Guildford Borough Council

2016 Air Quality Annual Status Report (ASR)

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

September 2016

Local Authority Officer	Gary Durrant
Department	Health and Community Care Services
Address	Millmead House, Millmead, Guildford, Surrey GU2 4BB
Telephone	01483-444373
E-mail	Gary.Durrant@guildford.gov.uk
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Executive Summary: Air Quality in Our Area

Overview of Air Quality in Guildford Borough

This overview is a summary of the state of air quality in the Guildford Borough Council (GBC) area and progress on actions that the local authority and others are taking to improve air quality. The report covers of air quality monitoring in the years 2014 and 2015.

The principal issues and findings of the Annual Status report are:

- Monitoring of Nitrogen Dioxide (NO2) using passive diffusion tubes during 2014 and 2015 indicates that with one exception all sites have levels below the air quality objective levels.
- A study of a specific area of the B3000 road in the village of Compton was carried out following local concerns. Whilst five locations are well within the annual objective levels, one position constantly revealed concentrations in exceedance at the façade of a residence. Further monitoring and modelling is taking place to ascertain whether any further action is required.
- Guildford Borough Council (GBC) recognises that the significant source of air pollution in the borough is from road traffic. We have set up a number of new monitoring locations in areas where road traffic may have an influence on sensitive receptors.
- Surrey County Council (SCC) and the Highways Agency (HA) are the highway authorities; in addition, GBC has produced a Guildford Borough Transport Strategy 2016, which includes a section on air quality.
- GBC have established an Air Quality Monitoring Task and Finish Scrutiny Group, where councillors are working with officers together to examine our duties and commitments under the Local Air Quality Management (LAQM) regime.
- GBC recognises the need to co-ordinate work with partners and the public in order to improve air quality. One of the targets for 2016 is to produce an Air Quality Strategy to address the key issues.

Air Quality in Guildford Borough

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].

History and Background

The Borough of Guildford, centred on the town of Guildford, has a population around 130,000, approximately half of which live within the urban area. The main source of emissions in Guildford Borough is from motor vehicles. Four major roads pass through the Borough. The M25 enters the Borough briefly at Wisley at its junction with the A3. The A3 runs from north to south through the Borough, linking with the A31, which joins the A331 Blackwater

[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

Valley Road. Whilst the land use is predominantly residential, there are a number of light industrial sites; to date there is no record of any significant air quality impact from these locations.

Guildford Borough established Smoke Control Areas in the 1960's covering approximately 12 square kilometres of the urban area.

Air Quality Review and Assessments from 2000 to 2014 concluded that based on the compliance with national air quality objective levels there was no requirement for GBC to declare an Air Quality Management Area. This Annual Status Report (ASR) considers the monitoring data over the calendar years 2014 and 2015 and compares the levels measured with national objectives. This report also considers actions to improve air quality, including GBC's measures to reduce emissions and vehicle use.

Previous automatic monitoring for both particulate matter (PM_{10}) and nitrogen dioxide (NO_2) monitoring provided sufficient historical data to demonstrate that exceedance of the objective values was highly unlikely. Monitoring of NO_2 using passive diffusion tubes continued at 17 locations. GBC does not monitor any other pollutants.

With the exception of one site, there have been no exceedances of either the short or long-term nitrogen objective value at any site with relevant exposure. One site required further investigation in the form of a Detailed Assessment and that work commenced in 2015. The area in question is the B3000, which passes through the village of Compton. Monitoring during 2015 using six diffusion tubes showed exceedance of the objective levels at only one. Levels at this site are constantly above the objective level.

GBC recognises that in order to deal with air quality, the co-operation of Surrey County Council (SCC), Highways Agency (HA) and the Environment Agency is vital. At officer level there is a Surrey Air Quality Group, where all eleven districts work with SCC to address statutory obligations and matters raised in the Surrey Air Quality Strategy 2016. Locally, the majority of the proposed actions can be found in the Guildford Borough Transport Plan 2016.

Actions to Improve Air Quality

Previous reports have stated that GBC and partner authorities have taken a number of initiatives to ease traffic congestion by linking car use with the promotion of public and alternative means of transport, these remain central to reducing pollution from vehicle exhaust emissions in Guildford. Park and ride schemes, car share schemes, car clubs, green scheme for electric vehicles, bus lanes, cycling and walking strategies and integrated transport plans, all form part of the overall approach.

Local Priorities and Challenges

GBC acknowledge and welcome that this and any future reports will focus on actions taken to improve air quality; to that effect, we recognise a number of challenges and have set out priorities in relation to those areas:

Challenge 1 – Clarify our approach to air quality

An air quality strategy will set out GBC's approach to local air quality and provide links to relevant transport plans:

- Produce a draft air quality strategy in line with the Surrey Air Quality Strategy 2016

Challenge 2 - Actions to improve air quality and monitor progress

The need to monitor the progress of actions and to quantify the results in terms of environmental benefit, including:

- Ensure compliance with Travel Plans linked to planning approvals.
- We will work through the Surrey Health and Wellbeing Board, Guildford Health and Wellbeing Board to encourage individual and organisational awareness of the need improve air quality by changing to cleaner transport and reducing motor vehicle emissions.

