WARRINGTON
Borough Council

2019 Air Quality Annual Status Report (ASR)

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

June 2019

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Executive Summary: Air Quality in Our Area

Air Quality in Warrington

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].

Air quality levels in 2018 for NO_2 have marginally improved when compared to the levels observed in 2017. The majority of Warrington has good air quality and meets the national objectives. Concentrations have further reduced at some locations within Air Quality Management Areas (AQMAs) to below the national standards. There remain some areas though, close to major roads, where NO_2 levels are still high and exceed the limits.

Air quality levels do fluctuate year on year. It is important to assess the longer term trend due to the meteorology before any conclusion can be reached that air quality is significantly improving and emissions are reducing. As a precautionary approach, the Warrington AQMA and the Motorway AQMA, will remain in place and will not be amended at this time.

The Air Quality Action Plan (AQAP) was formally adopted in April 2018. The main priority is to try to tackle the exceedances of NO_2 and to improve air quality generally, not just within the AQMAs but across the wider borough. The AQAP will sit alongside and inform major new Council policies, specifically the new emerging Local Plan and the updated Local Transport Plan (LTP4), which are being developed in 2019.

[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
[4] Public Health Outcomes Framework Indicator 3.01 – Fraction of mortality attributable to particulate pollution, 2017

Whilst fine particulates, known as $PM_{2.5}$, are not included within the regulations, there is substantial health evidence of the impacts. $PM_{2.5}$ levels have marginally reduced when compared to 2017. Longer term, $PM_{2.5}$ levels have been assessed, as part of the emerging Local Plan, as only seeing minor improvements and there is still concern over levels close to major roads when compared against the non-statutory World Health Organization guideline values. The AQAP and related policies have been developed to ensure that measures aimed at reducing NO_2 are complementary to reducing $PM_{2.5.}$

The predominant source of pollution at a local level relates to road transport. When considering vehicle miles travelled on Warrington roads from the Department for Transport figures (Appendix C), traffic volumes have remained approximately the same during 2016, 2017 and 2018 for all vehicle types since reaching the peak in 2016. In addition, ambitious growth plans for the borough emphasise the need for longer term action plans to be considered to ensure these are sustainable.

Whilst air quality levels are compared against the national objectives, the Council recognises that health benefits can still be realised by reducing pollution levels below these limits.

Local priorities revolve around a successful economy, reducing deprivation, improving the health inequalities across the wards. The Health and Wellbeing Strategy 2015 (to be revised in 2019) sets out the overarching aims of “Working together for stronger neighbourhoods, healthier people, a vibrant and resilient economy and greater equality across all our communities”.

The Council recognises the need to deliver its ambitious plans for a strong local economy, and the need for new housing provision, within a sustainable environmental framework; and the opportunities and challenges this presents.

The emerging Local Plan will set out the housing and employment need for the borough until 2037. Current evidence indicates that we will require approximately 18,900 new homes and 362 Ha of employment land. The Local Plan growth, and associated increases in traffic, has been assessed for the air quality impacts as part of the AQAP. This concludes that nitrogen dioxide levels are expected to improve due to the increased uptake in low emission vehicles, but that $PM_{2.5}$ concentration will see less of an improvement and will remain of concern.

The Council is committed to working with relevant partners to develop actions to further improve air quality, and with Public Health England to gain health evidence and advice of health impacts at a local level.

The current AQMAs, air quality reports and air quality data is available to be viewed at https://www.warrington.gov.uk/airquality

Actions to Improve Air Quality

The new AQAP was formally adopted in 2018. An Air Quality Programme Board to oversee implementation of the AQAP has been set up, chaired by the Director of Public Health, and includes Directors and senior management that oversee planning and transport alongside Portfolio Council members and a representative from Public Health England.

The focus has been on embedding air quality as a major aspect within the emerging Local Plan and the draft Local Transport Plan (LTP4). Actions have continued aimed at improving traffic flows, increasing cycling and use of travel planning.

Specific actions completed in 2018 are:

- Draft Local Plan has included specific policies drafted to include air quality. A borough wide air quality assessment has been carried out to assess impacts on air quality from the growth plans.
- Draft Local Transport Plan (LTP4) has sections on low emissions vehicles, active travel and consideration of air quality through the Plan. This is expected to be adopted by the end of 2019 subject to consultation.
- Warrington Intelligent Transport System along the A49 Winwick Road in the Warrington AQMA has been set up and initial results show improvements in flows and reduced journey time. A mobile phone app is being developed for release in 2019.
- Air quality is on the agenda for routine meetings with Highways England. Highways England have confirmed though, that at this time they have no proposed measures for the motorway network around Warrington to improve air quality in the Motorway AQMA.

Two bids were submitted for the Defra 2018 Air Quality Grant. The first one was for a schools project and website information, and the second bid for sensor trials and increased $PM_{2.5}$ monitoring. Both of these would have supported actions within the AQAP, but were unfortunately unsuccessful.

The major bus provider in Warrington, Warrington's Own Buses, submitted a grant bid for to support six electric buses to use on routes within Warrington. This bid was also unsuccessful.

Conclusions and Priorities

Air quality levels in 2018 have marginally improved compared to those observed in 2017 for NO_2, PM_{10} and for $PM_{2.5}$. Whilst some locations within AQMAs have reduced to below the objective level in 2018, it is important to consider the longer term trend to take into account annual fluctuations due to meteorological conditions. While levels have reduced there remain some locations areas within current AQMAs that still exceed the national objectives for NO_2.

The AQAP was adopted in 2018 and will supplement the emerging Local Plan and the new Local Transport Plan (LTP4). The AQAP will be reviewed in 2019 and revised, where necessary, for actions that have been completed and to consider new measures to be included, if appropriate.

The Council considers that actions contained within the AQAP should be prioritised and implemented in 2019, where possible, to improve air quality in order to meet the national objectives in the longer term. It is also acknowledged that actions to improve air quality have additional positive benefits by improving health and to deliver sustainable growth in the longer term. The focus of the AQAP is to improve air quality within the Warrington AQMA. Measures available to the Council to improve air quality though within the Motorway AQMA remain limited without support from Highways England

Local Engagement and How to get Involved

Whilst the Council has a strategic position to improve air quality, there are many actions that can be taken individually by the public to reduce individual emissions. These include cycling and walking, improved driving style to reduce fuel cost and increased use of public transport. All these actions can have the additional benefit of improving health and wellbeing as well as making financial savings.

Additional information is available on the Council Website for Travel Warrington at: https://www.warrington.gov.uk/travelwarrington

Additional information on air quality, and monitoring data, is available on the Council website at: https://www.warrington.gov.uk/airquality

Further information on air quality and actions that can be taken is available by emailing the Environmental Protection team to: environmental.health@warrington.gov.uk

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1 Local Air Quality Management

This report provides an overview of air quality in Warrington Borough Council during 2018. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Warrington 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://www.warrington.gov.uk/airquality

Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA(s).

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		
						At Declaration		Now		Name	Date of Publication	Link
Motorway AQMA	2003	NO2 Annual Mean	Warrington	An area 50m from roadside around the M62, M6 and M56	YES	47	µg/m3	46	µg/m3	Warrington Air Quality Action Plan	2018	www.warrington.gov.uk/airquality
Warrington AQMA	2016	NO2 Annual Mean	Warrington	Around the town centre and major arterial roads	NO	54	µg/m3	44	µg/m3	Warrington Air Quality Action Plan	2018	www.warrington.gov.uk/airquality

☒ **Warrington Borough Council confirm the information on UK-Air regarding their AQMA(s) is up to date**

2.2 Progress and Impact of Measures to address Air Quality in Warrington

Defra's appraisal of last year's ASR concluded "*on the basis of the evidence provided by the local authority the conclusions reached are acceptable for all sources and pollutants*" and that "*the report is well structured, detailed, and provides the information specified in the Guidance.*" Two comments were provided to help inform future reports:

1. *The maps provided for diffusion tube locations are unclear. Each site is not referenced. Please ensure maps are referenced with site IDs as used in results tables. Additionally the Council may wish to use larger scale maps, which may require a number of separate maps being used.*

This has been addressed within this report with a number of smaller scale maps used to increase clarity, as shown in Appendix D.

2. It is noted that diffusion tube sites DT3, 4, and 5 have not been corrected for bias adjustment. While the bias adjustment is close to 1, and these sites experienced low concentrations, please ensure that all future results are adjusted accordingly.

These tubes are tri-located with the analyser and have been used to calculate the local bias adjustment factor. These results have now also been adjusted using the bias adjustment factor.

Summary of progress of measures

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

More detail on these measures can be found in the AQAP. (www.warrington.gov.uk/airquality)

1. Local Plan Review

The draft Local Plan includes an Environmental Protection policy for air quality and sustainable transport policies. A borough wide air quality assessment has been carried out to assess the air quality impacts from the predicted additional

traffic generated by the housing and employment needs for the borough until 2037. This has assessed that air quality will improve over the life time of the Local Plan primarily due to national predicted uptakes in low emission vehicles. Nitrogen dioxide concentrations are expected to reduce by 22% by 2026 with only a minor number of locations exceeding the national objectives. All areas will meet the standards by 2036. Fine particulates, $PM_{2.5,}$ have also been assessed and compared against the World Health Organization guideline value. $PM_{2.5}$ is expected to see a 5% reduction in concentrations by 2036 but even in 2036 there is predicted to still be some areas that exceed the guideline value, irrespective of the Local Plan.

Subject to the outcome of consultation, the draft Local Plan is to be submitted to the Secretary of State in autumn 2019 with an Examination in Public in early 2020.

2. Sustainable Transport Strategies (Local Transport Plan 4)

Consultation has been completed in June 2019. Subject to the consultation, the revised plan is expected to be adopted towards the end 2019.

3. Environmental Protection SPD

An early draft of the document had been produced. To be adopted in line with the Local Plan.

4. Procurement Strategies

A new Council Strategy has been adopted in January 2019. This includes a specific consideration for “minimising environmental impact” including use of low and zero emission vehicles and plant.

This action is now completed.

5. Smoke Control Area Review

The majority of Warrington is designated as Smoke Control Areas. This is to be reviewed but due to the national Clean Air Strategy and the Environment Bill , which are expected to set additional Smoke Control Area requirements, this measure has been postponed to await the outcome of the national guidance.

6. Highways England/TfN Working Group

Air quality has been set up as a standing item on the agenda for the formal quarterly meetings undertaken with the Transport team.

Highways England have confirmed though, that Defra do not require any actions or have any proposals to improve air quality for the Motorway network around Warrington. This remains a major barrier to try to improve air quality within the local motorway network.

This action is now considered to be completed, although the Council will continue to lobby with Highways England to improve air quality in the Motorway AQMA due to emissions from their network.

7. Warrington Intelligent Transport System

This action has been completed for the A49 Winwick Road within the Warrington AQMA. Initial results show improvements in traffic flows with journey times on some lengths improved by up to 30%. The action will be retained within the AQAP to assess ongoing effectiveness. The scheme is to be considered to be used on other major roads.

8. Chester Road Promenade Route.

Will be a major new cycleway along Chester Road within the Warrington AQMA. Consultation on design options expected to take place in 2019.

9. Burtonwood to Omega Shared Pathway

A proposed shared pedestrian and cycle way linking to a major employment area adjacent to the Motorway AQMA. This action has been slightly delayed due to negotiations for land purchase. Expected works are due to begin in 2020.

