.7

Notes:

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

(2) N/A if not applicable.

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

a) Luton Borough Council (LBC) 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)
LN07	Guildford Street/Bute Street	Roadside	509227	221455	NO_2	NO	1.5	3.10	NO	2.60
LN11	Upper George Street	Roadside	508910	221321	NO_2	NO	20	2.65	NO	2.9
LN15	Armitage Garden	Roadside	505557	222325	NO_2	YES	7	2.1	NO	2.8
LN16	Belper Road	Roadside	505492	222607	NO_2	YES	5	2.45	NO	2.68
LN17	Wyndham Road	Roadside	505324	222812	NO_2	YES	4	1.75	NO	2.82
LN18	Copperfields	Roadside	505014	223538	NO_2	YES	2	1.55	NO	2.83
LN22	1 Mistletoe Hill	Urban Background	511341	221864	NO_2	NO	0	9.3	NO	2.45
LN23	Eaton Green Road 1	Roadside	511377	221814	NO_2	NO	18	6.4	NO	2.26
LN24	19 Barnston Close	Urban Background	511902	222144	NO_2	NO	0	6.95	NO	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
LN25	Eaton Green Road 2	Roadside	511893	222068	NO2	NO	17	1.86	NO	2.89
LN26	8 Keeble Close	Urban Background	512109	222234	NO2	NO	0	11.5	NO	2.7
LN27	Eaton Green Road 3	Roadside	512134	222198	NO2	NO	6	2.25	NO	2.71
LN28	Caddington Road	Roadside	507798	219832	NO2	NO	15	1.7	NO	2.6
LN52	Dunstable Rd/Cardigan St Residential	Roadside	508689	221379	NO2	YES	0	4.25	NO	2.84
LN53	3rd Floor Bagshawe Court F.F.	Suburban	507717	219923	NO2	NO	0	23	NO	9.79
LN54	M1 Corner Bagshawe Court F.F.	Suburban	507712	219915	NO2	NO	0	12	NO	1.95
LN55	M1 Corner Wyatt Court FF	Suburban	507732	219886	NO2	NO	0	13	NO	2.9
LN56	20 Wyatt Court FF	Suburban	507747	219894	NO2	NO	0	30	NO	2.9
LN57	Hitchin Rd/Cannon Lane Resi 1	Roadside	510747	224311	NO2	NO	2	9	NO	2.4

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)
LN58	Hitchin Rd/Cannon Lane Resi 2	Roadside	510747	224311	NO_2	NO	2	9	NO	2.4
LN59	Hitchin Rd/Cannon Lane Resi 3	Roadside	510747	224311	NO_2	NO	2	9	NO	2.4
LN61	CRAQM 2A	Roadside	508708	221352	NO_2	YES	6	2.5	YES	2
LN62	CRAQM 2B	Roadside	508708	221352	NO_2	YES	6	2.5	YES	2
LN63	CRAQM 2C	Roadside	508708	221352	NO_2	YES	6	2.5	YES	2
LN64	Park Viaduct - Park Street	Roadside	509563	220952	NO_2	NO	0.2	2.9	NO	2.65
LN65	Park Viaduct - Queens Close	Roadside	509486	220865	NO_2	NO	1.85	8.8	NO	1.85
LN66	Park Viaduct	Roadside	509288	220925	NO_2	YES	4.9	3.7	NO	2.65
LN67	Castle Street	Roadside	509083	220709	NO_2	NO	0	2.25	NO	2.7
LN68	London Road	Roadside	508969	220487	NO_2	NO	0	8.4	NO	2.57

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)
LN69	John Street	Roadside	509326	221357	NO_2	NO	0	1.65	NO	2.65
LN70	Crawley Green Road	Roadside	509813	221161	NO_2	NO	0	6	NO	2.62
LN71	Crescent Road	Urban Background	509549	221623	NO_2	NO	0	10.3	NO	2.4
LN72	Hucklesby Way	Urban Background	508937	221745	NO_2	NO	0	8.7	NO	2.5
LN73	Mill Street	Roadside	508959	221633	NO_2	NO	0	3.9	NO	2.9
LN74	Dunstable Road - Bury Park	Roadside	508165	222002	NO_2	NO	0	4.8	NO	2.5
LN75	New Bedford Road	Roadside	508745	222122	NO_2	NO	0	5.15	NO	2.5
LN76	Leagrave Road	Urban Background	507574	222948	NO_2	NO	0	8.8	NO	2.34
LN77	Marsh Road	Roadside	506496	224018	NO_2	NO	0	4.8	NO	2.5
LN78	Hibbert Street	Roadside	509109	220676	NO_2	NO	0.2	1.35	NO	2.4

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)
LN79	Castle Street 2	Roadside	509050	220634	NO_2	NO	-	2.05	NO	3.0
LN80	Windsor Street	Roadside	509038	220719	NO_2	NO	0.46	1.00	NO	2.33
LN81	Bank Close	Suburban	505034	223729	NO_2	YES	-	1.7	NO	2.55
LN82	11 Withy Close	Suburban	504828	223999	NO_2	YES	0	8.50	NO	2.50
LN83	b/h 9 Copperfields	Suburban	505116	223467	NO_2	YES	13	26	NO	2.50
LN84	97 Lime Avenue	Suburban	505230	223304	NO_2	YES	8.5	1.75	NO	2.5
LN85	26 Belper Road	Suburban	505481	222545	NO_2	YES	0	17	NO	2
LN86	Bradley Road (by M1 Bridge)	Roadside	505586	222235	NO_2	YES	-	2.3	NO	2.55

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.

b) London Luton Airport (LLA) 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)
LLA 1	Outside Zone 2	Other	511903	221278	NO_2	NO			NO	
LLA 2 (LA02)	Airport Approach Road	Roadside	511579	220960	NO_2	NO	880	3	NO	1.9
LLA 3 (LA03)	Runway Threshold Western	Other	511170	220436	NO_2	NO	1000	N/A	NO	1.8
LLA 4 (LA04)	Runway Threshold Eastern	Other	513644	221207	NO_2	NO	550	N/A	NO	2
LLA 5 (LA05)	Adjacent to Stand 5	Other	511711	221337	NO_2	NO	585	N/A	NO	1
LLA 6 (LA06)	President Way Jct	Roadside	511682	221727	NO_2	NO	230	3	NO	2.3
LLA 7	Drop Off Zone	Roadside	512166	221226	NO_2	NO			NO	
LLA 8 (LA08)	BAM Co-located	Other	511867	221148	NO_2	NO	820	N/A	NO	1.7
LLA 9 (LA09)	Stagenhoe Bottom Farm	Rural	517602	222572	NO_2	NO	30	N/A	NO	1.2
LLA 10 (LA10)	Grove Farm Slip End	Rural	507667	217744	NO_2	NO	30	N/A	NO	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)
LLA 11 (LA17)	Dane End	Roadside	513140	220669	NO_2	NO	130	1	NO	2.1
LLA 12 (LA14)	Adjacent to Stand 60	Roadside	511886	221566	NO_2	NO	420	N/A	NO	1
LLA 13 (LA15)	Eaton Green Road	Roadside	511901	222055	NO_2	NO	35	8	NO	2
LLA 14	Undercroft Access Road	Kerbside	511995	221316	NO_2	NO			NO	
LLA 15	Eaton Green Road – EasyJet CP	Kerbside	511168	221706	NO_2	NO			NO	
LLA 16	Exit Road Plaza	Roadside	512158	221087	NO_2	NO			NO	
LLA 17	A1081 New Airport Way 1	Roadside	509489	219237	NO_2	NO			NO	
LLA 18	A1081 New Airport Way 2	Roadside	510991	220497	NO_2	NO			NO	
LA01	Terminal Patio	Other	511847	221336	NO_2	NO	620	N/A	NO	7
LA07	Terminal Car Park	Other	512181	221352	NO_2	NO	780	N/A	NO	2.3

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)
LA16	Set Down Area	Kerbside	511954	221313	NO_2	NO	690	0.5	NO	2
LA18	Breachwood Green	Kerbside	515053	221778	NO_2	NO			NO	
LA19	Kensworth	Kerbside	502848	218161	NO_2	NO			NO	
LA20	Short Term Car Park	Kerbside			NO_2	NO			NO	

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

a) Luton Borough Council (LBC) sites

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2014	2015	2016	2017	2018
LN60 (HB007)	Roadside	Automatic	100	100	NDA	**43**	**47**	39	37
LN07	Roadside	Diffusion Tube	75	75	NDA	NDA	30	27	27
LN11	Roadside	Diffusion Tube	100	100	37	35	39	34	34
LN15	Roadside	Diffusion Tube	92	92	32	30	31	30	26
LN16	Roadside	Diffusion Tube	100	100	37	35	36	35	30
LN17	Roadside	Diffusion Tube	100	100	**41**	36	39	36	34
LN18	Roadside	Diffusion Tube	100	100	30	26	28	24	24
LN22	Urban Background	Diffusion Tube	100	100	23	21	25	23	22
LN23	Roadside	Diffusion Tube	100	100	32	32	36	37	30
LN24	Urban Background	Diffusion Tube	100	100	24	21	24	22	20
LN25	Roadside	Diffusion Tube	100	100	31	28	30	29	28
LN26	Urban Background	Diffusion Tube	100	100	22	21	21	20	20
LN27	Roadside	Diffusion Tube	100	100	28	28	30	30	28

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2014	2015	2016	2017	2018
LN28	Roadside	Diffusion Tube	92	92	**49**	**43**	**46**	**46**	**40**
LN52	Roadside	Diffusion Tube	92	92	**52**	**46**	**49**	**43**	40
LN53	Suburban	Diffusion Tube	100	100	34	33	34	33	28
LN54	Suburban	Diffusion Tube	83	83	**40**	32	34	34	27
LN55	Suburban	Diffusion Tube	75	75	36	31	34	33	29
LN56	Suburban	Diffusion Tube	100	100	33	32	34	31	30
LN57	Roadside	Diffusion Tube	0	0	33	31	33	NDA	NDA
LN58	Roadside	Diffusion Tube	0	0	33	31	32	NDA	NDA
LN59	Roadside	Diffusion Tube	0	0	33	31	34	NDA	NDA
LN61	Roadside	Diffusion Tube	100	100	NDA	**43**	**45**	**43**	38
LN62	Roadside	Diffusion Tube	100	100	NDA	**43**	**46**	**41**	**40**
LN63	Roadside	Diffusion Tube	100	100	NDA	**41**	**46**	**42**	**42**
LN64	Roadside	Diffusion Tube	92	92	NDA	32	34	31	28
LN65	Roadside	Diffusion Tube	83	83	NDA	26	27	26	23
LN66	Roadside	Diffusion Tube	92	92	NDA	37	39	39	33
LN67	Roadside	Diffusion Tube	92	92	NDA	**44**	**48**	**42**	**41**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2014	2015	2016	2017	2018
LN68	Roadside	Diffusion Tube	100	100	NDA	32	35	33	31
LN69	Roadside	Diffusion Tube	100	100	NDA	29	33	31	30
LN70	Roadside	Diffusion Tube	100	100	NDA	31	34	34	31
LN71	Urban Background	Diffusion Tube	100	100	NDA	28	32	31	31
LN72	Urban Background	Diffusion Tube	83	83	NDA	27	31	30	31
LN73	Roadside	Diffusion Tube	100	100	NDA	37	**44**	**42**	38
LN74	Roadside	Diffusion Tube	100	100	NDA	39	**41**	39	36
LN75	Roadside	Diffusion Tube	100	100	NDA	38	**41**	38	37
LN76	Urban Background	Diffusion Tube	100	100	NDA	30	34	32	31
LN77	Roadside	Diffusion Tube	100	100	NDA	35	37	36	33
LN78	Roadside	Diffusion Tube	83	83	NDA	NDA	34	32	29
LN79	Roadside	Diffusion Tube	92	92	NDA	NDA	37	33	37
LN80	Roadside	Diffusion Tube	92	92	NDA	NDA	36	34	37
LN81	Suburban	Diffusion Tube	100	100	NDA	NDA	NDA	38	32
LN82	Suburban	Diffusion Tube	83	83	NDA	NDA	NDA	32	27
LN83	Suburban	Diffusion Tube	92	92	NDA	NDA	NDA	25	25

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2014	2015	2016	2017	2018
LN84	Suburban	Diffusion Tube	67	67	NDA	NDA	NDA	27	25
LN85	Suburban	Diffusion Tube	33	33	NDA	NDA	NDA	NDA	28
LN86	Roadside	Diffusion Tube	100	100	NDA	NDA	NDA	**42**	37

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

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

Notes:

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

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

(1) 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.

b) London Luton Airport (LLA) sites

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2014	2015	2016	2017	2018
LLA 1	Other	Diffusion Tube	92	92	NDA	NDA	NDA	NDA	**46**
LLA 2 (LA02)	Roadside	Diffusion Tube	100	100	33	29	**40**	38	38
LLA 3 (LA03)	Other	Diffusion Tube	100	100	22	17	24	23	25
LLA 4 (LA04)	Other	Diffusion Tube	100	100	18	13	17	19	18
LLA 5 (LA05)	Other	Diffusion Tube	100	100	38	34	**43**	**40**	**40**
LLA 6 (LA06)	Roadside	Diffusion Tube	100	100	32	26	34	35	35
LLA 7	Road	Diffusion Tube	92	92	NDA	NDA	NDA	NDA	**44**
LLA 8 (LA08)	Other	Diffusion Tube	100	100	28	24	34	32	32
LLA 9 (LA09)	Rural	Diffusion Tube	100	100	11	7	10	11	11
LLA 10 (LA10)	Rural	Diffusion Tube	100	100	13	9	12	11	12
LLA 11 (LA17)	Roadside	Diffusion Tube	100	100	11	11	15	15	15
LLA 12 (LA14)	Roadside	Diffusion Tube	100	100	33	29	39	38	38
LLA 13 (LA15)	Roadside	Diffusion Tube	100	100	27	21	27	25	26
LLA 14	Kerbside	Diffusion Tube	92	92	NDA	NDA	NDA	NDA	**42**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2014	2015	2016	2017	2018
LLA 15	Kerbside	Diffusion Tube	100	100	NDA	NDA	NDA	NDA	32
LLA 16	Roadside	Diffusion Tube	92	92	NDA	NDA	NDA	NDA	**44**
LLA 17	Roadside	Diffusion Tube	100	58	NDA	NDA	NDA	NDA	**40**
LLA 18	Roadside	Diffusion Tube	100	58	NDA	NDA	NDA	NDA	38
LA01	Other	Diffusion Tube	0	0	35	28	31	33	NDA
LA07	Other	Diffusion Tube	0	0	25	23	36	**46**	NDA
LA16	Kerbside	Diffusion Tube	0	0	37	30	**41**	40	NDA
LA18	Kerbside	Diffusion Tube	0	0	NDA	NDA	14	14	NDA
LA19	Kerbside	Diffusion Tube	0	0	NDA	NDA	12	NDA	NDA
LA20	Kerbside	Diffusion Tube	0	0	NDA	NDA	NDA	**41**	NDA

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

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

Notes:

Exceedances of the NO_2 annual mean objective of $40\mu g/m^3$ are shown in **bold**.