Challenge 3 - Monitoring and reporting of air pollution levels:

Monitoring of air pollution levels at existing and new locations with the results being published on the GBC website:

- Revise and expand the nitrogen dioxide diffusion tube coverage to include new locations on arterial roads and villages potentially or reportedly affected by traffic congestion
- Annual review of locations of diffusion tubes
- Carry out further diffusion tube monitoring and a modelling of nitrogen dioxide and particulates in the village of Compton
- Ensure that the GBC website contains the most up to date results.

Challenge 4 - Reducing vehicle emissions:

GBC to take actions to reduce vehicle emissions within existing duties and responsibilities:

- Review the Council's vehicle fleet and officer's transport emissions
- Ensure that emissions are a factor in procurement of GBC vehicles
- Review how taxi licensing could be used to reduce vehicle emissions
- Promote the benefits of low emission vehicles
- Encourage an increase in low emission vehicles.

Challenge 5 – Planning controls on development

The requirement for additional housing and associated infrastructure across GBC and the south east of England, represents significant challenge of maintaining and improving air quality. The Local Plan for Guildford Borough is a key document.

- Planning applications - Where a proposed development is likely to impact local air quality, it must include an air quality assessment and Environmental Health/ Planning should ensure the implementation of relevant control measures
- Travel plans associated with planning approvals should be monitored and compliant
- Conduct air quality modelling exercises for six major sites identified in the Local Plan and major changes to road systems.

How to Get Involved

Guildford Borough has a number of ways that the public can get involved in air quality issues (relevant web links); they include:

1. Reporting bonfires or air pollution incidents to our Customer Service Centre, to enable investigation under the Environmental Protection Act 1990 or other related legislation. http://www.guildford.gov.uk/bonfires

2. Reporting on residential localities where traffic congestion is significant, in order that monitoring of air pollution can be considered under the Annual Status Report mechanism. https://www.guildford.gov.uk/article/14060/Report-air-quality

3. Use cleaner (ultra-low emission) vehicles. Advice is available from The Office for Low Emission Vehicles https://www.gov.uk/government/organisations/office-for-low-emission-vehicles

4. Reduce vehicle use, by participation in sustainable transport options; public transport, park and ride, walking, cycling, car clubs and car sharing. http://www.guildford.gov.uk/carclubs https://www.surreycc.gov.uk/roads-and-transport/buses-and-trains/guildford-park-and-ride

5. Ensure compliance with Smoke Control Orders, by only using authorised appliances and fuel. http://www.guildford.gov.uk/article/1734/Smoke-control-area

6. Participate in the activities of Guildford Environmental Forum. http://www.gefweb.org.uk/index.html

7. Comment on the potential impact of proposed developments in the Borough via the planning process. http://www.guildford.gov.uk/commentonaplanningapplication

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1 Local Air Quality Management

This report provides an overview of air quality in Guildford Borough during 2014 and 2015. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Guildford 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 the objectives.

GBC currently does not have any AQMAs.

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

GBC has implemented a number of measures during the current reporting years of 2014-15 designed to improve local air quality. GBC works with the Surrey Transport Plan (SCC), and although this prioritises AQMAs, it is also focuses on providing general improvements in air quality. GBC's priorities for the coming year are:

- The Guildford Borough Transport Strategy 2016 has an indicative programme which includes measures set out as far as 2034, actions anticipated within the current year are:
    - Guildford Town Centre Transport Package -improvements for buses and active modes have been planned
    - The car clubs will be expanded and utilise more electric vehicles
    - Increase train service frequency on the North Downs line to two fast trains per hour between Reading and Gatwick, via Guildford
    - Increase number of electric charging points in car parks-
        - The Bedford Road and Millmead car parks are due to have additional charging points installed during 2016.
- Main internal GBC measures as part of our commitment to improving air quality:
    - Provision of two electric pool cars for staff use and associated charging points
    - Provide more guidance on Smoke Control Orders, Travel Plans and other legislative requirements via the GBC website
    - Improve air quality monitoring information on GBC website- the data will be displayed as raw unadjusted levels to keep the public more informed
    - Where practicable, procurement of ultra-low emission fleet vehicles is encouraged
    - Continue to encourage home working and report on the environmental benefits.

Details of all measures completed, in progress or planned are set out in Table 2.1. More detail on these measures can be found in the:

- Surrey Transport Plan: Air Quality Strategy (Surrey County Council, 2011)
- Guildford Borough Transport Strategy 2016
- Guildford Borough Cycling Plan 2015.

Key completed measures are:

- GBC has a green scheme for car parking, which heavily discounts parking of electric vehicles. http://www.guildford.gov.uk/carparks
- The Guildford Borough Transport Strategy 2016 was published in June 2016.

