2018 Air Quality Annual Status Report (ASR)

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

June 2018

Local Authority Officer	Stuart Maxwell
Department	Environmental Protection
Address	Mount Pleasant Road, Royal Tunbridge Wells, Kent TN1 1RS
Telephone	01622 602216
E-mail	stuartmaxwell@midkent.gov.uk
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Executive Summary: Air Quality in Our Area

Air Quality in Tunbridge Wells

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].

Tunbridge Wells is a borough in Kent and consists of the main town of Royal Tunbridge Wells and a number of small towns and villages including Paddock Wood, Cranbrook and Hawkhurst. The borough is largely rural in character.

The population of the borough in 2016 was 116,900 based on figures from the Office for National Statistics. This is expected to rise to 122,700 by 2026. The main roads which serve the borough include the A26, A264, A267 and the A21.

Royal Tunbridge Wells suffers from congestion, particularly on the approach roads to the town centre. Other pollution sources, including commercial, industrial and domestic sources, also make a contribution to the background pollution concentrations.

There is one Air Quality Management Area (AQMA) declared in the Borough due to exceedances of the annual mean Air Quality Strategy (AQS) objective for nitrogen dioxide (NO_2). This AQMA was originally declared in 2005 and extended in 2011 due to exceedances outside of the original AQMA boundaries. The most recent Action Plan was adopted by the Council in 2010 and included a series of measures to improve air quality. The actions in the plan have largely been completed and work is ongoing on producing a new action plan, a draft of which will go to public consultation in August 2018.

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

The 2017 annual mean NO_2 level, measured at the A26 St John's Roadside automatic monitoring location was slightly lower than previous years, and was actually equal to the annual mean objective for NO_2 at 40µg/m^3. The 1-hour objective for NO_2 was met at this location, with no instances of the hourly mean exceeding 200µg/m^3.

For the 2017 non-automatic monitoring data set there were only two sites within the existing AQMA where the annual mean AQS objective was exceeded. The two sites are:

- TW34 - The Cutout St John's Road; and
- TW41 - 38 The Pantiles/London Road

These sites are not located at the façade of relevant receptors. Therefore, the NO_2 fall-off with distance calculator was used to estimate the NO_2 concentration at the nearest locations relevant for exposure.

Following the fall-off calculations, the annual mean NO_2 concentrations at the closest locations of relevant exposure to all the sites were found to be below the 40µg/m^3 objective.

Actions to Improve Air Quality

The AQAP for Tunbridge Wells Borough Council was reviewed in 2016 and was found to have been largely completed and in need of an update. The process of producing an updated action plan is well in hand and it is anticipated that, subject to Cabinet approval, a draft will go to public consultation in August 2018.

The proposed general borough-wide measures to improve air quality include:-

Support for measures to increase the use of sustainable transport modes such as walking and cycling.
Investigation of a Low Emission Standard for buses.
Incorporation of an SPD into the emerging Local Plan
Engaging with schools to reduce the impact of school traffic.

In addition, a few of the existing policies and strategies also in place to help improve air quality within the borough include:

- Kent and Medway Air Quality Partnership Air Quality and Planning Technical Guidance (July 2011)
- Kent County Council Local Transport Plan (2011-2016)
- Tunbridge Wells Borough Local Plan (2006)
- Tunbridge Wells Borough Development Plan – Transport strategy (2015 – 2026)

Local Priorities and Challenges

The A26 through Southborough suffers congestion throughout the day, being the main link between Tonbridge, the A21 and Tunbridge Wells. The A26 is an important strategic link in the Kent road system, and will remain so for the foreseeable future. Achieving the necessary reductions in traffic on this route to achieve the NO_2 annual mean objective/EU Limit value is therefore considered challenging. Nevertheless there does seem to be a real downward trend in NO_2 levels

How to Get Involved

As transport is the main source of air pollution within the borough of Tunbridge Wells, the easiest way for the public to get involved with helping to improve air quality within the area would be to look at alternatives to the way they usually travel.

The following are suggested alternatives to private travel that would contribute to improving the air quality within the Borough:

- Use public transport where available – This reduces the number of private vehicles in operation reducing pollutant concentration and helping to reduce congestion;

- Walk or cycle if your journey allows – From choosing to walk or cycle for your journey the number of vehicles is reduced and also there is the added benefit of keeping fit and healthy;

- Car/lift sharing – Where a number of individuals are making similar journeys, such as travelling to work or to school car sharing reduces the number of vehicles on the road and therefore the amount of emissions being released. This can be promoted via travel plans through the workplace and within schools; and there is further information on https://kent.liftshare.com

- Alternative fuel / more efficient vehicles – Choosing a vehicle that meets the specific needs of the owner. Fully electric, hybrid fuel and more fuel efficient cars are available and all have different benefits by reducing the amount of emissions being released.

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1 Local Air Quality Management

This report provides an overview of air quality in Tunbridge Wells Borough Council during 2017. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to review and assess air quality in their areas regularly, 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 Tunbridge Wells Borough Council to improve air quality and documenting any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of the objectives.

A summary of AQMAs declared by Tunbridge Wells 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=287.

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	
A26 AQMA	Declared <Date>, 2005 Amended <Date “2011	NO_2 40µgm^{-3}	Tunbridge Wells	The A26 between Park Road and Neville Terrace and also including Grosvenor Road at 0-80m from the road	No	41.8	27.9	TWBC AQAP 2009 http://aqma.defra.gov.uk/action-plans/TWBC%20AQAP%202009.pdf

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

In 2017 TWBC reported that the existing Tunbridge Wells Air Quality Action Plan had been completed, in as much as the actions have either been completed, or were no longer considered viable for a variety of reasons. The AQAP achieved a number of important measures, including:-

- Tunbridge Wells Borough Transport Strategy was prepared and adopted in July 2015;
- A Station Travel Plan has been prepared for Tunbridge Wells station and includes an Action Plan to improve access to the station by modes including walking, cycling and bus;
- An electric vehicle (EV) funded by KCC was added to the fleet on a temporary basis;
- The Tunbridge Wells Cycling Forum was established to help make Tunbridge Wells a more cycle-friendly Borough; and
- A Freight Action Plan has been prepared which aims 'to promote safe and sustainable freight distribution networks into, out of and within Kent,' and 'to address any negative impacts on local communities and the environment both now and in the future'

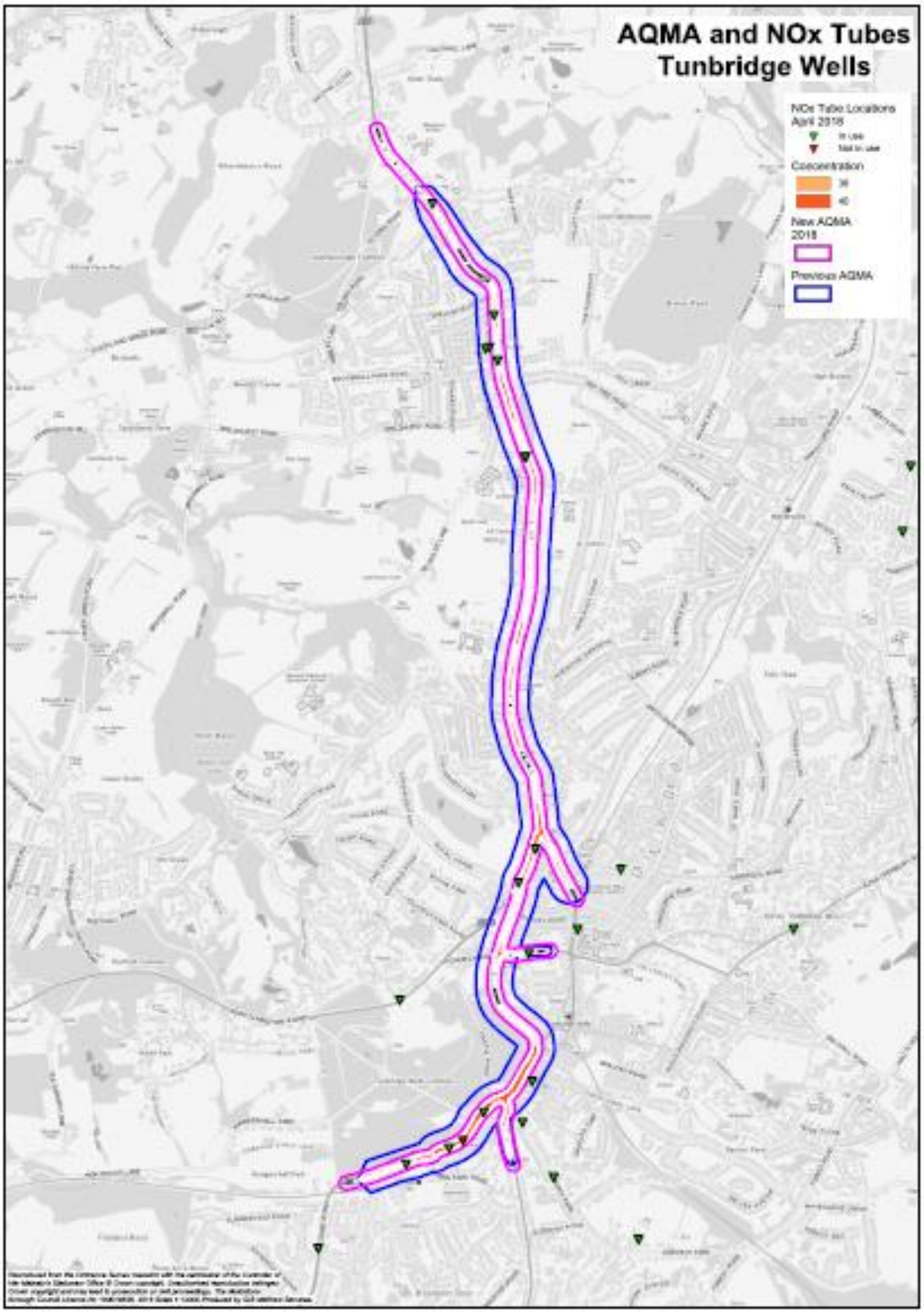
Work has started on producing a new AQAP for Tunbridge Wells and a draft of this is expected to go for public consultation in August of 2018. Modelling work commissioned from Air Quality Consultants Ltd has suggested that the current AQMA should be extended slightly to the north and south, but that the buffer, which currently stands at 80m, either side of the centreline of the A26 carriageway, could be reduced to 30m. Public consultation on this is likely to take place at the same time as the consultation on the new Air Quality Action Plan.
A Map of the proposed new AQMA is shown in Figure 2.1, with the existing AQMA for comparison

Discussions have been ongoing, regarding potential actions which could be included in the new AQAP. Actions will fall into three themes, namely Transport, Planning and Public Health. Actions provisionally included in the Action Plan are:-

- Support for measures to increase the use of sustainable transport modes such as walking and cycling.
- Consider the establishment of an Air Quality Protection zone to replace the AQMA, when we are confident that the AQMA can be revoked.