10. Warrington West Railway Station

Anticipated opening will be in summer 2019, subject to the Office of Rail and Road Approval. The car park serving the new railway station will have 14 electric vehicle charging points.

11. Centre Park Link Road

This is expected to reduce traffic volumes and improve flows within the town centre at Bridgefoot roundabout and the AQMA.

Construction work started April 2019, with expected completion in April 2021.

12. Western Link Road

This major new road is proposed to significantly reduce traffic in the town centre and within the Warrington AQMA. The proposal is now accepted on the Department of Transport's Programme of Entry schemes. Revised programme for the delivery is to be published in 2019.

13. Clean Air Zone Feasibility Study.

An initial feasibility scoping has been carried out as part of the Transformational Projects Study. At this stage within the LTP4, it is not proposed to take a Clean Air Zone forward due to the implementation cost compared to predicted benefit.

The action is considered completed.

14. School, Nursery, Care Home Action Group

No formal group has been set up but meetings have been held with the Council's Schools advisor and travel planning team. Air quality monitoring has been carried out at one primary school as part of lesson plans.

A bid was submitted under the Defra Air Quality Grant 2018 for funding for a major schools project to support this action. Unfortunately this bid was unsuccessful.

Progress has been slower than expected due to staff resources and waiting on the outcome of the grant bid. This action is planned to significantly progress in 2019.

15. Temporary Play Streets

Application forms and guidance documents have been developed. A trial event is proposed to occur during summer 2019.

16. Air Quality Webpage

The pages are drafted and due to be published in July 2019. This will feature interactive maps for Smoke Control Areas and AQMA plus information on health and for schools. This action is expected to be completed in 2019.

17. $PM_{2.5}$ Monitoring

A bid was submitted under the Defra Air Quality Grant 2018 for funding to trial new sensors. Unfortunately this bid was unsuccessful. At the moment there is no funding allocated for this action and, at this time, the Council is unable to complete this action.

Key completed measures are:

- Borough wide air quality modelling has been completed to assess the proposed growth within the emerging Local Plan.
- Air quality is now on the agenda for routine meetings with Highways England and the Council's Transport Team.
- Warrington Intelligent Transport System to improve flows and journey time is fully operational along the A49 Winwick Road within the Warrington AQMA.
- Clean Air Zone initial scoping assessment has been produced.
- Council Procurement now includes air quality within the procurement strategy.

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

- Local Transport Plan (LTP4) to be adopted. This will lead on to further actions.
- Warrington West Rail Station to open at the end of summer 2019.
- Updated Air Quality webpage to improve public engagement to encourage behavioural change. Includes schools information and links to health along with interactive maps showing location of AQMAs and Smoke Control Areas.
- Temporary Play Streets. The first trial event to be in summer 2019, followed by on-line application process.

Warrington Borough Council's priorities for the coming year are to continue to work on the actions set out within the AQAP. Completed actions will be kept within the AQAP to enable post evaluation. The AQAP will be revised, where appropriate, to consider additional actions to replace those completed.

The principal challenges and barriers to implementation that Warrington Borough Council anticipates facing are funding and resources to complete the actions.

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

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Development Plan Context: Local Plan Review	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	WBC Planning Policy: WBC funded	2017	Dec-19	Plan in place	N/A	Public consultation carried out. To be submitted to the S of S autumn 2019 and Examination in Public early 2020	Apr-20	Outcome of consultation and approval by Planning Inspectorate
2	Sustainable Transport Strategies: Local Transport Plan (LTP4)	Policy Guidance and Development Control	Other policy	Transport Planning	2017	Dec-18	LTP 4 produced	N/A	Draft Plan produced, under consultation	Dec-19	Outcome of consultation
3	Environmental Protection SPD	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Environmental Protection	Apr-18	Dec-18	Document in place	N/A	Initial draft produced	Apr-20	Dependent upon Local Plan review
4	Council Procurement Policies	Policy Guidance and Development Control	Sustainable Procurement Guidance	Procurement	Apr-18	Dec-18	Document in place	N/A	Completed	Dec-18	Policy in place
5	Smoke Control Area Review	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Environmental Protection / Legal services	Apr-18	Dec-18	Review carried out	N/A	Currently deferred	Dec-19	Dependent upon national legislation changes

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
6	Highways England / TfN Working Group	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	Transport Planning / Highways England	2018	Dec-18	Highlight AQMA motorway improvements	N/A	Completed	Dec-18	Air quality now included as agenda item. No actions within Motorway AQMA proposed by HE.
7	Warrington intelligent Transport System	Traffic Management	UTC, Congestion management, traffic reduction	UTMC	2017	2018-19	Journey times	<1 µg/m3	Action completed, assessing journey time improvements	Jun-19	System installed and showing improved journey times. Mobile phone app being developed
8	Chester Road Cycleway	Transport Planning and Infrastructure	Cycle network	Transport planning	2017-18	2018-19	Number of users	<1 µg/m3	Early Design work undertaken	Dec-20	To encourage modal change within Warrington AQMA
9	Burtonwood to Omega Cycling/walking link	Transport Planning and Infrastructure	Cycle network	Transport Planning	2017-18	2018-19	Number of users	<1 µg/m3	Early Design work undertaken and CPO for land acquisition	Dec-20	Dependant on consultation and land acquisition
10	Warrington West Rail Station	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	Transport Planning	2017-18	2018-19	Station opened	<1 µg/m3	Construction close to completion	Sep-19	Risk are mitigated against for late summer opening
11	Centre Park Link Road	Transport Planning and Infrastructure	Other	Transport Planning	2017	2018-19	Road completed	6 µg/m3 on Chester Road and 11 µg/m3 on Wilson Patten Street monitoring points	Planning permission granted and ground works started April 2019	Apr-21	Risk are mitigated against for 2021 completion date

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
12	Western Link Road	Transport Planning and Infrastructure	Other	Transport Planning	2017-18	2020	Full business case submitted to DfT for funding	Further transport modelling work with AQ assessment to be undertaken	Funding allocated in March 2019	2023-24	Dependant on consultation
13	Clean Air Zone Feasibility Study	Policy Guidance and Development Control	Low Emissions Strategy	Transport Planning	2017	2018	Study completed	N/A	Initial study finished. Not to be progressed at this time	Dec-19	Not being progressed due to no funding allocated for set up
14	School, Nursery and Care Home Action Group	Policy Guidance and Development Control	Other policy	Environmental Protection / Public Health	2018	Apr-18	Steering group to be set up	N/A	Initial work with several schools on monitoring	Sep-19	No funding allocated for any actions, grant bid unsuccessful. Staff time and resource
15	Temporary Play Streets	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	Public Health	Apr-18	Aug-18	No of events held	N/A	Trail event to be held in Summer 2019	Dec-19	Staff resources required to be allocated
16	Air Quality webpage update	Public Information	Via the Internet	Environmental Protection	2017	Apr-18	Hits on page	N/A	Pages drafted. To go live when full Council webpages updated in July	Jul-19	Action expected to be completed
17	PM2.5 monitoring	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Environmental Protection	2017	2018	Monitoring in place	N/A	Defra funding sought but unsuccessful	Dec-18	Funding not allocated

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.

$PM_{2.5}$ impacts on mortality are included within the Public Health Outcomes Framework Indicator 3.01. The most recent figures available are for 2017, which show a reduction to 4.3% from 4.9% in 2016. The figures for 2018 have not yet been released. Figure A.5 in Appendix A shows the trend since 2010 for Warrington, compared to the North West. The Council has used this as part of the health evidence to produce a chapter on Air Quality in the Joint Needs Strategic Assessment (JSNA) Framework that has been adopted in April 2018.

Warrington Borough Council considers that the measures within the AQAP to reduce NO_2 will be complementary in reducing $PM_{2.5}$ emissions.

Action 1 within the AQAP for the Local Plan growth proposals, included a borough wide air quality assessment for $PM_{2.5}$ levels. This concluded that whilst there will be some improvements, there will still remain areas that exceed the World Health Organization guideline value in 2036. It is accepted that further actions, through the LTP4 and other measures, will be required to meet this value.

Action 17 within the AQAP is to carry out $PM_{2.5}$ monitoring to gain further evidence of concentrations within poor air quality areas. Funding for this was sought via the Defra Air Quality Grant, but this was unsuccessful. There remains a gap in funding to carry this action out at this current time. Until funding is secured, this action is unable to be completed.

Regarding Smoke Control Areas, the majority of Warrington has been covered by Smoke Control Orders since the 1970s. The Council is aware though, of a recent increase in domestic wood burning stoves, which even with Defra approved appliances, will still result in result in increased fine particulate and NOx emissions. There are some outlying wards that are not covered by Smoke Control Orders. It is proposed within the AQAP to assess whether the whole of Warrington should be

included under one order, although this action has been delayed to await the outcome of the draft Environment Bill and subsequent guidance for local authorities on new legislative powers.

Planning applications for new developments are screened for air quality and, if considered necessary, include $PM_{2.5}$ impacts and exposure. The Environmental Protection Supplementary Planning Document will be updated as a measure within the AQAP in line with the new emerging Local Plan update.

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 the objectives.

Warrington Borough Council undertook automatic (continuous) monitoring at 3 sites during 2018. Table A.1 in Appendix A shows the details of the sites.

Monitoring data from the Selby Street AURN site is available at

https://uk-air.defra.gov.uk/networks/network-info?view=aurn

The data for Chester Road and Parker Street roadside sites is available from the UK Air Quality website at

http://www.ukairquality.net/

The links can be accessed through the Council air quality webpage at

https://www.warrington.gov.uk/airquality

Alternatively the data can be provided by the Council on request.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Warrington Borough Council undertook non- automatic (passive) monitoring of NO_2 at 42 sites during 2018. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

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

For diffusion tubes, the full 2018 dataset of monthly mean values is provided in Appendix B.

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

Monitoring data shows similar levels to those measured in 2017, whilst some sites show marginal improvements, there are some locations that are marginally worse.

The number of locations showing an exceedance in the annual mean objective has slightly reduced. There are though, locations still within current AQMAs that continue to show exceedances , or have a risk of exceedance (within 10% of the objective limit), in the annual mean objective and confirm the need for these areas to remain designated. Monitoring will continue at locations that previously showed exceedances to assess longer term trends. As per the guidance, it is not proposed to amend the extent of any of the AQMAs at this time, unless there is at least 3 consecutive years of data showing no risk of exceedance.

There are no locations where there is a measured annual means greater than 60µg/m^3, which would indicate that an exceedance of the 1-hour mean objective could be likely.

Trends

Trend data for NO_2 for roadside, urban background, and rural background is shown in figure A.1 in Appendix A. This shows that there can be significant variations and annual fluctuations in concentrations, concluded to be meteorological conditions that affect dispersion and secondary formation of pollutants. Assessment of the linear

trend, between 2007 and 2018, does indicate that concentrations on average over this period have been declining for urban background, rural background and roadside.

An assessment of the trend of all monitoring within AQMAs between 2009 and 2017 indicates that nitrogen dioxide levels at roadside have on average reduced, but the level of this is dependant upon the location.

The longer term trends will continue to be assessed in future ASRs.

Warrington AQMA

As with previous annual reviews there continues to be measured exceedances on Parker Street with concentrations similar to 2017. DT9 shows an exceedance of 41.9µg/m^3 when distance corrected to the nearest residential property. The Parker Street real time analyser though records 38.1 µg/m^3 which while below the objective still remains a risk of exceedance. Wilson Patten Street diffusion tube DT10 shows a marginal improvement to 39.5µg/m^3. When distance correction is applied, the 2018 concentration is below the objective level. Monitoring at these locations will continue for assessment of the impact of the new Centre Park Link Road (AQAP action 11) when it is operational in 2021.