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
1	Guildford Borough Park and Ride sites	Alternatives to private vehicle use	Bus based Park & Ride	SCC/GBC	N/A	2015	Restrain or reduce traffic	There are four park and ride sites: Artington, Merrow, Onslow and, Spectrum.	2015	Further Park and Ride schemes are outlined in the Local Plan
2	GBC Transport policy	Alternatives to private vehicle use	Car & lift sharing schemes	SCC/GBC	1999	Ongoing	Restrain or reduce traffic	GBC have a register of car sharers.	Ongoing	
3	Car Clubs in Guildford Town Centre	Alternatives to private vehicle use	Car Clubs	SCC/GBC	2016	2016	Restrain or reduce traffic	GBC are working in partnership with SCC and Enterprise Car Club to develop the scheme, with funding from the Department for Transport. There are 8 car clubs in Guildford town centre, all vehicles are either low or ultra- low emission with at least 3 electric vehicles.	Ongoing	This should be encouraged in other parts of Guildford Borough
4	Environmental Protection Act 1990	Environmental Permits	Other	GBC	2015	2016	Control emissions at source	Updated cremators at Guildford Crematorium	2016	

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
5	GBC Air Quality Strategy	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	SCC/GBC	2016	2016	Targets within strategy	GBC needs to produce an air quality strategy to compliment the Surrey County Council Air Quality Strategy 2016	2017	
6	Smoke Control Orders compliance	Promoting Low Emission Plant	Regulations for fuel quality for low emission fuels for stationary and mobile sources	GBC	2016	2016	Compliance with statute	Guildford town centre has Smoke Control areas set up in 1960's.	Ongoing	Increase awareness of the areas on GBC website
7	GBC procurement of vehicles	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	GBC	2016	2016	Reduce emissions at source	GBC procurement of fleet and lease vehicles geared toward ultra-low emission vehicles where practicable.	Ongoing	
8	GBC procurement of vehicles	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	GBC	2016	2016	Reduce emissions at source	Two electric pool cars (Nissan Leaf) have been purchased and charging points are due to be installed at GBC Millmead offices.	August 2017	
9	Council Transport policy	Promoting Travel Alternatives	Encourage / Facilitate home-working	GBC	1999	Ongoing	Restrain or reduce traffic	Subject to their duties council officers are encouraged to work from home.	Ongoing	Encourage reporting of participation and environmental benefit.

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
10	“	“	Promotion of cycling	GBC	2015	2016	Health and restrain or reduce traffic	Guildford Borough cycling plan 2015	Ongoing	
11	“	“	Promotion of walking	GBC	Ongoing	Ongoing	Health and restrain or reduce traffic	GBC walking strategy 2002 Walking for health	Ongoing	
12	“	“	School Travel Plans	SCC	Ongoing	Ongoing	Restrain or reduce traffic	These are usually voluntary or dealt with as part of planning approvals.	Ongoing	Compliance checks are required and need to be audited
13	“	“	Work Travel Plans	GBC	Ongoing	Ongoing	Restrain or reduce traffic	These are usually voluntary or dealt with as part of planning approvals.	Ongoing	Compliance checks are required and need to be audited.
14	GBC website	Public Information	Via leaflets, Via the Internet	GBC	2016	2016	Public perception of issues	Air quality page on GBC website – to be revised	December 2016	Provision of updated information on measured levels and how to reduce air pollution.
15	Green scheme parking fees for electric vehicles	Traffic Management	Emission based parking or permit charges	GBC	2015	2016	Reducing emissions	Owners of electric vehicles can apply for a parking permit to obtain reduced fees.	2017	Additional charging points to be installed in GBC car parks.

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
16	Road Investment Strategy schemes to tackle congestion on Strategic Road Network	"	Urban Traffic Control, Congestion management, traffic reduction	GBC/SCC	2016	Ongoing	Restrain or reduce traffic	Planning phase as part of the Guildford Borough Transport Strategy; includes a number of actions on the A3 junctions	2034	Long term objectives over the next 20 years
17	Guildford Town Centre Transport Package improvements for buses and active modes	Transport Planning and Infrastructure	Bus route improvements	SCC	2015	2016	Restrain or reduce traffic	Implementation phases are staggered; current bus targeted schemes are the A25/A320 Stoke crossroads improvement scheme including some bus priority	2017-18	
18	Improvements to cycling network	Transport Planning and Infrastructure	Cycle network	GBC/SCC	2015	2016	Alternative means of transport	Travel Smart in Surrey have used funding to improve and extend parts of the National Cycle Network in Guildford Borough	2016	

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
19	Great Western Railway increased service frequency on North Downs Line with introduction of a second fast service in each hour via Guildford rail station between Reading and Gatwick Airport	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	Great Western Railway	2015	2016	Alternative means of transport	Implementation phase is due to commence during 2016	May 2017	Implementation is on schedule
20	Increase cycle hire	Transport Planning and Infrastructure	Public cycle hire scheme	GBC/South-West Trains	2013	2013	Alternative means of transport	Cycle hire from Guildford mainline station. (Brompton bikes).	Implemented 2013	Consideration to expand to other stations in the Borough

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.

GBC is taking measures as shown in Section 2.2 to address air quality, any actions, which reduce emissions and vehicle use will have a significant impact on $PM_{2.5}$: . Whilst there are no plans to monitor $PM_{2.5,}$ GBC, along with a number of other Surrey authorities, are considering a county wide modelling exercise.