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

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

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

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

c) Defra AURN sites

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2014	2015	2016	2017	2018
CM2 (LUTR; UKA00605)	Roadside	Automatic	99	99	NDA	**45**	**50**	**44**	**43**

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

Notes:

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

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

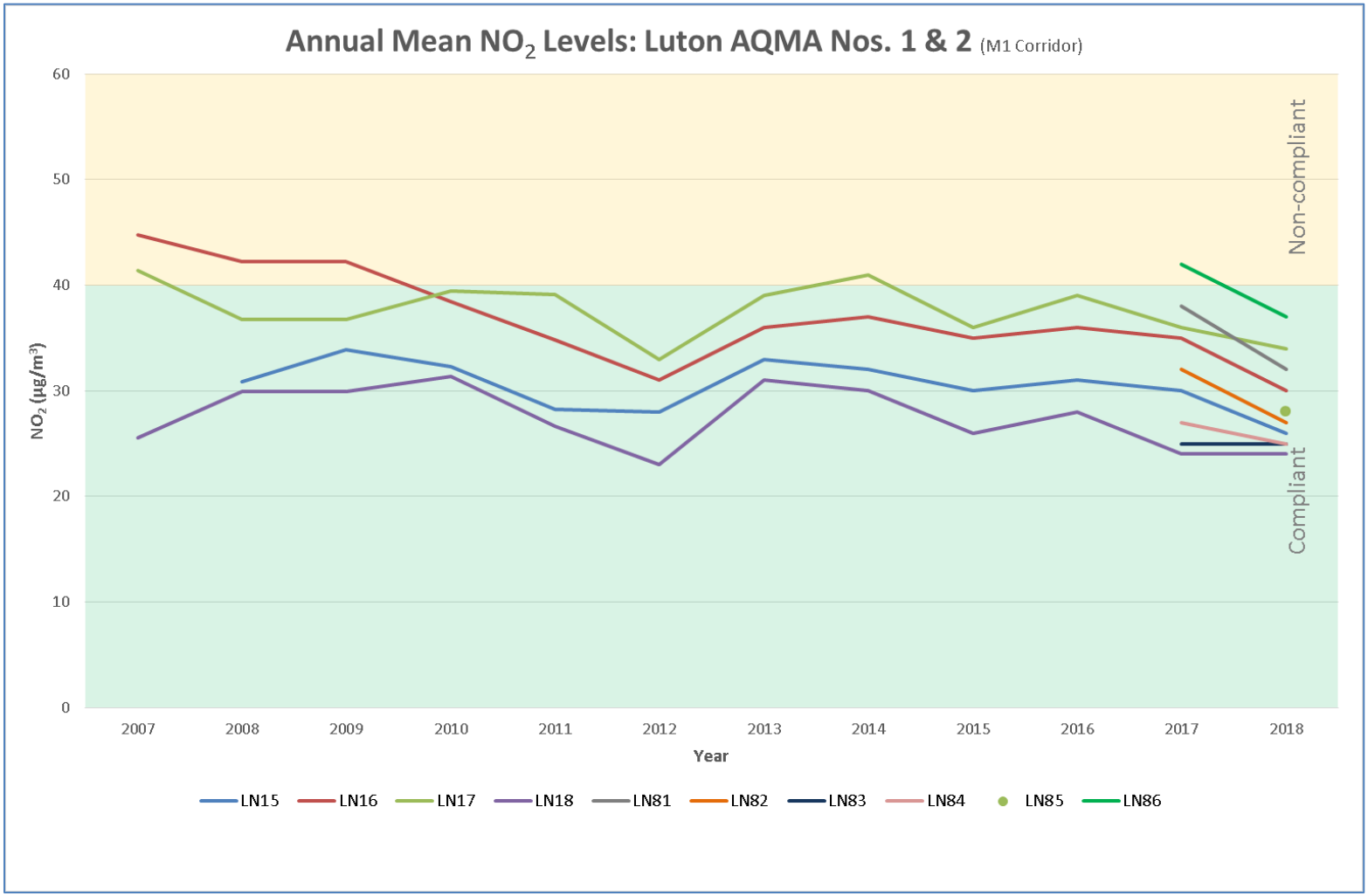
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

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

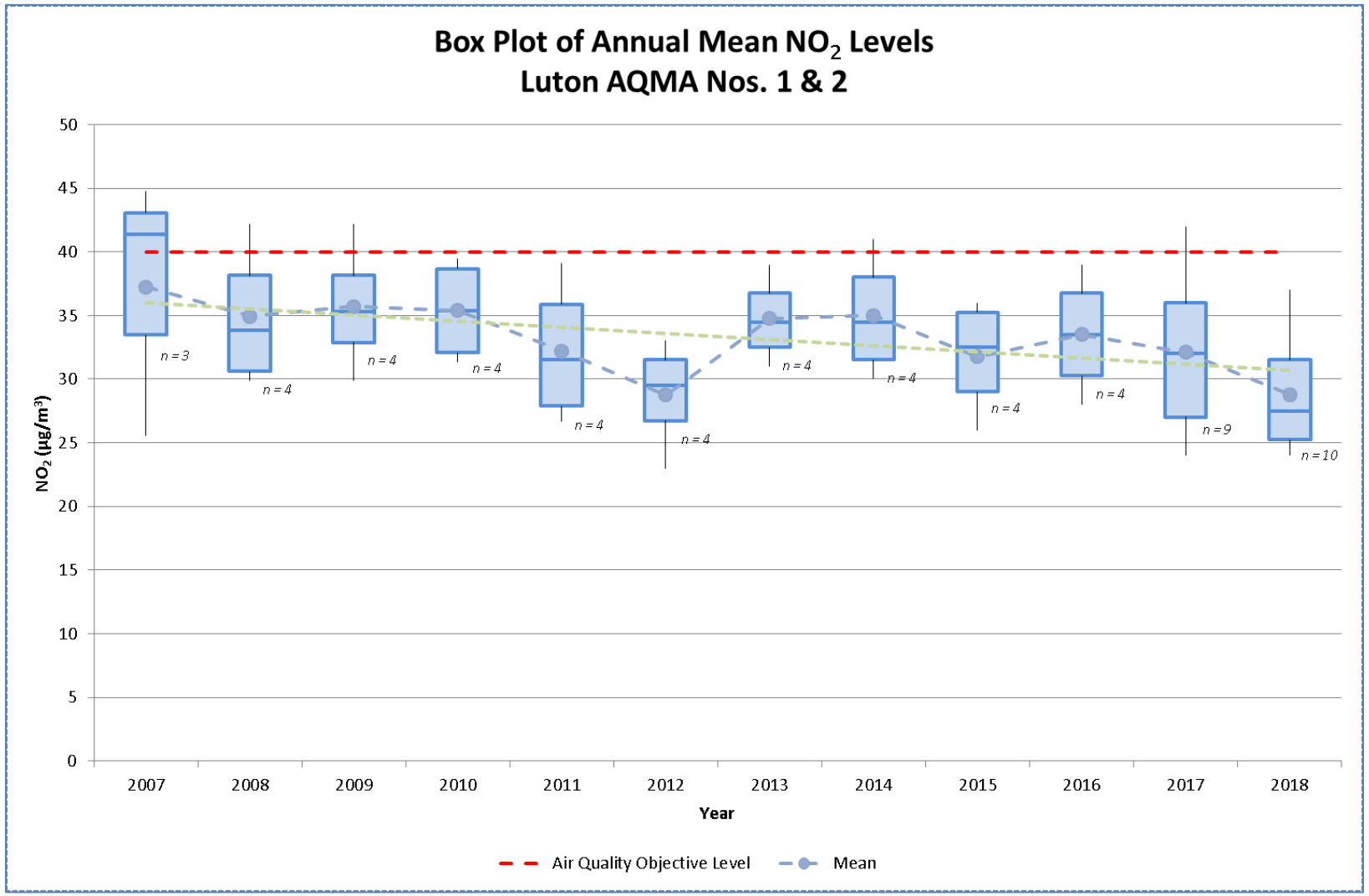
(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

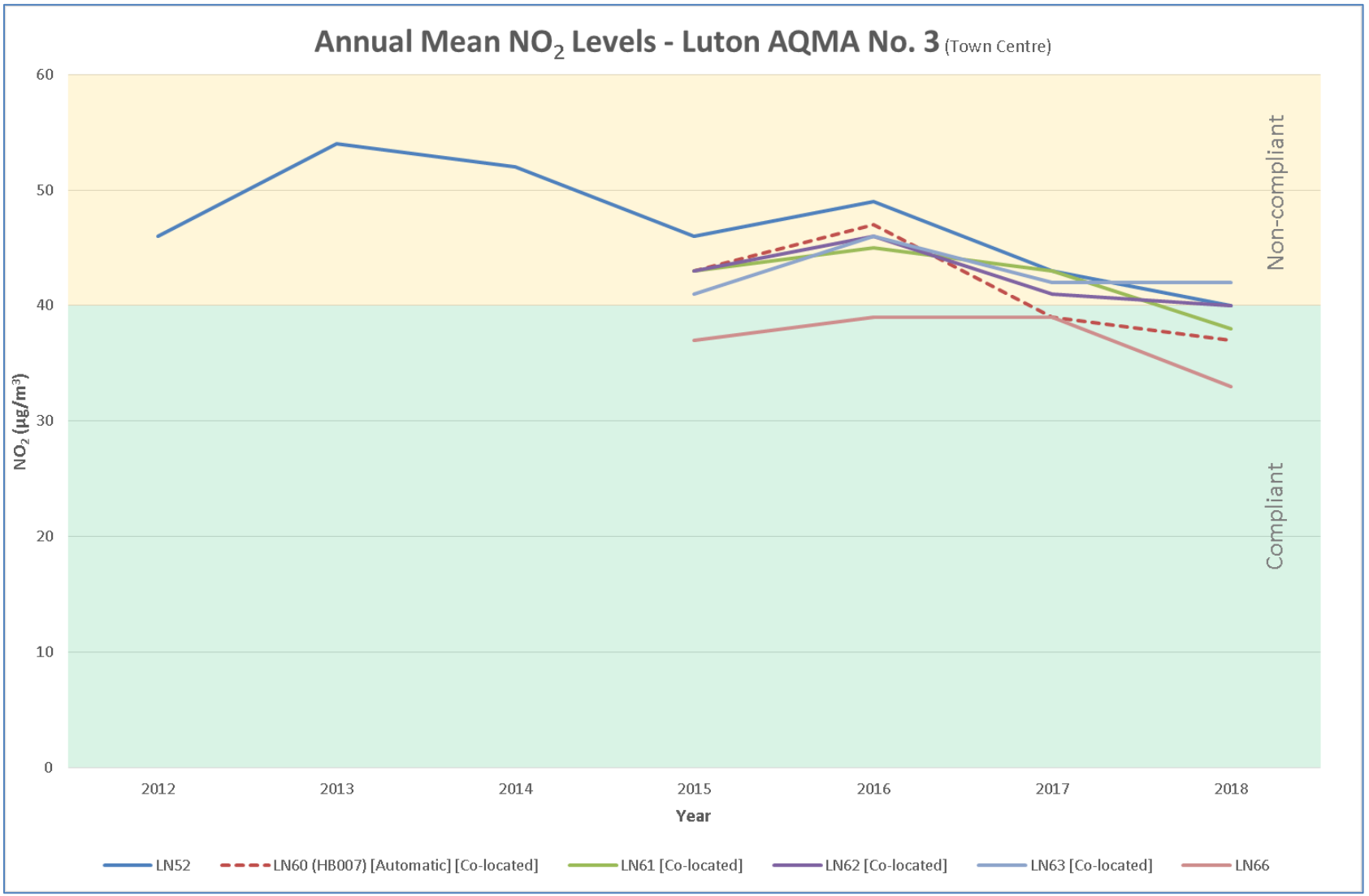
a) Annual Mean NO_2 Levels: Luton AQMA Nos. 1 & 2 (M1 Corridor)



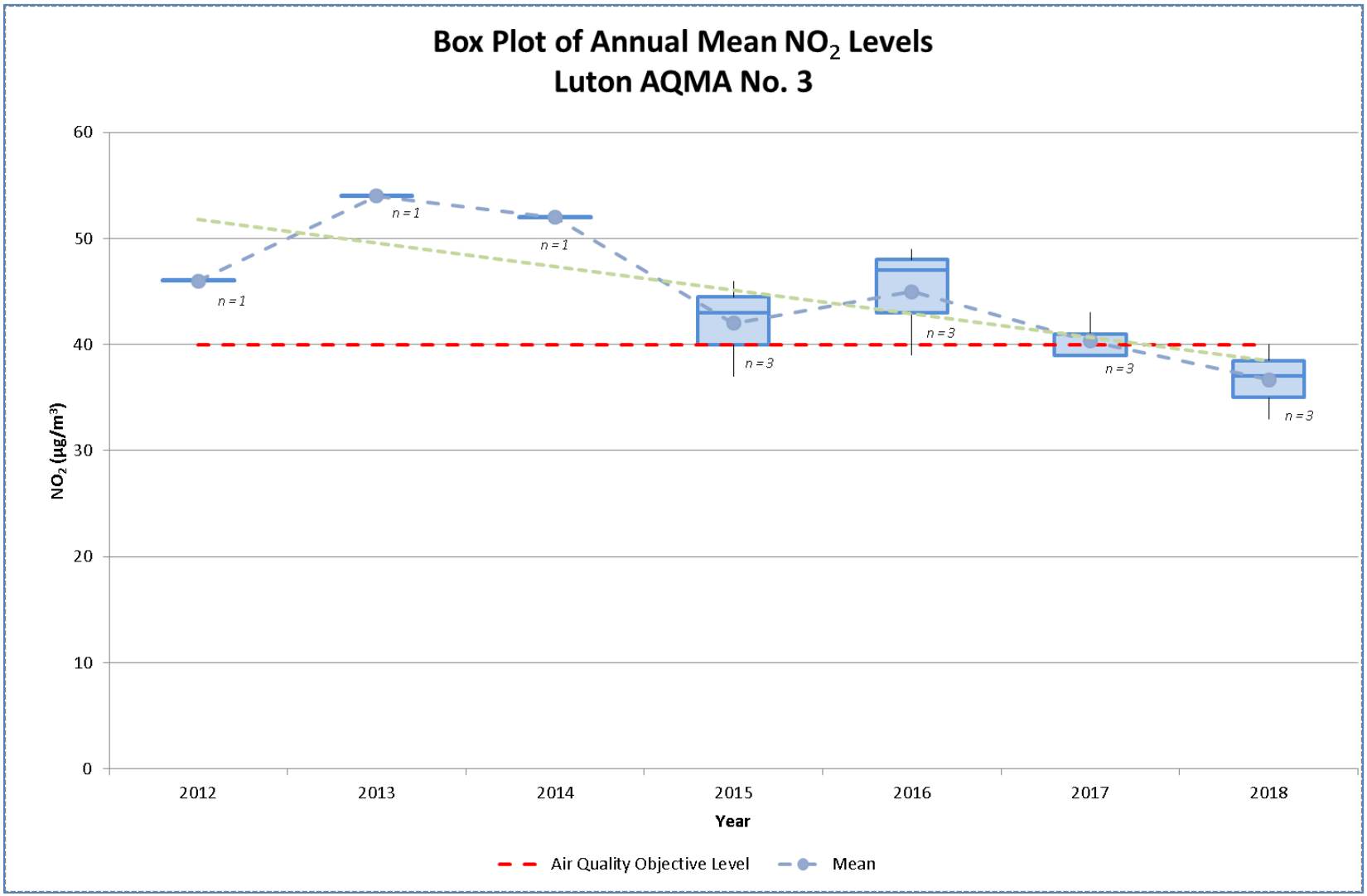
b) Box Plot of Annual Mean NO_2 Levels: Luton AQMA Nos. 1 & 2 (M1 Corridor)