Crosfield Island 2 tube (DT12) has previously measured concentrations above or near to the objective limit but, similar to 2017, records a concentration of 32.2 µg/m^3, below the objective levels. It should be noted though that the data collection for DT12 is low due to the tube going missing on site as occurred in 2017, therefore a seasonal correction has been applied increasing the uncertainty.

Baxter Street 1 (DT13), located on a house front on the opposite side of Crosfield traffic island, measures a concentration of 39.6 µg/m^3 , at the objective level. This is a slight improvement on the exceedance in 2017 but is still of concern.

Chester Road locations (DT17, DT18 and DT19) all show concentration below the objective limit. DT17 records a slight risk of exceedance of 36.6 µg/m^3 similar to 2017. DT18 shows a significant reduction to 31.6 µg/m^3 compared to the risk of exceedance on 2017 although there no evidence for this lower level at this location compared to the other sites, it is likely to be due to freer flowing traffic. DT18 though, has been seasonally adjusted due to low data collection which will increase the

uncertainty. The data at this location is supported by the Chester Road analyser (CM3) concentration of 30µg/m^3. DT19 measure 34.1µg/m^3 , below the objective level and similar to the level in 2017. is below the objective level compared to previous years, which had showed a risk of exceedance. DT20 at Walton Terrace, immediately south of the Chester Road swing bridge, shows a reduction in concentrations since 2017 to 34.5µg/m^3 . Chester Road will continue to be monitored in 2019 and will be used to assess the impacts from the Centre Park Link Road.

Along Wildersppol Causeway, NO_2 concentrations have improved and are below the objective level. Wilderspool Causeway (DT21) has a reduced concentration of 31µg/m^3 where previously had recorded levels as a risk of exceedance close to the objective level. Wilderspool Causeway 3 (DT22) was placed to assess levels by a childrens' nursey on a junction between Wilderspool Causeway and Gainsborough Road. This recorded a level of slighlty reduced level compared ot 2017 of 30.1µg/m^3. Wilderspool Causeway 2 (DT23) has previously recorded concentrations that exceed the objective level, but similar to 2017, has reduced to a level of 33.7 µg/m^3 . Monitoring at these locations will continue in 2019.

On Knutsford Road, between Bridgefoot and Latchford, NO_2 concentrations have improved and are below the objective level. Knutsford Road (DT25) has previously recorded concentrations that exceed, or have a risk of exceedance, of the objective level. This has reduced further in 2018 to record a level of 30.2 µg/m^3 . Knutsford Road 2 (DT26) has previously shown levels with a risk of exceedance, but this significantly reduced in 2017 and levels in 2018 remain similar at 28.3 µg/m^3 .

In Latchford Village, concentrations have improved but some locations show a risk of exceedance and remain of concern. Kingsway South (DT27) has previously recorded concentrations above the objective limit, but in 2017 this reduced and in 2018 shows further but slight improvements with a concentration of 35.2 µg/m^3 . Latchford Village 2 (DT28) records a marginal improvement will a concentration of 39.9 µg/m^3 . Latchford Village 3 (DT29) recorded an exceedance in 2016, but this to below the objective limit in 2017 and records further marginal reductions to 33.7 µg/m^3 . Latchford Villlage 4 (DT30) was placed out during 2017 to assess concentration outside the entrance to the Thomas Boteler High School. This shows similar levels to 2017 with an average of 29.8 µg/m^3.

Mersey Street 1 (DT31) has previously measured concentrations above the objective level but these reduced to just below the limits in 2017. For 2018 there is a further marginal improvement to 37.7 µg/m^3 and there remans a risk of exceedance at this location. Napier Street (DT32) was located to assess the drop off in concentrations from DT31 amd the extent of the AQMA. This continues to measure a concentration below the objectives and sees a significant reduction in concentration to 24 µg/m^3 although monitoring at this location ceased in 2018 and the data has been seasonally corrected. James Lee House (DT33) has previously measured exceedances. In 2017, there was a reduction to below the objective limit. In 2018, DT33 further reduces to 36.2 µg/m^3 still showing a risk of exceedance, but has been seasonally corrected due to low data collection as the tube was missing from site, which increases the uncertainty.

Bewsey Street (DT34) has previously measured levels below the objective limit, but still with a risk of exceedance. In 2018 this shows concentrations of 32.3 µg/m^3 , similar to those in 2017.

Crosfield Street (DT36) had exceeded the objective limits in previous years. In 2017, this level has reduced significicantly below the objectve limit, but recorded a concentration slightly higher in 2018 of 36 µg/m^3. Monitoring at this location will continue in 2018 to assess the trend.

Along the A49 Winwick Road concentrations have improved but there remains a location that exceeds the objective. Winwick Road 1 (DT42) reduced in 2017 to below the the objection limit. In 2018 this saw a further improvement to 32.6 µg/m^3. Winwick Road locations 2 (DT43) and 3 (DT44) are improved compared to 2017, but continue to show exceedances above the objective limit in 2018. DT43 measures 40.3 µg/m^3 , which when distance corrected to the nearest residential is 37.7 µg/m^3. DT44 measured 43.9 µg/m^3 which represents the closest residential to roadside and confirms the requirement for the AQMA.

Motorway AQMA

Manchester Road (DT6) is located adjacent to residential 22m from the M6 motorway and is within the AQMA. The residential is raised approximately 5m above the carriageway. Previous years has seen exceedances in the objective limit but in 2017

there was a reduction measuring a concentration of 39.4 µg/m^3, although data capture was low. In 2018 data capture was improved with the measured concentration now being 45.6 µg/m^3 showing an exceedance and confirming the requirement for the AQMA.

To assess motorway emissions further, new montoring was set up in May 2018 by the M62 and the M56. Both locations also had a number of months where the tubes were missing on site which further reduced the data capture. Due to the short monitoring period, both tubes have been seasonally adjusted, which does increase the uncertainty. DT7 is located next to residential just outside the AQMA, 60m from the M62. This recorded an annual concentration of 29.7 µg/m^3. DT8 is located 17m from the M56 within the Motorway AQMA and recorded an annual concentration of 34.2 µg/m^3. These locations will continue to be monitored during 2019.

Locations outside AQMAs

The real time analyser at Selby Street (CM1) is part of the AURN and measures concentrations for urban background. For 2018, this measured 21.4 µg/m^3 , simlar to the level in 2017. Bruche Avenue (DT2) is located to represent urban background levels. For 2018, this has measured a concentration of 16.6 µg/m^3 , lower than in previous years. It must be noted that monitoring was ceased during the year to allow other locations to be assessed, therefore the data has been adjusted which will increase the uncertainty.

Risley Moss (DT1) measures concentrations at a rural background site and recorded a concentration of 16.4 µg/m^3 in 2018. Data capture though was low at the site due to the tube going missing, therefore the data has been adjusted accordingly.

Winmarleigh Street (DT11) is located within the town centre outside of the AQMA to assess drop off from the main Wilson Patten Street and town centre levels. This is located at worse case location next to residential apartments by the Museum Street junction. Levels have been close to but below the objectives in previous years. Monitoring at this location ceased in 2018 to allow other locations to be assessed, therefore the data has been adjusted. For 2018, the measured concentration is reduced compared to 2017 with a concentration of 26.9 µg/m^3.

Stockton Heath 3 (DT24) is located near the beginning of the main residential area on London Road and continues to measure levels below the objective limit with a concentration of 27.5 µg/m^3, a slight redcution in the concentration measured in 2017.

Tanners Lane (DT35) was located in 2017 just outside the Warrington AQMA by a medical and health care centre immediately adjacent to a busy junction. This was to gain evidence of air quality levels that may affect people with existing health problems that would use the centre. This measured a significant reduction compared to 2017 with a concentration of 32.4 µg/m^3. Monitoring at this location ceased during 2018 and the data has been adjusted accordingly.

Previous assessments have highlighted potential exceedances at locations within the Padgate area and monitoring was expanded in 2018 to assess the extent. King Edward Street (DT37) measured 37.9 µg/m^3 in 2018, a reduction compared to the 2017 levels. When this is distance corrected to the nearest property, the concentration reduces to 34.8 µg/m^3, below the level where there could be a risk of exceedance. Padgate Lane 1 (DT38) a concentration of 35.1 µg/m^3 has been measured, similar to the level in 2017. Padgate Lane 2 (DT39), has previously measured exceedances which are close to the objective limits, which reduced in 2017. In 2018 a concentration of 35.1 µg/m^3, below the objective limit. Additional, new locations have been monitored during 2018 at Steel Street (DT40) and Manchester Road (DT41). DT40 measures a concentration of 42.4 µg/m^3, but when a distance calculation had been applied to the nearet residential, a concentration of 37.8 µg/m^3 is calculated, below the objective level but still with a risk of exceedance. DT41 measures a concentration of 32.4 µg/m^3 , below the objectice value when seasonally adjusted. Due to the levels being close to the limits in previous years, monitoring will be continued during 2019.

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.

The Selby Street site was affiliated into the national network (AURN) in 2008. As a result of this, particulate monitoring is carried out using FDMS type B/C, which meets the EU equivalence criteria, for PM_{10} and $PM_{2.5}$ measurement. A BAM type analyser replaced the FDMS analyser in November 2018 as part of the national network upgrade. The site is overseen by Bureau Veritas and Ricardo AEA who carry out all data ratification and analyser servicing and auditing. The site represents typical urban background exposure. There is no exceedance in the annual objective, which is consistent with previous years.

Data capture for 2018 is poor at 69.8% due to various issues with the FDMS analyser, which resulted in erroneous data being completely removed for January and February and reduced capture rates in May and July. For 2018, when seasonally corrected, there was a measured annual average concentration of 13 µg/m^3, which is a slight increase when compared to 2017 concentrations.

The 24 hour mean objective of 50µgm^3 is not to be exceeded more than 35 times a year. This was exceeded once during 2018 and continues to meet the annual 24 hour mean objective.

Trend data since 2009 is shown in Figure A.3 (Appendix A). This indicates that since 2009, concentrations of PM_{10} have been reducing for urban background.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

Similar to the PM_{10}, $PM_{2.5}$ was measured using the TEOM FDMS system which was then replaced by a BAM unit in November as part of the AURN at the Selby Street monitoring site. Data has been ratified as part of the AURN.

The annual mean is 9 $\mu g/m^3$ with data capture at 89%. This is a marginal improvement on the 2017 concentration. Trend data is shown in Figure A.4 (Appendix A).

The results show that the proposed target level of 25 by 2020 is being met at urban background, but the concentration remains close to the guidance level recommended by the World Health Organization.

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	Selby Street	Urban Background	359151	388218	NO2, PM2.5, PM10	NO	Chemiluminescent; FDMS/BAM	22m	50m	2.5
CM2	Parker Street	Roadside	360015	387907	NO2	YES	Chemiluminescent	1m	2 m	1.5
CM3	Chester Road	Roadside	360331	386454	NO2	YES	Chemiluminescent	1m	2 m	1.5

Notes:

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

(2) N/A if not applicable.