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

GBC has no automatic (continuous) monitoring sites.

3.1.2 Non-Automatic Monitoring Sites

GBC undertook non- automatic (passive) monitoring of NO_2 at 14 sites during 2014-2015. Six more sites were added in November 2014 making a total of 20 sites monitored in the year 2015-2016. Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for "annualisation" and bias. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Details of the diffusion tube monitoring carried out throughout GBC are shown in:

- Table A.2 and Graph A1 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 2014 and 2015 datasets of monthly mean values are provided in Appendix B.
- For the purposes of the report, monitoring in specific areas of the borough are reported as follows:

Guildford town centre locations

GD1 is a roadside location at Bridge Street. The location is of interest for short term exposure due to high pedestrian usage trying to gain access to the Guildford Station or the Town Centre. The annual mean results from diffusion tube monitoring exceeded 40µg/m3 in 2011 but has shown a decreasing trend since. The annual mean slightly increased in 2015, but at 33µg/m3 remained below the guidance value.

In 2010 report, the YMCA with first floor residential accomodation was identified as potential site of public exposure with regard to long term objective value. Assessment carried out in accordance with the procedure specified in TG(09) using the calculator tool, and at a background level of 28 ug/m3, a concentration of 32.0 ug/m3 was calculated. The annual mean objective was not considered to be exceeded, but in 2012, the council added another monitoring point GD13 approximately 6m from the nearest building façade (see map D2). Annual mean at this location was 40 ug/m3 in 2012. The concentration at the receptor was calculated to be 38.4 ug/m3 (reference: Air Quality Report 2013 http://www.guildford.gov.uk/media/16292/Air-Quality-Report-2013/pdf/Air_Quality_report_2013.pdf) . The air quality objective has not been exceeded in subsequent years.

Junction of Stoke Road/York Road, Guildford

GD2 and GD4 are located at York Road/Stoke Road junction. The NO_2 levels at both the locations remained below the air quality objective between 2011 – 2014 and were showing decreasing trend. The concentration at GD4 is slightly lower than GD2 as GD4 is normally not subjected to same degree of traffic buildup as GD2.
In 2015, the annual mean objective was exceeded at GD4. This is likely to be the result of additional queuingof traffic at a temporary set of traffic lights and one lane closure for a large part of the year during construction of a new retail store. We will therefore review data for this site during 2016.

Junction A3/M25, Wisley

This location (GD5) was selected to give an indication of background levels in an area of high traffic flow. As the nearest residential property is over 450 metres away it is not considered to be a site of relevant exposure

although the annual mean air quality objective for NO_2 consistently exceeded. This site location has been revised to be nearer residential property.

Compton Village B3000:

Six tubes have been in place during 2015. Five of these (C1,2,3,5,6) are significantly below objective levels but one (C4) exceeds this level. It is of note that the residential building façade is within 5m from the kerb and pollutant dispersal may be resticted.

Further assessment at this location is in progress and a review of tube locations has been carried out. Three new tubes locations have been added close to the location C4. The rest of the monitoring locations (C1,2, 3, 5 & 6) are discontinued. An air quality modelling exercise using Advanced Dispersion Modelling Software (ADMS) was commissioned in June 2016.

Validation

In future years, we will locate diffusion tubes near to the continuous monitoring station operated by Waverley Borough Council at the junction of Bear Lane and East Street, Farnham, Surrey (XOS 484087, YOS 146972), to test correlation of the annual mean measurement with that from a continuous automatic monitoring device.

Future monitoring site proposals

We aim to carry out further nitrogen dioxide diffusion tube monitoring at the following new sites during 2016/17:

1. Stoke Road, Guildford
2. High Street, Ripley
3. Newark Lane, Ripley
4. Elm Corner, Wisley
5. Horsham Road, Shalford
6. St Mary's Church Hall, Send Road, Send
7. Box and Holly Court, Send Road, Send
8. The Street, Tongham
9. Pitch Place, Worplesdon

Appendix A: Monitoring Results

Table A.1 – Details of Non-Automatic Monitoring Sites 2014-2015

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)
GD1	Bridge Street	Roadside	499269	149522	NO_2	N	NA	<5m	N	2 -3
GD2	York Road	Roadside	499799	149934	NO2	N	12m	<5m	N	2 -3
GD3	Josephs Road	Urban background	499659	150739	NO2	N	0m	>5m	N	2 -3
GD5	Wisley	Kerbside	507947	159099	NO2	N	NA	<1m	N	2 -3
GD6	The Chantry	Rural background	500385	148342	NO2	N	0m	120	N	2 -3
GD8	Down Lane	Roadside	496302	148429	NO2	N	NA	<5m	N	2 -3
GD9	A331, Ash	Roadside	488275	149859	NO2	N	NA	<5m	N	2 -3
GD10	The Garth	Urban background	488629	150032	NO2	N	0m	>5m	N	2 -3
GD11	Beckingham Road	Near Road	498133	150648	NO2	N	0m	8m	N	2 -3
GD13	YMCA	Kerbside	499305	149512	NO2	N	6m	<1	N	2 -3
GD14	Sandfields	Roadside	499800	149913	NO2	N	5m	<5	N	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)
C1	New Pond Road E	Kerbside	497005	146328	NO2	N	NA	<1	N	2 -3
C2	New Pond Road W	Kerbside	495411	147412	NO2	N	NA	<1	N	2 -3
C3	Compton 3	Near road	495509	147024	NO2	N	0m	6	N	2 -3
C4	Compton 4	Roadside	495437	147288	NO2	N	0m	<5	N	2 -3
C5	Compton 5	Roadside/near road	495498	147097	NO2	N	0m	8		2 -3
C6	Compton 6	Near road	495453	147206	NO2	N	0m	10		2 -3