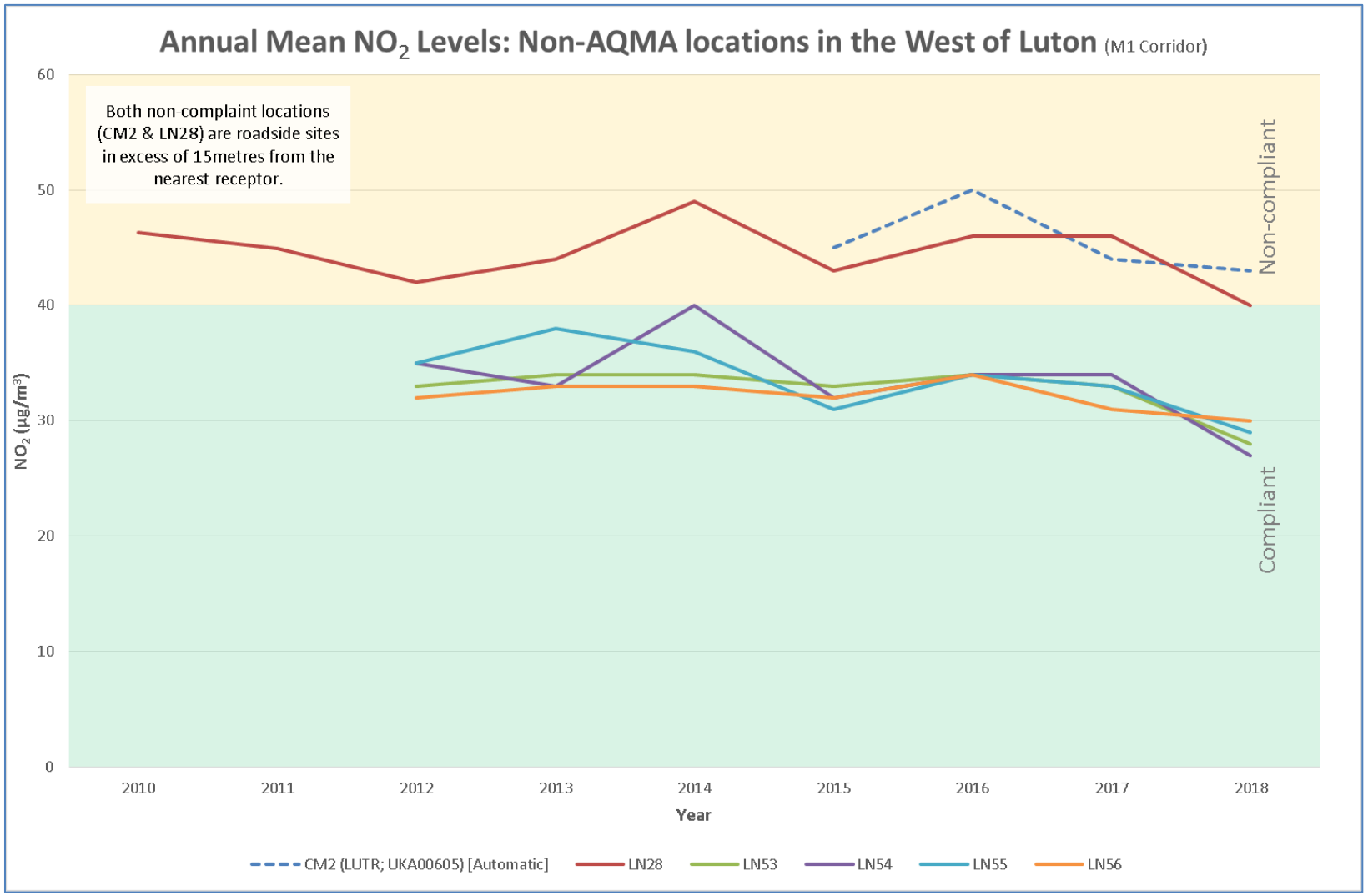
c) Annual Mean NO_2 Levels: Luton AQMA No. 3 (Town Centre)



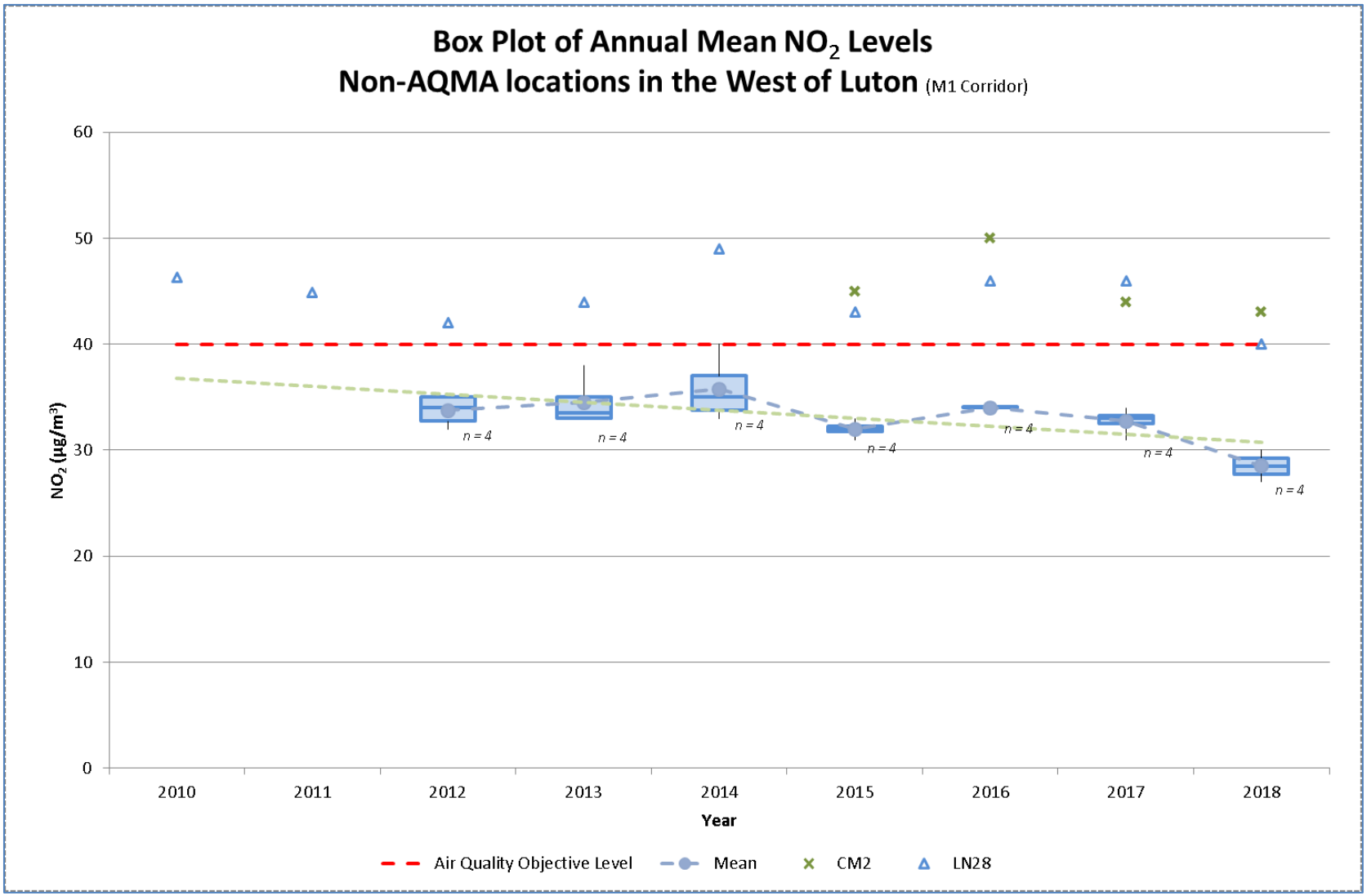
d) Box Plot of Annual Mean NO_2 Levels: Luton AQMA No. 3 (Town Centre)



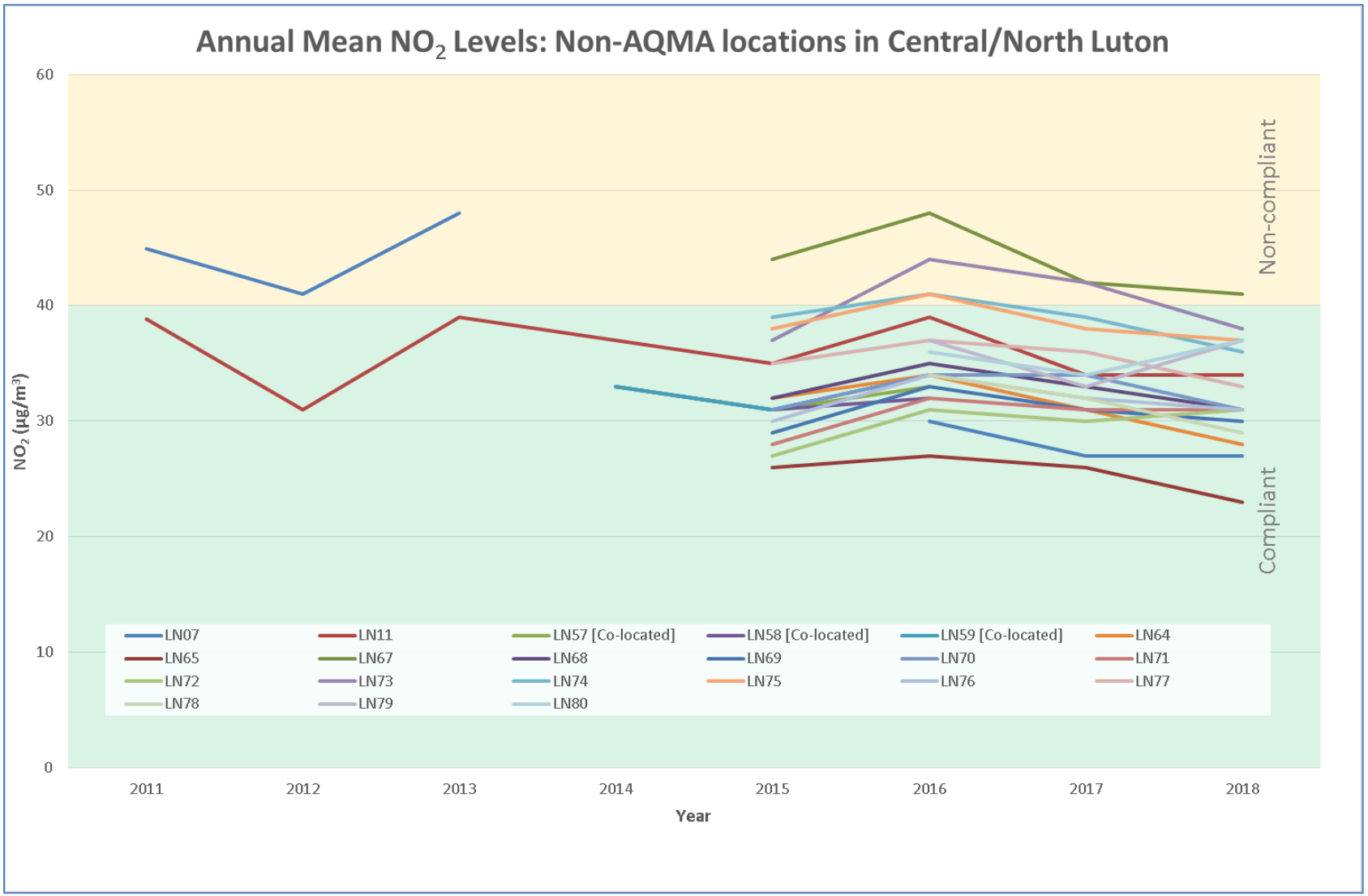
e) Annual Mean NO_2 Levels: Non-AQMA locations in the West of Luton (M1 Corridor)



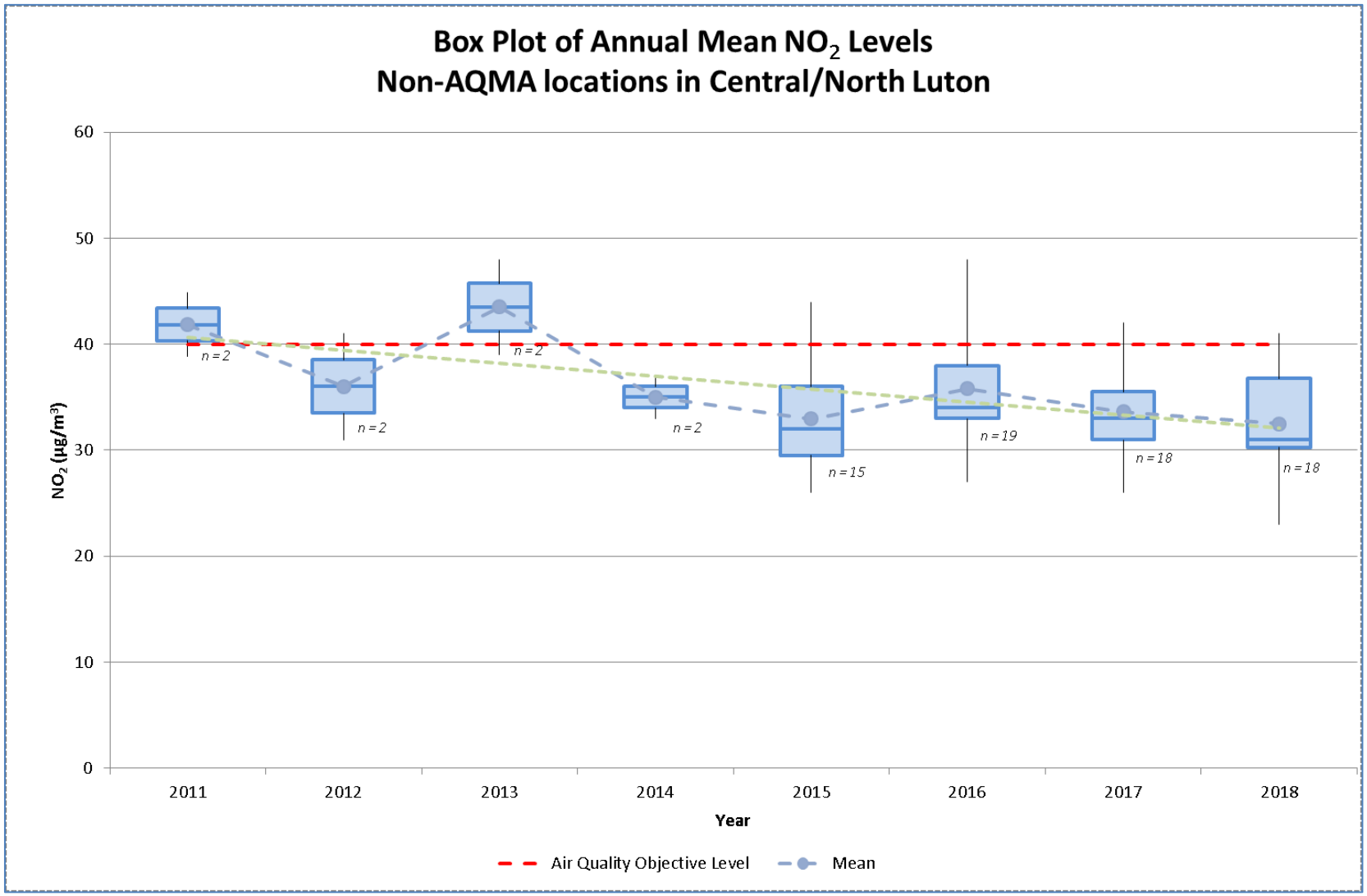
f) Box Plot of Annual Mean NO_2 Levels: Non-AQMA locations in the West of Luton (M1 Corridor)