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

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)
DT1	WA08 Risley Moss	Rural	366949	392004	NO2	NO	n/a	n/a	NO	1.5
DT2	WA14 Bruche Avenue	Urban Background	362792	389503	NO2	NO	5	28	NO	2
DT3	WA22 Selby Street	Urban Background	359152	388218	NO2	NO	n/a	50	YES	2.5
DT4	WA23 Selby Street	Urban Background	359152	388218	NO2	NO	n/a	50	YES	2.5
DT5	WA24 Selby Street	Urban Background	359152	388218	NO2	NO	n/a	50	YES	2.5
DT6	WA111 M6 Manchester Road	Roadside	366102	389214	NO2	YES	0	16	NO	2
DT7	WA123 M62 Radley Lane	Roadside	361655	391914	NO2	NO	0	60	NO	2.5
DT8	WA124 M56 Queastybirch	Roadside	360233	381994	NO2	YES	17	17	NO	1.5
DT9	WA20 Parker St	Roadside	360044	388048	NO2	YES	2	1.5	NO	2.5
DT10	WA102 Wilson Patten Street	Roadside	360309	387848	NO2	YES	4.5	1	NO	2.5
DT11	WA114 Winmarleigh Street	Roadside	360243	387932	NO2	NO	2	2	NO	2.5
DT12	WA67 Crosfield Island 2	Roadside	359509	388235	NO2	YES	0	14.5	NO	2.5

DT13	WA65 Baxter Street 1	Urban Centre	359452	388111	NO2	YES	0	2	NO	2.5
DT14	WA85 Old Liverpool Road 4	Roadside	359430	387947	NO2	NO	4	2	NO	2.5
DT15	WA30 Old Liverpool Rd	Roadside	358867	387672	NO2	NO	3	3	NO	2.5
DT16	WA86 Old Liverpool Road 5	Roadside	357765	387908	NO2	NO	2	3	NO	2.5
DT17	WA68 Chester Road	Roadside	360648	387388	NO2	YES	3	3	NO	2.5
DT18	WA72 Chester Road 3	Roadside	360513	387048	NO2	YES	5.5	3	NO	2.5
DT19	WA87 Chester Road 5	Roadside	360407	386237	NO2	YES	4	2	NO	2.5
DT20	WA93 Walton Terrace	Roadside	360450	386052	NO2	YES	3	2	NO	2.5
DT21	WA76 Wilderspool Causeway	Roadside	360880	387247	NO2	YES	2.5	2.5	NO	2.5
DT22	WA118 Wilderspool Causeway 3	Roadside	361220	386874	NO2	YES	10	3.3	NO	2.5
DT23	WA94 Wilderspool Causeway 2	Roadside	361319	386508	NO2	YES	0	2	NO	2.5
DT24	WA90 Stockton Heath 3	Roadside	361470	385981	NO2	NO	3	2	NO	2.5
DT25	WA77 Knutsford Road 1	Roadside	361898	387430	NO2	YES	0	3	NO	2.5

DT26	WA103 Knutsford Road 2	Roadside	361019	387.633	NO2	YES	5	7	NO	2.5
DT27	WA92 Kingsway South (Latchford)	Urban Centre	362810	387187	NO2	YES	0	3	NO	2
DT28	WA105 Latchford Village 2	Roadside	362779	387288	NO2	YES	1	1.5	NO	2.5
DT29	WA115 Latchford Village 3	Roadside	362604	387222	NO2	YES	55	2	NO	2.5
DT30	WA116 Latchford Village 4	Roadside	362465	387249	NO2	YES	2.5	2	NO	2.5
DT31	WA78 Mersey Street	Roadside	361005	388145	NO2	YES	2.5	6	NO	2.5
DT32	WA100 Napier Street	Roadside	361005	388106	NO2	NO	0	35 (to Mersey Street)	NO	2.5
DT33	WA99 James Lee House	Roadside	361097	388459	NO2	YES	0	3	NO	2.5
DT34	WA80 Bewsey Street	Roadside	360462	388501	NO2	YES	0	30 (to train line)	NO	2.5
DT35	WA117 Tanners Lane	Roadside	360361	388657	NO2	NO	4	3	NO	2.5
DT36	WA83 Crosfield Street	Roadside	360040	388406	NO2	YES	4.5	2.5	NO	2.5
DT37	WA89 King Edward Street	Roadside	362392	389101	NO2	NO	2.5	2	NO	2.5

DT38	WA107 Padgate Lane 1	Roadside	362235	389248	NO2	NO	2.5	1.5	NO	2.5
DT39	WA108 Padgate Lane 2	Roadside	362060	389170	NO2	NO	2.5	2	NO	2.5
DT40	WA125 Steel Street	Roadside	362131	389473	NO2	NO	7	1.5	NO	2.5
DT41	WA126 Manchester Road	Roadside	362375	389033	NO2	NO	6	2	NO	2.5
DT42	WA95 Win Rd 1	Roadside	360598	389820	NO2	YES	5.5	5	NO	2.5
DT43	WA96 Win Rd 2	Roadside	360484	390416	NO2	YES	5.5	3	NO	2.5
DT44	WA112 Win Rd 3	Roadside	360434	390968	NO2	YES	0	2	NO	2.5

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	NO_2 Annual Mean Concentration (µg/m^3) [3]				
					2014	2015	2016	2017	2018
CM1	Urban Background	Automatic	92.2	92.2	20.5	24.4	25	21	21.4
CM2	Roadside	Automatic	93.5	93.5	**53.8**	**40**	**47**	37.9	38.1
CM3	Roadside	Automatic	82.1	82.1	32.2	37	34	32	30
DT1 (WA08 Risley Moss)	Rural	Diffusion Tube	58.3	58.3	19.1	25.2	18.8	17.3	16.1
DT2 (WA14 Bruche Avenue)	Urban Background	Diffusion Tube	100	33.3	19.1	23.3	23.6	19.3	16.6
DT3 (WA22 Selby Street)	Urban Background	Diffusion Tube	100	100	20.3	24.4	24.7	21.2	21.4
DT4 (WA23 Selby Street)	Urban Background	Diffusion Tube	100	100	20.5	25	25.6	21.6	21.3
DT5 (WA24 Selby Street)	Urban Background	Diffusion Tube	100	100	20.7	24.4	24.4	21.5	21.7
DT6 (WA111 M6)	Roadside	Diffusion Tube	91.7	91.7	**41.7**	**55.5**	**44.2**	39.4	**45.6**
DT7 (WA123 M62)	Roadside	Diffusion Tube	62.5	41.7					29.7
DT8 (WA124 M56)	Roadside	Diffusion Tube	75	50					34.2
DT9 (WA20 Parker St)	Roadside	Diffusion Tube	100	100	**47.6**	**55.2**	**55.7**	**45.2**	**45.9**
DT10 (WA102 Wilson Patten Street)	Roadside	Diffusion Tube	100	100	**41.1**	**47**	**49.5**	**40.7**	39.5
DT11 (WA114 Winmarleigh Street)	Roadside	Diffusion Tube	100	33.3	29.5	**40.1**	39.4	31.7	26.9

DT12 (WA67 Crosfield Island 2)	Roadside	Diffusion Tube	66.7	66.7	33.8	**41.2**	37.5	32.8	32.19
DT13 (WA65 Baxter Street 1)	Roadside	Diffusion Tube	91.7	91.7	40	**51**	**49.9**	**42.1**	39.6
DT14 (WA85 Old Liverpool Road 4)	Roadside	Diffusion Tube	100	100	34.7	**41.1**	**42.3**	37.7	35.5
DT15 (WA30 Old Liverpool Rd)	Roadside	Diffusion Tube	75	33.3	33.4	**41.4**	**40.6**	37	31.6
DT16 (WA86 Old Liverpool Road 5)	Roadside	Diffusion Tube	100	33.3	30.1	36.6	36.8	34.9	27.2
DT17 (WA68 Chester Road)	Roadside	Diffusion Tube	100	100	35.7	**44.7**	**46.6**	36.2	36.6
DT18 (WA72 Chester Road 3)	Roadside	Diffusion Tube	66.7	66.7	34.2	39.9	39.2	37.6	31.6
DT19 (WA87 Chester Road 5)	Roadside	Diffusion Tube	100	100	30.1	**40.1**	38.4	34.5	34.1
DT20 (WA93 Walton Terrace)	Roadside	Diffusion Tube	100	100	33.2	**45.1**	**40.9**	37.1	34.5
DT21 (WA76 Wilderspool Causeway)	Roadside	Diffusion Tube	100	100	30.4	39.1	38.7	34.1	31
DT22 (WA118 Wilderspool Causeway 3)	Roadside	Diffusion Tube	91.7	91.7				31.8	30.1
DT23 (WA94 Wilderspool Causeway 2)	Roadside	Diffusion Tube	100	100	31.8	**45.6**	**40.4**	34.8	33.7
DT24 (WA90 Stock Heath 3)	Roadside	Diffusion Tube	100	100	29.5	35.3	33.4	28.5	27.5

DT25 (WA77 Knutsford Road 1)	Roadside	Diffusion Tube	100	100	31.9	**40.2**	38	33.1	30.2
DT26 (WA103 Knutsford Road 2)	Roadside	Diffusion Tube	100	100	28.2	36	34.9	29.8	28.3
DT27 (WA92 Kingsway South (Latchford))	Roadside	Diffusion Tube	100	100	33.6	**42**	**42.2**	36.2	35.2
DT28 (WA105 Latchford Village 2)	Roadside	Diffusion Tube	100	100	43.7	**49.3**	**48.3**	**41.4**	39.9
DT29 (WA115 Latchford Village 3)	Roadside	Diffusion Tube	100	100		35.4	**42.5**	34.5	33.7
DT30 (WA116 Latchford Village 4)	Roadside	Diffusion Tube	83.3	83.3				30.5	29.8
DT31 (WA78 Mersey Street)	Roadside	Diffusion Tube	100	100	37.1	**45.9**	**43.4**	38.4	37.7
DT32 (WA100 Napier Street)	Roadside	Diffusion Tube	100	25	27.7	38.1	37	34.7	24
DT33 (WA99 James Lee House)	Roadside	Diffusion Tube	66.7	66.7	30.3	**43.5**	**42.1**	38.3	36.2
DT34 (WA80 Bewsey Street)	Roadside	Diffusion Tube	91.7	91.7	31.6	36.6	37.7	32.9	32.3
DT35 (WA117 Tanners Lane)	Roadside	Diffusion Tube	100	33.3				**42.5**	32.4
DT36 (WA83 Crosfield Street)	Roadside	Diffusion Tube	91.7	91.7	33.3	**45.7**	**41.9**	32.2	36
DT37 (WA89 King Edward Street)	Roadside	Diffusion Tube	83.3	83.3	38.8	**45.6**	**47.4**	**42.2**	37.9

DT38 (WA107 Padgate Lane 1)	Roadside	Diffusion Tube	100	100	31	**41.4**	**42.1**	38	35.1
DT39 (WA108 Padgate Lane 2)	Roadside	Diffusion Tube	91.7	91.7	33.9	**45.8**	**45.3**	37.6	35.1
DT40 (WA125 Steel Street)	Roadside	Diffusion Tube	100	66.7					**42.4**
DT41 (WA126 Manchester Road)	Roadside	Diffusion Tube	100	66.7					32.4
DT42 (WA95 Winwick Road 1)	Roadside	Diffusion Tube	91.7	91.7	32	39.5	39.9	34.7	32.6
DT43 (WA96 Winwick Road 2)	Roadside	Diffusion Tube	100	100	**45.8**	**47.2**	**50**	**44.2**	**40.3**
DT44 (WA112 Winwick Road 3)	Roadside	Diffusion Tube	100	100	**40**	**52**	**55**	**49.3**	**43.9**