- Expansion of the Car Club scheme.
- Investigation of a Low Emission Standard for buses.
- Incorporation of an air quality SPD into the emerging Local Plan
- Use S106 funding to introduce a bike share scheme.
- Engaging with schools to reduce the impact of school traffic.

Figure 2.1 Comparison on Existing AQMA and Proposed New AQMA



Ongoing work in 2017 which occurred in the absence of the formal action plan included:-
The new A21 non-motorised users link was completed and consists of a 2.1 mile footpath and cycleway for pedestrians, equestrians and cyclists to safely access alongside the A21 between Vauxhall Lane and Longfield Road.

The 21st Century Way cycle route will connect Tunbridge Wells town centre to the North Farm Industrial Estate to benefit both cyclists and pedestrians. The scheme will improve the existing route and improvements will also be made to the existing Public Rights of Way. The scheme will consist of improved signage and lighting, the introduction of lower speed limits, improved surfacing and vegetation clearance. Consultation has been completed and designs are now being finalised.

KCC has approval and the budget to construct Phase 1 and 3 of the A26 cycle route scheme – between Royal Tunbridge Wells town centre and the junction with Speldhurst Road and from Mabledon to Tonbridge town centre.

Cycle parking at High Brooms Station was recently increased from 20 spaces up to 52 in double tier racks. There is also improved lighting and CCTV. This was initially supported by a £15,000 grant from KCC Highways.

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.

The Public Health Outcomes Framework indicator for the fraction of deaths attributable to $PM_{2.5}$ in Tunbridge Wells is 5.0%, which is below national average of 5.3%.

Tunbridge Wells Borough Council does not currently undertake any monitoring of $PM_{2.5}$, and consequently there are currently no specific measures in place to address $PM_{2.5}$ concentrations within Tunbridge Wells Borough.

LAQM.TG16 Table A.1 Action Toolbox provides a list of measures that can be implemented to tackle $PM_{2.5}$. Tunbridge Wells Borough Council will review these actions to consider whether any can be included in our new AQAP. However, it is recognised that any measures employed to reduce NO_2 and PM_{10} will also have a beneficial effect on $PM_{2.5}$.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Tunbridge Wells Borough Council undertook automatic (continuous) monitoring at one site during 2017. Table A.1 in Appendix A shows the details of the site. The monitoring results are available at http://www.kentair.org.uk/data/data-selector

A maps showing the location of the monitoring site is 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

Tunbridge Wells Borough Council undertook non-automatic (passive) monitoring of NO_2 at 29 sites during 2017. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) 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)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 7 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

Results for 2017 indicate that the annual mean NO_2 level at the A26 St John's Roadside automatic monitoring location was equal to the annual mean objective for NO_2 at 40µgm^{-3}. The 1-hour objective for NO_2 was met at the St John's Roadside monitoring location, with no instances of the hourly mean exceeding 200µg/m^3 (see Table A.4).

Figure 3.1 shows the trend in NO_2 concentration from 2011 through to 2017 at the A26 St John's Roadside location. This shows the fluctuation in annual mean concentrations. The highest concentrations were recorded in 2012 and 2014 with the annual mean concentration of 48µg/m^3, however the annual mean concentration measured in 2017, at 40 µg/m^3 was the lowest measured in recent years.

Figure 3.1 – Trends in Annual Mean NO_2 Concentrations Measured at the Automatic Monitoring Site

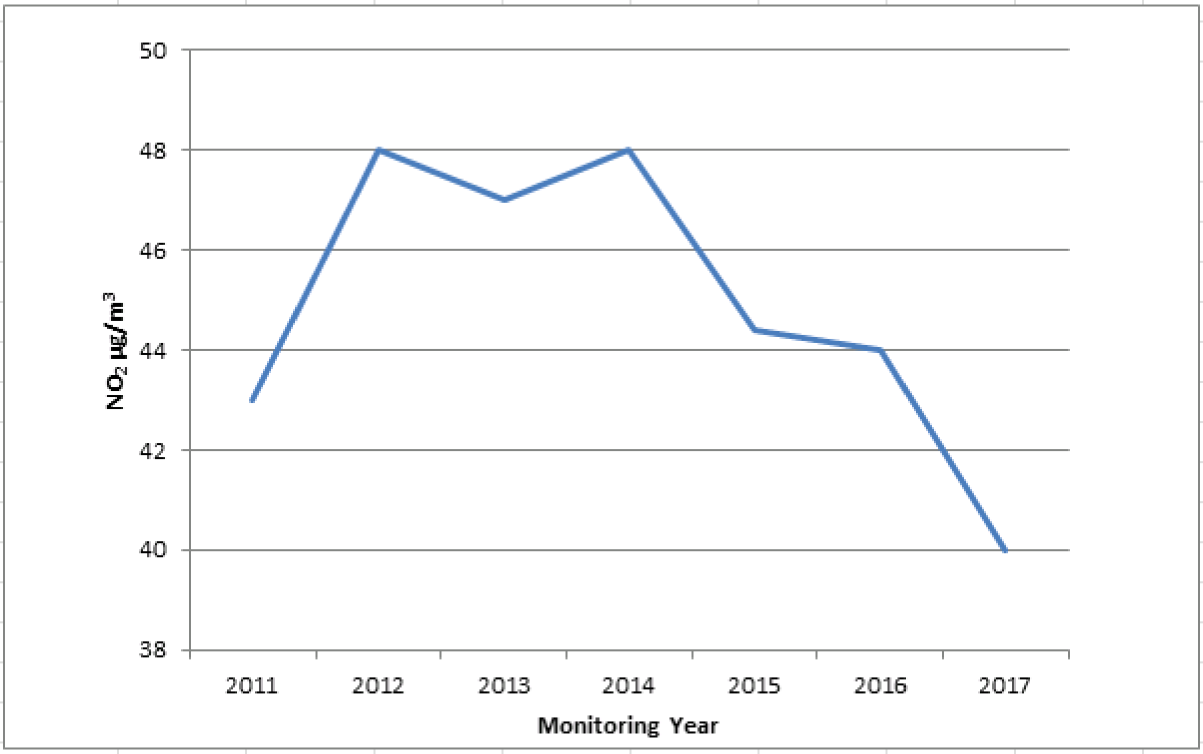


Figure 3.2 shows the trend in NO_2 concentration at diffusion tube monitoring sites within the AQMA from 2011 through to 2017. The figure shows that all the sites

except TW41 showed a peak in annual mean concentration in 2012, however site TW41 recorded the highest NO_2 concentrations within the existing AQMA in all the monitoring years. There were two sites within the existing AQMA where the annual mean AQS objective was exceeded in 2017. Both sites had recorded exceedances in previous years. The two sites were:

- TW34 - The Cutout St John's Road; and
- TW41 - 38 The Pantiles/London Road.

Figure 3.2 – Trends in Annual Mean NO_2 Concentrations Measured at Diffusion Tube Monitoring Sites within the Existing AQMA

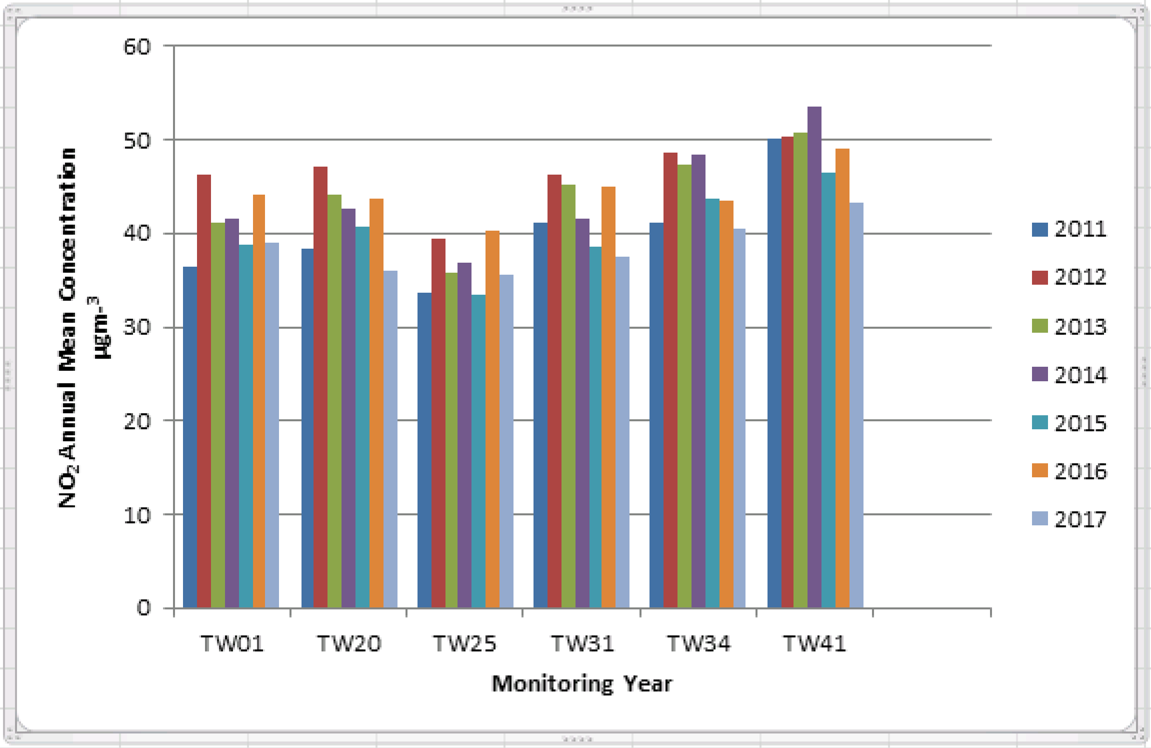
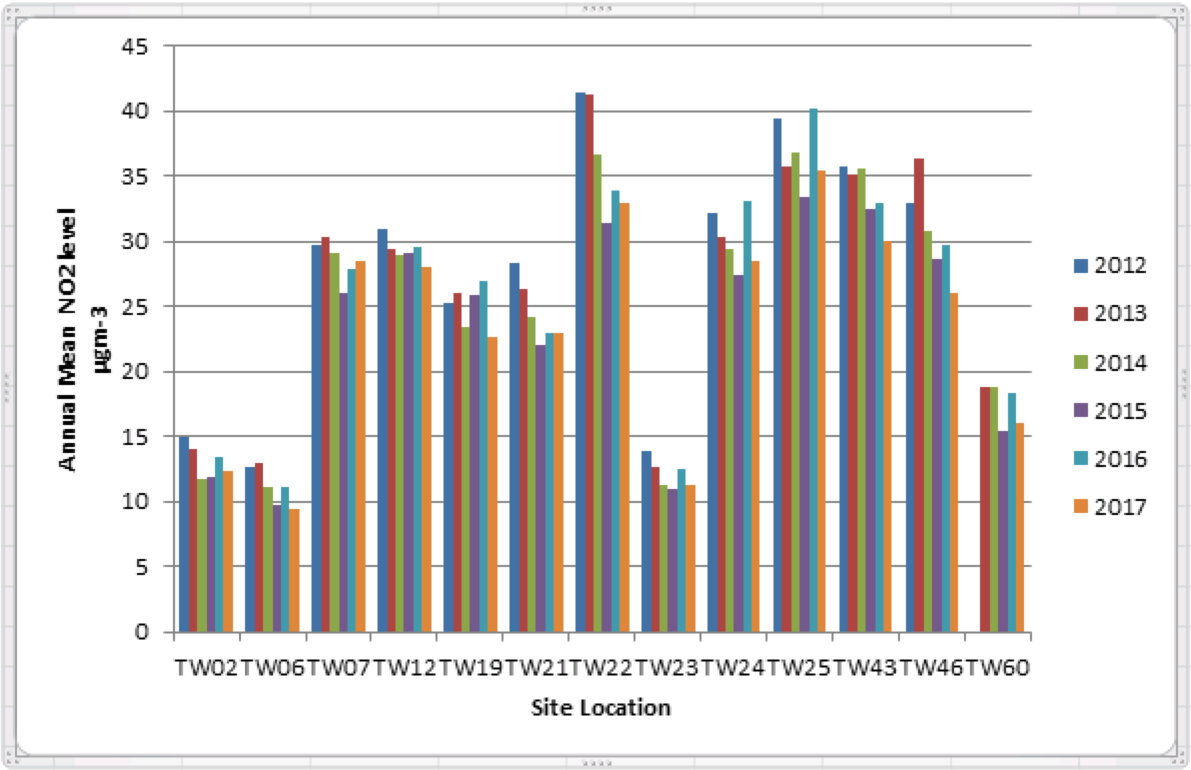