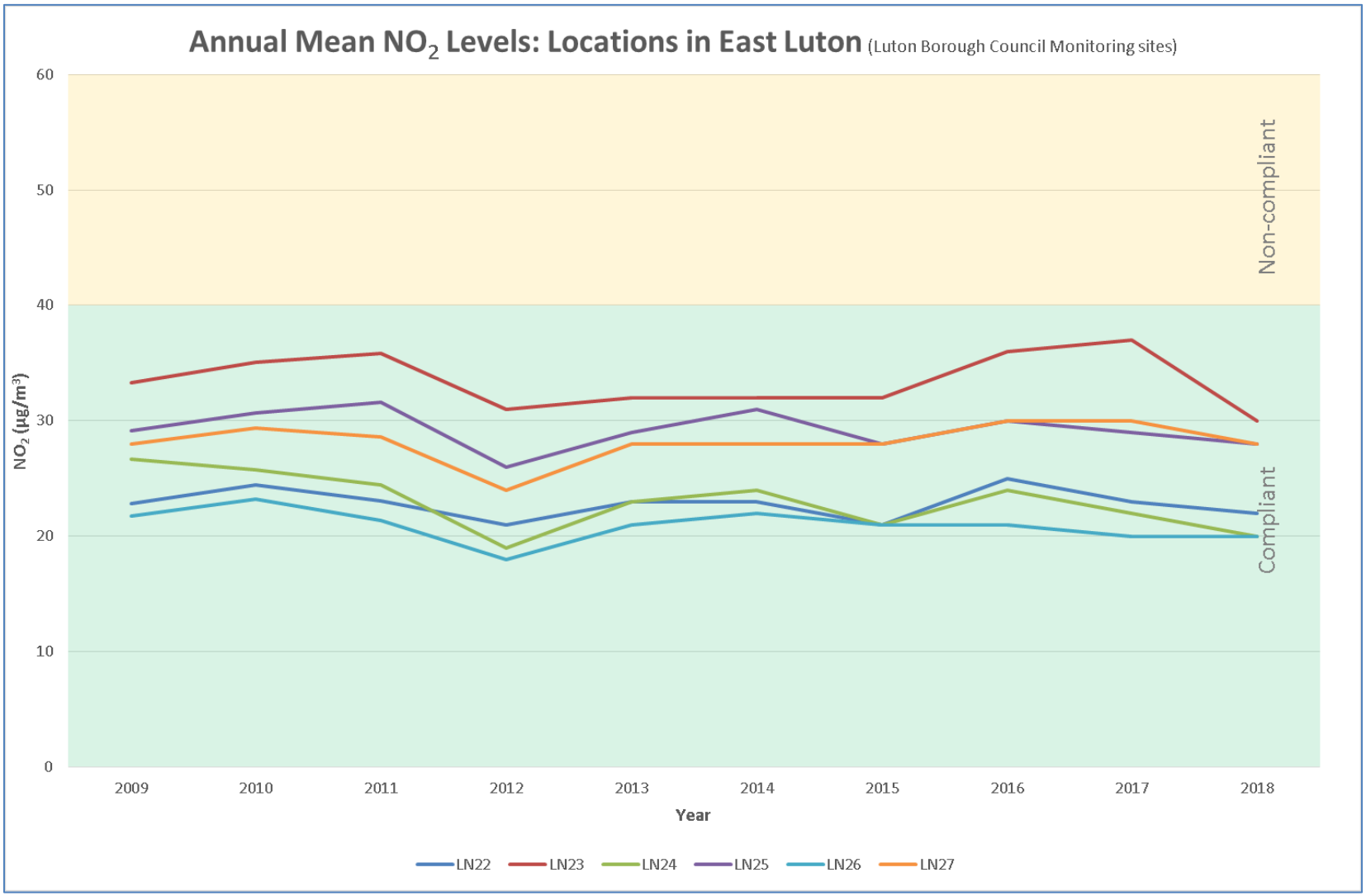
g) Annual Mean NO_2 Levels: Non-AQMA locations in Central / North Luton



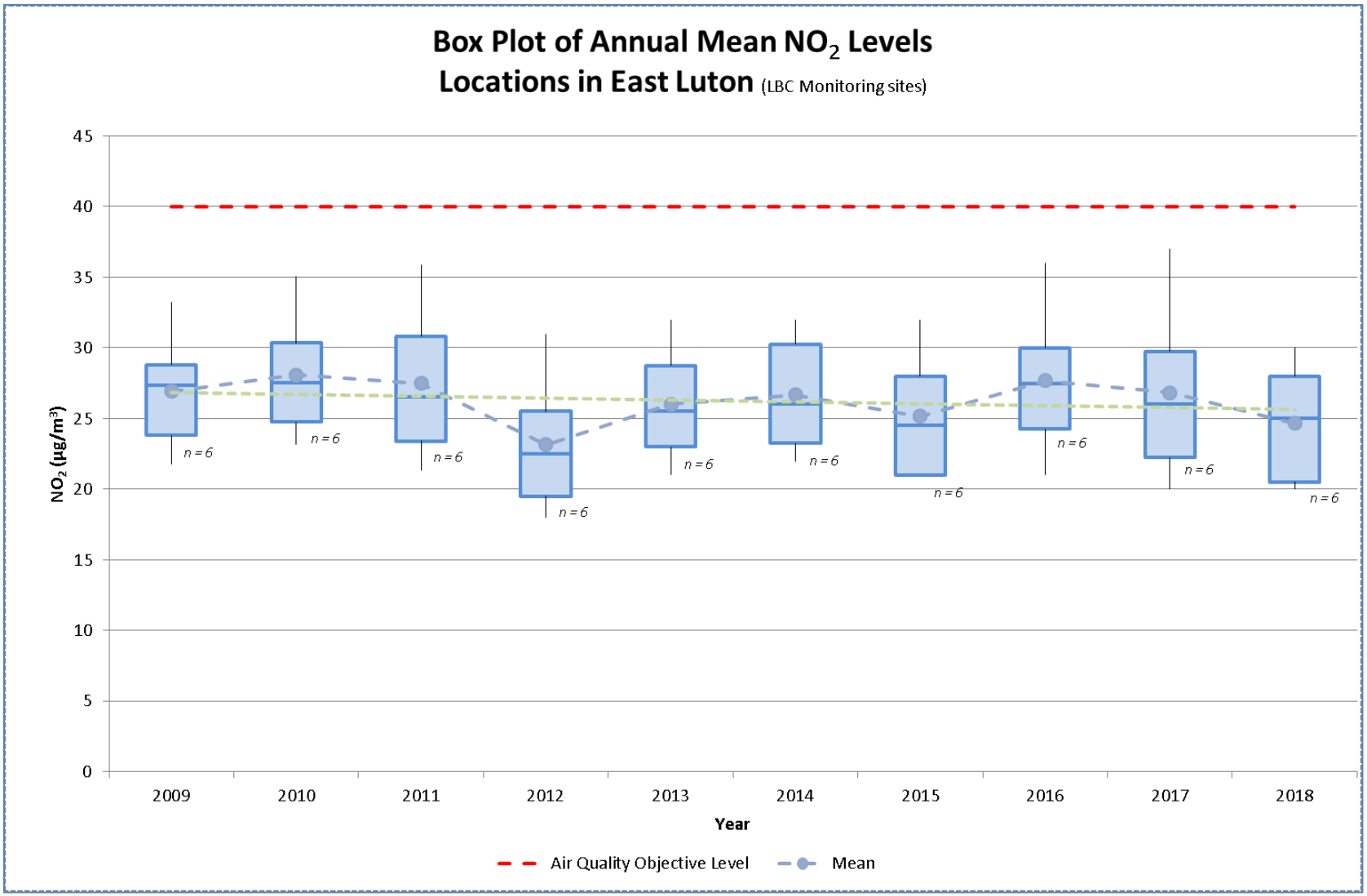
h) Box Plot of Annual Mean NO_2 Levels: Non-AQMA locations in Central / North Luton



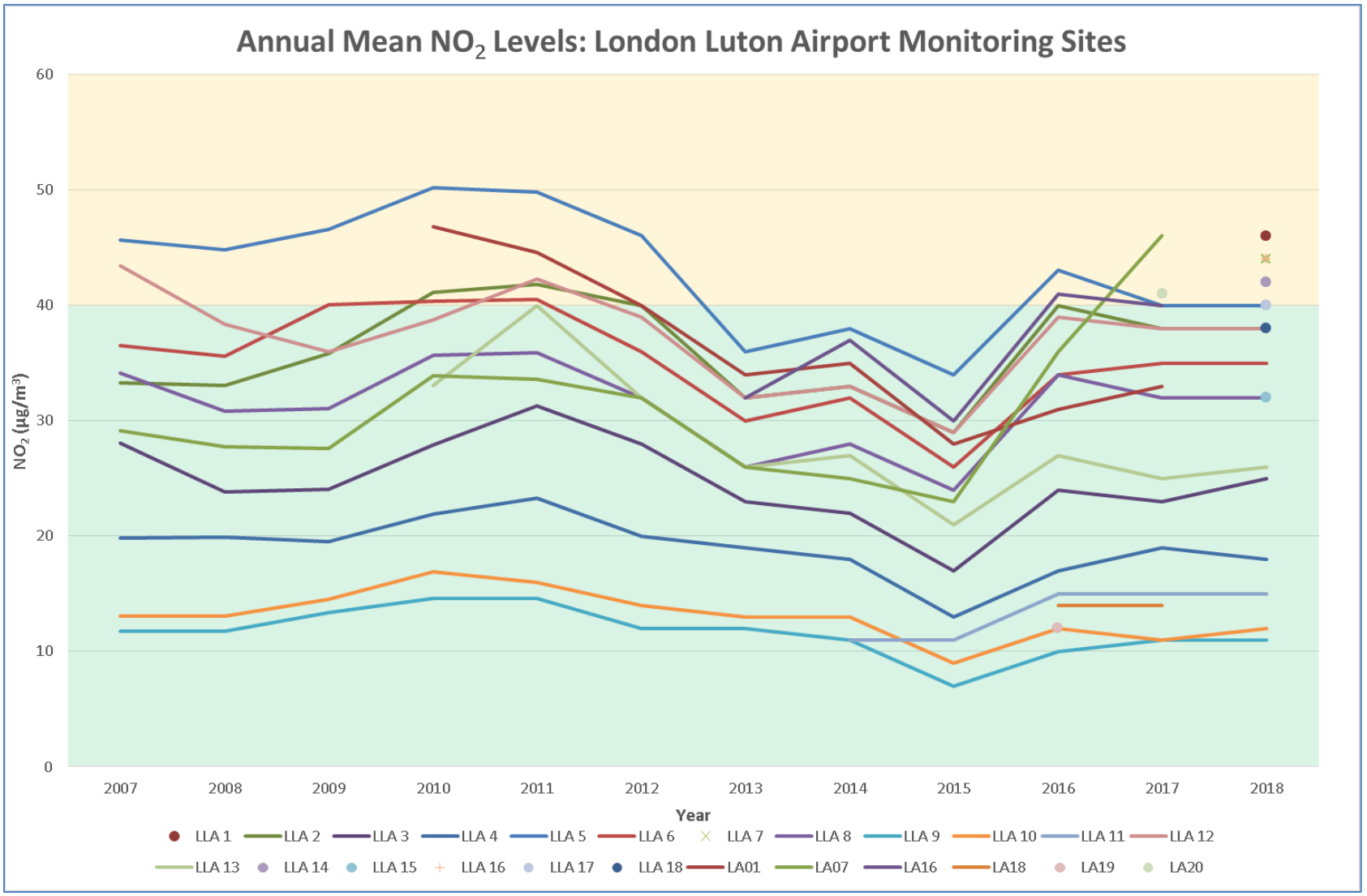
i) Annual Mean NO_2 Levels: Locations in East Luton (Luton Borough Council Monitoring Sites)



j) Box Plot of Annual Mean NO_2 Levels: Locations in East Luton (LBC Monitoring Sites)



k) Annual Mean NO_2 Levels: London Luton Airport Monitoring Sites



l) Box Plot of Annual Mean NO_2 Levels: London Luton Airport Monitoring Sites

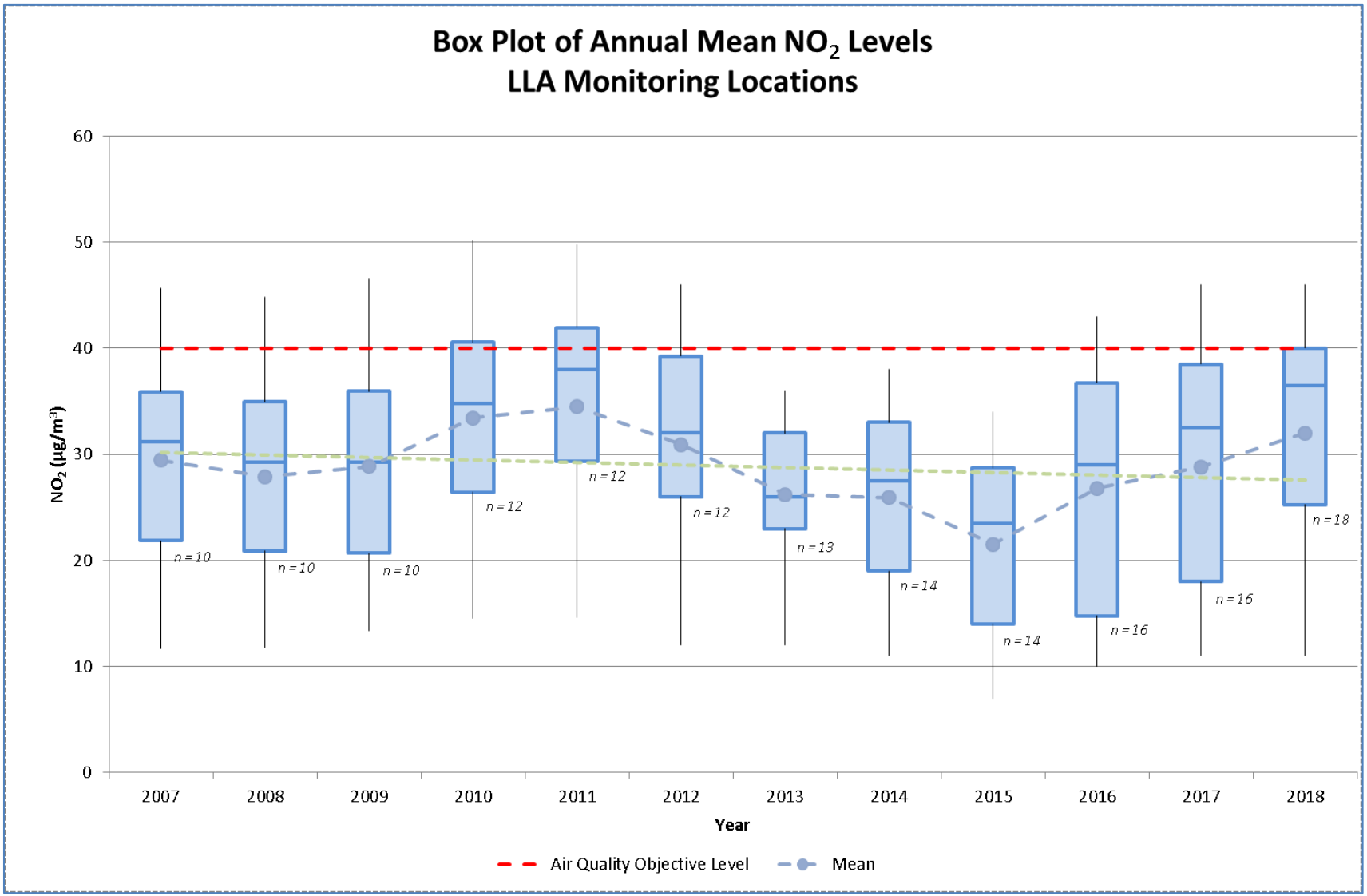


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2014	2015	2016	2017	2018
LN60 *(HB007)*	Roadside	Automatic	100	100	NDA	0	2	0	0
CM2 *(LUTR; UKA00605)*	Roadside	Automatic	99	99	NDA	1	16	6	0

Notes:

