



**WOKINGHAM
BOROUGH COUNCIL**

**2023 Air Quality Management Area Revocation
In fulfilment of Part IV of the Environment Act 1995 Local
Air Quality Management**

Date: November 2023

Information	Wokingham Borough Council Details
Local Authority Officer	Emma Choules Residential & Environmental Team
Department	Enforcement & Safety
Address	Wokingham Borough Council Shute End Wokingham Berkshire RG40 1BN
Telephone	0118 974 6000
E-mail	Environmental.Health@wokingham.gov.uk
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1 Introduction

This report was produced on behalf of Wokingham Borough Council and constitutes the required information under which the Council is to apply for the revocation of two Area Quality Management Areas (AQMAs) known as Twyford Crossroad and the M4.

The AQMA revocation report has been developed in recognition of the legal requirement on the local authority to work towards the Air Quality Strategy (AQS) objectives under Part IV of the Environment Act 1995 and the relevant Regulations made under that part and to meet the requirements of the Local Air Quality Management (LAQM) statutory process.

This report will provide the Council with robust evidence as required under the LAQM guidance, LAQM.TG (22), to enable it to revoke the two AQMAs.

2 Local Air Quality Management

2.1 Review and Assessment of Air Quality

Under the Environment Act 1995 local authorities are required to review and assess local air quality annually against national air quality objectives. This process sits under the Local Air Quality Management (LAQM) programme which requires local authorities to report annually to the department for Environment, Food and Rural Affairs (DEFRA).

The air quality objectives applicable to LAQM in England are set out in the Air Quality Standard Regulations 2010. The pollutant of concern for these 2 AQMAs is Nitrogen Dioxide only and the limits are set out in Table 1 below. The current AQMAs have been declared for the **annual objective**.

Table 1: The National Nitrogen Dioxide Air Quality Objectives

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO ₂)	200µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO ₂)	40µg/m ³	Annual mean

2.2 Health Impacts

Air pollution is associated with several adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Air Pollution can be harmful to everyone, but particularly affects the most vulnerable in society: children, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas^{1,2}.

Poor air quality is also a contributory factor in mortality. The mortality burden of air pollution within the UK is equivalent to 29,000 to 43,000 deaths at typical ages³, with a total estimated healthcare cost to the NHS and social care of £157 million in 2017⁴.

The major source of air quality pollutants in Wokingham Borough is road transport, and the main pollutant of concern is nitrogen dioxide (NO₂). Within the Borough there are three Air Quality Management Areas (AQMAs) which have been declared for exceedances of the Annual Mean NO₂ and 1-hour Objectives. These are located in Wokingham Town Centre, Twyford Centre Crossroads, and 60m either side of, the M4 throughout the whole of the borough ([Local Authority Details - Defra, UK](#)). (See Appendix A for the maps of Twyford Crossroads and M4 AQMAs).

2.3 Current Air Quality Management Area Status

In the comments from the June 2023 Annual Status Report (ASR) for Wokingham Borough Council DEFRA has recommended the revocation of two of the AQMAs the Twyford Crossroads and the M4, as they have both recorded annual levels at or below 36.0 µg/m³ for 3 continuous years.

2.4 Requirements for revoking an Air Quality Management Area (AQMA)

The process for the revoking an AQMA is set out in the DEFRA Local Air Quality Management Policy (22) and Technical Guidance (22). The Technical Guidance states that;

¹ Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

² Defra. Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

³ Defra. Air quality appraisal: damage cost guidance, January 2023

⁴ Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

“3.57 The revocation of an AQMA should be considered following three consecutive years of compliance with the relevant objective as evidenced through monitoring. Where NO₂ monitoring is completed using diffusion tubes, to account for the inherent uncertainty associated with the monitoring method, it is recommended that revocation of an AQMA should be considered following three consecutive years of annual mean NO₂ concentrations being lower than 36µg/m³ (i.e. within 10% of the annual mean NO₂ objective). There should not be any declared AQMAs for which compliance with the relevant objective has been achieved for a consecutive five-year period.”

Wokingham Borough Council has robust monitoring data for both the Twyford Crossroads and the M4, that has recorded annual levels at or below 36.0 µg/m³ for 3 continuous years they can both be revoked.

3 M4 Air Quality Management Area

3.1 The M4 AQMA

The M4 AQMA was declared for the NO₂ annual mean in 2001 and amended in 2004. It is a Zone 60m either side of the M4 from the Council’s boundaries with Reading Borough Council (in the west) & Royal Borough Windsor & Maidenhead (in the East), it runs throughout the borough including an extended area along the A329 Reading Road where it underpasses the M4, (See Appendix A Map 1).

3.2 The Nitrogen Dioxide Levels

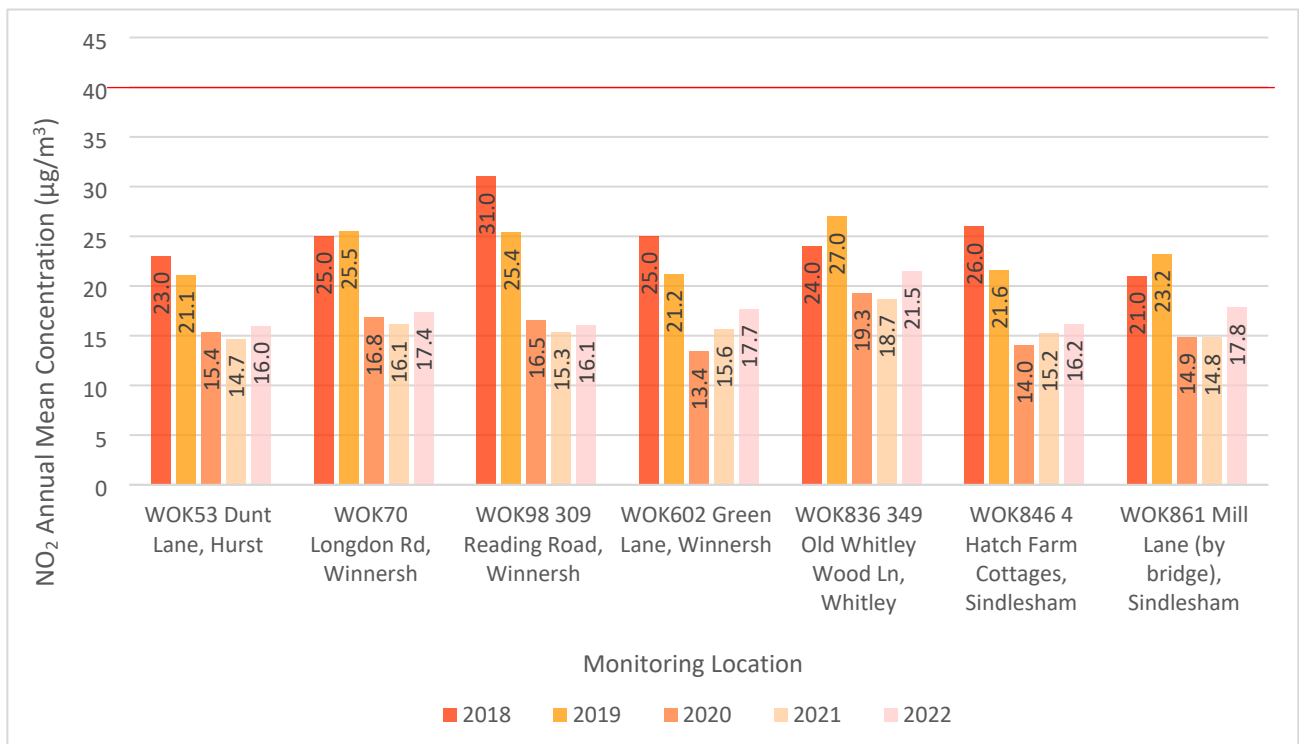
The NO₂ levels for the M4 AQMA, have been monitored using diffusion tubes since 2001 at 7 locations (see Map 3 and 4). These are all located within the AQMA.