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

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

Notes:

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

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

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

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

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

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

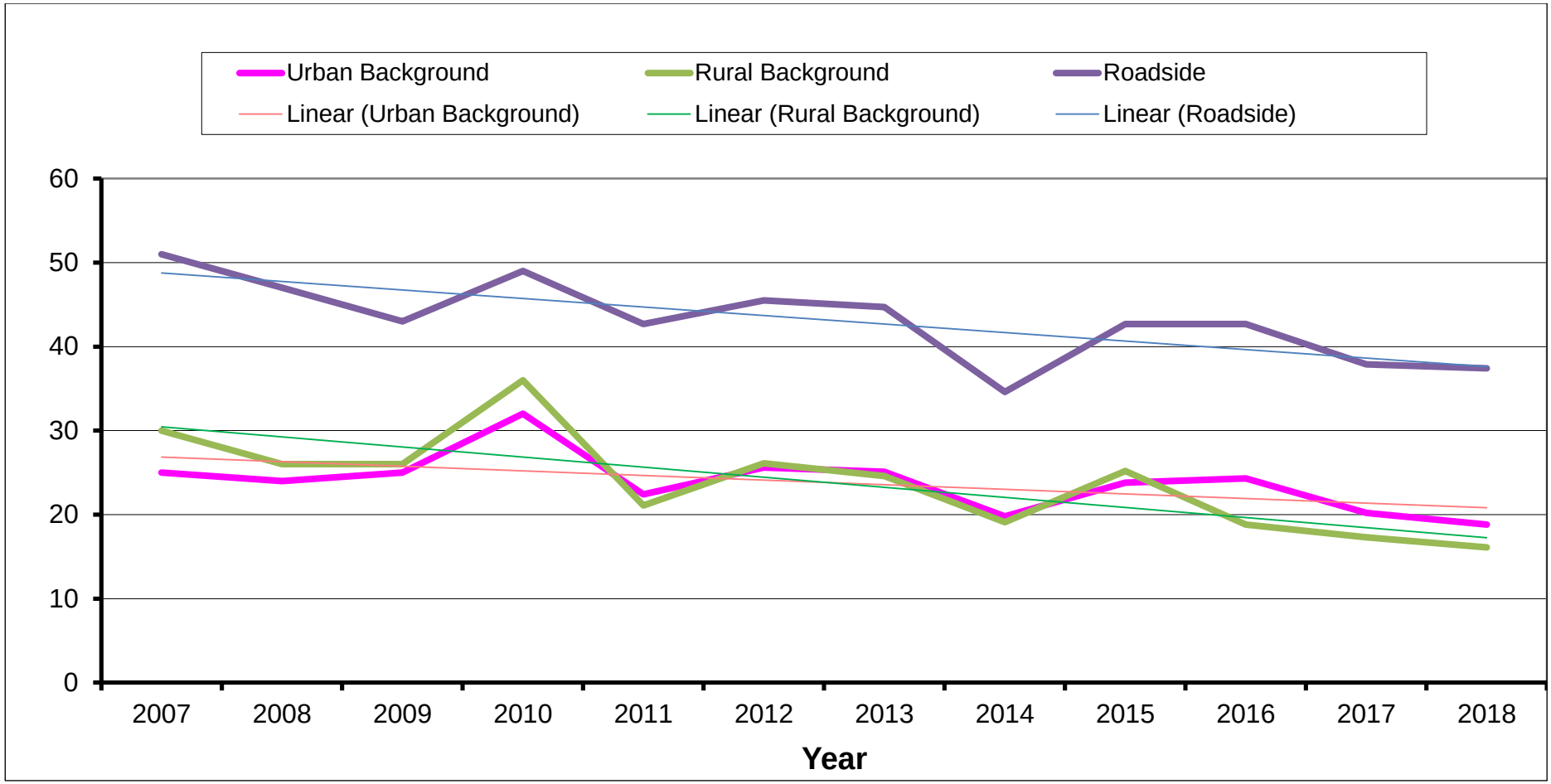


Figure A.2 – Trends in Annual Mean NO_2 Average Concentrations within AQMAs

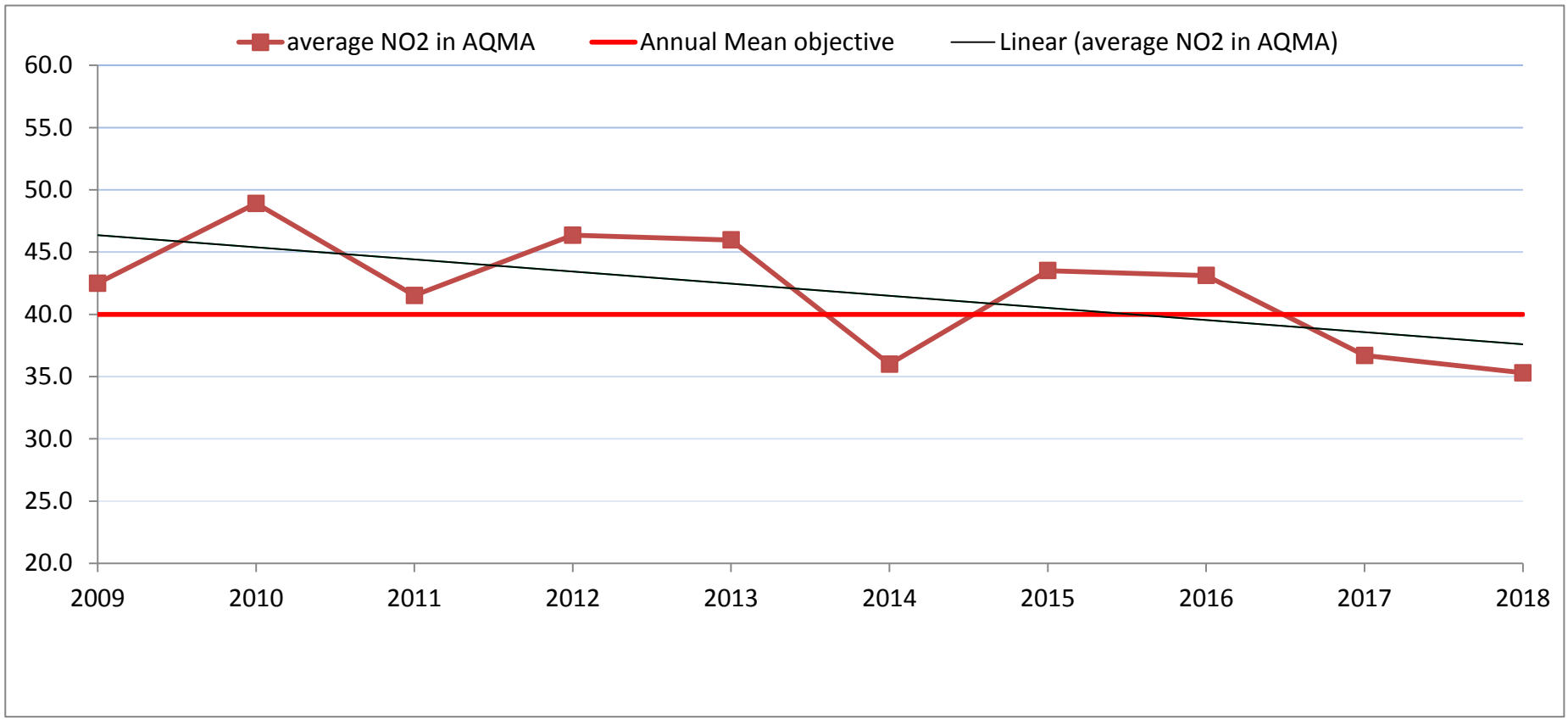


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2014	2015	2016	2017	2018
CM1	Urban Background	Automatic	92	92	0	0	0	0	0
CM2	Roadside	Automatic	93.5	93.5	0 (138 µg/m^3)	0 (118 µg/m^3)	0 (130 µg/m^3)	0 (119 µg/m^3)	2
CM3	Roadside	Automatic	82.1	82.1	0	0	0	0	0 (113 µg/m^3)

Notes:

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
CM1	Urban Background	69.8	69.8	16	15	16	12	13

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

Notes:

Exceedances of the PM_{10} annual mean objective of 40$\mu g/m^3$ are shown in **bold.**

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

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

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

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

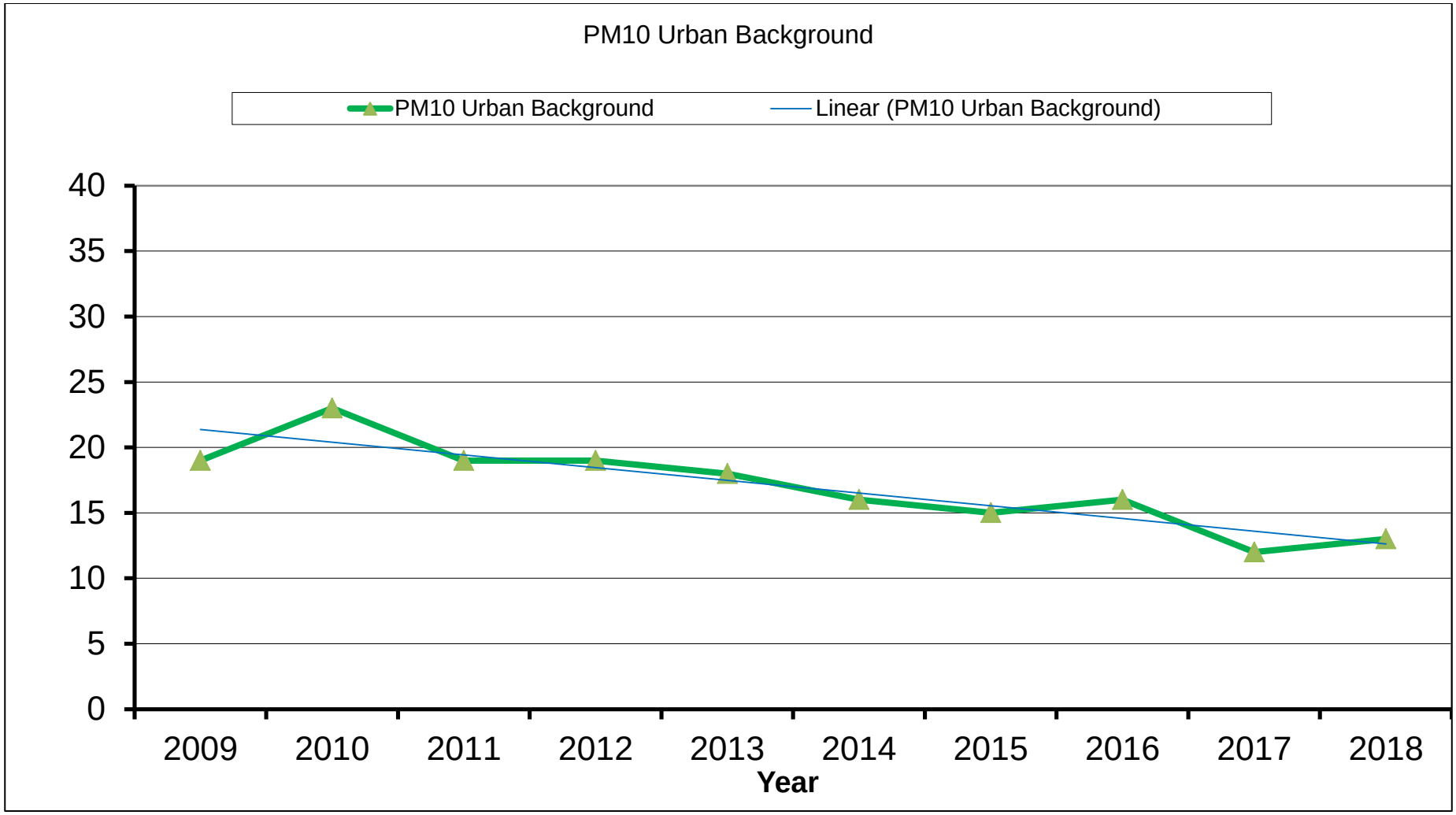


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2014	2015	2016	2017	2018
CM1	Urban Background	69	69	5	2	0	3	1