Figure 3.3 shows the trend in annual mean NO_2 concentration at the diffusion tube locations outside of the existing AQMA over the past five years. It can be seen that the annual mean NO_2 objective has been met in all the sites in 2017. The majority of sites showed peak concentrations in 2012 and 2013. The annual mean NO_2 concentration in 2017 has decreased compared to previous years for the majority for the sites. 2017 levels for NO_2 are generally similar to 2015 levels, which were also generally low.

Figure 3.3 – Trends in Annual Mean NO_2 Concentrations Measured at Diffusion Tube Monitoring Sites outside the Existing AQMA



Those sites with annual mean NO_2 exceedances in 2017 are not located at the facades of relevant receptors and the NO_2 fall-off with distance calculator was therefore used to estimate the NO_2 concentration at the nearest locations of relevant exposure for these sites.

Table 3.1 provides the information for the NO_2 fall-off distance correction. The details of the NO_2 fall-off distance correction calculation for these sites are presented in Appendix C. TW01 has been included here because the level was very close to the objective at 39µgm^{-3}.

Table 3.1 – Fall-off Distance Correction of Sites Exceeding the NO_2 Annual Mean Objective (2017)

Site ID	In AQMA?	Distance Kerb-Receptor (m)	Distance Kerb-Monitor (m)	Background Concentration(µg/m^3)	Bias Adjusted and annualised Annual Mean (µg/m^3)	Distance Corrected Annual Mean (µg/m^3)
TW01	Y	6.2	2	11.3	39	31.7
TW34	Y	18	4	11.3	40.5	28.2
TW41	Y	6.6	1.8	11.3	43.3	33.8

Following the fall-off calculations, the annual mean NO_2 concentrations at the closest locations of relevant exposure to all the sites showing an exceedance were found to be below the 40µg/m^3 objective.

No sites were recorded with annual mean greater than 60µg/m^3, which indicates that an exceedance of the 1-hour mean objective is unlikely at any of the monitoring locations.

3.2.2 Particulate Matter (PM_{10})

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

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

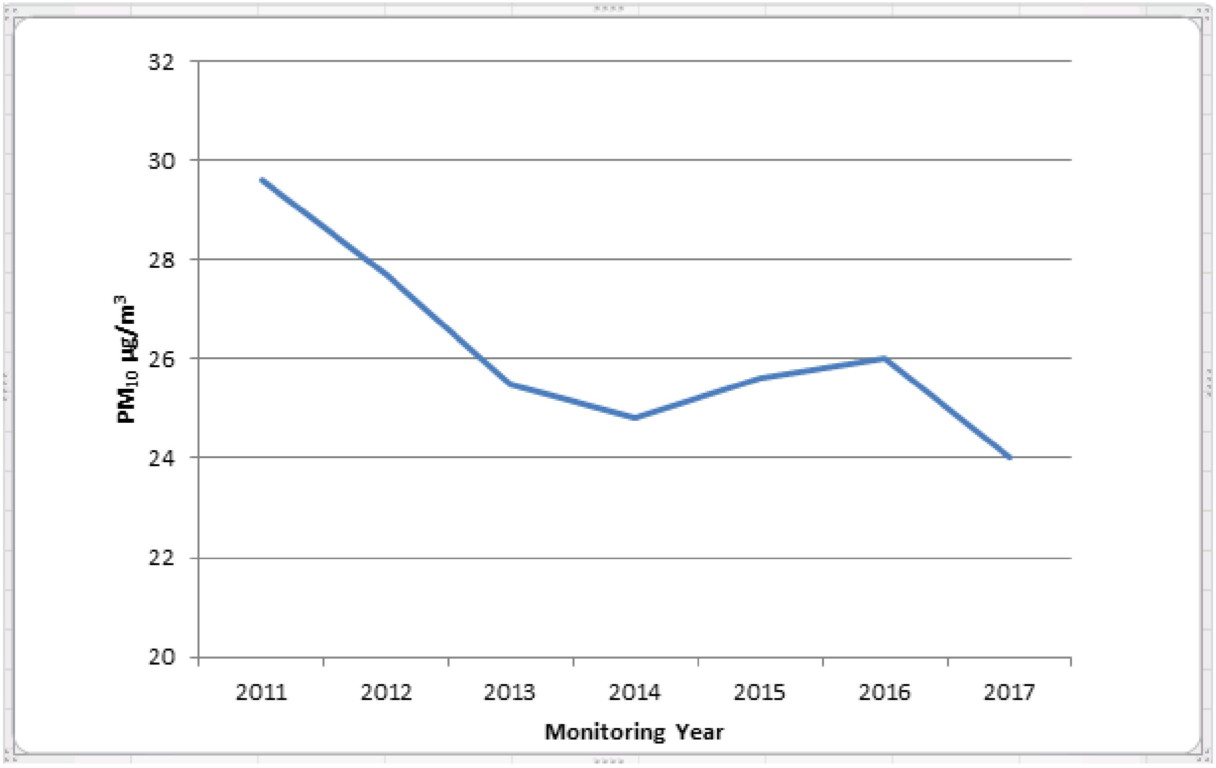
Figure 3.4 shows the trend in annual mean PM_{10} concentrations at the A26 Roadside monitoring location in the past seven years. It can be seen that the concentrations show decreases from 2011 to 2014. In 2015 and 2016 the annual mean PM_{10} concentration increased slightly, however, the level recorded in 2017 as the lowest in recent years at 24µgm^{-3}. PM_{10} levels in Tunbridge Wells are consistently below the objective level.

3.2.3 Conclusions and Recommendations

2017 was the second year in which, although exceedances of the NO_2 annual mean objective were recorded at the roadside, there were no exceedances at the nearest receptor. If recent trends continue, Tunbridge Wells Borough Council is likely to be in a position to revoke its AQMA in the near future.

The data available to us now, compared to when the AQMA was originally declared, allows us to be more confident about exactly where the areas of poor air quality really are. It could be argued that since current data suggests there are no exceedances of the national objective at sensitive receptors the AQMA could be withdrawn immediately. However this has been a relatively short term trend and so is not considered appropriate at this time. The withdrawal of the AQMA would also greatly reduce the control and protection from unsuitable development in this area that it currently enables. The council proposes to continue to monitor the levels of air quality closely and undertake a further review should a trend of 5 years data continue to show no exceedances at residential receptors. In this time and as part of the new action plan, the council will also seek ensure the continued protection of this area by defining an “air quality protection zone” within the emerging local plan.

Figure 3.4 – Trends in Annual Mean PM_{10} Concentrations Measured at the Automatic Monitoring Site



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)
CM1	A26 St John's Road, Southborough	R	558260	141599	NO_2 and PM_{10}	Y	Chemiluminescence and TEOM	18.0	4.0	3

(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.

(3) R-roadside

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [(1)]	Distance to kerb of nearest road (m) [(2)]	Tube collocated with a Continuous Analyser?	Height (m)
TW01	62 London Road, Southborough	R	558121	142214	NO_2	Y	4.2m	2	N	2.4
TW02	11 The Hurst, Tunbridge Wells	B	560016	141248	NO_2	N	6.0m	1.6	N	2.1
TW06	4 Surrey Close, Broadwater Down, Tunbridge Wells	B	557624	137760	NO_2	N	3.7m	1.8	N	2.8
TW07	High Street, Tunbridge Wells	R	558286	138896	NO_2	N	4.3m	1	N	2.4
TW12	Monson Road, Tunbridge Wells	R	558482	139557	NO_2	N	2.0m	1.8	N	2.4
TW19	Maidstone Road, Paddock Wood	R	566875	145083	NO_2	N	2.5m	1.8	N	2.5
TW20	Mount Ephraim, Tunbridge Wells	R	558300	139903	NO_2	Y	2.8m	2	N	2.4
TW21	46-48 Victoria Road, Tunbridge Wells	R	558670	139815	NO_2	N	1.7m	1.9	N	2.4
TW22	Pembury Road, Tunbridge Wells	R	559417	139556	NO_2	N	16.0m	1	N	2.3
TW23	2 Nevill Gate, Tunbridge Wells	B	558746	138213	NO_2	N	16.0m	0.65	N	2.4
TW24	Still Lane, 22/24 London Road, Southborough	R	557854	142697	NO_2	N	6.0m	1.75	N	2.6
TW25	Flying Dutchman	R	558136	142017	NO_2	Y	1.8m	2.6	Triplicate	2.9
TW31	London Rd/Mount Ephraim Junction	R	558227	139757	NO_2	Y	3.1m	1.0	Triplicate	2.7
TW34	AQ Station, The Cutout St John's Road, Tunbridge Wells	R	558239	141640	NO_2	Y	14.0m	4	Triplicate and co-located	3
TW38	Pembury Road, Seven Springs	R	560847	140395	NO_2	N	7.0m	2.3	N	2.5
TW41	London Rd (38 The Pantiles/London Road), Tunbridge Wells	R	558076	138762	NO_2	Y	4.8m	1.8	N	2.3
TW42	High Street, Hawkhurst (8 The Colonade)	R	576102	130567	NO_2	N	2.1m	2.6	N	2.5
TW43	Church Road/Clarence Road, Tunbridge Wells	R	558271	139451	NO_2	N	2.6m	1.3	N	2.6
TW44	Crescent Road/Calverly Crescent, Tunbridge Wells	R	558712	139424	NO_2	N	5.4m	2	N	2.5
TW46	A26 Eridge Road	R	557740	138538	NO_2	N	12.0m	1	N	2.4
TW47	32 High St, Pembury	R	562330	140754	NO_2	N	8m	1	N	2
TW50	A264 Mt Ephraim	R	557713	139249	NO_2	N	2.5m	1	N	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)
TW51	1 Western Road	R	558101	142074	NO_2	N	4.0m	1.6	N	2.2
TW52	7 Western Road	R	558086	142070	NO_2	N	4.0m	1.6	N	2.5
TW53	Warrington Road, Paddock Wood	R	567637	144739	NO_2	N	9.0m	1.8	N	2.5
TW54	Union House	R	557987	138641	NO_2	N	48.19	2.2	N	2.6
TW55	Mascalls Park, Badsell Road	R	566748	144112	NO_2	N	11.0m	1.8	N	2.5
TW56	32 Liptraps Lane, TN2 3AA	R	559923	138609	NO_2	N	7.2m	1	N	2.5
TW57	2 Liptraps Lane, TN2 3BS	R	559888	138719	NO_2	N	5.5m	1.2	N	2.85
TW58	Union House.	R	557927	138173	NO_2	N		1.3	N	2.5
TW60	Gorse Road	B	560230	140150	NO_2	N	10.0m	30	N	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.