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

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

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

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

Figure A.2 – Trends in Number of NO_2 1-Hour Means > 200µg/m^3

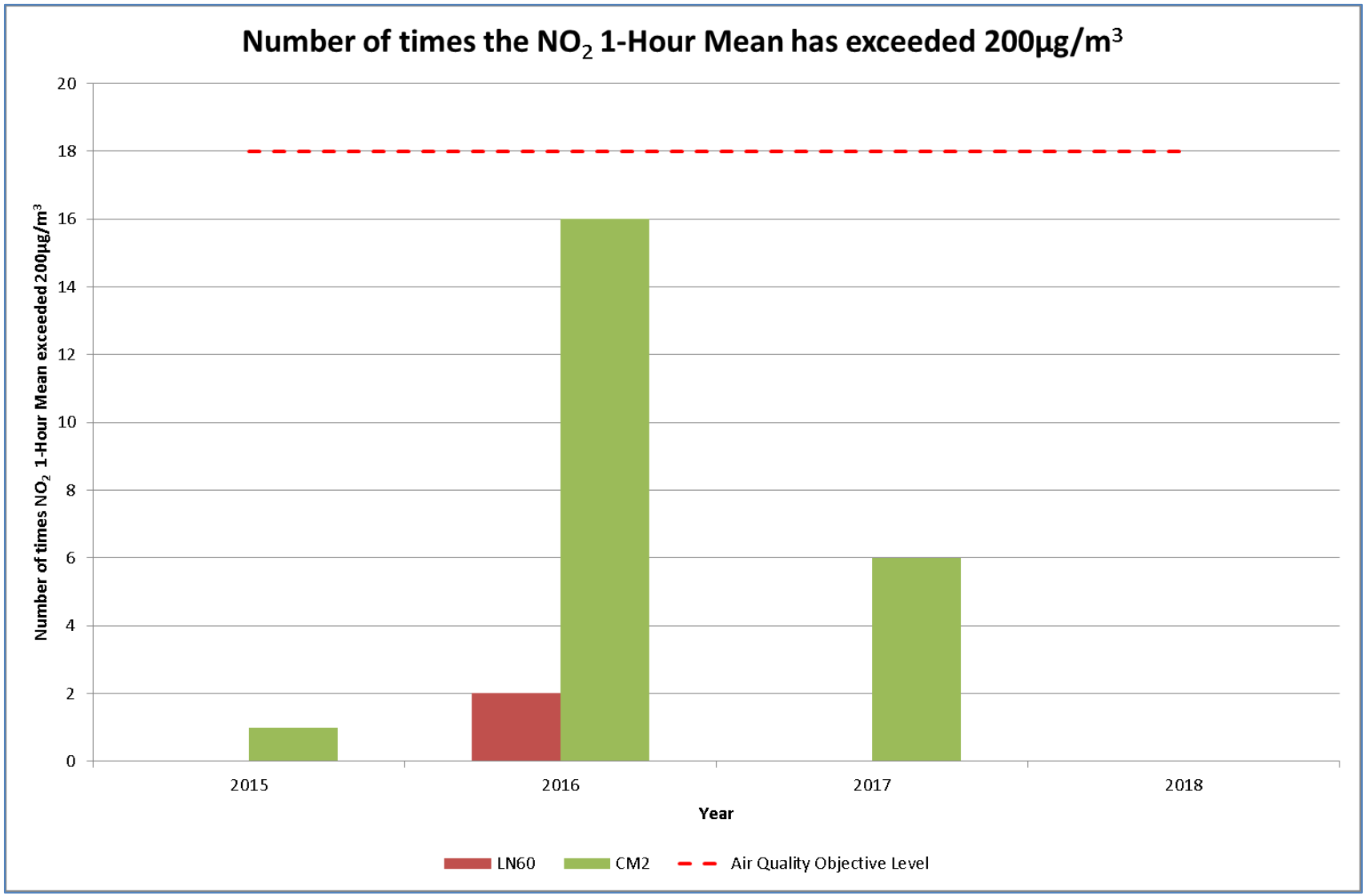


Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2014	2015	2016	2017	2018
LN60 *(HB007)*	Roadside	98	98	NDA	15	15	16	16
LA08 *(HB006)*	Urban Background	96	96	18	15	18	18	17

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

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.

Figure A.3 – Trends in Annual Mean PM_{10} Concentrations

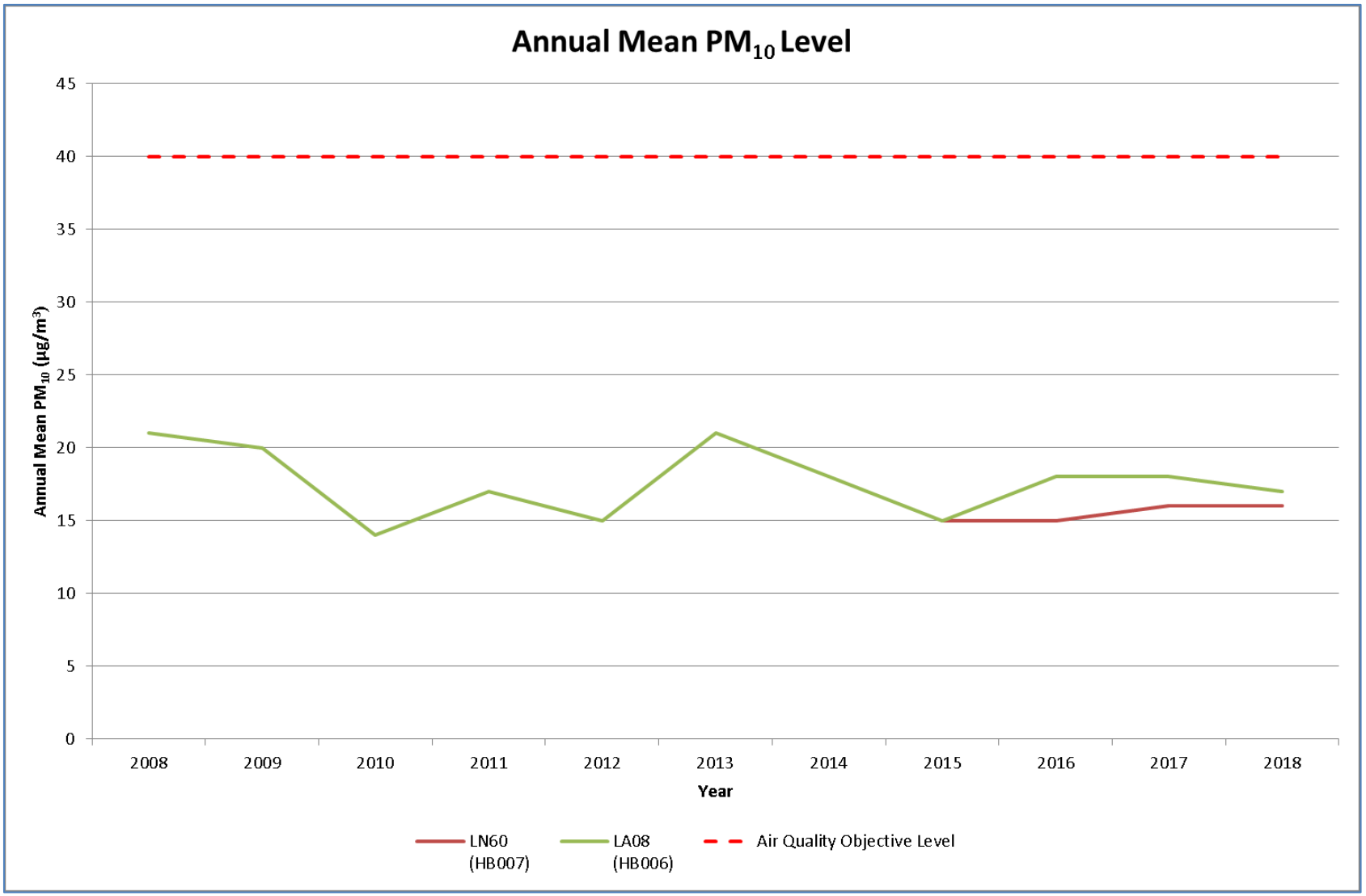


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2014	2015	2016	2017	2018
LN60 *(HB007)*	Roadside	98	98	NDA	5	3	4	1
LA08 *(HB006)*	Urban Background	96	96	6	0	1	1	1

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.

Figure A.4 – Trends in Number of 24-Hour Mean PM_{10} Results >50µg/m^3

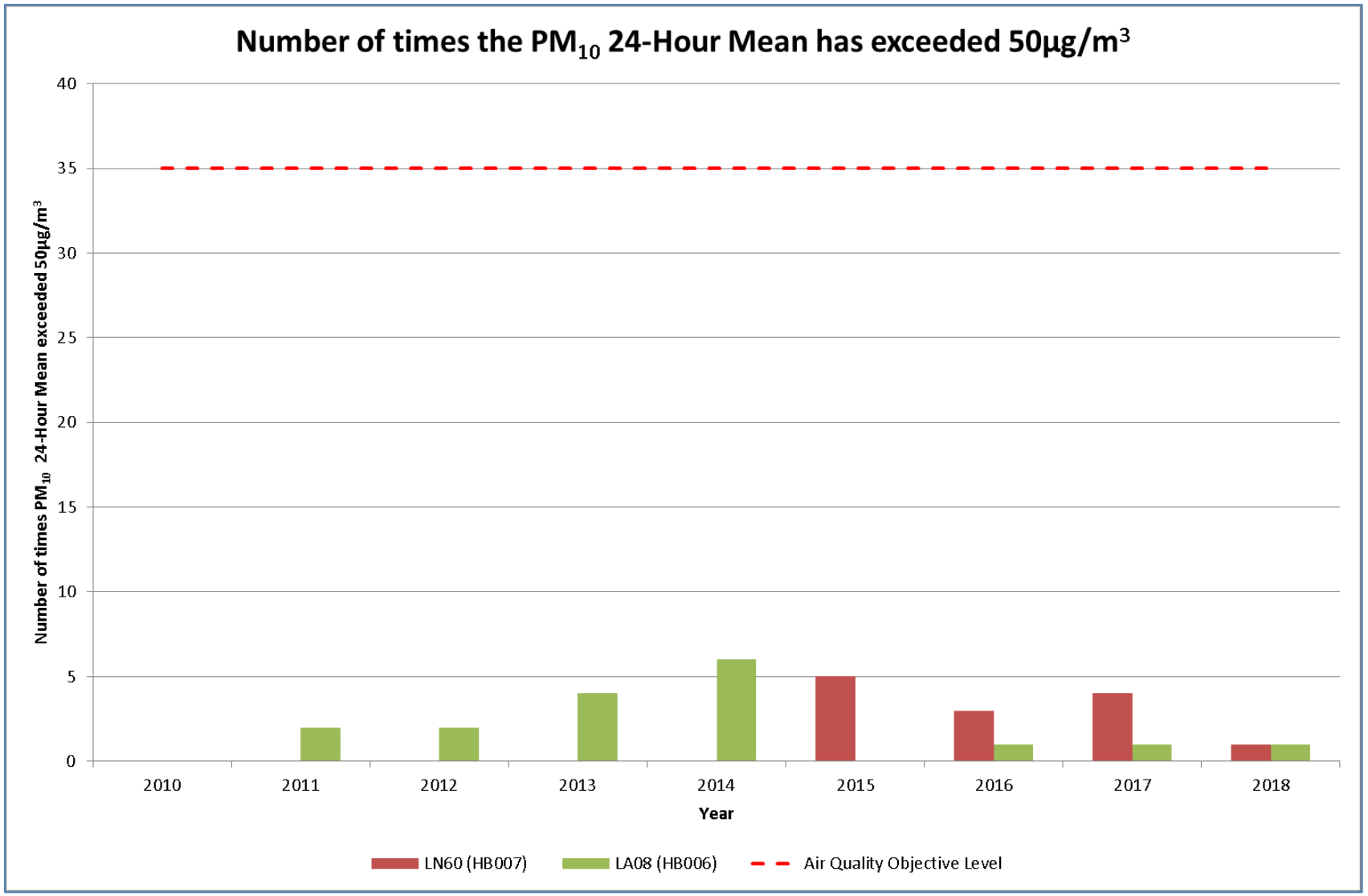


Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
				2014	2015	2016	2017	2018
LN60 *(HB007)*	Roadside	98	98	NDA	9	10	10	10

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

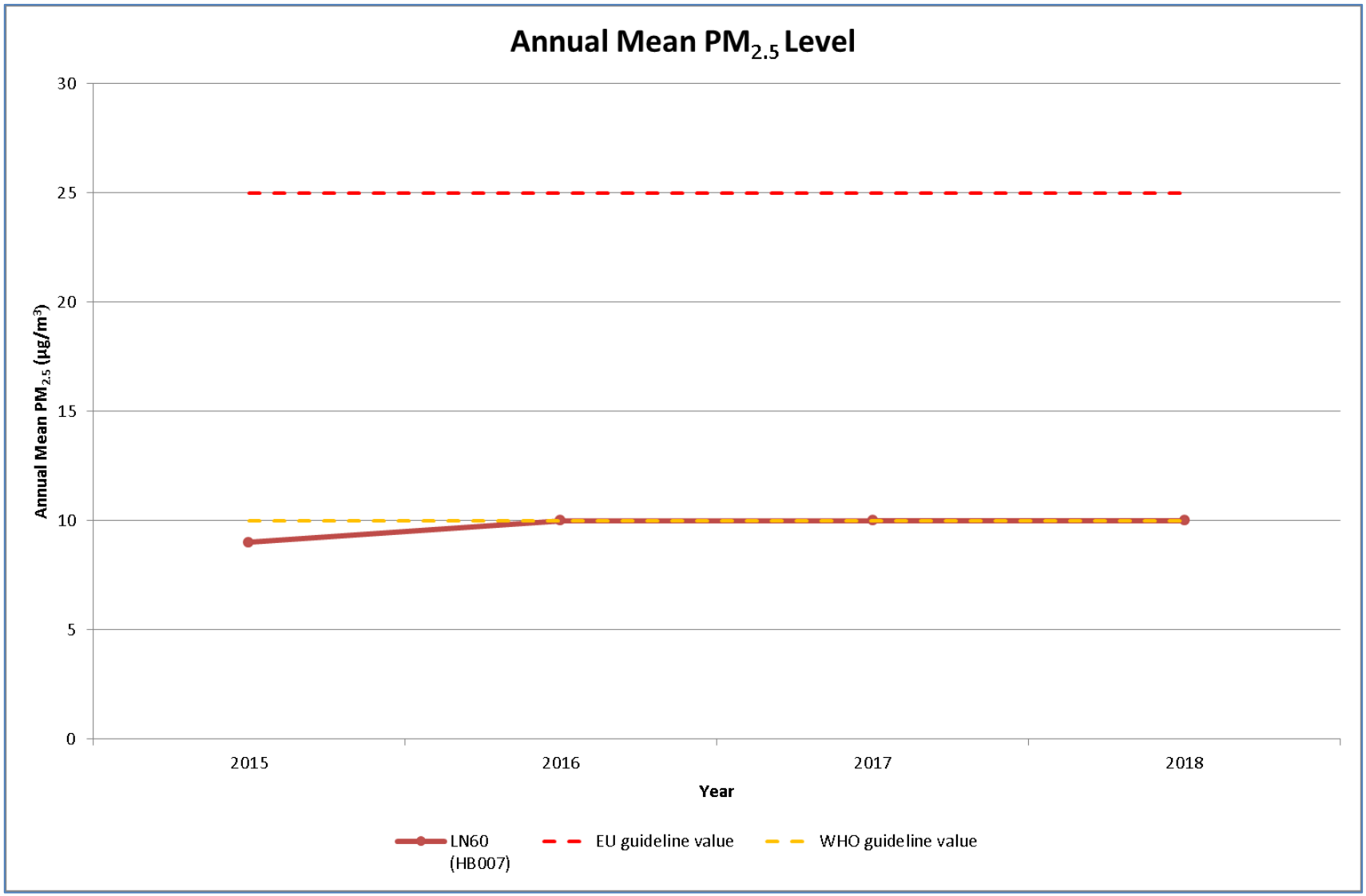
Notes:

(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.