(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.2 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2014 (%) (2)	Valid Data Capture 2015 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
						2011	2012	2013	2014	2015
GD1	Roadside	Diffusion Tube		100	83	42	37	35	31	33
GD2	Roadside	Diffusion Tube		83	67	39	37	39	25	33(3)
GD3	Urban background	Diffusion Tube		92	58	21	22	22	16	20(3)
GD5	Kerbside	Diffusion Tube		100	83	44	44	45	40	46
GD6	Rural background	Diffusion Tube		83	83	13	13	14	14	13
GD8	Roadside	Diffusion Tube		92	92	23	26	23	19	25
GD9	Roadside	Diffusion Tube		92	83	24	26	27	31	30
GD10	Urban background	Diffusion Tube		100	83	16	19	18	16	17
GD11	Near Road	Diffusion Tube		100	83	30	27	29	29	28
GD13	Kerbside	Diffusion Tube		100	83		40	35	31	38
GD14	Roadside	Diffusion Tube		92	33		35	37	30	42
C1	Kerbside	Diffusion Tube		17	83				22	28
C2	Kerbside	Diffusion Tube		17	83				32	28
C3	Near road	Diffusion Tube			67					21(3)
C4	Roadside	Diffusion Tube		50	83				67(3)	53
C5	Roadside/near road	Diffusion Tube			67					27(3)
C6	Near road	Diffusion Tube			67					17(3)

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

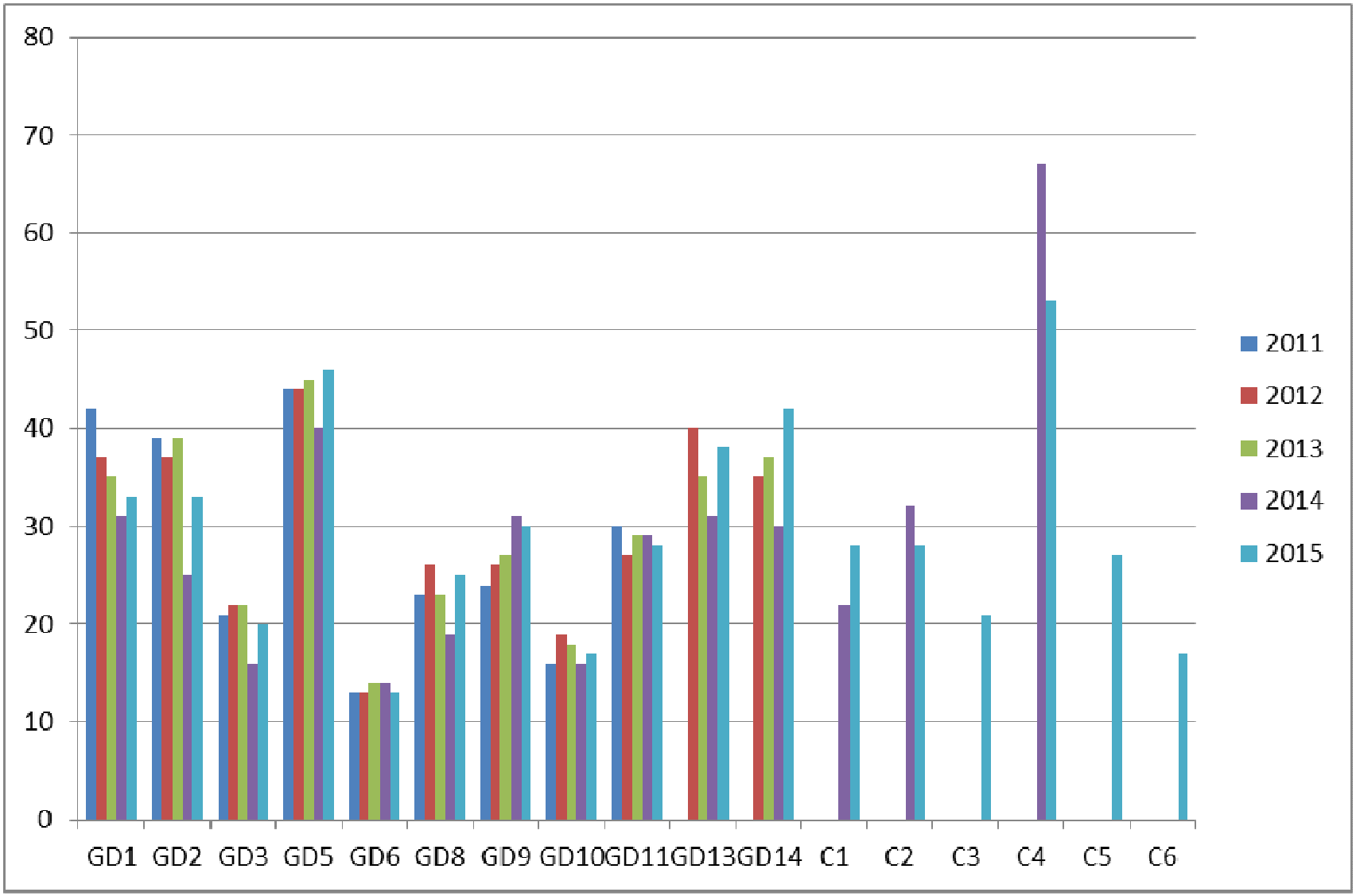
NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