(3) R-roadside, B-background

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)						
					2011	2012	2013	2014	2015	2016	2017
CM1	R	Automatic	91.3	91.3	**43**	**48**	**47**	**48**	**44.4**	**44**	**40**
TW01	R	Diffusion Tube	100	100	36.4	**46.3**	**41.1**	**41.6**	38.7	**44.2**	39
TW02	B	Diffusion Tube	100	100	12.2	14.9	14	11.7	11.9	13.4	12.3
TW06	B	Diffusion Tube	100	100	9.7	12.6	12.9	11.2	9.8	11.1	9.4
TW07	R	Diffusion Tube	91.7	91.7	27.4	29.7	30.3	29.1	26.1	27.9	28.5
TW12	R	Diffusion Tube	83.3	83.3	28.5	31	29.5	29	29.2	29.6	28.1
TW19	R	Diffusion Tube	100	100	24.3	25.3	26	23.5	25.9	26.9	22.7
TW20	R	Diffusion Tube	100	100	38.3	**47.2**	**44.2**	**42.6**	**40.7**	**43.7**	36.0
TW21	R	Diffusion Tube	91.7	91.7	23.7	28.3	26.4	24.2	22.1	23.0	22.9
TW22	R	Diffusion Tube	91.7	91.7	31.5	**41.4**	**41.3**	36.6	31.4	33.9	33
TW23	B	Diffusion Tube	91.7	91.7	12.9	13.9	12.6	11.3	11.0	12.5	11.3
TW24	R	Diffusion Tube	100	100	24.5	32.2	30.3	29.4	27.5	33.2	28.5
TW25	R	Diffusion Tube	83.3	83.3	33.7	39.5	35.8	36.8	33.4	**40.2**	35.5
TW31	R	Diffusion Tube	91.7	91.7	**41.2**	**46.2**	**45.1**	**41.5**	38.5	**45**	37.5
TW34	R	Diffusion Tube	100	100	**41.2**	**48.7**	**47.3**	**48.5**	**43.6**	**43.5**	**40.5**
TW38	R	Diffusion Tube	83.3	100	38.8	**46.5**	**44.6**	**44.6**	36.8	39.4	37.4
TW41	R	Diffusion Tube	100	83.3	**50.1**	**50.4**	**50.8**	**53.6**	**46.5**	**49.1**	**43.3**
TW42	R	Diffusion Tube	66.6	66.6	21.4	28	26.8	24.8	22.4	27.0	27.2
TW43	R	Diffusion Tube	91.7	91.7	32.2	35.7	35.2	35.6	32.5	32.9	30.1
TW46	R	Diffusion Tube	100	100	29.8	32.9	36.3	30.8	28.7	29.8	26
TW50	R	Diffusion Tube	100	100	-	31	29.4	27.5	24.5	30.7	28.5
TW51	R	Diffusion Tube	100	100						19.3	18
TW52	R	Diffusion Tube	100	100						20.0	14.9
TW53	R	Diffusion Tube	100	100						15.9	20.0
TW54	R	Diffusion Tube	100	33.3						33.0	33.3
TW55	R	Diffusion Tube	91.7	91.7						18.3	18.4
TW56	R	Diffusion Tube	100	25							21.0
TW57	R	Diffusion Tube	100	25							20.1
TW58	R	Diffusion Tube	100	25							30.3
TW60	B	Diffusion Tube	91.7	91.7	-	-	18.8	18.8	15.5	18.3	16.1

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 **<u>bold and underlined.</u>**

(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 75% or less. See Appendix C for details.

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)						
					2011	2012	2013	2014	2015	2016	2017
CM1	Roadside	Automatic	91.3%	91.3%	0	1	0	0	0	0	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 90%, the 99.8th percentile of 1-hour means is provided in brackets.

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)						
				2011	2012	2013	2014	2015	2016	2017
CM1	Roadside	95.6%	95.6%	29.6	27.7	25.5	24.8	25.6	26.0	24

Notes: Exceedances of the PM_{10} annual mean objective of 40µg/m^3 are shown in **bold.**

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

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

(3) All means have been "annualised" as per Technical Guidance LAQM.TG16, where valid data capture for the full calendar year is 75% or less. See Appendix C for details.

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)						
				2011	2012	2013	2014	2015	2016	2017
CM1	Roadside	95.2%	95.2%	12	15	15	13	10	10	13

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 90%, the 90.4th percentile of 24-hour means is provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2017

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

Site ID	NO_2 Mean Concentrations (µg/m^3)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (0.72)
TW01	78.9	54.4	51.1	60.9	53.9	51.2	47.9	49.6	53.8	46.5	49.1	52	54.1	39.0
TW02	31.4	18.7	18.4	17.6	13.8	9.7	8.8	10.3	13.6	15.1	28.1	19.8	17.1	12.3
TW06	26.6	15.9	15.1	14.4	11.1	7.1	6.1	7.5	11.7	10.8	16.7	14.2	13.1	9.4
TW07	42.7	38.1	69.1	70.6	31.4	29.2	25.5	26.9	28	30.5	43.6		39.6	28.5
TW12	51.7	38.6	41.3	35.8	36.6	32.4	30.3		37.6		46.8	39.3	39.0	28.1
TW19	48	35.2	33.6	32.3	31.1	24.9	22.5	23.1	30	30.4	37	29.9	31.5	22.7
TW20	63.5	58.2	54.6	62.6	49.9	39.8	39.9	40.2	49.1	49.8	47.5	45.7	50.1	36.0
TW21	52.1	33.2	33.6	32	32.1	25.7	22.4	21.8	-	28.5	40.1	27.7	31.7	22.9
TW22	62.5	-	47	45	41.7	35.8	32.4	36.3	45.1	45.3	61.2	51.6	45.8	33
TW23	28.2	18	16.8	14.7	12.1		9.1	9.9	12.4	10.1	24.7	16.2	15.7	11.3
TW24	50.6	45.1	42.7	42.3	34.2	35.9	30.3	33.3	39.8	36.2	53.7	31.3	39.6	28.5
TW25	75.7		50.1	56.6	46.5	40.4	39	41.6	47.8		61.8	33.7	49.3	35.5
TW31	66.2		47.4	67.3	60.3	51.2	48.5	40.1	47.5	51	43.3	49.4	52	37.5
TW34.1	72.8	58.8	57.1	61.9	60.3	67.6	52.6	45.3	51.2	46.1	49.3	44.5	57.8	**41.6**
TW34.2	61.8	53.9	61.4	63.7	63.2	63.5	50.5	49.6	53	43.9	51.7	48.8	55.4	39.9
TW34.3	60.5	61.9	61.8	62.9	62.2	65.3	50.7	51	51.8	39.5	52.9	48.8	55.8	**40.1**
TW38	65.2		46.6	50.5	50.1	54.1	46.5	43.5	55.6	46.1	61.2		51.9	37.4
TW41	75.2	66.9	46.6	34.9	75.8	71.4	62.6	58.1	59.6	49	63.3	58.8	60.2	**43.3**
TW42	52.6	33.6	35.3	39.4		28.9	29.6	30.5	34.6	-	-		37.7(a)	27.2
TW43	62.5	43.3	40.6	44.8	-	39.3	34.9	40.3	37.1	26.6	50.4	40.1	41.8	30.1
TW46	37.1	36.3	40.8	42.1	40.5	34.3	28.6	32.4	35.5	27.3	41.8	36.2	36.1	26
TW50	50.3	58.2	54.6	41.1	34.9	30.7	27.7	28.8	33.8	32.8	46	36.2	39.6	28.5
TW51	44.9	29.1	27.7	23.1	23.4	17.8	15.3	12.2	21.9	19.6	29.2	36.2	25.0	18

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 (0.72)
TW52	39.2	24.2	21	20	18.1	13.6	11	15.1	17.7	20	26.3	21.4	20.6	14.9
TW53	32.9	21.8	21.3	20.5	17.9	15	12.5	13.5	18.2	14.8	26.5	21.7	19.7	20.0
TW54	59.6	50.3	54.2	50.9									46.2(a)	33.3
TW55	44.5	26.5	25	30.4	29.3	20	19.1	15.4	23	18.4	29.5		25.6	18.4
TW56										32.9	43.9	32.8	29.2(a)	21.0
TW57										32.8	39	32.8	27.9(a)	20.1
TW58										49.2	56.8	51.7	42.1(a)	30.3
TW60	35.7	25.9	-	19.3	20.7	20	16.1	16.5	22.8	18	30.7	20.1	22.3	16.1

(1) See Appendix C for details on bias adjustment

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

Diffusion Tube Bias Adjustment Factors

The diffusion tubes are supplied and analysed by Environmental Scientifics Group (ESG) Didcot utilising the 50% triethanolamine (TEA) in acetone preparation method. A bias adjustment of 0.77 for the year 2017 (based on 27 studies) has been derived from the national bias adjustment calculator.

For previous data, years 2011 to 2016, the bias adjustment factors have been taken from the Council's previous LAQM annual reports. The factors used were 0.70 (2011), 0.79 (2012) and 0.76 (2013), 0.78 (2014) 0.75 (2015) and 0.77 (2016)

Factor from Local Co-location Studies

Tunbridge Wells Borough Council have a set of triplicate tubes at site TW34 co-located with the A26 Roadside continuous analyser in Southborough. The local bias adjustment factor is 0.72 (see Table C.1 and Figure C.1).