Figure A.5 – Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO_2 Monthly Diffusion Tube Results – 2018

a) Luton Borough Council (LBC) sites

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 (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
LN07	25.17	30.36	28.77	23.63	*0.47**	*0.45**	-	25.11	26.60	35.97	33.70	36.60	29.5	27.5	26.8
LN11	32.43	35.67	37.37	29.96	37.98	36.60	34.87	35.20	34.75	44.48	36.97	37.38	36.3	33.8	-
LN15	18.27	26.88	34.77	23.04	22.72	-	27.57	26.11	30.13	32.12	33.51	34.62	28.2	26.2	-
LN16	20.71	32.85	38.31	27.21	31.18	22.10	31.24	30.25	34.31	37.58	37.08	38.11	32.2	30.0	-
LN17	26.63	39.80	43.19	31.28	41.07	37.73	31.35	25.89	28.03	38.46	50.84	38.30	36.5	33.9	30.9
LN18	19.42	24.91	33.68	23.31	29.34	24.01	23.04	18.68	17.46	30.54	33.86	30.22	26.0	24.2	-
LN22	16.68	23.88	35.45	19.51	17.95	13.30	19.55	18.66	22.13	26.50	32.27	29.42	23.2	21.6	-
LN23	23.97	30.74	28.73	32.78	28.42	25.60	34.65	31.63	34.29	38.28	32.24	37.94	31.9	29.7	27.1
LN24	14.95	25.51	25.70	17.00	23.57	10.97	17.92	16.30	18.71	25.32	34.26	27.98	21.8	20.3	-
LN25	13.81	34.22	29.94	22.10	14.75	48.31	27.33	25.60	31.57	35.93	34.53	36.16	30.2	28.1	22.4
LN26	17.50	21.88	22.96	16.95	15.11	12.46	18.08	17.40	20.28	24.38	26.77	44.99	21.7	20.2	-
LN27	14.12	37.21	33.29	23.70	18.78	31.60	29.87	26.67	27.34	38.03	41.67	32.70	30.3	28.1	24.7
LN28	18.42	48.50	42.94	37.12	61.29	39.31	51.59	44.35	45.17	47.77	*0.47**	40.77	43.4	**40.3**	27.5

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 (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
LN52	16.93	52.79	49.08	42.72	32.00	*1.01**	47.10	40.66	37.53	51.16	52.49	44.98	42.5	39.5	-
LN53	22.10	34.35	35.58	27.71	24.03	19.60	31.88	27.79	31.56	35.50	34.72	34.99	30.3	28.2	-
LN54	18.45	31.69	32.20	25.58	22.74	19.58	32.82	31.54	-	35.13	35.82	-	28.6	26.6	-
LN55	15.69	33.29	33.05	22.26	*0.47**	*0.90**	-	31.86	34.89	34.88	39.90	32.90	31.0	28.8	-
LN56	14.49	37.93	31.56	24.01	22.87	18.78	29.69	29.84	28.00	33.29	38.15	65.90	31.9	29.7	-
LN61	21.02	39.73	42.98	36.61	41.62	36.20	45.99	36.58	39.06	46.91	48.74	48.65	41.2	38.3	33.4
LN62	30.15	61.19	45.16	35.12	43.17	33.12	43.00	39.57	42.64	49.93	44.81	45.32	43.3	**40.3**	34.8
LN63	22.89	49.89	41.60	41.46	40.08	37.34	56.11	44.99	49.88	48.87	52.54	42.44	44.9	**41.8**	35.9
LN64	14.70	34.60	34.62	26.30	30.91	29.50	-	26.38	28.46	35.57	31.80	39.59	30.2	28.1	-
LN65	18.00	29.88	-	19.08	27.18	24.66	24.42	21.48	24.89	-	29.71	31.41	25.1	23.3	23.0
LN66	21.69	40.67	39.63	29.10	34.05	24.84	37.05	38.10	40.70	-	40.57	42.67	35.4	32.9	29.7
LN67	20.84	47.72	52.11	44.42	52.80	46.53	49.78	39.93	40.76	43.95	*0.47**	47.68	44.2	**41.1**	-
LN68	18.91	37.37	36.84	28.51	34.31	31.57	31.30	32.83	35.65	34.89	37.79	37.61	33.7	31.4	-
LN69	20.85	34.25	32.87	27.48	32.97	27.44	32.46	30.66	30.23	36.54	34.72	35.22	31.8	29.5	-
LN70	26.22	37.73	37.28	29.20	31.20	27.73	36.32	32.05	33.07	36.59	35.31	34.68	33.4	31.1	-
LN71	16.81	39.80	33.62	28.90	35.37	30.47	36.09	29.89	34.95	39.12	35.27	34.53	33.6	31.2	-
LN72	31.12	-	-	38.02	32.86	22.74	34.85	32.30	31.91	35.01	34.31	37.17	33.0	30.7	-
LN73	27.26	42.96	43.97	45.15	39.61	32.11	43.69	38.25	39.41	37.21	44.18	44.89	40.4	37.6	-
LN74	17.01	38.06	37.84	33.37	41.08	32.53	44.53	39.72	39.61	44.38	41.20	40.08	38.3	35.7	-

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 (0.93) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
LN75	19.02	43.30	40.19	32.84	40.65	34.81	42.20	38.12	37.21	47.37	45.44	40.38	39.3	36.6	-
LN76	50.99	36.98	34.43	27.52	37.32	36.14	30.66	25.10	24.87	35.88	31.45	34.68	33.1	30.8	-
LN77	24.97	36.22	36.38	32.87	30.07	26.46	39.39	37.98	33.72	41.79	42.81	42.46	35.9	33.4	-
LN78	22.28	39.73	36.25	25.68	-	21.08	-	27.23	29.13	31.77	36.03	39.34	30.9	28.7	-
LN79	15.06	47.33	40.52	36.20	37.62	36.81	36.15	32.54	-	40.73	39.98	78.19	40.1	37.3	-
LN80	25.44	42.82	40.38	30.04	47.38	35.27	37.08	27.56	30.51	37.31	*0.47**	81.38	39.6	36.8	-
LN81	22.30	40.10	36.69	37.91	25.55	19.35	32.04	32.04	36.30	40.06	44.35	40.82	34.5	32.1	-
LN82	17.03	33.34	30.62	24.68	21.66	-	-	31.12	32.61	32.77	31.95	34.40	29.0	27.0	-
LN83	14.97	35.88	33.48	26.17	-	27.81	22.40	19.84	19.54	29.62	33.64	26.69	26.4	24.5	-
LN84	11.55	38.70	39.93	28.91	-	-	-	21.34	22.09	32.03	35.53	-	28.8	25.2	-
LN85	-	-	-	-	-	-	-	*340.52**	34.62	31.76	29.04	32.67	32.0	28.2	-
LN86	26.61	44.05	45.25	40.23	32.30	29.51	39.60	38.66	42.53	41.31	44.28	50.49	40.1	37.3	-

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

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

☒ **Where applicable, data has been distance corrected for relevant exposure**

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.**

* Excluded as outlier

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

(2) Distance corrected to nearest relevant public exposure.

b) London Luton Airport (LLA) sites

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 (0.92) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
LLA 1	38.73	46.29	48.65	39.83	44.23	33.63	*4.13**	55.61	57.78	60.55	58.61	63.71	49.8	**45.8**	-
LLA 2 (LA02)	35.90	45.24	37.42	38.92	43.51	39.22	38.36	41.37	42.36	44.58	39.98	46.21	41.1	37.8	-
LLA 3 (LA03)	30.35	35.81	30.86	22.74	22.35	21.29	20.52	20.89	22.48	31.48	31.31	30.13	26.7	24.6	-
LLA 4 (LA04)	29.85	24.74	20.65	17.53	10.70	9.32	15.09	19.65	19.79	19.20	25.78	27.25	20.0	18.4	-
LLA 5 (LA05)	41.57	45.86	46.39	42.27	45.81	43.48	43.72	40.05	40.42	45.34	47.89	44.22	43.9	**40.4**	-
LLA 6 (LA06)	37.01	42.24	37.28	38.85	34.27	26.16	40.42	40.65	37.23	39.29	37.3	47.71	38.2	35.1	-
LLA 7	49.49	50.40	48.06	47.71	44.77	30.61	45.27	-	51.10	58.54	41.84	52.84	47.3	**43.5**	-
LLA 8 (LA08)	34.56	41.12	36.74	33.59	35.32	29.04	32.23	30.39	30.11	36.74	40.65	39.56	35.0	32.2	-
LLA 9 (LA09)	18.55	18.05	14.81	10.49	8.88	6.47	7.52	8.33	7.97	11.71	18.75	14.35	12.2	11.2	-
LLA 10 (LA10)	18.50	18.67	18.35	14.17	6.51	4.37	9.66	9.89	9.23	13.42	22	16.15	13.4	12.3	-
LLA 11 (LA17)	14.70	21.06	19.93	13.65	12.59	8.98	13.05	13.68	14.67	18.29	23.29	22.45	16.4	15.1	-
LLA 12 (LA14)	42.75	44.77	47.19	39.46	*1.74**	27.16	36.07	37.00	32.81	40.78	48.84	52.34	40.8	37.6	-
LLA 13 (LA15)	28.53	34.85	32.66	27.75	22.22	15.83	22.92	26.42	24.46	28.05	33.52	36.31	27.8	25.6	-

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 (0.92) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
LLA 14	39.36	48.60	51.21	45.88	48.74	37.59	41.15	42.29	49.62	-	54.57	47.99	46.1	**42.4**	-
LLA 15	39.76	31.92	39.51	35.96	34.77	27.31	36.70	30.82	28.51	38.31	35.58	40.76	35.0	32.2	-
LLA 16	35.33	52.10	47.55	40.01	49.45	-	55.63	48.90	43.89	50.12	41.06	56.65	47.3	**43.5**	-
LLA 17	-	-	-	-	-	41.59	41.86	42.83	38.29	36.94	41.57	41.51	40.7	**40.4**	-
LLA 18	-	-	-	-	-	47.61	44.29	34.57	27.53	37.49	35.32	37.64	37.8	37.5	-

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

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

☒ **Where applicable, data has been distance corrected for relevant exposure**

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

Automatic Monitoring

The nitrogen dioxide analyser on Dunstable Road East (LN60) is subject to fortnightly routine calibration by a Luton Borough Council Officer. The co-located FIDAS particulate analyser does not require calibration.

All automatic monitoring data collected at the Dunstable Road East, London Luton Airport (LA08) and Luton A505 Roadside (CM2) sites is managed by Ricardo Energy & Environment using the quality control procedures utilised by Defra's national air quality network stations. These procedures represent best practice and fully meet the requirements set out in LAQM.TG(16). Ricardo Energy & Environment currently provide UKAS accredited quality control audits and data management services to all Defra national network (AURN) air quality monitoring stations.

All collected data is screened and scaled (based on site calibrations) and the final data set presented within this report (Figures C.1, C.2 and C.3) has benefitted from a full process of data ratification, including thorough additional data quality checks and a ratification process that corrects data for instrument sensitivity drift between routine calibrations.

Figure C.1 – 2018 Air Pollution Report – LN60: Luton Dunstable Road East (Site ID: HB007)

Air Pollution Report

Air Quality England

1st January to 31st December 2018

Luton Dunstable Road East (Site ID: HB007)

These data have been fully ratified

Only relevant statistics for LAQM are presented in the table. Cells with - indicate no data available or calculated.

Pollutant	NO µg/m³	NO_2 µg/m³	NO_x as NO_2 µg/m³	PM_{10} µg/m³	PM_{25} µg/m³
Number Days Low	-	365	-	356	355
Number Days Moderate	-	0	-	1	1
Number Days High	-	0	-	0	1
Number Days Very High	-	0	-	0	0
Max Daily Mean	178	83	348	63	55
Annual Max	468	156	855	96	74
Annual Mean	33	37	87	16	10
98th Percentile of daily mean	-	-	-	36	-
90th Percentile of daily mean	-	-	-	27	-
99.8th Percentile of hourly mean	-	114	-	-	-
98th Percentile of hourly mean	143	88	300	43	31
95th Percentile of hourly mean	100	77	225	34	24
50th Percentile of hourly mean	22	34	68	13	7
% Annual data capture	**99.78%**	**99.78%**	**99.78%**	**97.77%**	**97.77%**

Instruments:

PM_{10}: FIDAS

All gaseous pollutant mass units are at 20°C and 1013mb. Particulate matter concentrations are reported at ambient temperature and pressure. NO_X mass units are NO_X as NO_2 µg m-3

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Report produced by Ricardo Energy & Environment

Pollutant	Air Quality Standards regulations 2010	Exceedances	Days
PM_{10} particulate matter (Hourly measured)	daily mean > 50 microgrammes per metre cubed	1	1
PM_{10} particulate matter (Hourly measured)	Annual mean > 40 microgrammes per metre cubed	0	-
Nitrogen dioxide	Hourly Mean > 200 microgrammes per metre cubed	0	0
Nitrogen dioxide	Annual Mean > 40 microgrammes per metre cubed	0	-

Annual Graph

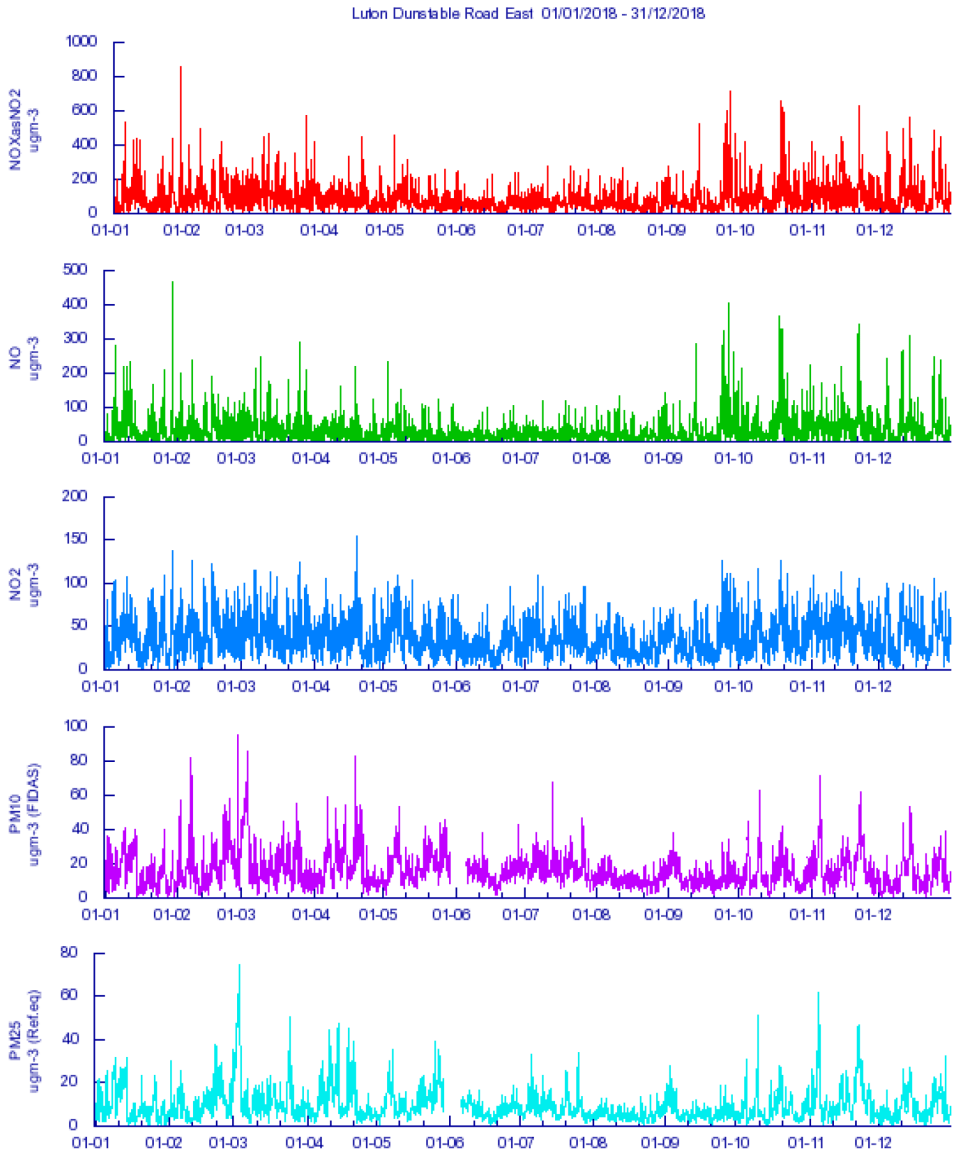

Figure C.2 – 2018 Air Pollution Report – LA08: London Luton Airport (Site ID: HB006)

Air Pollution Report

Air Quality England

1st January to 31st December 2018

London Luton Airport (Site ID: HB006)

These data have been fully ratified

Only relevant statistics for LAQM are presented in the table. Cells with - indicate no data available or calculated.