- WOK53 – Dunt Lane, Hurst
- WOK70 - London Road, Winnersh
- WOK98 – 309 Reading Road, Winnersh
- WOK602 Green Lane, Winnersh
- WOK 836 – 349 Old Whitley Wood Lan4, Whitley
- WOK846 – 4 Hatch Farm Cottages, Sindlesham
- WOK861 - Mill Lane, Sindlesham

The results (se Figure 1 below) have been 36.0 µg/m³ or below for the past 5 years, within the highest level reaching 31.0 µg/m³ in 2018. Whilst the levels have started to rise slightly since 2020-2021 when the M4 had reduced traffic volumes due to the pandemic lockdowns, the levels have not risen to the levels measured pre 2020. A number of factors may attribute to this, including an

increased use of electric vehicles, more people working from home and “hybrid working”, and the implementation of the M4 smart motorway. Highways England commence the smart motorway construction in 2018 and was fully implemented in 2022. From 2018 – 2021 the section from Junction 8 to Junction 12, within which is this AQMA, the traffic speed was limited to 50 mph in 3 lanes, then increased to 60 mph during the testing period in 4 lanes during the final few months before completion. From December 2021 the motorway was reopened to traffic at the national speed limit.

Figure 1: Diffusion tube Nitrogen Dioxide Levels in the M4 AQMA from 2018 to 2022



3.3 Historic Continuous Monitoring

Between 25/03/2013 and 31/12/2016 automatic monitoring at Old Whitley Wood Lane, north of M4 was carried out, (results in Table 2 below). During this period there were only two exceedances of the 1-hour Objective in 2016 (18 are permitted) and the highest annual average of 36.9 µg/m³ was recorded in 2014.

3.3.1 Table 2: The results from the continuous monitoring unit from 2013 to 2016 at the M4 AQMA.

Year	NO ₂ 1 Hourly mean	NO ₂ Annual Mean (µg/m ³)
2016	2 exceedances	34.2
2015	Unit off line	Unit offline
2014	0 exceedances	36.9
2013	0 exceedances	30.2

3.4 Future Monitoring

Monitoring will continue at the 7 sites using diffusion tubes, as advised in LAQM.TG (22) to ensure that the levels remain at 36.0 µg/m³ or below, for the next 3 years, unless directed otherwise from DEFRA.

3.5 QA/QC of Monitoring Data

All the monitoring data is presented with a robust quality assurance and quality control refer to Appendix B for full details.

4 Twyford Crossroads AQMA

4.1 The AQMA

The Twyford Crossroads AQMA was declared for the exceedance of annual mean NO₂ in 2015. It includes the residential and commercial properties along parts of High Street in the west, Wargrave Road in the northwest, London Road in the north-east and Church Street the south-east (see Appendix A Map 2).

4.2 The Nitrogen Dioxide Levels

The nitrogen dioxide levels for the Twyford Crossroads AQMA, have been monitoring the NO₂ Annual mean objective using diffusion tubes (5 sites, 3 of which are triplicate) and a reference continuous monitor (see Appendix A Map 5). The sites are located as followed;

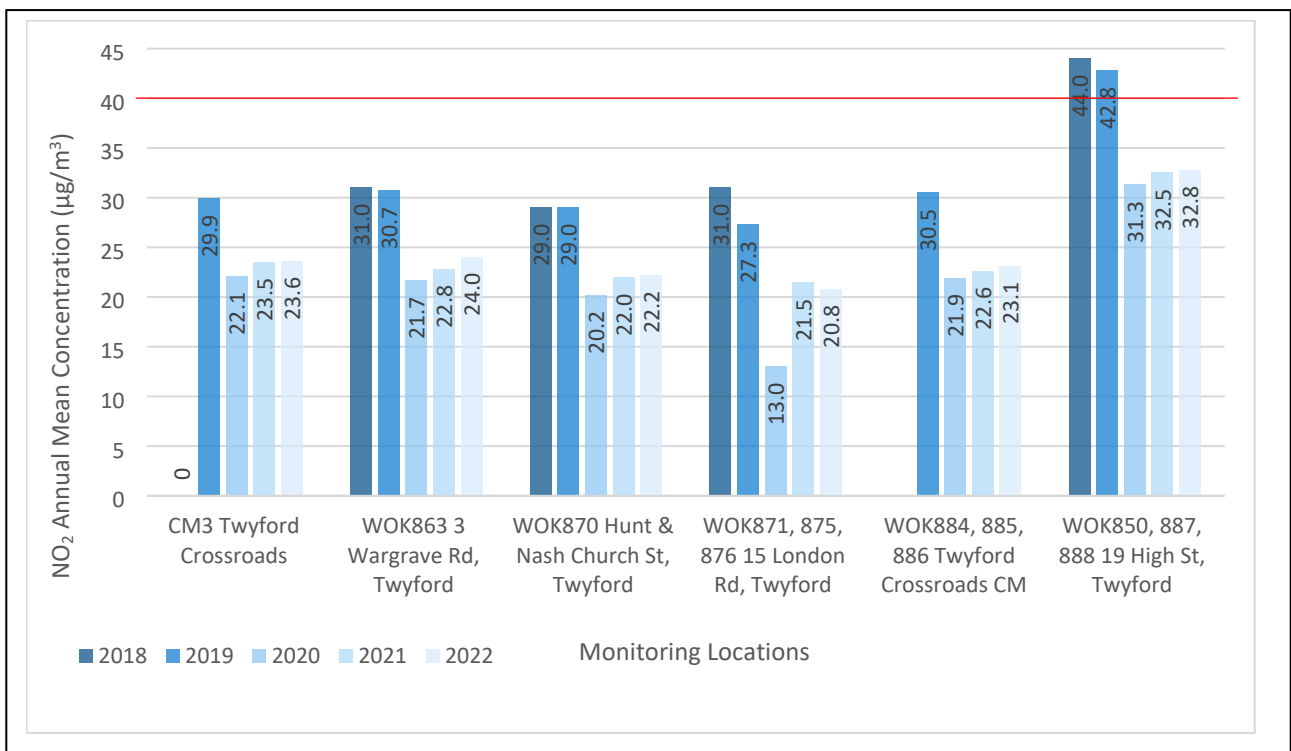
- WOK863 - 3 Wargrave Road, Twyford
- WOK870 - Hunt & Nash Church St, Twyford