Table C.1 – Local Bias Factors

Site ID	Diffusion Tube Data capture	Continuous Monitor Data Capture for Periods Used	Diffusion Tube Annual Mean (µg/m^3)	Continuous Monitor Annual Mean (µg/m^3)	Bias Factor A	Bias Factor B
CM1	100%	91.3%	56	40	0.72	38%

Figure C.1 – Local Bias Adjustment Factor Calculation Sheet

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

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	95% CI of mean	Automatic Method Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor
1	03/01/2017	01/02/2017	72.8	61.8	60.5	65	6.8	10	16.8	56	76.7	Good	Good
2	01/02/2017	01/03/2017	58.8	53.9	61.9	58	4.0	7	10.0	40.7	98.2	Good	Good
3	01/03/2017	31/03/2017	57.1	61.4	61.8	60	2.6	4	6.5	39.4	95.8	Good	Good
4	31/03/2017	26/03/2017	61.9	63.7	62.9	63	0.9	1	2.2	45.8	77.1	Good	Good
5	26/04/2017	31/05/2017	60.3	63.2	62.2	62	1.5	2	3.7	47	81.9	Good	Good
6	31/05/2017	28/06/2017	67.6	63.5	65.3	65	2.1	3	5.1	44	95.1	Good	Good
7	26/06/2017	01/08/2017	52.6	50.5	50.7	51	1.2	2	2.9	38	99.6	Good	Good
8	01/08/2017	30/08/2017	45.3	49.6	51.0	49	3.0	6	7.4	32	86.5	Good	Good
9	30/08/2017	27/09/2017	51.2	53.0	51.8	52	0.9	2	2.3	38	99.7	Good	Good
10	27/09/2017	01/11/2017	46.1	43.9	39.5	43	3.4	8	8.3	31	95	Good	Good
11	01/11/2017	06/12/2017	49.3	51.7	52.9	51	1.8	4	4.6	39.5	88.8	Good	Good
12	06/12/2017	05/01/2018	44.5	48.8	48.8	47	2.5	5	6.2	33.2	99.3	Good	Good
13													

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

Overall survey --> Good precision | Good Overall DC

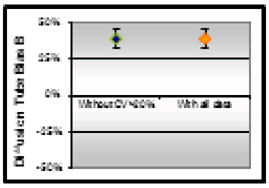
Site Name/ ID:

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

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A 0.72 (0.69 - 0.76)
Bias B 38% (31% - 45%)
Diffusion Tubes Mean: 56 µgm⁻³
Mean CV (Precision): 5
Automatic Mean: 40 µgm⁻³
Data Capture for periods used: 91%
Adjusted Tubes Mean: 40 (38 - 42) µgm⁻³

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 0.72 (0.69 - 0.76)
Bias B 38% (31% - 45%)
Diffusion Tubes Mean: 56 µgm⁻³
Mean CV (Precision): 5
Automatic Mean: 40 µgm⁻³
Data Capture for periods used: 91%
Adjusted Tubes Mean: 40 (38 - 42) µgm⁻³



Jaume Targa, for AEA
Version 04 - February 2011

Discussion of Choice of Factor to Use

Data have been corrected using a bias adjustment factor, which is an estimate of the systematic difference between diffusion tube concentrations and continuous monitoring, the latter assumed to be a more accurate method of monitoring. The technical guidance LAQM.TG 16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tubes. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data from NO_x / NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

With regard to the application of a bias adjustment factor for the diffusion tubes, the technical guidance LAQM.TG 16 and LAQM Helpdesk[4] recommends use of a local bias adjustment factor where available and relevant to diffusion tube sites.

[4] laqm.defra.gov.uk

The local bias adjustment factor for 2017 was calculated as 0.72 (see Figure C.1). The monitoring site had good data capture (91.3%) and the tubes showed good precision for all months, with 100% data capture throughout the year..

For comparison, the national bias adjustment factor for the laboratory and tube preparation method for 2016 was 0.77 based on 27 studies (March 2018). Because of the good data capture and precision of the local factor, it was decided to use that to correct the 2017 data. Although the difference between the two factors is relatively small, we note that at 0.72, the local bias correction factor is relatively low, and is less conservative than the national bias correction factor would have been.

PM Monitoring Adjustment

The Council undertook monitoring of PM_{10} using a TEOM analyser at one location during 2017. The monitoring results for the TEOM have been VCM[5] corrected prior to reporting.

Short to Long Term Adjustment

Data capture for the diffusion tube sites was generally good in 2017. There were 5 sites which recorded less than 75% data capture during 2017. These were all sites which were discontinued during 2017, or new sites which were started during 2017 and these have been annualised according to the method set out in LAQM TG16 box 7.9, using data from Maidstone's rural background site. The details of the annualisation have been provided in Table C.2 below.

Table C.2 – Short-Term to Long-Term Monitoring Data Adjustment

Site	Uncorrected Diffusion Tube Mean (µg/m^3)	Maidstone Detling AF	Annualised Data Average µg/m^3	Annualised Bias Adjusted Concentration (µg/m^3)
TW42	35.6	1.06	37.7	27.2
TW54	53.75	0.86	46.2	33.3
TW56	36.5	0.80	29.2	21.0
TW57	34.8	0.80	27.9	20.1
TW58	52.6	0.80	42.1	30.3

[5] Volatile Correction Model – Used to correct TEOM measurements for the loss of volatile components of particulate matter that occur due to the high sampling temperatures employed by this instrument

QA/QC of Automatic Monitoring

Calibration of the A26 Roadside site is undertaken fortnightly by TWBC's Environmental Protection Team. Matts Monitors undertake 6 monthly servicing, and the QA/QC is part of the K&MAQMN which includes daily data checks and annual audits. The K&MAQMN contract is run by Air Quality Data Management and Envitech Europe who ratify the data.

Further QA/QC AQMS Network Manager

QA/QC of Automatic Air Quality Instruments

Air quality measurements from automatic instruments are validated and ratified to the standards described in the Local Air Quality Management – Technical Guidance LAQM (TG16)
https://laqm.defra.gov.uk/technical-guidance
by Air Quality Data Management (AQDM) http://www.aqdm.co.uk

Validation

This process operates on data during the data collection stage. All data are continually screened algorithmically and manually for anomalies. There are several techniques designed to discover spurious and unusual measurements within a very large dataset. These anomalies may be due to equipment failure, human error, power failures, interference or other disturbances. Automatic screening can only safely identify spurious results that need further manual investigation.
Raw data from the gaseous instruments (e.g. NOx, O_3, SO_2 and CO) are scaled into concentrations using the latest values derived from the manual and automatic calibrations. These instruments are not absolute and suffer drifts. Both the zero baseline (background) and the sensitivity may change over time. Regular calibrations with certified gas standards are used to measure the zero and sensitivity. However, these are only valid for the moment of the calibration since the instrument will continue to drift. Raw measurements from particulate instruments (e.g. PM_{10} and $PM_{2.5}$) generally do not require scaling into concentrations. The original raw data are always preserved intact while the processed data are dynamically scaled and edited.

Ratification

This is the process that finalises the data to produce the measurements suitable for reporting. All available information is critically assessed so that the best data scaling is applied and all anomalies are appropriately edited. Generally this operates at three, six or twelve month intervals. However, unexpected faults can be identified during the instrument routine services or independent audits which are often at 6-monthly intervals. In practice, therefore, the data can only be fully ratified in 12-month or annual periods. The data processing performed during the three and six monthly cycles helps build a reliable dataset that is finalised at the end of the year.

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

- the correct scaling of data
- ignoring calibrations that were poor e.g. a spent zero scrubber
- closely tracking rapid drifts or eliminating the data
- comparing the measurements with other pollutants and nearby sites
- corrections due to span cylinder drift
- corrections due to flow drifts for the particulate instruments
- corrections for ozone instrument sensitivity drifts
- eliminating measurements for NO2 conversion inefficiencies
- eliminating periods where calibration gas is in the ambient dataset
- identifying periods were instruments are warming-up after a powercut
- identification of anomalies due to mains power spikes
- correcting problems with the date and time stamp
- observations made during the sites visits and services

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

The PM_{10} concentrations require scaling into Gravimetric Equivalent concentration units by use of the Volatile Correction Model (VCM) http://www.volatile-correction-model.info or by corrections published by Defra https://uk-air.defra.gov.uk/networks/monitoring-methods?view=mcerts-scheme depending on the measurement technique.

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

QC Audits

The National Physical Laboratory, (NPL) carry out annual audits to rigorously evaluate analysers to obtain an assessment of performance level. This information, in conjunction with the full analyser data set and calibration and service records, help ensure data quality specifications have been met during the preceding period. Additionally, an assessment of the station calibration cylinder concentrations provides an indication that the cylinder concentrations remain stable and therefore suitable for data scaling purposes.

The following describes the audit process:-

1 Oxides of Nitrogen

1.1 Analyser Response Factors

A stable "intercalibration standard", validated against NPL primary standards, is transported to each site and is sampled by the analyser.

The analyser also samples from a cylinder containing certified metrology grade zero air, or catalytic scrubbers of known efficiency.

The analyser factor quoted is the response to the intercalibration standard, expressed in $nmol.mol^{-1}.logged\ unit^{-1}$, with the zero point being the response to zero air.

For oxides of nitrogen analysers, the NO_x and NO channel response factors are derived from an NO in nitrogen cylinder.

1.2 Analyser Linearity

To determine analyser linearity, a series of amount fractions are produced (using dynamic dilution techniques) covering the analyser range. The analyser output is noted for each of these amount fractions. A linear regression is then carried out, relating analyser output to the dilution factor at each point. The linearity error is defined as the maximum residual of the regression slope.

1.3 Analyser noise levels.

This is defined here as the standard error of ten successive spot readings of analyser output when fully stabilised on zero (zero noise) or span (span noise) amount fraction.

1.4 NO_x analyser Converter Efficiency

NO_2 to NO Converter efficiency is determined as follows:

A stable amount fraction of NO is produced, (by two stage dynamic dilution) and the analyser outputs, NO_x and NO, are noted after a suitable stabilisation period.

Ozone is added to the sample, converting some NO to NO_2, note however, the total NO_x in the sample remains constant. Again, following appropriate stabilisation times, the NO_x and NO outputs are noted.

Converter (in)efficiency is defined as the change in scaled NO_x signal as a percentage ratio of the change in the scaled NO signal.

1.5 Estimation of Site Cylinder Amount fractions

The site cylinder amount fractions are evaluated by sampling from the site cylinder and using the analyser response factors, section 1.1, to derive their amount fraction.

2 **Particle Analysers.**

2.1 Analyser Flow Rates

Flow rates are measured by calibrated flow audit measurement systems. A leak check is also carried out.

2.2 Analyser Calibration Constants

TEOM Analyser calibration constants are measured by consideration of the change in frequency induced by placing pre-weighed masses on the analyser sensors.

QA/QC of Diffusion Tube Monitoring

ESG Didcot is a UKAS accredited laboratory and participates in the in the new AIR-PT (Proficiency Test) Scheme previously known as the Workplace Analysis Scheme for Proficiency (WASP)) for NO_2 tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The lab follows the procedures set out in the Harmonisation Practical Guidance. In the latest available results, ESG Didcot scored as follows: AIR-PT AR018 (Jan to Feb 2017) 100%, AIR-PT AR019 (April to May 2017) 100%, AIR-PT AR021 (July to August 2017) 75% and AIR-PT AR022 (September to October 2017) 100%. The percentage score reflects the results deemed to be satisfactory based upon the z-score of < ± 2. Based on 23 studies, 100% of all local Authority co-location studies in 2017, using the 50% TEA in acetone preparation method, were rated as 'good' (tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%).