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

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

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

Graph A1 – Trend in NO_2 Annual Mean for past five years (2011 – 2015)



Short-term to Long-term Data adjustment

A period adjustment (annualisation) calculation was carried out for the diffusion tube sites,2014 and 2015 with valid data capture less than 75% (75% is the threshold for satisfactory data capture according to Box 3.2 in LAQM.TG(09)). The details are covered in Appendix C of the report.

Appendix B: Full Monthly Diffusion Tube Results for 2014

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2014

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 (1)
GD1	36	34	35	34	23	32	34	28	33	31	42	37	33.25	31
GD2	42	no sample	no sample	35	40	37	39	27	43	41	32	36	37.2	25
GD3	22	20	25	22	19	21	24	16	no sample	20	17	19	20.45455	16
GD4	20	22	25	21	17	20	22	20	27	18	18	18	20.66667	17
GD5	43	52	41	39	50	59	49	45	45	36	41	40	45	36
GD6	14	14	15	13	11	11	13	13	12	0	11	0	10.58333	14
GD7	16	14	19	14	13	12	14	10	16	11	12	15	13.83333	11
GD8	21	18	32	28	20	20	25	21	36	19	20	No sample	23.63636	19
GD9	no sample	51	42	39	33	40	41	33	44	33	36	29	38.27273	31
GD10	19	15	23	17	10	13	15	13	19	16	24	22	17.16667	16
GD11	34	37	35	31	18	28	27	24	33	39	41	30	31.41667	29
GD13	39	31	43	39	36	42	43	37	48	34	34	32	38.16667	31
GD14	no sample	38	46	37	39	39	43	34	49	32	31	29	37.90909	30
C1											34	29	31.5	22
C2											34	36	35	32.2
C4							95	64	79	56	68	63	70.83333	65

(1) See Appendix C for details on bias adjustment

Table B.2 – NO_2 Monthly Diffusion Tube Results - 2015

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 (1)
GD1	27	40	33	32	no sample	no sample	34	31	35	38	34	33.8	27	33
GD2	27	45	no sample	33	no sample	no sample	no sample	34	32	34	43	30	30.6	37
GD3	18	25	26	22	no sample	no sample	no sample	no sample	no sample	27	18	15	21.6	23
GD4	23	28	25	21	no sample	no sample	no sample					24.3	23	26
GD5	29	46	52	45	no sample	no sample	35	46	50	53	36	39	43.1	46
GD6	15	14	14	10	no sample	no sample	8	12	10	16	11	9	11.9	13
GD7	15	18	13	11	no sample	no sample	no sample					14.3	15	15
GD8	23	33	32	27	no sample	no sample	16	21	no sample	26	18	11	23.0	25
GD9	28	45	39	34	no sample	no sample	13	23	24	37	18	17	27.8	30
GD10	21	24	20	17	no sample	no sample	11	14	19	18	14	15	17.3	17
GD11	29	38	25	32	no sample	no sample	20	29	27	27	30	30	28.7	28
GD13	37	47	39	37	no sample	no sample	28	36	34	41	29	30	35.8	38
GD14	31	44	43	39	no sample	no sample	no sample	no sample	no sample	no sample	no sample		39.3	42
C1	31	35	30	28	no sample	no sample	19	31	29	36	26	17	28.2	28
C2	33	38	34	30	no sample	no sample	21	24	29	25	29	26	28.9	28
C3			28	25	no sample	no sample	14	19	23	20	19	16	20.5	21
C4	74	71	57	56	no sample	no sample	49	49	58	42	47	39	54.2	53

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 (1)
C5			30	26	no sample	no sample	19	24	29	28	27	22	25.6	26
C6			22	19	no sample	no sample	11	16	17	20	14	11	16.3	16

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

C.1 Diffusion Tubes

Lambeth Scientific Services supplied a majority of the diffusion tubes for 2014 -2015 period, these were prepared using a 50% triethanolamine (TEA) method, the remainder were monitored using the Gradko diffusion tubes (20%TEA). To achieve more consistency from June 2015, all diffusion tubes were changed to Lambeth. The monitoring data presented in green in the monthly tube results (Appendix B) represents the Gradko diffusion tubes.