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

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

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

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
				2014	2015	2016	2017	2018
CM1	Urban Background	89.9	89.9	14	11	11	10	9

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

Notes:

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

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

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

Figure A.4 – Trends in Annual Mean $PM_{2.5}$ Concentrations

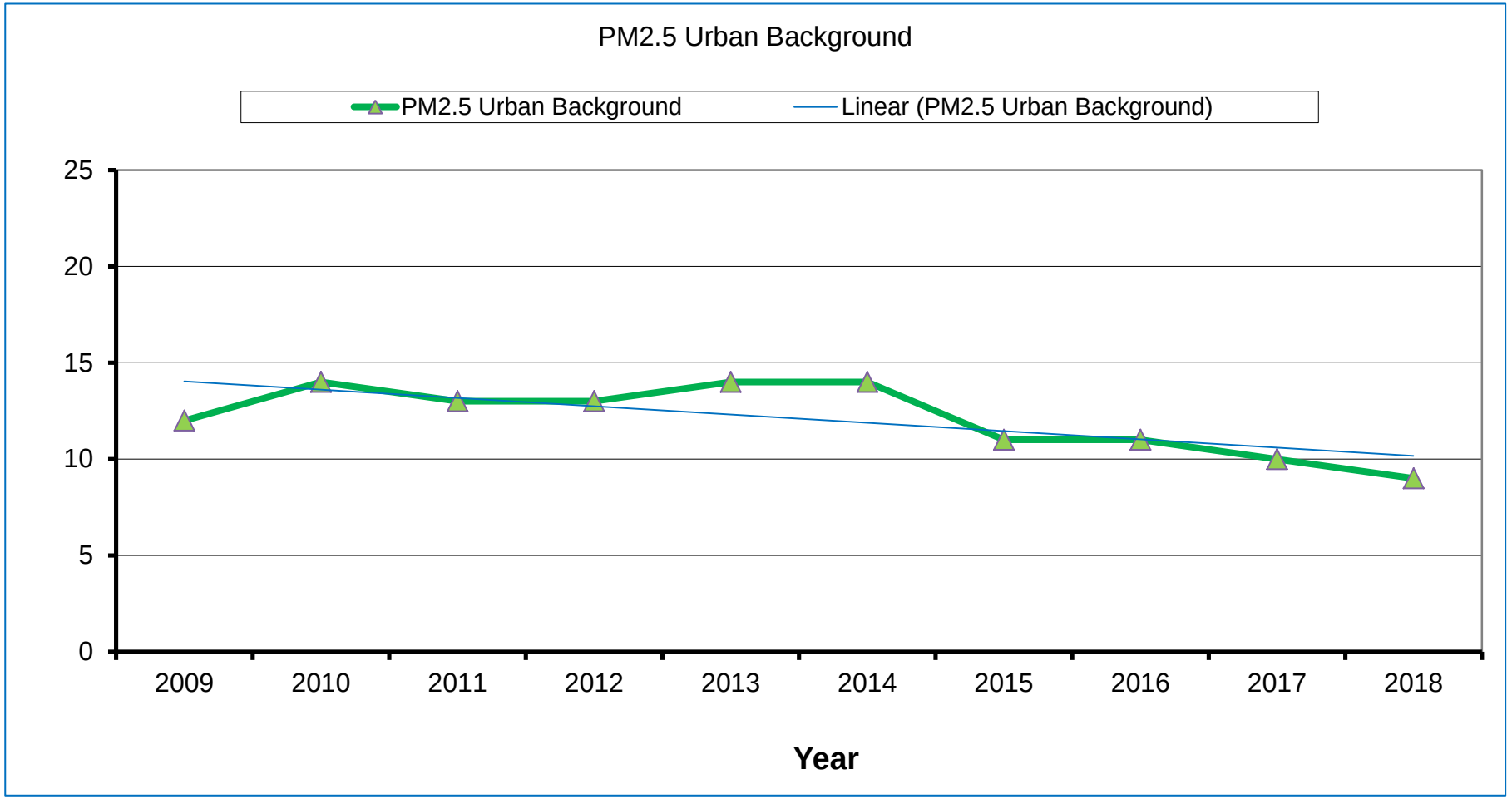
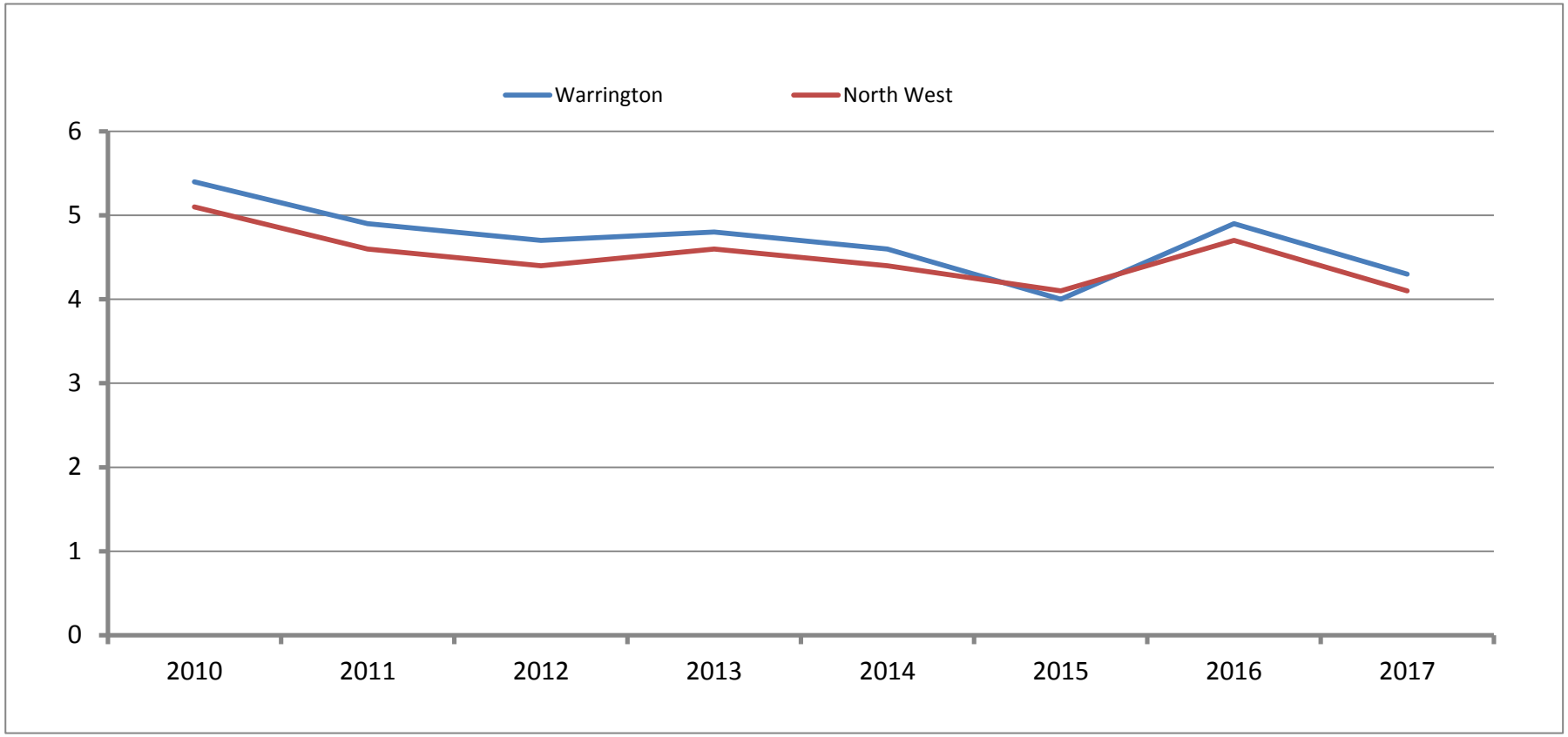


Figure A.5 – Trend of PHOF indicator 3.01 - Fraction of mortality attributable to particulate air pollution



Appendix B: Full Monthly Diffusion Tube Results for 2018

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

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 (0.996) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
DT1 (WA08 Risley Moss)	Erroneous data (water in tube)	23.1	15.8	16.4	13.4	12.9	Tube missing	Erroneous data	14.7	Tube missing	21.8	Tube missing	16.9	16.1	
DT2 (WA14 Bruche Avenue)	22.7	24.6	12.3	19.4	-	-	-	-	-	-	-	-	19.7	19.6	
DT3 (WA22 Selby Street)	27.54	30.95	16.04	22.21	16.39	15.72	14.76	15.41	16.7	21.86	28.45	30.24	21.4	21.3	
DT4 (WA23 Selby Street)	26.96	29.3	16.6	22.53	16.79	15.27	15.65	15.53	17.6	21.18	29.38	28.61	21.3	21.2	
DT5 (WA24 Selby Street)	29.46	28.4	21.69	21.85	16.8	15.46	15.78	14.79	16.72	22.16	29.89	27.74	21.7	21.6	
DT6 (WA111 M6 Manchester Road)	47.9	58.88	25.53	Tube missing	56.94	50.61	45.27	31.8	32.37	49.9	58.74	45.43	45.8	45.6	

DT7 (WA123 M62 Radley Lane)	-	-	-	-	Tube missing	30.16	27.1	Tube missing	22.94	30.96	27.91	Tube missing	27.8	29.7	
DT8 (WA124 M56 Queastybirch)	-	-	-	-	22.59	30.16	26.68	25.59	Tube missing	Tube missing	49.23	39.79	32.3	34.2	30.0
DT9 (WA20 Parker St)	47.17	58.89	26.09	47.88	46.5	45.88	44.81	36.72	36.03	53.66	54.26	54.89	46.1	**45.9**	**41.9**
DT10 (WA102 Wilson Patten Street)	48.28	50.17	23.37	41.08	36.69	39.9	38.02	32.58	31.24	46.86	45.54	42.16	39.7	39.5	33.6
DT11 (WA114 Winmarleigh Street)	37.76	37.3	19.96	32.41	-	-	-	-	-	-	-	-	31.9	26.9	
DT12 (WA67 Crosfield Island 2)	Tube missing	35.46	19.15	33.59	Tube missing	Tube missing	33.94	25.8	28.61	Tube missing	42.72	45.14	33.1	32.2	
DT13 (WA65 Baxter Street 1)	41.84	Tube missing	27.87	42.58	40.09	36.23	42.34	33.44	35.96	47.74	45.14	44.38	39.8	39.6	
DT14 (WA85 Old Liverpool Road 4)	41.82	42.6	19.81	35.75	30.58	31.89	36.09	30.63	31.41	40.57	43.1	43.38	35.6	35.5	31.1
DT15 (WA30 Old Liverpool Rd)	Tube missing	44.17	27.02	39.96	-	-	-	-	-	-	-	-	37.1	36.9	34.3