- WOK871, 875, 876 - 15 London Road, Twyford
- WOK884, 885, 886 - Twyford Crossroads Continuous Monitor
- WOK850, 887 888 - 19 High Street, Twyford.

The results have been 36.0 µg/m³ or below for the past 5 years, in 4 of the diffusion tube locations and continuous monitor (shown in Figure 2 below). One of the diffusion tube locations, 19 High Street has been 36.0 µg/m³ or below since 2020. Whilst the NO₂ has started to rise slightly since 2020 they remain below the 2019 levels.

A number of factors can attribute to these reduced levels including an increased use of electric vehicles, more people working from home and “hybrid working”, increase in public transport use, and reduction in vehicle idling.

4.3 Figure 2: Continuous Monitor (CM) and diffusion tube Annual NO₂ concentrations at Twyford Crossroads AQMA from 2018 to 2022



4.4 Current Monitoring

Throughout 2023 the 5 diffusion tubes site within the AQMA have remained in place along with the continuous monitor. For the first 9 months the continuous monitoring results show that the annual NO₂ is predicted to remain below 36.0µg/m³ (Figure 3), with the average for quarters 1, 2, and 3 at

21.4µg/m³, which is below the 2022 NO₂ results for the same period of 23.3 µg/m³. The results from the diffusion tubes will not be known until the raw data has been bias corrected, however they are predicted to be below 36µg/m³ from analysing the previous year’s data and the current data from the continuous monitoring.

4.4.1 Figure 3: A table showing the Jan – Sept 2023 Continuous monitoring data for the Twyford Crossroads and the monthly and quarterly NO₂ comparison with 2022.

Month	Average NO concentration (µg/m ³)		NO2 Monthly comparison (%)	Quarterly Annual Average		Quarterly comparison (%)
	2022	2023		2022	2023	
January	33.2	28.9	-6.7	28.4	26.2	- 8
February	23.0	27.4	6.2			
March	28.5	22.2	-3.5			
April	26.2	21.3	-23	20.9	20.0	- 4.4
May	26.7	19.0	-41			
June	23.5	19.7	-19			
July	19.6	15.5	-27	20.7	17.6	-16.2
August	16.5	16.5	-7			
September	20.9	20.9	-20			

4.5 Future Monitoring

Monitoring will continue at the 5 diffusion tubes sites to ensure that the levels remain at 36.0 µg/m³ or below, for the next 3 years, unless direct otherwise from DEFRA.

4.6 QA/QC of Monitoring Data

All the monitoring data is presented with a robust quality assurance and quality control refer to Appendix B for full details.

5 Ongoing measure to improve the local Air Quality

In addition to working to reduce and maintain NO₂ concentrations below the annual objective in all areas of the Borough, we will continue to assess planning applications to ensure that future developments and changes to the road networks across the Borough do not lead to an increase in the NO₂ concentration above the annual mean objective of 40µg/m³. We will also continue to regulate installations to ensure that emission limits are not exceeded and also undertake regulation of smoke and waste burning to reduce impacts on local air quality. We will continue to provide our Anti-Idling

Schools Kit to the local Primary's as well as running Clean Air Day, and other campaigns which help improve our air quality. ([air-quality-school-toolkit-final-version-1-003.pdf](https://www.air-quality-school-toolkit-final-version-1-003.pdf) (publicprotectionpartnership.org.uk)).

5.1 Current Borough Wide Monitoring

In the 2023 Annual Status Report Wokingham Borough Council confirmed it has 47 diffusion tube sites monitoring NO₂ levels in borough and that they have shown a decreasing trend since 2018. No diffusion tube sites in 2022 located within Wokingham exceeded the Annual Mean Objective. No diffusion tube results were recorded above 60µg/m³, indicating no exceedances of the 1-hour NO₂ objective.

The continuous monitoring unit in Peach Street Wokingham town centre, within the Wokingham AQMA, recorded an Annual Mean NO₂ level of 27.1µg/m³ in 2022, which meets the Annual Mean NO₂ Objective (40µg/m³). The continuous monitoring also met the 1-hour NO₂ objective.

Within the Twyford AQMA the continuous monitoring recorded an Annual Mean NO₂ level of 23.6µg/m³, which also met the objective. The continuous monitoring also met the 1 hour NO₂ objective.

Furthermore, there were no exceedances of the Annual Mean NO₂ Objective from the monitoring sites within the M4 AQMA.

Wokingham Borough Council will be continuing to monitor the Air Quality across the borough (using diffusion tubes and continuous monitor(s) as appropriate. It may move the locations and add new areas to monitoring schedule as the local environment changes, such as new housing developments, changes to the road networks and the reduction of NO₂ across the borough. Wokingham is committed to continuing our work to reduce levels of pollution throughout the borough.

The council will continue working toward reducing the concentration of all air pollutants to achieve the Air Quality Objectives as stated in the Environmental Act 2021.

6 Consultation

Wokingham Borough Council will consult with stakeholders during the process of revocation of the two AQMAs.

7 What are the next Steps?

Wokingham will commence the process of revoking two AQMAs including a 4 week consultation period with statutory consultees and stakeholders.