Figure C.2 – Fall-off Distance Correction of the Site TW41

BUREAU VERITAS

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1.8	metres
Step 2	How far from the KERB is your receptor (in metres)?	6.6	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	11.3	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	43.3	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	33.8	µg/m^3

Figure C.2 – Fall-off Distance Correction of the Site TW34

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	4	metres
Step 2	How far from the KERB is your receptor (in metres)?	18	metres
Step 3	What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?	11.3	$\mu g/m^3$
Step 4	What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?	40.5	$\mu g/m^3$
Result	The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor	28.2	$\mu g/m^3$

Figure C.3 – Fall-off Distance Correction of the Site TW01

Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	2	metres
Step 2	How far from the KERB is your receptor (in metres)?	6.2	metres
Step 3	What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?	11.3	$\mu g/m^3$
Step 4	What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?	39	$\mu g/m^3$
Result	The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor	31.7	$\mu g/m^3$

Appendix D: Map(s) of Monitoring Locations

Figure D.1 – Map of Non-Automatic Monitoring Sites: Paddock Wood

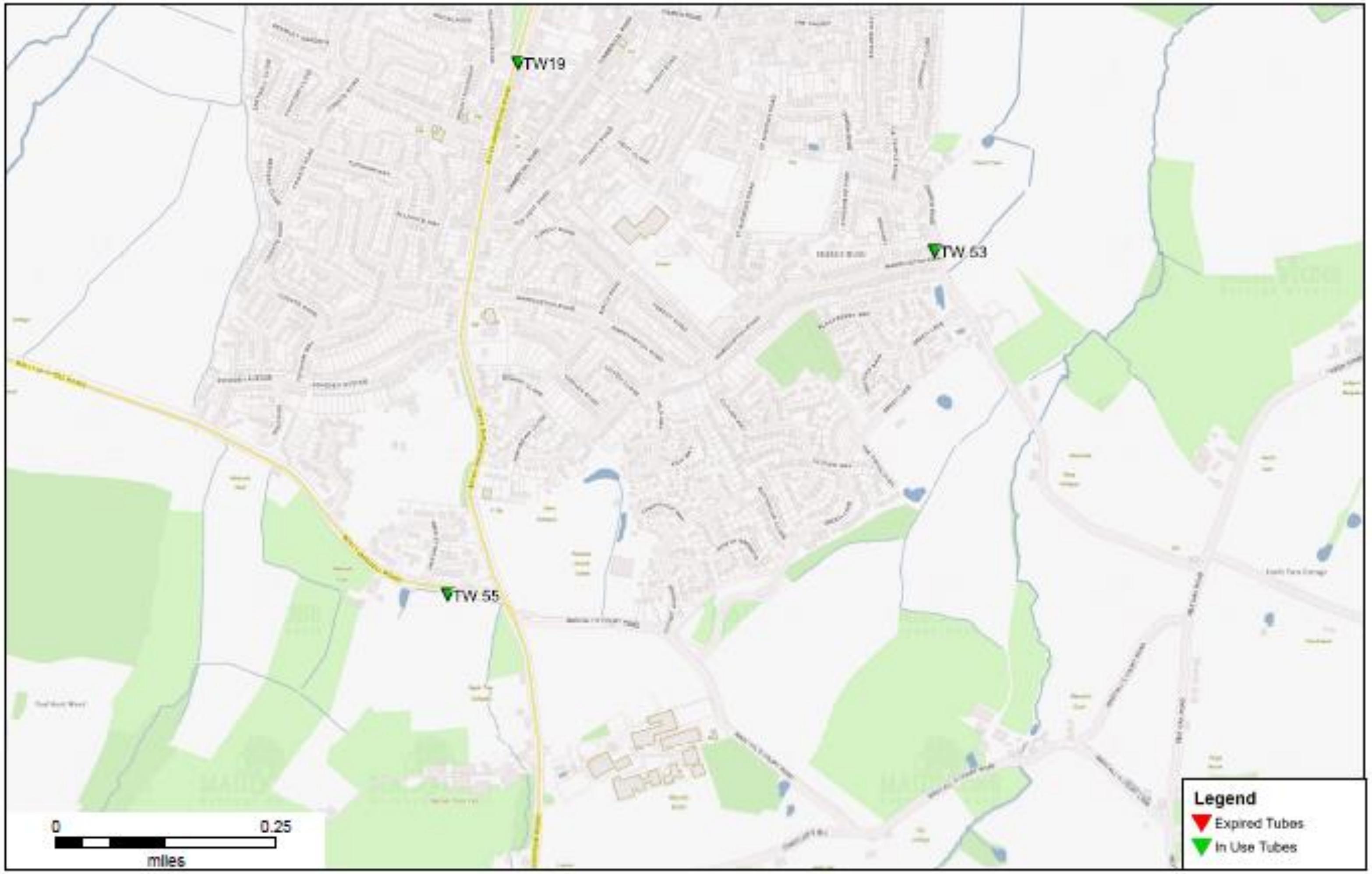


Figure D.2 – Map of Non-Automatic Monitoring Sites: Highgate

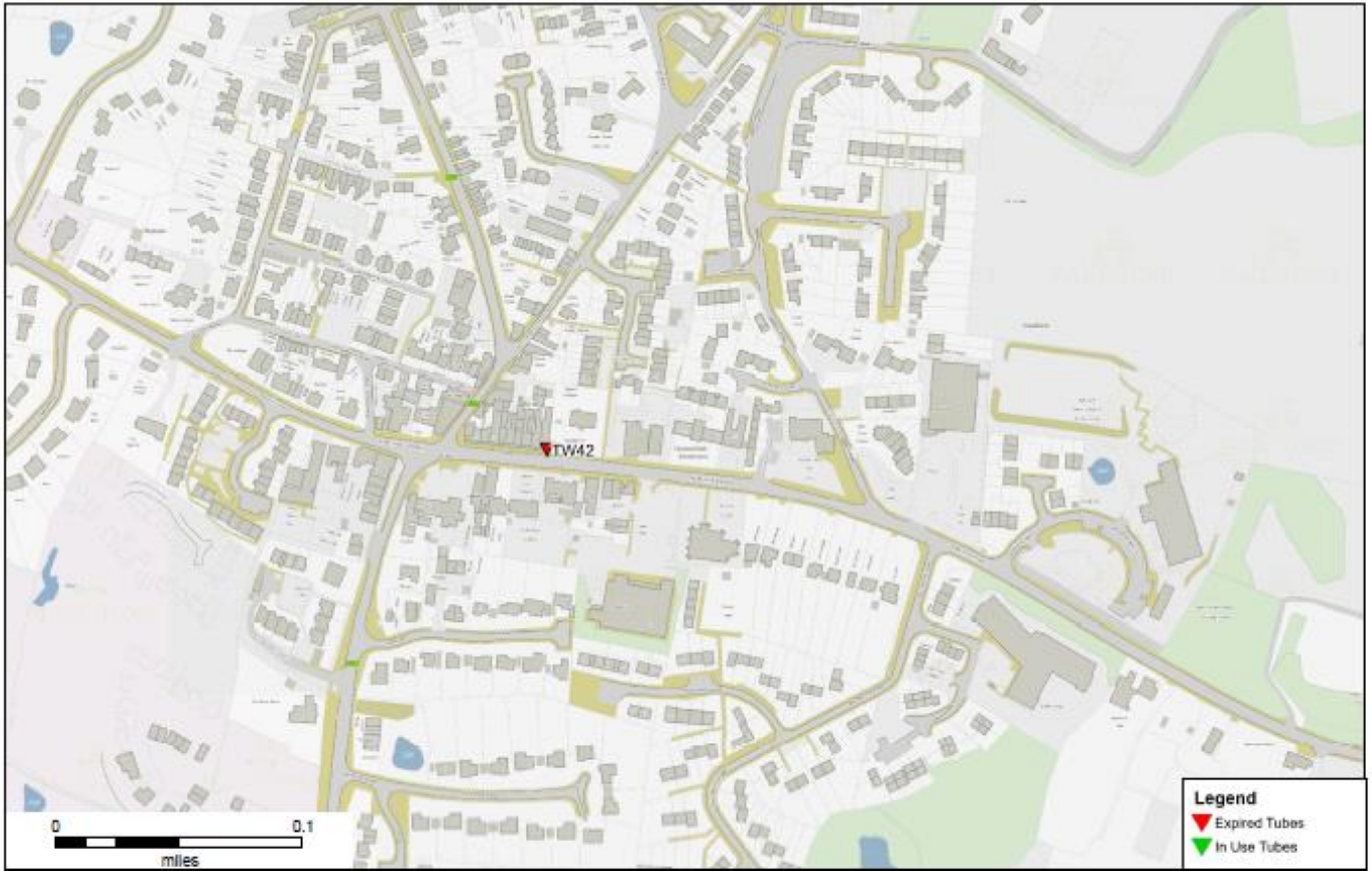


Figure D.3 – Map of Non-Automatic Monitoring Sites: Royal Tunbridge Wells, Town Centre 1