DT16 (WA86 Old Liverpool Road 5)	33.78	39.87	23.53	31.47	-	-	-	-	-	-	-	-	32.2	27.2	26.3
DT17 (WA68 Chester Road)	40.8	45.78	24.41	39.8	34.81	33.03	31.77	31.36	34.75	40.51	42.29	41.1	36.7	36.6	33.6
DT18 (WA72 Chester Road 3)	39.58	41.13	26.79	33.32	30.42	26.34	30.78	25.86	Tube missing	Tube missing	Missing	Missing	31.8	31.6	28.9
DT19 (WA87 Chester Road 5)	40.58	41.97	27.92	34.15	31.34	30.11	35.97	29.62	26.77	37.3	38.97	36.54	34.3	34.1	30.6
DT20 (WA93 Walton Terrace)	39	41.69	21.1	32.68	30.58	31.63	37.66	32.51	32.36	36.63	37.95	41.95	34.6	34.5	31.2
DT21 (WA76 Wilderspool Causeway)	37.41	40.09	21.33	32.41	28.16	27.75	26.93	25.45	24.08	33.43	37.01	39.77	31.2	31.0	29.4
DT22 (WA118 Wilderspool Causeway 3)	38.7	36.98	17.16	32.19	30.83	29.32	29.19	24.29	24.35	35.84	missing	33.73	30.2	30.1	
DT23 (WA94 Wilderspool Causeway 2)	40.96	47.21	21.5	35.18	26.91	27.17	36.11	27.38	28.85	37.74	38.28	38.77	33.8	33.7	
DT24 (WA90 Stockton	33.18	38.91	18.73	29.95	25.11	22.36	24.97	20.36	21.98	31.62	31.09	32.96	27.6	27.5	26.5

Heath 3)															
DT25 (WA77 Knutsford Road 1)	32.48	39.08	21.26	30.22	25.95	23.27	33.17	25.76	28.32	29.91	36.52	38.17	30.3	30.2	
DT26 (WA103 Knutsford Road 2)	34.51	37.53	19.45	27.68	25.37	22.92	25.99	23.26	23.06	31.66	34.64	34.56	28.4	28.3	26.8
DT27 (WA92 Kingsway South (Latchford))	35.53	45.69	24.54	39.97	37.5	36.05	32.34	26.87	27.1	34.63	43.52	40.87	35.4	35.2	
DT28 (WA105 Latchford Village 2)	47.13	49.77	34.21	40.76	34.93	32.72	38.13	33.09	33.64	40.94	48.35	46.99	40.1	39.9	34.8
DT29 (WA115 Latchford Village 3)	42.34	40.91	24.28	36.73	29.01	31.73	32.19	25.5	25.92	35.2	42.66	39.72	33.8	33.7	31.4
DT30 (WA116 Latchford Village 4)	34.45	39.54	Erroneous data	Tube missing	29.87	29.47	26.2	21.8	22.36	30.5	30.2	34.47	29.9	29.8	
DT31 (WA78 Mersey Street)	39.1	49.33	33.31	52.03	35.37	31.63	25.17	31.86	26.71	37.03	44.26	48.61	37.9	37.7	35.9
DT32 (WA100 Napier Street)	Tube missing	35.4	18.54	30.27	-	-	-	-	-	-	-	-	28.1	24.0	

DT33 (WA99 James Lee House)	39.41	Tube missing	Tube missing	Tube missing	30.42	28.58	32.65	27.94	31.92	40.48	40.01	Tube missing	33.9	36.2	
DT34 (WA80 Bewsey Street)	Tube missing	41.75	23.16	33.74	26.54	27.02	33.35	25.67	25.79	33.5	43.87	42.84	32.5	32.3	
DT35 (WA117 Tanners Lane)	47.17	42.96	26.68	36.79	-	-	-	-	-	-	-	-	38.4	32.4	
DT36 (WA83 Crosfield Street)	40.98	45.98	31.64	33.63	30.24	29.15	Tube missing	28.71	31.14	41.74	40.97	43.4	36.1	36.0	32.4
DT37 (WA89 King Edward Street)	46.39	50.47	26.67	40.45	37.2	37.98	38.04	29.25	31.37	43.14	Tube missing	Tube missing	38.1	37.9	34.8
DT38 (WA107 Padgate Lane 1)	41.09	47.8	21.81	33.48	31	32.25	35.06	27.61	27.79	36.94	40.44	48.15	35.3	35.1	32.2
DT39 (WA108 Padgate Lane 2)	46.09	50.15	22.03	39.22	28.78	31.6	30.32	27.25	28.74	34.85	Tube missing	49.16	35.3	35.1	32.5
DT40 (WA125 Steel Street)	-	-	-	-	32.87	34.31	40.02	33.04	31.51	43.62	51.8	46.08	39.2	**42.4**	37.8
DT41 (WA126 Manchester Road)	-	-	-	-	28.66	29.36	21.67	23.78	25.31	33.71	42.1	34.57	29.9	32.4	28.2
DT42	36.25	43.05	18.2	31.46	Tube	26.88	31.58	31.1	30.07	37.08	36.35	38.27	32.8	32.6	30.4

(WA95 Winwick Road 1)					missing									
DT43 (WA96 Winwick Road 2)	45.84	48.69	23.28	40.56	32.61	30.77	41.77	37.78	37.65	46.18	46.9	52.93	40.4	**40.3**	37.7
DT44 (WA112 Winwick Road 3)	53.71	56.69	21.72	42.03	43.04	45.04	35.85	40.17	41.48	47.4	47.38	54.15	44.1	**43.9**	

☒ **Local bias adjustment factor used**

☐ **National bias adjustment factor used**

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

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

Notes:

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

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

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

(2) Distance corrected to nearest relevant public exposure.

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

Diffusion Tube Bias Adjustment

The Council uses Gradko International Ltd Laboratories to supply and analyse our diffusion tubes. The tubes are prepared using 20% triethanolamine (TEA) in water. Manufacture and analysis of the tubes by Gradko are covered by UKAS accreditation with the WASP results for 2018 ranking the laboratory as 'satisfactory' for 100% of results. Triplicate tubes are co-located with our automated site at Selby Street that benefits from full quality control procedures as part of the AURN and includes an independent audit by Ricardo-AEA. An internal Council audit of the raw diffusion tubes that are then bias corrected is carried out.

Local bias adjustment factors using the Selby Street ratified AURN background data have been calculated and used as this is considered to effectively represent the local conditions and therefore any bias calculated is considered more relevant. Continued use of this also enables comparison with previous year's datasets. The analyser at Selby Street is affiliated within the AURN and is subject to their data quality checks and auditing. There have been no highlighted performance issues or significant maintenance issues with the NO_2 analyser.

From using the tri-located tubes at Selby Street the Warrington study there were 12 periods of data, all recording good precision, collected for 2018, with a bias adjustment factor of 0.996 and a bias of <-1%.

The Defra National Diffusion Tube Bias Adjustment Factors reports 30 studies, with the factor varying between 0.76 to 1.21 and an average of 0.93. This shows that using the local factor of 0.98 is reasonable for our corrections

Annualisation/seasonal correction

Any monitoring sites with less than 75% data collection have been annualised in accordance with LAQM.TG16. A number of sites have been corrected this way, either due to the monitoring period being less 9 months or due to tubes going

"missing" on site. All tubes have been corrected using the Selby Street data as this represents the closest local site.

The Selby Street PM_{10} analyser had low data collection. This has been corrected using the AURN site at Liverpool Speke.

Table C.2 – Annualisation/seasonal correction

Site	Period of monitoring	Average	Selby St average	Selby St annual mean	Factor	Seasonally adjusted figure
DT1 (WA8 Risley Moss)	Feb – June, Sept, Nov	16.8	22.35	21.37	0.96	16.1
DT2 (WA14 Bruche Ave)	Jan - April	19.6	25.19	21.37	0.85	16.6
WA67 Crosfield Island 2	Feb – April, July – Sept, Nov, Dec	32.9	21.84	21.37	0.98	32.2
DT7 (WA123 M62)	June, July, Sept-Nov	27.7	19.96	21.37	1.07	29.7
DT8 (WA124 M56)	May – Aug, Nov, Dec	32.2	20.14	21.37	1.06	45.2
DT12 (WA67 Crosfield)	Feb – April, July – Sept, Nov, Dec	32.9	21.84	21.37	0.98	32.2
DT15 (WA30 OLR)	Feb - April	36.9	24.95	21.37	0.86	31.6
DT16 (WA86 OLR)	Jan - April	32.0	25.19	21.37	0.85	27.2
DT18 (WA72 Chester Rd 3)	Jan - Aug	31.7	21.45	21.37	1.00	31.6
DT32 (WA100 Napier St)	Feb - April	28.0	24.95	21.37	0.86	24.0
DT33 (WA99 James Lee House)	Jan, May - Nov	33.8	19.95	21.37	1.07	36.21
DT35 (WA117) Tanners Lane	Jan - April	38.2	25.19	21.37	0.85	32.4
DT40 (WA125 Steel St)	May - Dec	39.0	19.66	21.37	1.09	42.4
DT41 (WA126 Manc Rd)	May - Dec	29.8	19.66	21.37	1.09	32.4
CM1 (PM10)	Mar - Dec	12.96	13.65	13.97	1.023	13.3

Distance correction

Where relevant, data has been distance corrected using the Defra/Bureau Veritas NO_2 Fall Off with Distance Calculator v4.2. The distances are shown in Table A2 and corrected results in Table B1.

QA/QC of Automatic Monitoring

QA/QC was contracted to ESU1 Ltd for the NOx analysers at the Selby Street, Parker Street and Chester Road sites during 2017. Fortnightly calibrations are carried out by a trained officer from the Council. Six monthly routine services are carried out by the contractor at each site. In addition, Ricardo-AEA provides six monthly independent QC audit checks for the Selby Street site as part of the AURN requirements. All QC checks have passed for each site.

Selby Street NOx and PM data is ratified as part of the AURN. Parker Street and Chester Road data is ratified and provided by AQDM consultants.