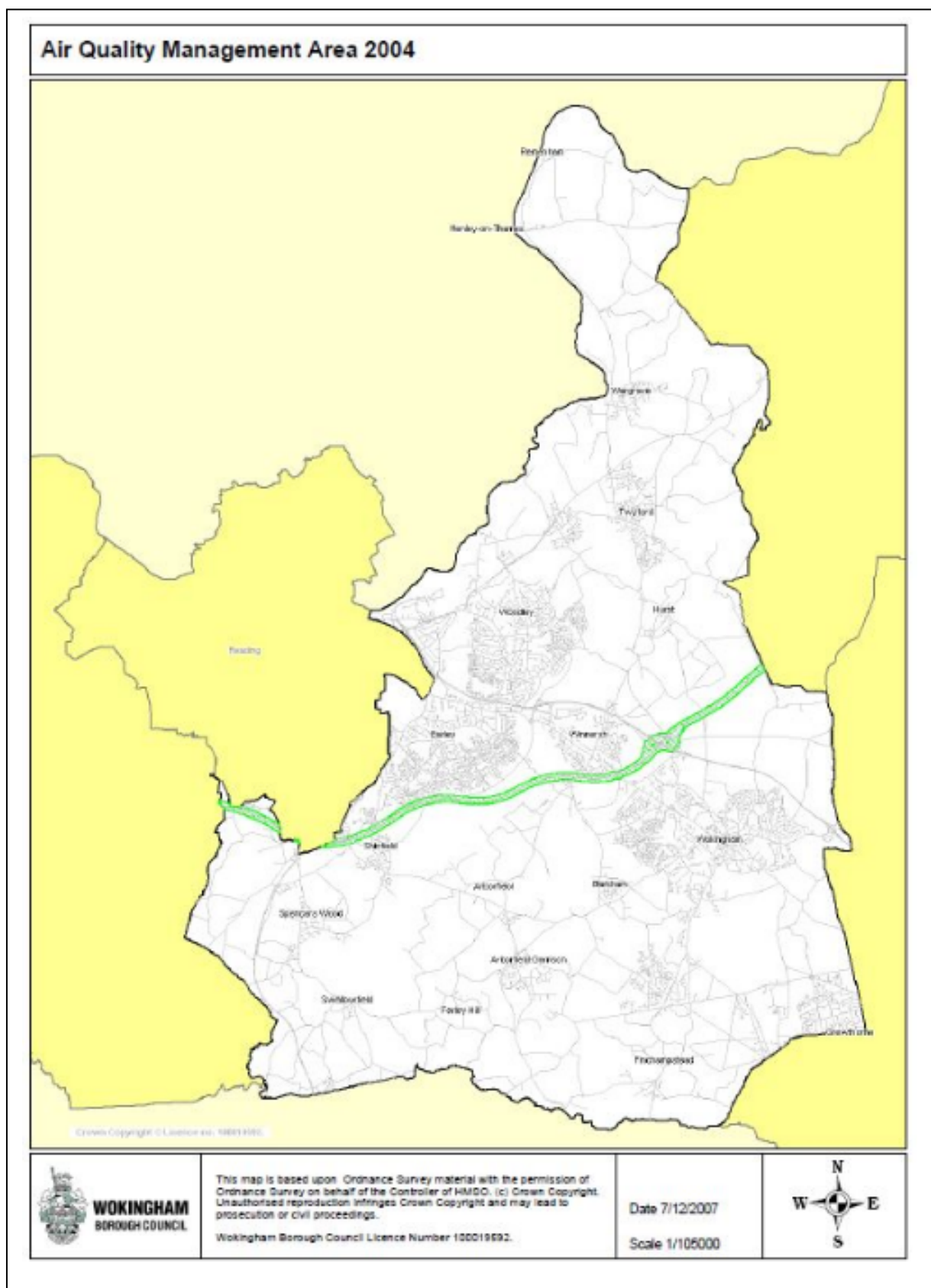
The process will include a report submission to DEFRA and a revocation order will be issued and made available on our website.

8 References and Papers

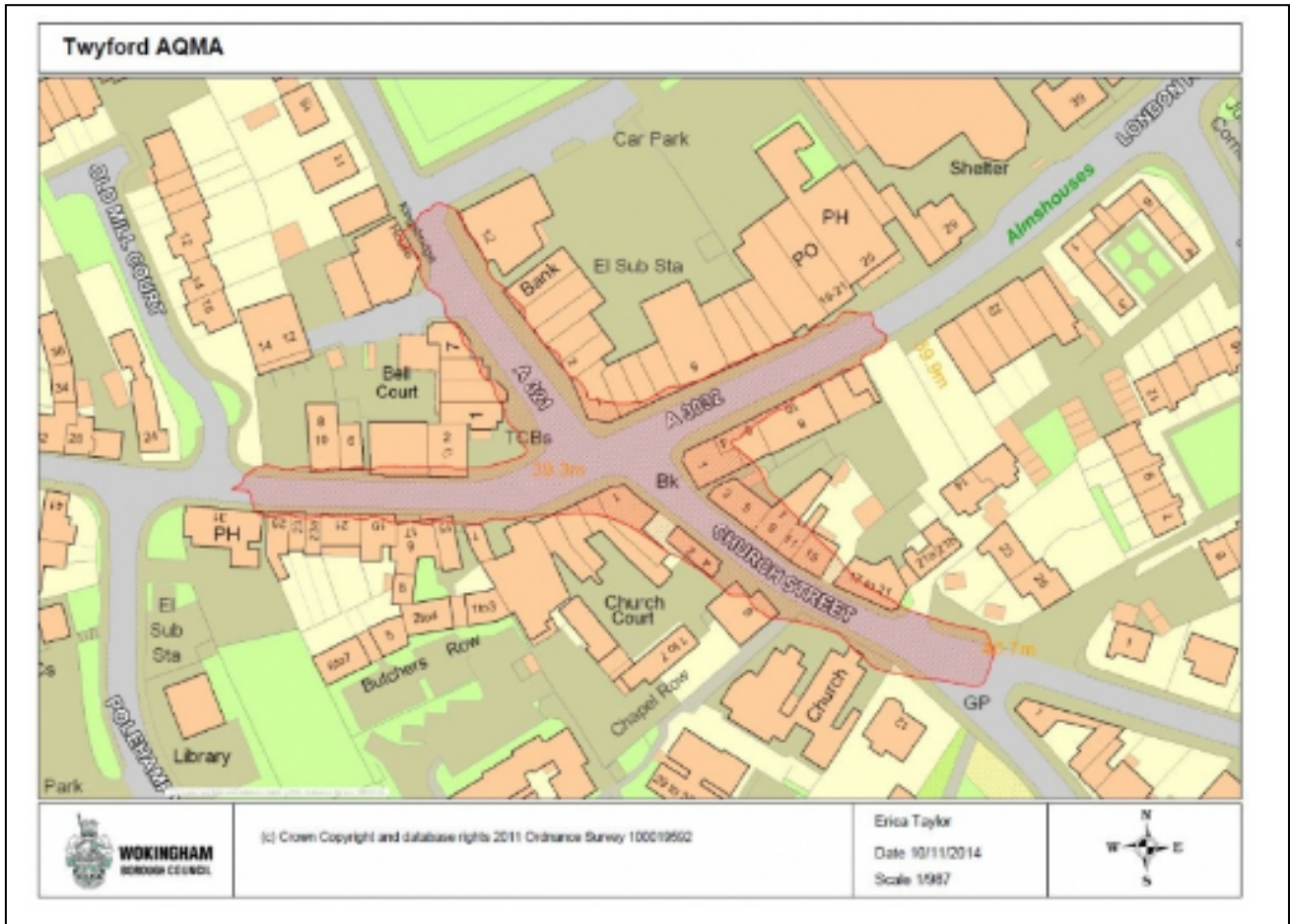
- **Wokingham Borough Council Annual Status Report** (*June 2023*), by Charlie Fielder.
[Air Quality Monitoring - PPP \(publicprotectionpartnership.org.uk\)](https://publicprotectionpartnership.org.uk)
- **Air Quality Management Areas (AQMAs)** (*DEFRA October 2023*)
[AQMA Details - Defra, UK](#)
- **Local Air Quality Management Technical Guidance LAQM.TG(22)** (*August 2022*).
Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
[LAQM-TG22-August-22-v1.0.pdf \(defra.gov.uk\)](#)
- **Local Air Quality Management Policy Guidance LAQM.PG(22)** (*August 2022*).
Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
[LAQM-Policy-Guidance-2022.pdf \(defra.gov.uk\)](#)