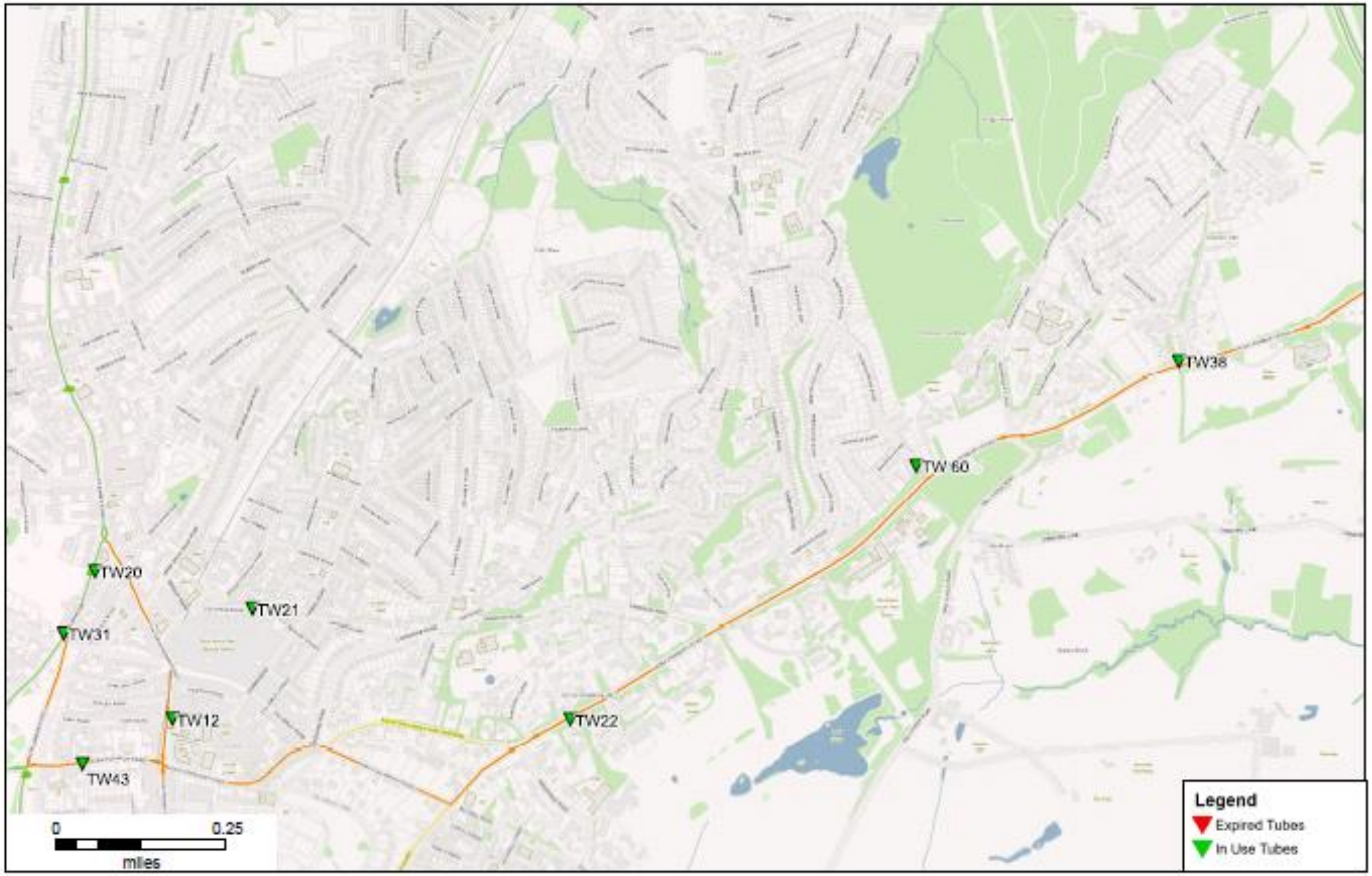


Figure D.4 – Map of Non-Automatic Monitoring Sites: Town Centre 2

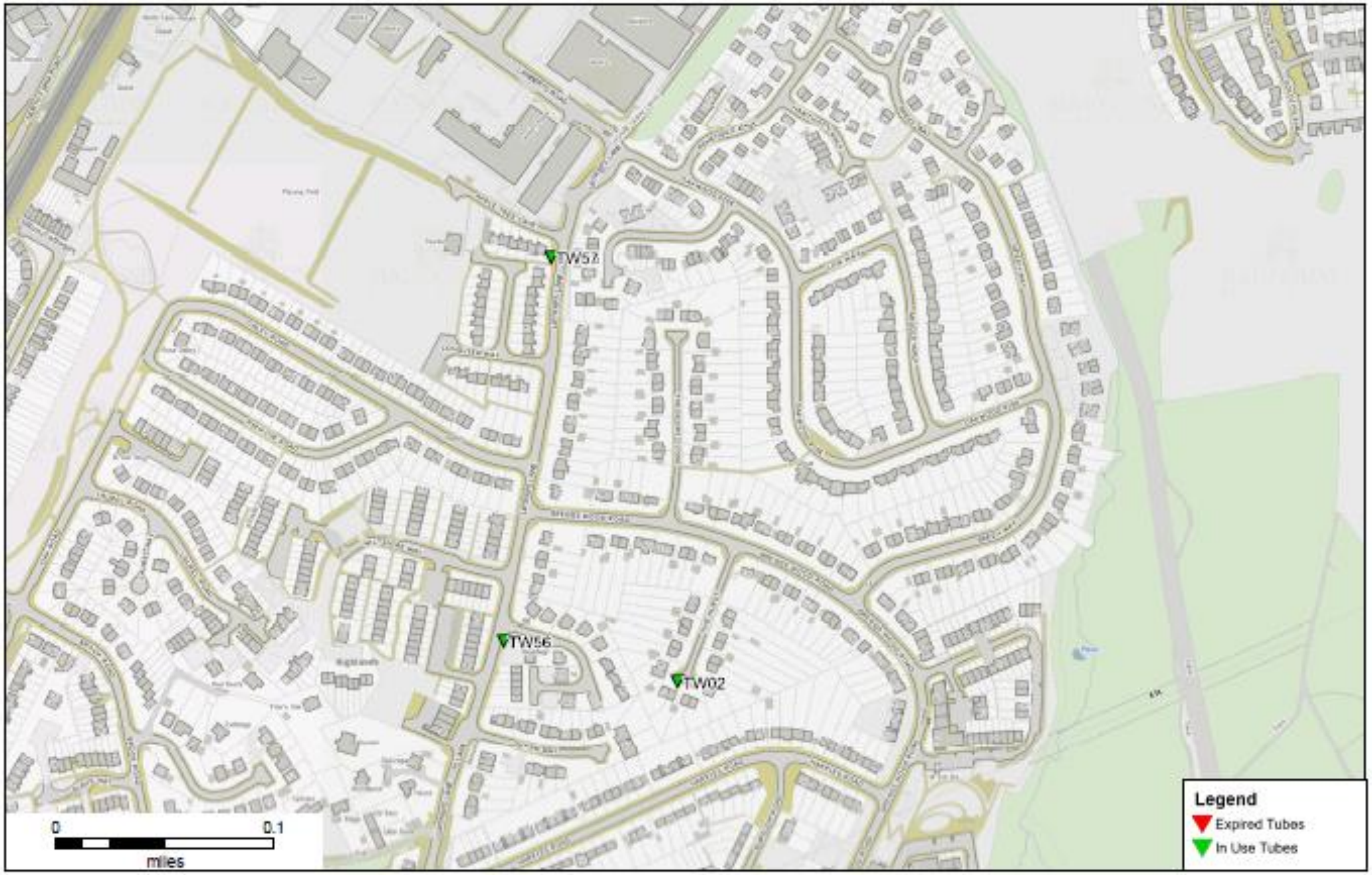


Figure D.5 – Map of Non-Automatic Monitoring Sites: Town Centre 3

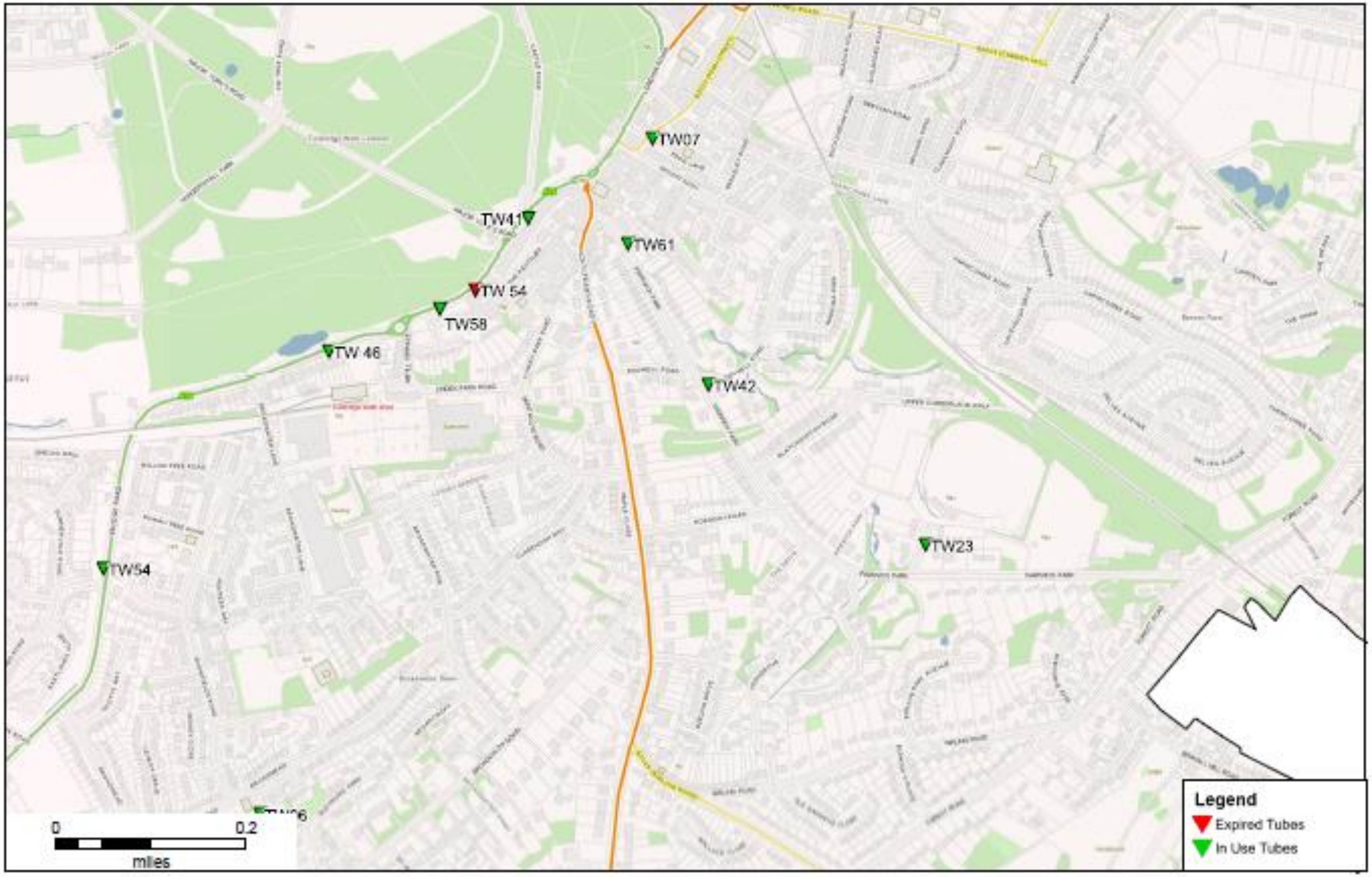


Figure D.6 – Map of Non-Automatic Monitoring Sites: Town Centre Expanded

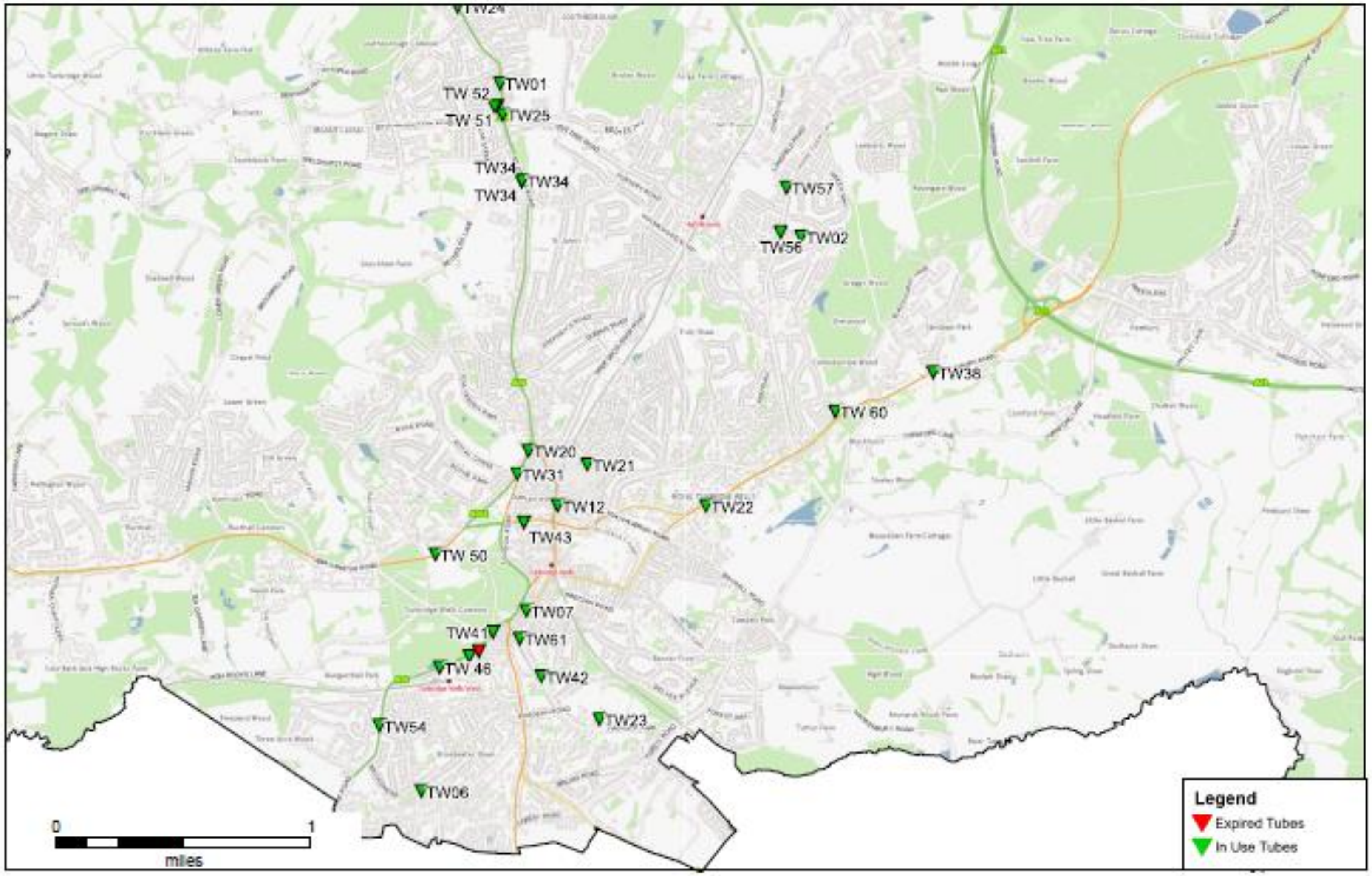


Figure D.7 – Map of Non-Automatic Monitoring Sites: London Road

Figure D.8 – Map of Non-Automatic Monitoring Sites: Southborough

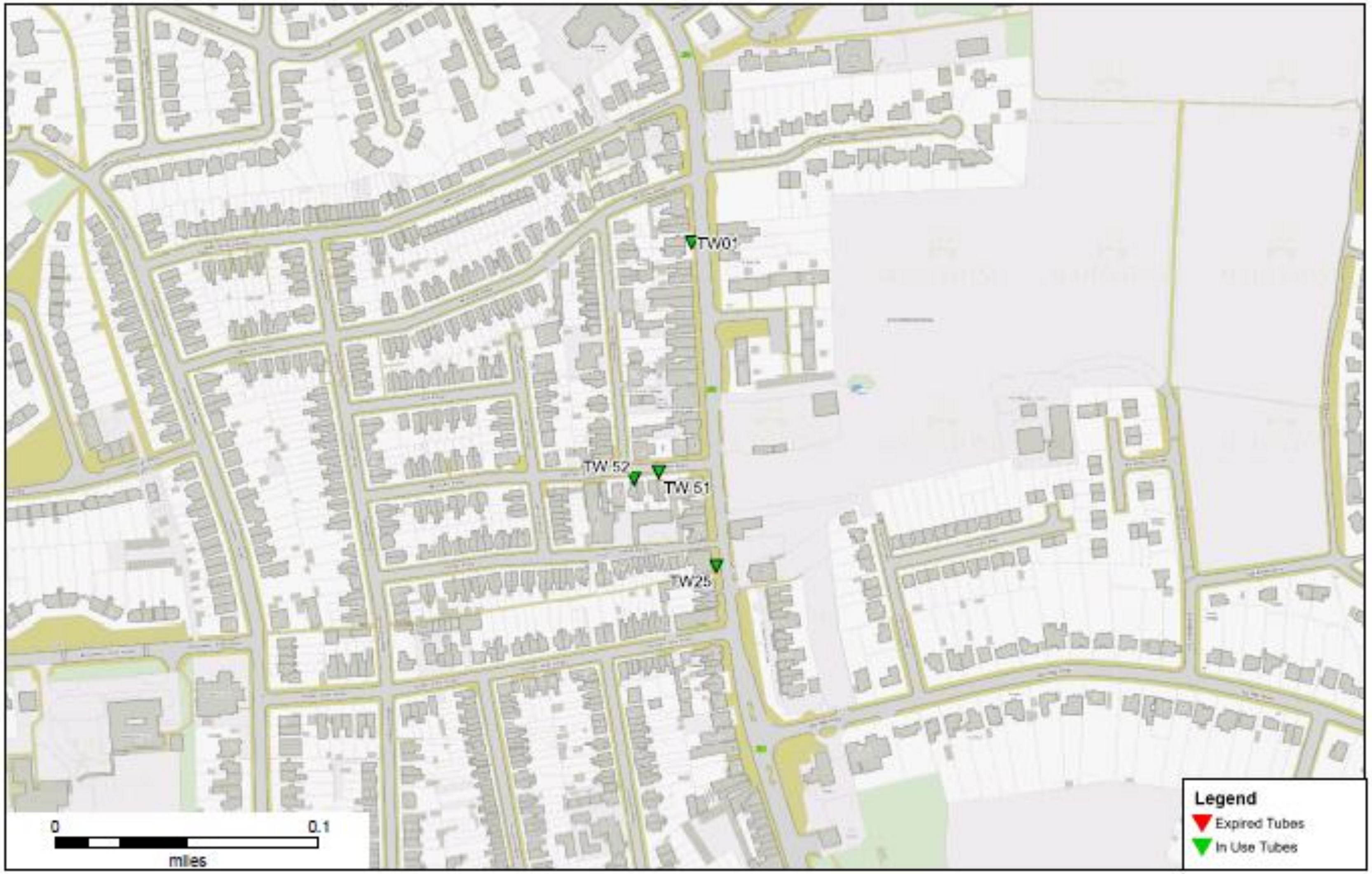
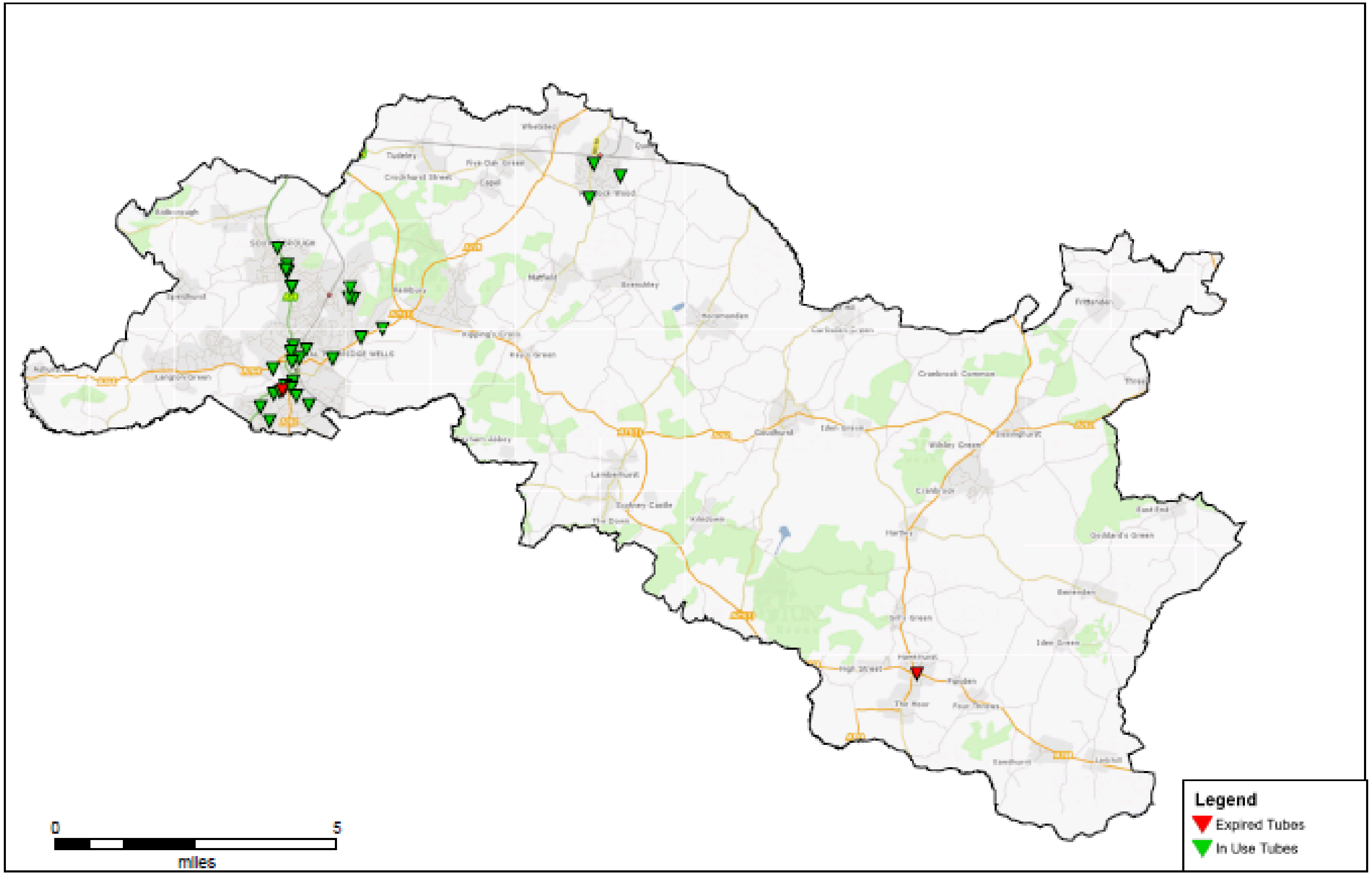


Figure D.9 – Map of Non-Automatic Monitoring Sites across Tunbridge Wells Borough



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[6]	
	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

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

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values’
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
VCM	Volatile Correction Model
K&MAQMN	The Kent and Medway Air Quality Monitoring Network

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- http://laqm.defra.gov.uk/documents/LAQM-AIR-PT-Rounds-1-12-(April-2015-February-2017)-NO2-report.pdf