C.2 Table of bias adjustment factors:

Year	National bias adjustment factor, Gradko (20% TEA in water)	National bias adjustment factor, Lambeth (50% TEA in acetone)
2011	0.89	1.06
2012	0.97	0.91
2013	0.95	0.87
2014	0.91	0.80
2015	0.88	1.07

C.3 Annualisation of data:

The Compton site C4 was added to the monitoring sites in July 2014, thus data capture of 50%. The data was annualised using the data from three background sites (all three are urban background) in Woking Borough below. The annualisation factor Ra calculated is 1.02.

C1 and C2 were not annualised as these two sites were introduced in November 2014 and only two months data was available for these two locations.

Sites	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Church	28	25	32	28	25	21	21	19	24	22	19	35	24.9
BD	22	19	22	20	14	13	13	14	21	16	16	18	17.3
CW	22	27	60	26	21	19	21	34	26	24	18	24	26.8

In 2015, data capture for sites GD2, GD3, C3, C5 and C6 were below 75% and were annualised using the monitoring data from three urban background sites in Woking:

Sites	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Church	28	28	20	24	16	17	18	22	26	33	23	22	23
BD	29	21	18	15	11	9	8	15	15	20	14	16	16
CW	30	27	23	21	19	13	17	19	22	23	24	25	22

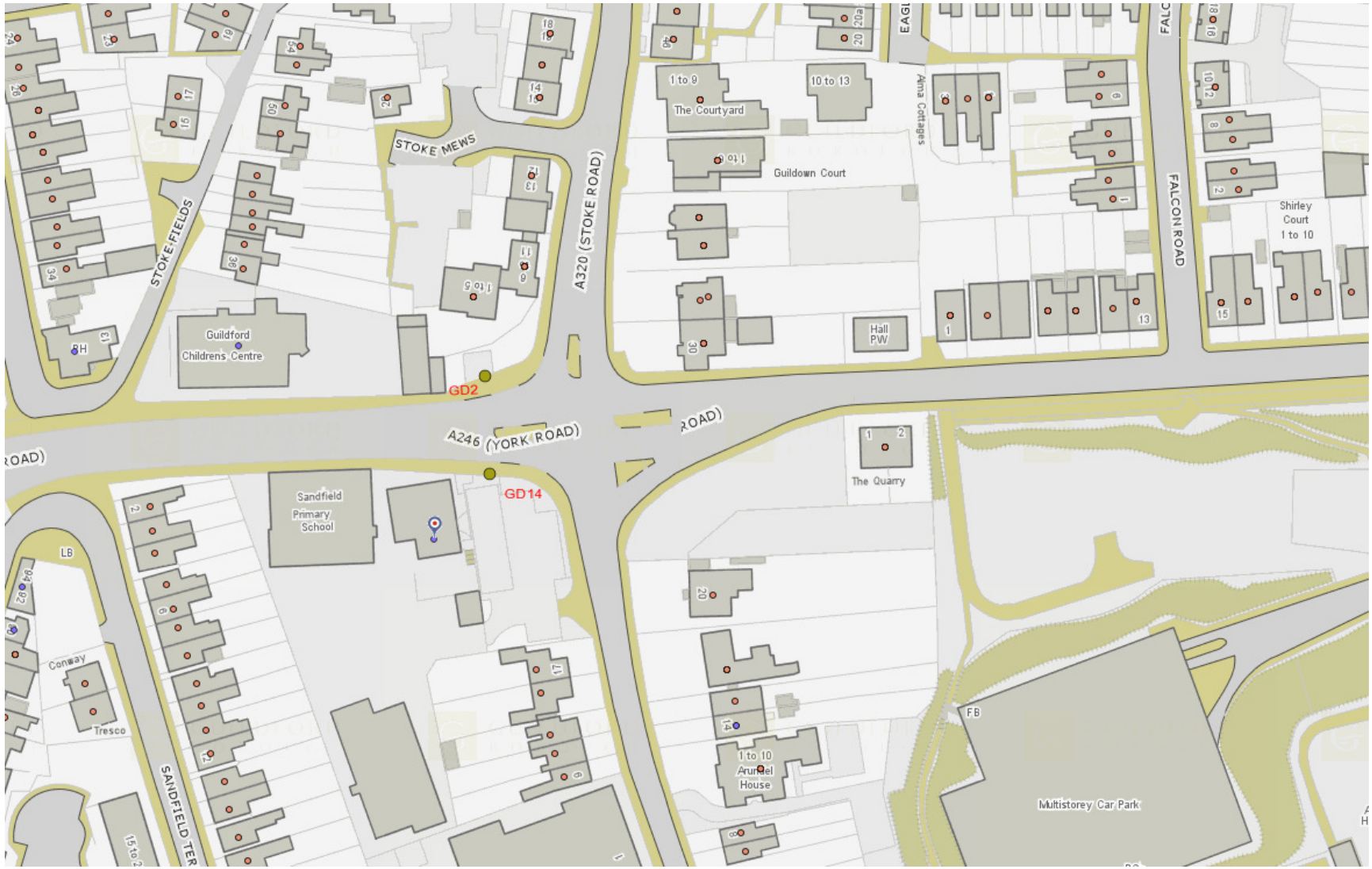
The annualisation factors (Ra) calculated are 0.89, 0.88, 1.01, 1.01 and 1.01 for the sites GD2, GD3, C3, C5 and C6 respectively.