Appendix A

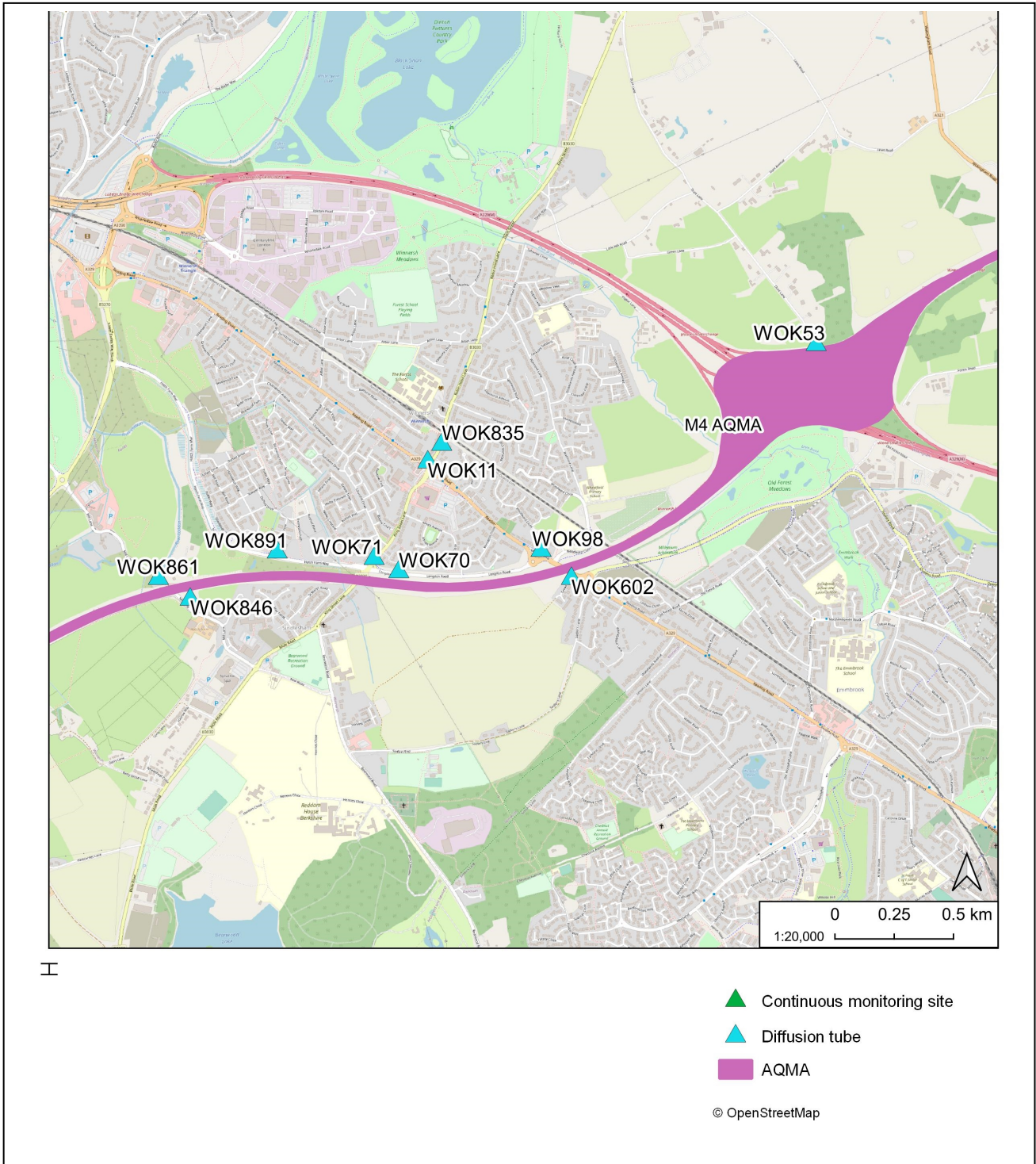
Map 1: The M4 AQMA



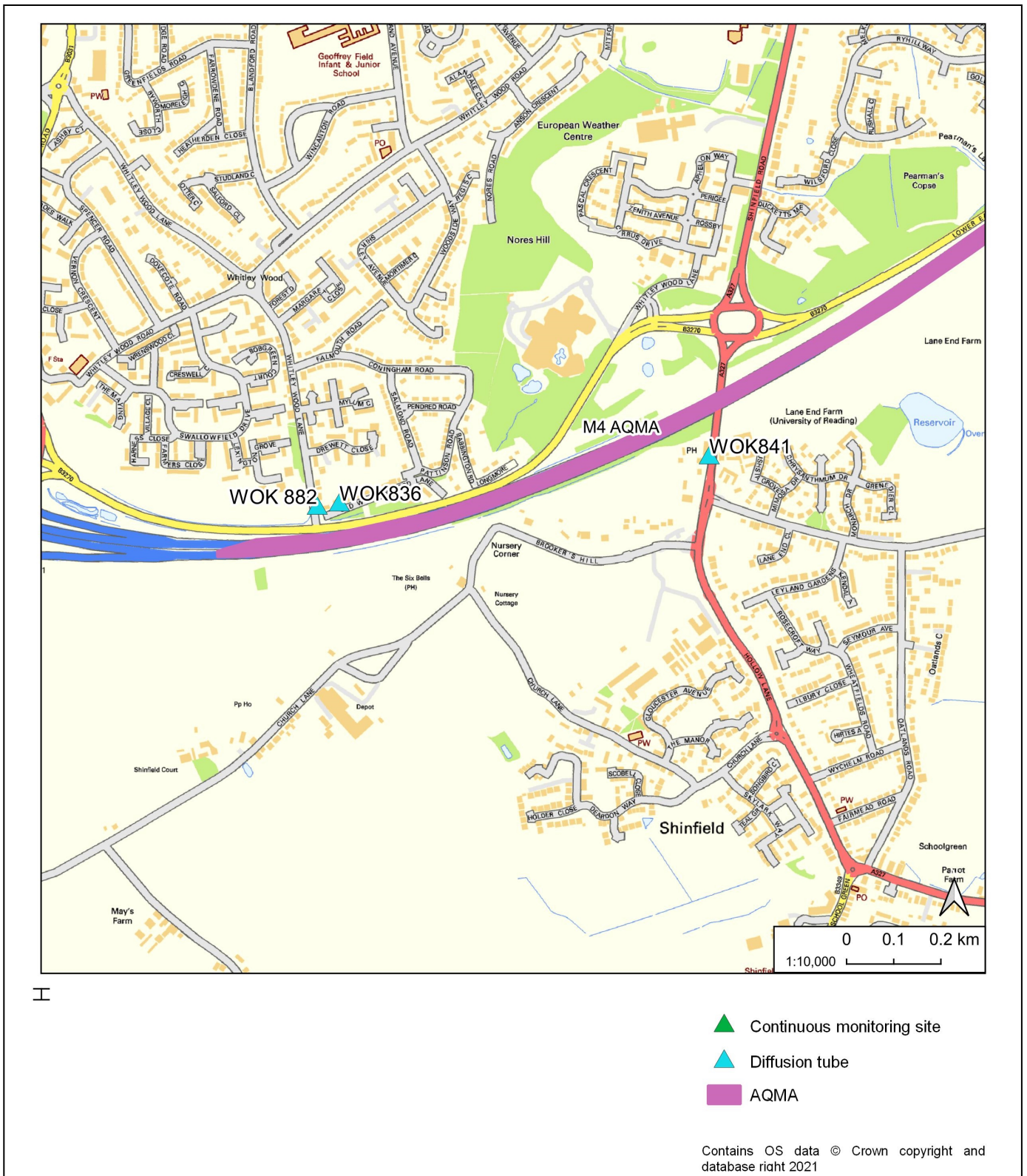
Map 2: The Twyford Crossroads AQMA ([AQMA Details - Defra, UK](#))



Map 3: The M4 AQMA (East) diffusion tube monitoring locations



Map 4: The M4 AQMA (West) diffusion tube monitoring locations

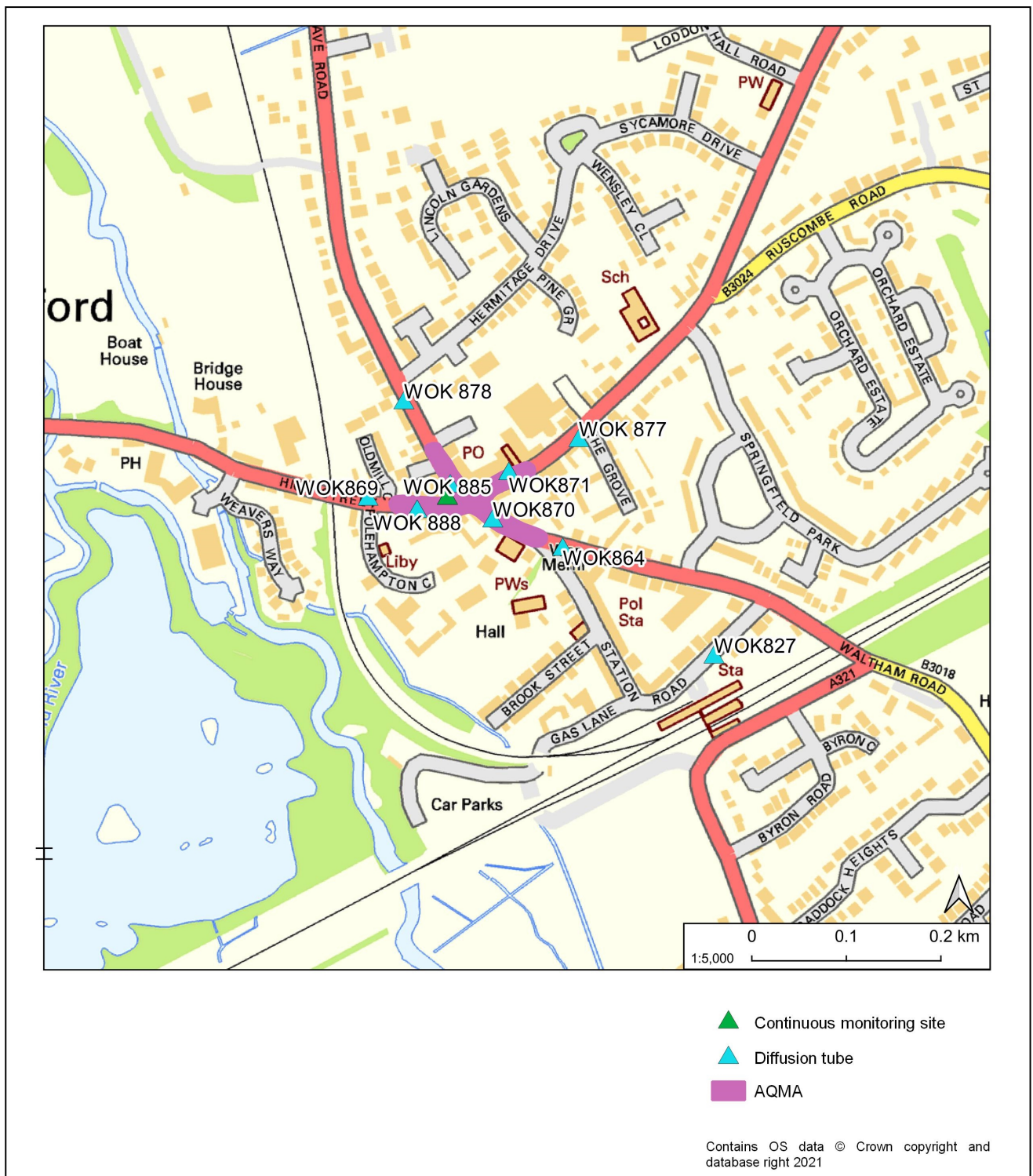


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- ▲ Continuous monitoring site
- ▲ Diffusion tube
- AQMA

Contains OS data © Crown copyright and database right 2021

Map 5: The Twyford AQMA diffusion tube and continuous monitoring locations



Appendix B: QA/QC for the Diffusion Tubes and Continuous Monitor

QA/QC Diffusion Tubes

Wokingham Borough Council uses GRADKO as the supplier used for diffusion tubes within 2022 and the method of preparation, e.g. 20% TEA in water. The monitoring that has been completed is in adherence with the 2022 DEFRA Diffusion Tube Monitoring Calendar.