Pollutant	PM_{10} µg/m³
Number Days Low	350
Number Days Moderate	1
Number Days High	0
Number Days Very High	0
Max Daily Mean	64
Annual Max	130
Annual Mean	17
98th Percentile of daily mean	33
90th Percentile of daily mean	25
98th Percentile of hourly mean	42
95th Percentile of hourly mean	33
50th Percentile of hourly mean	16
% Annual data capture	**96.38%**

Instruments:

PM_{10}: BAM Gravimetric Equivalent (correction applied)

All gaseous pollutant mass units are at 20°C and 1013mb. Particulate matter concentrations are reported at ambient temperature and pressure. NO_X mass units are NO_X as NO_2 µg m-3

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Report produced by Ricardo Energy & Environment

Pollutant	Air Quality Standards regulations 2010	Exceedances	Days
PM_{10} particulate matter (Hourly measured)	daily mean > 50 microgrammes per metre cubed	1	1
PM_{10} particulate matter (Hourly measured)	Annual mean > 40 microgrammes per metre cubed	0	-

Annual Graph

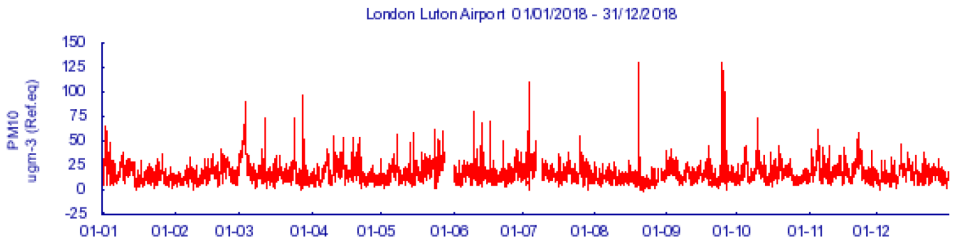


Figure C.3 – 2018 Air Pollution Report – CM2: Luton A505 Roadside (Site ID: LUTR)

Air Quality England

Air Pollution Report

1st January to 31st December 2018

(Site ID: LUTR)

These data have been fully ratified

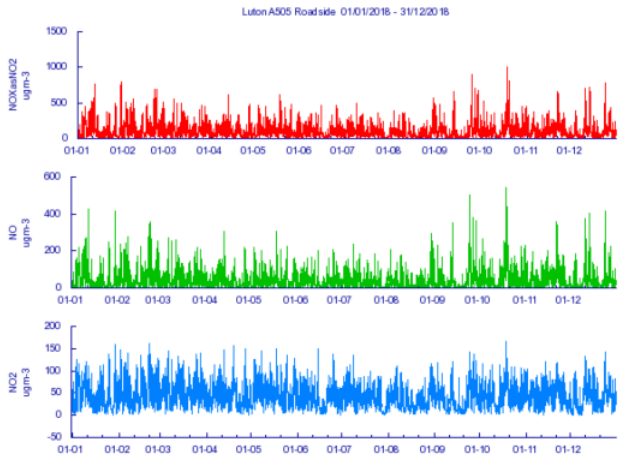
Only relevant statistics for LAQM are presented in the table. Cells with - indicate no data available or calculated.

Pollutant	NO µg/m³	NO_2 µg/m³	NO_x as NO_2 µg/m³
Number Days Low	-	365	-
Number Days Moderate	-	0	-
Number Days High	-	0	-
Number Days Very High	-	0	-
Max Daily Mean	211	89	401
Annual Max	545	165	1,000
Annual Mean	44	43	111
99.8th Percentile of hourly mean	-	142	-
98th Percentile of hourly mean	197	108	396
95th Percentile of hourly mean	144	92	309
50th Percentile of hourly mean	28	39	83
% Annual data capture	**99.42%**	**99.18%**	**99.18%**

All gaseous pollutant mass units are at 20°C and 1013mb. Particulate matter concentrations are reported at ambient temperature and pressure. NO_X mass units are NO_X as NO_2 µg m-3

Pollutant	Air quality standard	Exceedances	Days
Nitrogen dioxide	Hourly Mean > 200 microgrammes per metre cubed	0	0
Nitrogen dioxide	Annual Mean > 40 microgrammes per metre cubed	1	-

Annual Graph



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Report produced by Ricardo Energy & Environment

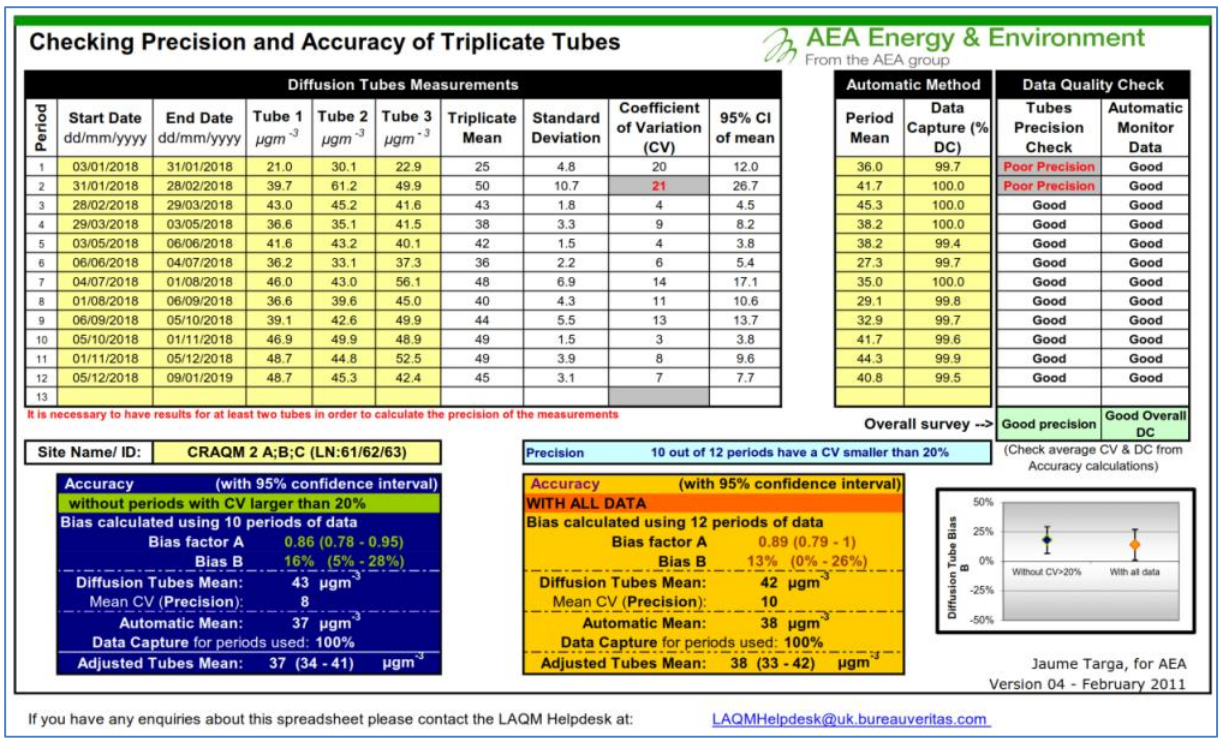
Diffusion Tube Analysis

The tubes deployed by Luton Borough Council are supplied by Gradko International Ltd. and use a preparation of 20% Triethanolamine (TEA) in deionised water. The exposed tubes are analysed in accordance with Gradko's documented in-house *Laboratory Method GLM7* which complies with the guidelines set out in Defra's *'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance'*. The analysis of diffusion tube samples to determine the amount of nitrogen dioxide present on the tubes is within the scope of their UKAS schedule. Gradko participates in the AIR NO_2 PT scheme, the results of which indicate that during 2018 100% of QC samples were analysed satisfactorily. During the same period, reported nitrogen dioxide diffusion tube collocation studies indicate that the laboratory achieved good precision in 28 out of 30 studies where tubes prepared with 20% TEA in water were used.

Using the AEA_DifTPAB_v04.xls spreadsheet published on the Defra LAQM Support website to check the precision of collocated tubes, the results for the triplicate tubes collocated with the continuous analyser on Dunstable Road East were shown to demonstrate *"Good precision"* (see Figure C.4).

The tubes deployed by London Luton Airport are also supplied by Gradko International Ltd. but use a preparation of 50% TEA in acetone. During 2018, the laboratory achieved good precision in all 8 reported collocation studies where 50% TEA in acetone tubes were used.

Figure C.4 – Precision and Accuracy of Diffusion Tubes Collocated with the NO_2 Analyser on Dunstable Road East (LN60)



Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	03/01/2018	31/01/2018	21.0	30.1	22.9	25	4.8	20	12.0
2	31/01/2018	28/02/2018	39.7	61.2	49.9	50	10.7	21	26.7
3	28/02/2018	29/03/2018	43.0	45.2	41.6	43	1.8	4	4.5
4	29/03/2018	03/05/2018	36.6	35.1	41.5	38	3.3	9	8.2
5	03/05/2018	06/06/2018	41.6	43.2	40.1	42	1.5	4	3.8
6	06/06/2018	04/07/2018	36.2	33.1	37.3	36	2.2	6	5.4
7	04/07/2018	01/08/2018	46.0	43.0	56.1	48	6.9	14	17.1
8	01/08/2018	06/09/2018	36.6	39.6	45.0	40	4.3	11	10.6
9	06/09/2018	05/10/2018	39.1	42.6	49.9	44	5.5	13	13.7
10	05/10/2018	01/11/2018	46.9	49.9	48.9	49	1.5	3	3.8
11	01/11/2018	05/12/2018	48.7	44.8	52.5	49	3.9	8	9.6
12	05/12/2018	09/01/2019	48.7	45.3	42.4	45	3.1	7	7.7
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
36.0	99.7	Poor Precision	Good
41.7	100.0	Poor Precision	Good
45.3	100.0	Good	Good
38.2	100.0	Good	Good
38.2	99.4	Good	Good
27.3	99.7	Good	Good
35.0	100.0	Good	Good
29.1	99.8	Good	Good
32.9	99.7	Good	Good
41.7	99.6	Good	Good
44.3	99.9	Good	Good
40.8	99.5	Good	Good
Overall survey -->		Good precision	Good Overall DC

(Check average CV & DC from Accuracy calculations)

Site Name/ ID: CRAQM 2 A;B;C (LN:61/62/63)

Precision: 10 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 10 periods of data
Bias factor A 0.86 (0.78 - 0.95)
Bias B 16% (5% - 28%)
Diffusion Tubes Mean: 43 µgm^{-3}
Mean CV (Precision): 8
Automatic Mean: 37 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 37 (34 - 41) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 0.89 (0.79 - 1)
Bias B 13% (0% - 26%)
Diffusion Tubes Mean: 42 µgm^{-3}
Mean CV (Precision): 10
Automatic Mean: 38 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 38 (33 - 42) µgm^{-3}

Jaume Targa, for AEA
Version 04 - February 2011

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

Diffusion Tube Bias Adjustment

As well as evaluating the precision of the collocated diffusion tubes, corresponding autoanalyser data was input into AEA_DifPAB_v04.xls to calculate a local bias adjustment factor of 0.86 for the LBC diffusion tubes (see Figure C.4).

Consulting the *National Diffusion Tube Bias Adjustment Factor Spreadsheet Version 03/19* published on the Defra LAQM Support website, for Gradko during 2018 a national bias adjustment factor of 0.93 was obtained for the LBC tubes (20% TEA in water - based on 30 studies; Figure C.5) and 0.92 for LLA tubes (50% TEA in acetone – based on 8 studies; Figure C.6).

Although there is only 7.8% difference between the two LBC adjustment values, the choice of local or national bias correction factor does have a noticeable impact on the 2018 diffusion tube results – as can be seen in Table C.1.

If the locally derived factor is used, when compared with the previous year the measured annual mean NO_2 level decreases at all but two sites (*LN79 – Castle Street 2* and *LN80 – Windsor Street*, which increase and remain unchanged respectively) and no sites exceed the annual mean NO_2 air quality objective level of 40µg/m^3. However, if the national factor is used the number of sites showing a reduction compared to 2017 reduces to 33, with three showing an increase (*LN72*, *LN79* & *LN80*) and a further

seven remaining unchanged (*LN07, LN11, LN18, LN26, LN63, LN71 & LN83*) when rounded to the nearest integer. In addition to this, using the national factor the air quality objective for annual mean NO_2 is exceeded at three unique locations (*LN28 – Caddington Road*, *LN62/63 – CRAQM2 [co-located]* and *LN67 – Castle Street*).

Having given due consideration to the guidance in Box 7.11 of LAQM.TG16, a decision was made to take a precautionary approach and apply the national coefficient.

Table C.1 – Comparison of diffusion tube output obtained using local and national bias correction factors

	Local	National
Bias Correction Factor	0.86	0.93
Percentage Difference	7.8%	
Number of unique exceedances	0	3
Max	38.6µg/m^3	41.8µg/m^3
Min	18.7µg/m^3	20.2µg/m^3
Range	19.9µg/m^3	21.6µg/m^3
Average	28.7µg/m^3	31.1µg/m^3
Higher than previous year (when rounded to the nearest integer)	1	3
Lower than previous year (when rounded to the nearest integer)	41	33
Unchanged (cf. 2017) (when rounded to the nearest integer)	1	7
Max increase (cf. 2017)	2µg/m^3 LN79 +5%	4µg/m^3 LN79 +13%
Max decrease (cf. 2017)	-9µg/m^3 LN54 -27%	-7µg/m^3 LN54 -21%
Average difference (cf. 2017)	-4.7µg/m^3 (-13.6%)	-2.3µg/m^3 (-6.6%)

Figure C.5 – National Bias Adjustment Factor – LBC (20% TEA in water)

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/19

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 spreadhseet 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 2019

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 (To undo your selection, choose (All) from the pop-up list)	Year[2] (To undo your selection, choose (All))	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[5]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in water	2018	R	Ards and North Down Borough Council	11	36	29	27.4%	G	0.78
Gradko	20% TEA in water	2018	R	Gedling Borough Council	12	33	32	5.6%	G	0.95
Gradko	20% TEA in water	2018	R	Lisburn & Castlereagh City Council	12	32	24	32.1%	G	0.76
Gradko	20% TEA in water	2018	R	Monmouthshire County Council	12	38	36	4.7%	G	0.96
Gradko	20% TEA in water	2018	UB	Northampton Borough Council	12	16	13	26.8%	G	0.79
Gradko	20% TEA in water	2018	R	Bedford Borough Council	11	32	29	9.2%	G	0.92
Gradko	20% TEA in water	2018	R	Borough Council of King's Lynn and West Norfolk	12	26	24	6.0%	G	0.94
Gradko	20% TEA in water	2018	R	Cheshire West and Chester	12	36	37	-2.5%	G	1.03
Gradko	20% TEA in water	2018	R	Cheshire West and Chester	12	43	40	6.1%	G	0.94
Gradko	20% TEA in water	2018	R	Fareham Borough Council	12	28	34	-17.5%	G	1.21
Gradko	20% TEA in water	2018	R	Fareham Borough Council	12	37	34	8.9%	G	0.92
Gradko	20% TEA in water	2018	R	Fareham Borough Council	12	32	28	12.6%	G	0.89
Gradko	20% TEA in water	2018	R	NOTTINGHAM CITY COUNCIL	12	35	34	0.3%	G	1.00
Gradko	20% TEA in water	2018	R	Bracknell Forest Borough Council	12	44	37	19.4%	G	0.84
Gradko	20% TEA in water	2018	R	Brighton & Hove City Council	9	48	50	-3.7%	G	1.04
Gradko	20% TEA in water	2018	R	Eastleigh Borough Council	11	28	32	-12.0%	G	1.14
Gradko	20% TEA in water	2018	R	Eastleigh Borough Council	12	42	38	10.2%	G	0.91
Gradko	20% TEA in water	2018	UB	Eastleigh Borough Council	12	27	28	-4.4%	G	1.05
Gradko	20% TEA in water	2018	R	Gateshead Council	12	29	25	13.9%	G	0.88
Gradko	20% TEA in water	2018	R	Gateshead Council	12	32	29	10.8%	G	0.90
Gradko	20% TEA in water	2018	R	Gateshead Council	9	40	41	-1.8%	G	1.02
Gradko	20% TEA in water	2018	R	Wokingham Borough Council	12	38	33	13.2%	G	0.88
Gradko	20% TEA in water	2018	R	Bath & North East Somerset	12	40	39	4.0%	G	0.96
Gradko	20% TEA in water	2018	R	Bedford Borough Council	10	30	27	8.8%	G	0.92
Gradko	20% TEA in water	2018	KS	Marylebone Road Intercomparison	11	93	85	9.3%	G	0.91
Gradko	20% TEA in water	2018	R	South Gloucestershire Council	12	21	20	6.3%	G	0.94
Gradko	20% TEA in water	2018	R	Thurrock Borough Council	12	53	52	2.3%	S	0.98
Gradko	20% TEA in water	2018	R	Thurrock Borough Council	12	34	30	15.1%	G	0.87
Gradko	20% TEA in water	2018	R	Thurrock Borough Council	12	31	24	28.8%	G	0.78
Gradko	20% TEA in water	2018	UB	Thurrock Borough Council	12	27	25	9.2%	S	0.92
Gradko	20% TEA in water	2018		**Overall Factor[3] (30 studies)**				Use		0.93

[1] 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 Groups.
From 2011 for Environmental Scientific Groups use ESG Glasgow.
From 2011 for Harwell Scientific Services use ESG Didcot.
For 2017 for SOCOTEC use ESG Didcot, as name changed mid year.
For 2018 SOCOTEC entered as Didcot and Glasgow. Glasgow analysis lab moved to Didcot mid 2018.
For Staffordshire CC SS/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.
Kirklees Council stopped providing diffusion tubes in the middle of 2016.