Appendix D: Map(s) of Monitoring Locations

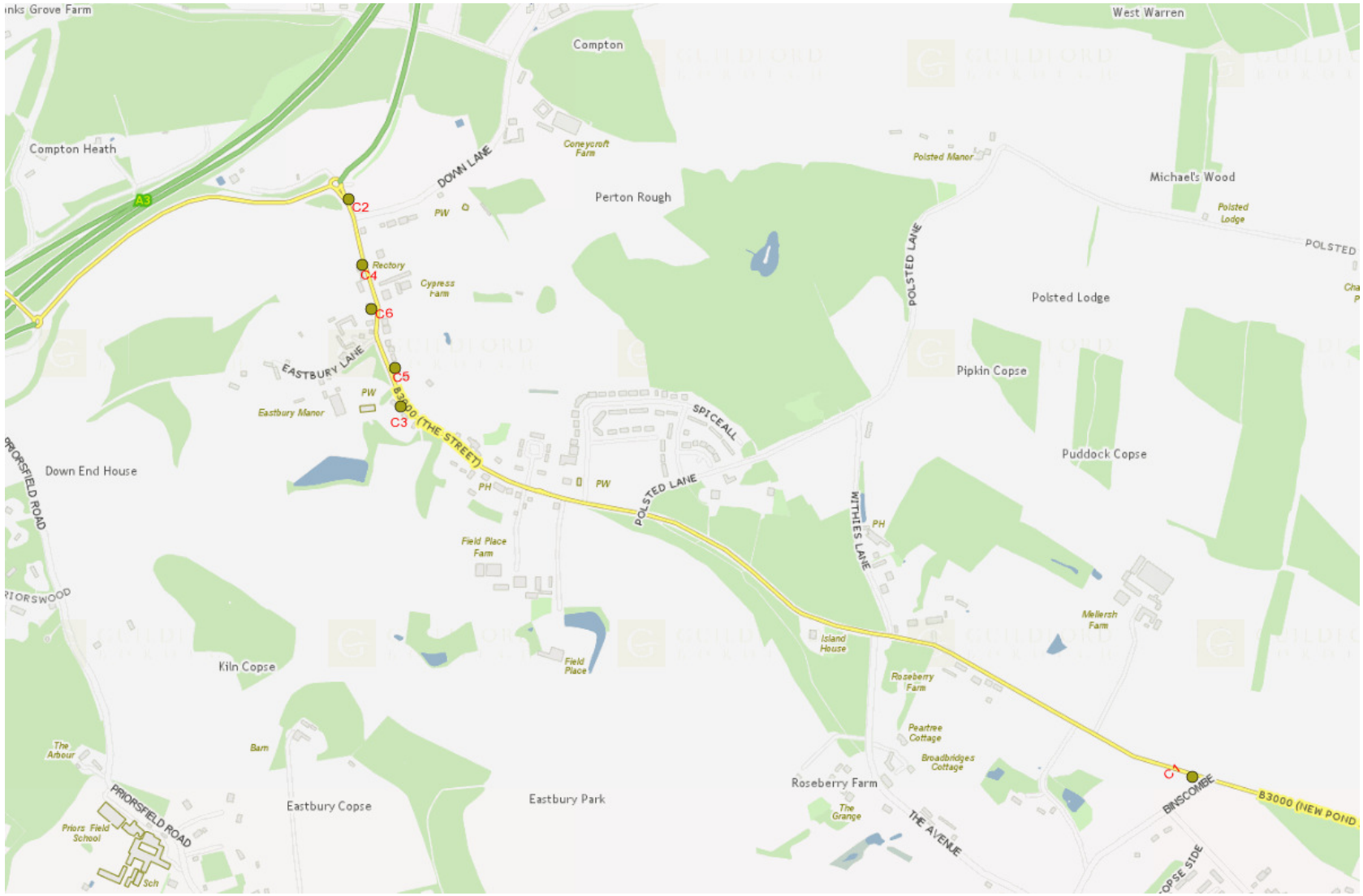
Map D1: Diffusion tubes 2014-2015

Map D2: Town Centre tubes

Map D3 York Road tubes



Map D4 Compton tubes



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[4] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control

References

1. Local Air Quality Management (TG16) Defra April 2016

2. Guildford Air Quality Reviews and Assessments 2006-2014

3. LAQM Tools

4. Guildford Transport Strategy: http://www.guildford.gov.uk/newlocalplan/CHttpHandler.ashx?id=21339&p=0

5 Surrey County Council (2011) Surrey Transport Plan: Air Quality Strategy

6 Guildford Borough Cycling Plan https://www.travelsmartsurrey.info/cycling/guildford-consult