The Workplace Analysis Scheme for Proficiency (WASP) is an independent analytical performance testing scheme, operated by the Health and Safety Laboratory (HSL). WASP formed a key part of the former UK NO₂ Network's QA/QC and remains an important QA/QC exercise for laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management. The laboratory participants analyse four spiked tubes and report the results to HSL. HSL assign a performance score to each laboratory's result, based on their deviation from the known mass of nitrite in the analyte. The Performance criteria are due to be changed, at present the criteria are based on the z-score method, and equates to the following:

GOOD: Results obtained by the participating laboratory are on average within 13% of the assigned value. This equates to a Rolling Performance Index (RPI) of 169 or less.

ACCEPTABLE: Results obtained by the participating laboratory are on average within 13-26% of the assigned value. This equates to an RPI of 169 - 676.

WARNING: Results obtained by the participating laboratory are on average within 26 – 39% of the assigned value. This equates to an RPI of 676 - 1521.

FAILURE: Results obtained by the participating laboratory differ by more than 39% of the assigned value. This equates to an RPI of greater than 1521.

However, from April 2009, the criteria has been based upon the Rolling Performance Index (RPI) statistic and will be tightened to the following:

GOOD: Results obtained by the participating laboratory are on average within 7.5% of the assigned value. This equates to an RPI of 56.25 or less.

ACCEPTABLE: Results obtained by the participating laboratory are on average within 15% of the assigned value. This equates to an RPI of 225 or less.

UNACCEPTABLE: Results obtained by the participating laboratory differ by more than 15% of the assigned value. This equates to an RPI of greater than 225.

Wokingham Borough Council use Gradko International for the supply and analysis of the nitrogen dioxide diffusion tubes for their non-automatic monitoring programme. Gradko's performance for AIR PT please see Table C.2. Nitrogen Dioxide AIR PT 2019.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Wokingham Borough Council have applied a local bias adjustment factor of **0.87** to the 2022 monitoring data. A summary of bias adjustment factors used by Wokingham Borough Council over the past five years is presented in Table B.. The sites which were used were Peach Street in Wokingham Town Centre (AQMA) and Twyford Crossroads (AQMA). Gradko International Ltd of St Martin's House 77 Wales Street Winchester Hampshire is the supplier and analyst of the nitrogen dioxide diffusion tubes. The tubes are analysed by U.V. spectrophotometry. The limit of detection is 20% TEA/Water.

Factor from Local Co-location Studies and Discussion of Choice of Factor to Use

The local co-located sites combined are used as bias adjustment factor 0.83 was applied. A copy of the co-location spreadsheet used is provided below.

In determining the bias adjustment factor for the 2022 data the following was taken into consideration:

Cases where the locally obtained bias adjustment factor may be more representative:

- Where the diffusion tube exposure periods weekly or fortnightly – the Wokingham sites are town centre & Twyford Village Crossroads, and the co-location study is monthly.
- For co-location sites with “good” precision for the diffusion tubes and with high quality chemiluminescence results – It can be seen from Figure C.4 below that both the Wokingham Town Centre & Twyford Village Crossroads co-location study achieved “good” precision, and “good Data Capture” both at 95% & 96%. The chemiluminescence monitors

results (automatic monitoring) are high quality (see the QA/QC of Automatic Monitoring section above).

Cases where the combined (national) bias adjustment factor may be more representative:

- Where the survey consists of tubes exposed over a range of settings, which differ from the co-location site – this is not the case for Wokingham Borough.
- Where the co-location study is for less than nine months, although the diffusion tube monitoring is for a longer period - The Wokingham town centre & Twyford Village Crossroads co-location study and diffusion tube surveys are for a full calendar year (2020).
- Where the automatic analyser has been operated using local, rather than national, QA/QC procedures - The Wokingham town centre chemiluminescence results (automatic monitoring) are high quality, see the QA/QC of Automatic Monitoring section above.
- Where data capture from the automatic analyser is less than 90%, or there have been problems with data quality. Due to Data capture from the Wokingham Town centre automatic monitor was 95% in 2020 (Figure C.3) & the data capture from the Twyford Crossroads automatic monitor was 96% in 2021 (Figure C.3).
- For co-location sites with “poor” precision or laboratories with predominately “poor” precision, as set out on the Review & Assessment Helpdesk website - It can be seen from the table below that both the Wokingham Town Centre & Twyford Village Cross Roads co-location study & achieved “good” precision and the laboratory precision was “good”. See the QA/QC of Diffusion Tube Monitoring section above.

In conclusion, it can be seen from the discussion above that due to the high data capture rate from the both the automatic analyser in Twyford (96%) and Wokingham (95%) that the combined back Local Bias Adjustment Factor was of 0.87 was used.

Table B.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	Local		0.87
2021	Local	-	0.83
2020	National	-	0.81
2019	National	09/20	0.88

2018	Local	-	0.95
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Table B.2 – Local Bias Adjustment Calculation

	Local Bias Adjustment Wokingham	Local Bias Adjustment Twyford
Periods used to calculate bias	11	11
Bias Factor A	0.85 (0.79 - 0.93)	0.89 (0.83 - 0.96)
Bias Factor B	18% (8% - 27%)	13% (5% - 21%)
Diffusion Tube Mean ($\mu\text{g}/\text{m}^3$)	32.7	26.2
Mean CV (Precision)	2.8%	3.1%
Automatic Mean ($\mu\text{g}/\text{m}^3$)	27.8	23.2
Data Capture	95%	96%
Adjusted Tube Mean ($\mu\text{g}/\text{m}^3$)	28 (26 - 30)	23 (22 - 25)

Notes:

A combined local bias adjustment factor of **0.87** has been used to bias adjust the 2022 diffusion tube results.

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO₂ fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO₂ concentrations corrected for distance are presented in **Error! Reference source not found.** No diffusion tube NO₂ monitoring locations within Wokingham Borough Council required distance correction during 20

QA/QC of Automatic Monitoring

TRL carry out the QA/QC on behalf of Wokingham Borough Council, below is their QA/QC procedure.

Site operation

Routine instrument calibrations are conducted approximately once a month, which involve zero and span checks, a written record of the gas analyser diagnostics and a general visual inspection of all equipment is undertaken. There is a written operating procedure, and a calibration record sheet is completed at every site visit.