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

[3] Overall factors have been calculated using orthogonal regression to allow for uncertainty in both the automatic monitor and diffusion tube. The uncertainty of the diffusion tube has been assumed to be double that of the automatic monitor.

[4] If you have your own co-location study, please send your data to us, so that it can be included here. If this is not possible, but you wish to combine these factors with your own, select and copy the relevant data from this spreadsheet and paste them into a new one (otherwise your calculations will include hidden data). Then add your own data and calculate the bias. To obtain a new correction factor that includes your data, average the bias (B) values, expressed as a factor, i.e. -16% is -0.16. Next add 1 to this value, e.g. -0.16 + 1.00 = 0.84 in this example, then take the inverse to give the bias adjustment factor 1/0.84 = 1.19. (This will not be exactly the same as the correction factor calculated using orthogonal regression as used in this spreadsheet, but will be reasonably close).

To add data download a questionnaire

[5] Where an annual data set falls into two years it has been ascribed to the year in which most of the data has fallen.

[6] Tube precision is determined as follows: G = Good precision - coefficient of variation (CV) of diffusion tube replicates is considered G when the CV of eight or more periods is less than 20%, and the average CV of all monitoring periods is less than 10%; P = Poor precision - CV of four or more periods >20% and/or average CV >10%; S = Single tube, therefore not applicable; na = not available.

Figure C. 6 – National Bias Adjustment Factor – LLA (50% TEA in acetone)

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/19

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 spreadhseet 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 2019

LAQM Helpdesk Website

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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 (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) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	50% TEA in acetone	2018	R	City of London	12	84	94	-10.7%	G	**1.12**
Gradko	50% TEA in acetone	2018	B	City of London	10	38	32	20.9%	G	**0.83**
Gradko	50% TEA in acetone	2018	R	RBWM	12	39	36	7.8%	G	**0.93**
Gradko	50% TEA in acetone	2018	R	RBWM	12	35	34	2.2%	G	**0.98**
Gradko	50% TEA in acetone	2018	SU	Redcar and Cleveland Borough Council	9	18	10	83.3%	G	**0.55**
Gradko	50% TEA in acetone	2018	R	West Berkshire	10	40	37	10.5%	G	**0.91**
Gradko	50% TEA in acetone	2018	KS	Marylebone Road Intercomparison	11	91	85	6.5%	G	**0.94**
Gradko	50% TEA in acetone	2018	UB	Reading Borough Council	12	20	26	-22.6%	G	**1.29**
Gradko	50% TEA in acetone	2018		**Overall Factor[3] (8 studies)**				Use		**0.92**

[1] 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 Groups. From 2011 for Environmental Scientific Groups use ESG Glasgow. From 2011 for Harwell Scientific Services use ESG Didcot. For 2017 for SOCOTEC use ESG Didcot, as name changed mid year. For 2018 SOCOTEC entered as Didcot and Glasgow. Glasgow analysis lab moved to Didcot mid 2018. For Staffordshire CC SS/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. Kirklees Council stopped providing diffusion tubes in the middle of 2016.
[2] In this situation it would be reasonable to use data from the nearest year.
[3] Overall factors have been calculated using orthogonal regression to allow for uncertainty in both the automatic monitor and diffusion tube. The uncertainty of the diffusion tube has been assumed to be double that of the automatic monitor.
[4] If you have your own co-location study, please send your data to us, so that it can be included here. If this is not possible, but you wish to combine these factors with your own, select and copy the relevant data from this spreadsheet and paste them into a new one (otherwise your calculations will include hidden data). Then add your own data and calculate the bias. To obtain a new correction factor that includes your data, average the bias (B) values, expressed as a factor, i.e. -16% is -0.16. Next add 1 to this value, e.g. -0.16 + 1.00 = 0.84 in this example, then take the inverse to give the bias adjustment factor 1/0.84 = 1.19. (This will not be exactly the same as the correction factor calculated using orthogonal regression as used in this spreadsheet, but will be reasonably close). To add data download a questionnaire
[5] Where an annual data set falls into two years it has been ascribed to the year in which most of the data has fallen.
[6] Tube precision is determined as follows: G = Good precision - coefficient of variation (CV) of diffusion tube replicates is considered G when the CV of eight or more periods is less than 20%, and the average CV of all monitoring periods is less than 10%; P = Poor precision - CV of four or more periods >20% and/or average CV >10%; S = Single tube, therefore not applicable; na = not available.

Diffusion Tube Distance Correction

In June 2018, monitoring commenced at two new LLA sites:

- LLA 17 – *A1081 New Airport Way 1*; and
- LLA 18 – *A1081 New Airport Way 2*

In addition to this, during the course of the year:

- 4 month's data was lost for LN84 – *97 Lime Avenue* as a result of the repeated removal of the diffusion tube; and
- 7 month's data was lost for LN85 – *26 Belper Road* due difficulties accessing the monitoring location.

As less than 9 month's worth of data was available for all 4 of these monitoring locations, the mean NO_2 concentration obtained using the partial dataset for each tube was annualised in accordance with the procedure detailed in LAQM.TG Box 7.10.

This adjustment was undertaken using whole year datasets from the following AURN monitoring sites (all within a 50 mile radius of Luton and with data capture rates of in excess of 85%):

- London N. Kensington (UKA00253) – Type: Urban Background
- London Hillingdon (UKA00266) – Type: Urban Background
- London Haringey Priory Park South (UKA00568) – Type: Urban Background

Diffusion Tube Distance Correction

Wherever possible diffusion tube monitoring locations are selected to be representative of exposure. However, where this is not practicable measurements should be adjusted to estimate the nitrogen dioxide concentration at the nearest location relevant for exposure.

Where necessary, this correction has been undertaken using the *NO_2 Fall-Off with Distance Calculator Version 4.2* available on the Defra LAQM Support website along with mean background NO_2 concentrations obtained from the 2017-based background NO_2 map for 2018.

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

Figure D.1 – Map of LBC & Defra NO_2 Monitoring Locations and AQMA Boundaries (AQMA Nos. 1 & 2) by M1

Figure D.2 – Map of LBC NO_2 Monitoring Locations in South Luton by M1

Figure D.3 – Map of LBC NO_2 Monitoring Locations and AQMA Boundaries (AQMA No. 3) in the Town Centre

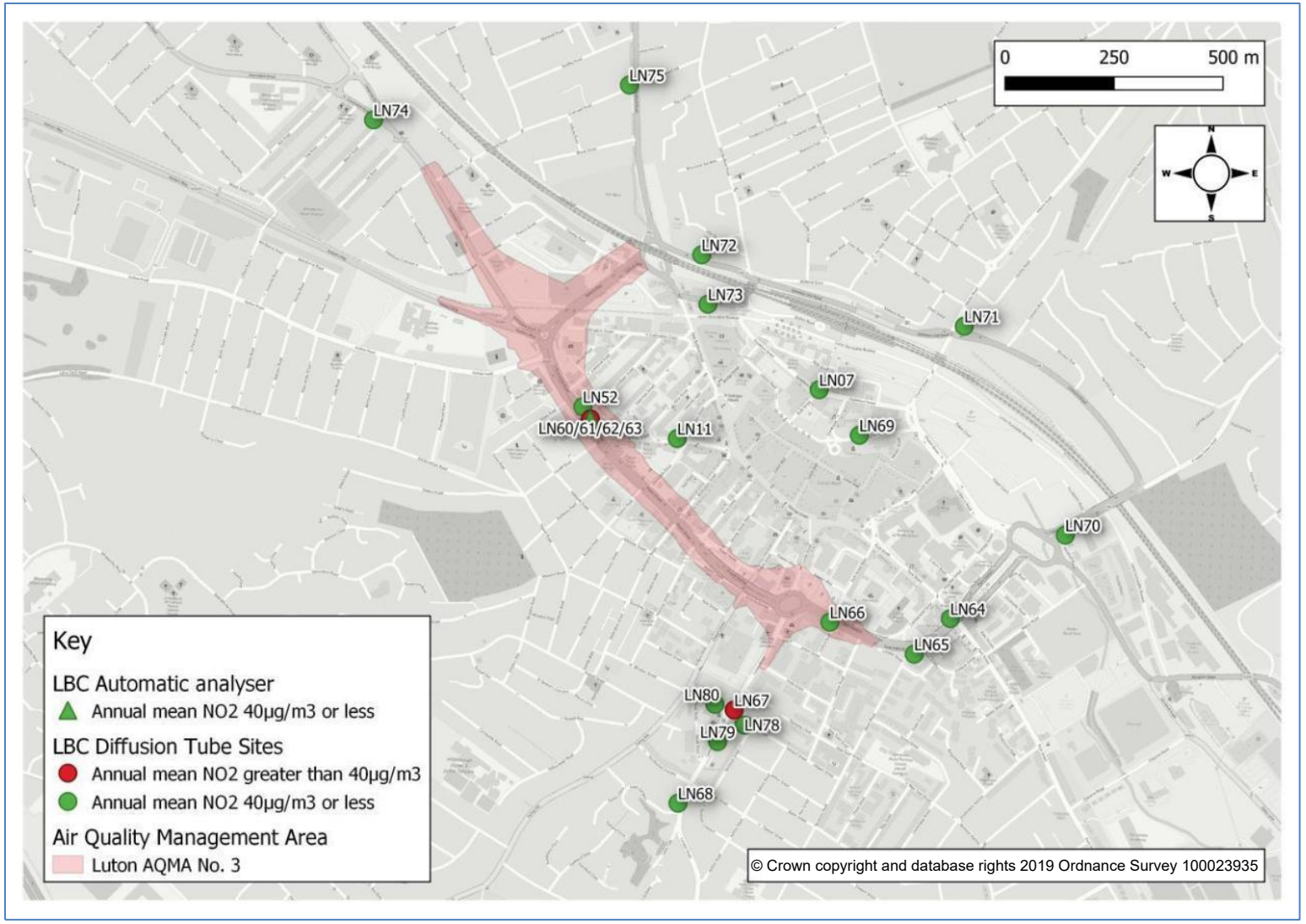
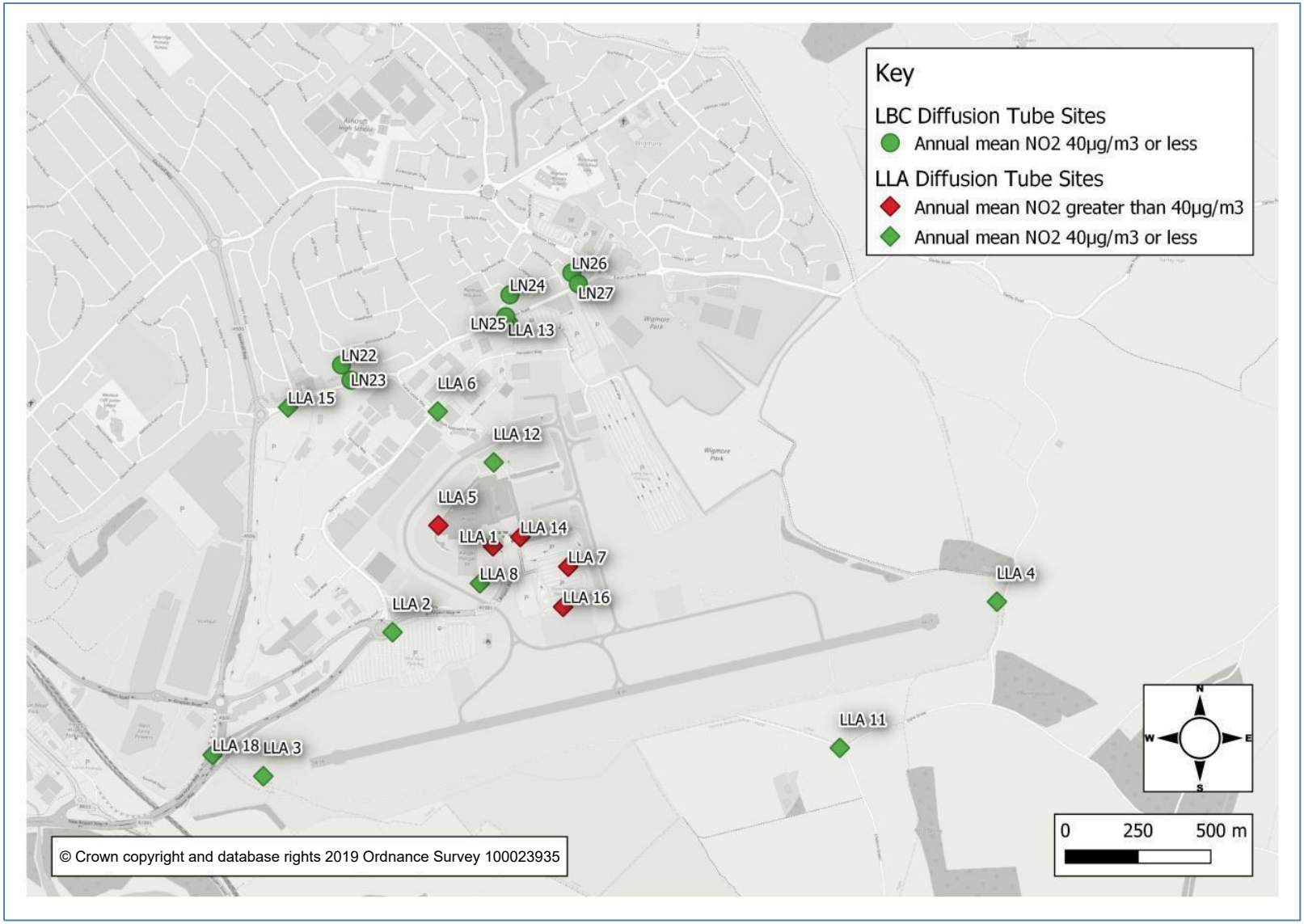


Figure D.4 – Map of LBC & LLA NO_2 Monitoring Locations around the Airport



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
BID	Business Improvement District
AURN	Automatic Urban and Rural Network – The UK's largest automatic air quality monitoring network and the main network used by Defra for compliance reporting against the Ambient Air Quality Directives
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
EV	Electric Vehicle
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LAQM.TG(16)	Local Air Quality Management Technical Guidance (TG16) [February 2018]
LBC	Luton Borough Council
LLA	London Luton Airport
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides

Abbreviation	Description
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
TEA	Triethanolamine
ULEV	Ultra-Low Emission Vehicle
UTMC	Urban Traffic Management and Control
VMS	Variable-message sign

References

- DEFRA, (2018). Local Air Quality Management: Technical Guidance (TG16) London [https://tinyurl.com/yaegeqpm]
- Luton Borough Council, (2011). Luton Local Transport Plan 3. Luton [https://tinyurl.com/y9r4vhkf]
- Luton Borough Council, (2017). Luton Local Plan 2011 – 2031. Luton [https://tinyurl.com/y9339fc8]