Data retrieval and daily data checking

Data from the monitoring station is retrieved and processed on a Campbell CR10x data logger as 15-minute mean data. The logger was interrogated via a Siemens TC35i GSM modem at 8-hourly intervals by the ENVIEW 2000 software hosted at TRL. This was used to retrieve, check and archive data. TRL's internal QA/QC procedures require all data to be backed up on a secure server and all documentation associated with each site to be uniquely identified and securely stored to provide an audit trail. Daily data inspections are undertaken during office hours using the facilities of the Data Management System. Initial observations of the Management System indicate whether the site has been contacted during its nominated 'poll time' overnight. If this has not been successful a manual poll of the site may be required. If this is not successful further investigation of the communications integrity will be required to establish contact with the site modem and data logger. Three-day plots of recorded data are viewed for the requested site, and these are inspected and assessed for continuity, validity, minimum and maximum values, date and time, power failures and general integrity. All anomalies are recorded on the Daily Check sheet, as required. Any anomalies or queries arising from daily inspection of data, or system operation, are brought to the attention of the Project Manager who will evaluate the situation and initialise any necessary action. In the event that the PM is not available, contact will be made with the next available senior person within the monitoring team. Any issues identified with equipment operation will be referred to the client for attention within 24 hours (excluding weekends). On a weekly basis, data are examined using summary statistics and outlier analysis to establish data validity. If unusual data episodes are recorded, these would be routinely examined over longer data periods to establish their impact on trends but would also be cross referenced with data peaks and troughs recorded at other national monitoring stations. In addition, integrity and validity of data logger clock times are checked, and any significant errors recorded in the Data Management System logbook. All site data recorded through the Data Management System is archived on TRL's Network. The data is backed up daily, and the TRL IT Department maintains these data within their long-term and secure archives. This secures all data in the event of any system failure.

Data calibration and ratification

Data is ratified as per AURN recommended procedures. The calibration and ratification process for automatic gas analysers corrects the raw dataset for any drift in the zero baseline and the upper range of the instrument. This is done using Evista software-based calibration and ratification process which incorporates the zero and span check information from the calibration visits. The zero reading recorded during the calibration visits is used to adjust any

offset of the baseline of the data. The difference between the span value obtained between one calibration visit and the next visit is used to calculate a factor. This change is assumed to occur at the same rate over the period between calibrations and as such the factor is used as a linear data scaler. This effectively results in the start of the period having no factor applied and the end of the period being scaled with the full factor with a sliding scale of the factor in-between. After applying the calibration factors, it is essential to screen the data, by visual examination, to see if they contain any unusual measurements or outliers. Errors in the data may occur as a result of equipment failure, human error, power failures, interference or other disturbances. Data validation and ratification is an important step in the monitoring process. Ratification involves considerable knowledge of pollutant behaviour and dispersion, instrumentation characteristics, field experience and judgement. On completion of this data correction procedure, the data set is converted to hourly means and a summary of the data is provided to Wokingham Borough Council at quarterly intervals and a calendar year annual report is prepared.

Independent Site Audits

In addition to these checks an independent site audit is carried out every 12 months to ensure the monitoring equipment is operating correctly. The audits that are carried out utilise procedures that are applied within DEFRA's National Automatic Air Monitoring Networks Quality Control Programme. The efficiency of the analyser's converter is checked, and the analyser is also flow and leak tested. The gas bottle used for calibrations on site is also checked against the auditor's gas bottle to ensure the stability of the gas concentration.

Twyford Village Cross Roads

The site audit for the Twyford Town Centre automatic monitoring unit was carried out on 26th January 2023. A major factor governing the analyser's performance is the NO_x analyser's converter and its ability to reduce the nitrogen dioxide to nitric oxide. The recommended range for instrumentation in the national automatic air monitoring network is in the range of 98% - 102% efficient. Our tests show the converter in the Twyford analyser to be 99.5% efficient at an NO₂ concentration of 271 ppb. Our tests show the converter in the Twyford analyser to be 99.5% efficient at an NO₂ concentration of 138 ppb. These are good result.

To ensure that the analyser was sampling only ambient air the instrument was leak checked. The results were satisfactory, indicating that the analyser sampling systems were free of significant leaks. The analyser exhibited good steady state responses to both zero and span (calibration) gases with acceptable levels of variation (noise).

As mentioned in the introduction, the site zero system produced a very unstable response, therefore the audit zero cylinder was used to determine the zero response of the analyser. In

order to provide reliable zero calibration results, we recommend the zero scrubber materials are changed at the next available opportunity.

The analyser flow rate was measured using a calibrated flow meter and compared against the analyser's flow rate sensor to evaluate its accuracy. The analyser's flow rate sensor was within $\pm 10\%$ of the calibrated flow meter and therefore passed this test.

Based on the NO_x analyser's response to the audit standard and audit zero, the concentrations of the stations NO cylinder have been reassessed. This provides an indication of the on-site standards stability (the gas concentration stabilities). For the purpose of these stability checks, the criteria adopted within the national network, and used here, is that the recalculated concentration should lie within 10% of the suppliers stated concentrations. The site cylinder was tested at all four TRL air quality monitoring stations and at each station the cylinder recalculation results were all within 3%. The results of the recalculations are presented in Table B.3.

Table B.3 Twyford Village Crossroads Recalculated Concentrations

TRL Twyford – NO cylinder 21901300298589				
	NO_x (ppb)	% change from stated	NO (ppb)	% change from stated
Manufacturers Stated Concentration	445	---	444	---
Recalculated concentration (26/01/23)	457	2.8	448	1.0

The recalculated results for the site NO cylinder 21901300298589 indicate the concentrations are stable, within the definition adopted above, and can therefore reliably be used to scale ambient data.

Certificate of Calibration

Calibration factors and zeros have been produced on the basis of the audit calibrations conducted. All of these calibrations were conducted with transfer standards traceable to national metrology standards. The Certificate of Calibration provides the calibration and zero

response factors for the oxides of nitrogen analysers under test on the day of the audits. It is available upon request from TRL.

Data Management

The following recommendations and comments can be made because of these audits:

- Compare the TRL database scaling factors for the day of the audit with the factors and zeros on the Certificate of Calibration. If a deviation greater than the uncertainty associated with the calibration factor on the certificate is found, investigate the underlying reason and implement suitable data management actions.

Automatic Monitoring Annualisation

All automatic monitoring locations within Wokingham Borough Council recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data.

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the NO₂ fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO₂ concentrations corrected for distance are presented in **Error! Reference source not found..)**

No automatic NO₂ monitoring locations within Wokingham Borough Council required distance correction during 2022.

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