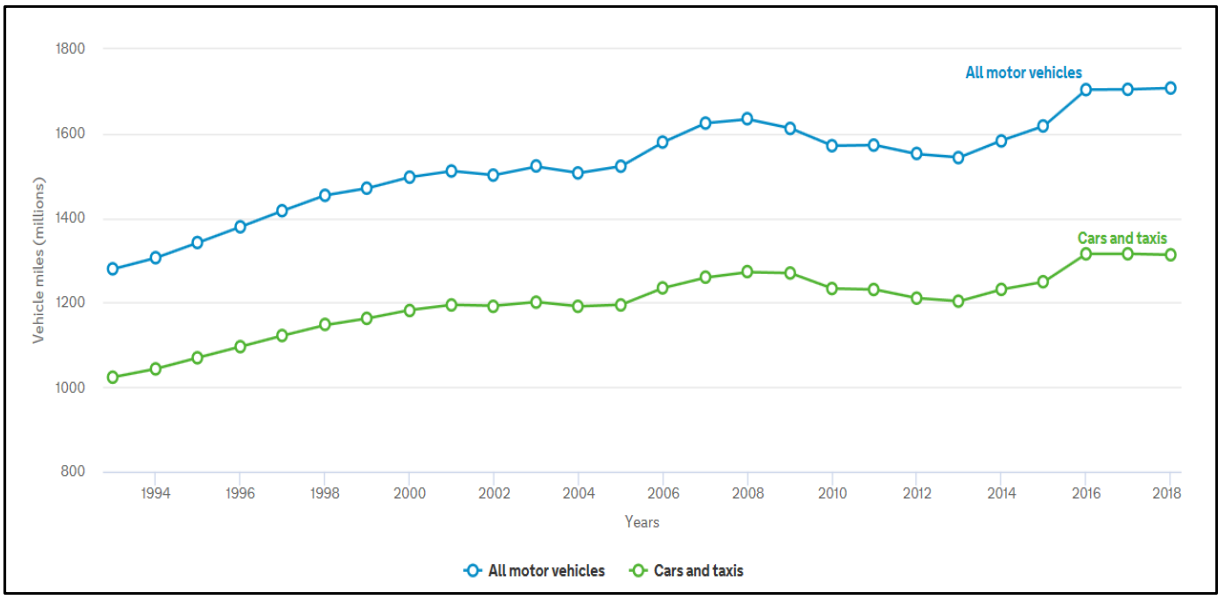
The PM_{10} and $PM_{2.5}$ FDMS analysers are affiliated into the AURN. Servicing is carried out by Air Monitors Ltd with six monthly QC audits by Ricardo-AEA on behalf of Defra. Fortnightly calibration checks are completed by a trained Council Officer with data supplied for verification to Bureau Veritas and Ricardo-AEA acting on behalf of Defra. No performance issues have been reported from the audits or servicing.

Road traffic Data

Road traffic data is taken from 142 count sites across Warrington operated by the DfT. This compares total miles driven for different vehicle modes. Miles driven on Warrington Roads reached a peak in 2016, and remains steady in 2017 and 2018. This is important to understand for modelling work and predictions and to assess how volumes affect air quality as engine technology improves.

In 2018, a total of 1.7 billion miles were driven by all motorised vehicles on Warrington roads, including on the motorway network. 1.3 billion of those miles were driven by private cars and taxis.

Figure C.2 – Annual traffic (total vehicle miles) on Warrington Roads (source: https://roadtraffic.dft.gov.uk/local-authorities/74)



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

Map D.1 - AQMAs

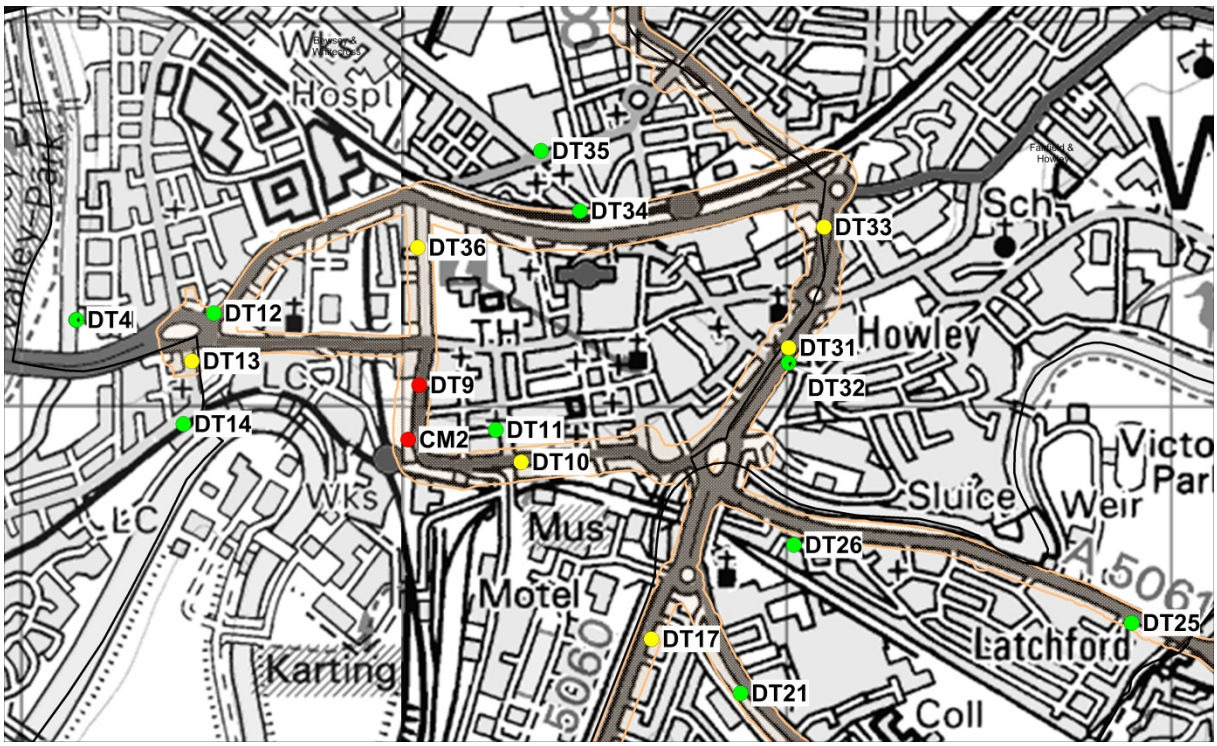
Monitoring locations have been colour coded to represent measured nitrogen dioxide concentrations compared to the relevant objective limit.

- Exceeding the limit
- Risk of exceeding (within 10%)
- Meet the objective limit

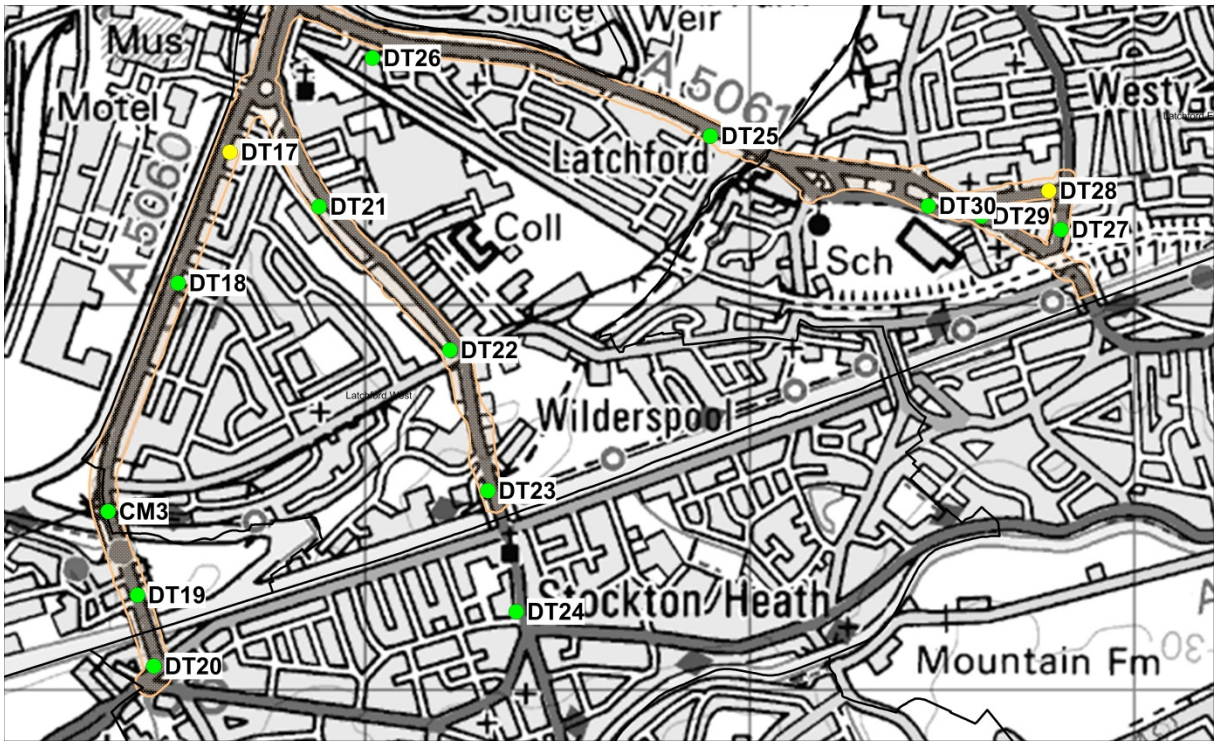
Map D.2 – All monitoring locations

Warrington AQMA monitoring locations

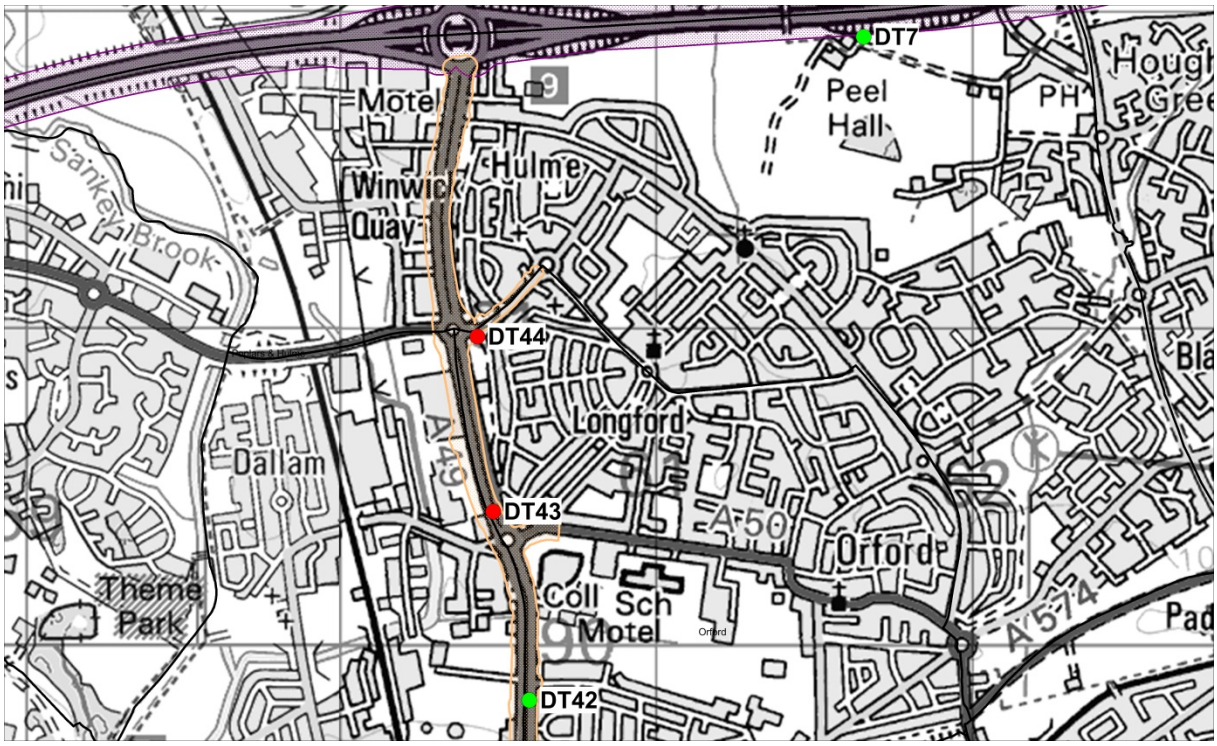
Map D.3 – Town Centre monitoring locations



Map D.4 – Chester Rd, Wilderspool Causeway, Knutsford Rd, Latchford monitoring locations

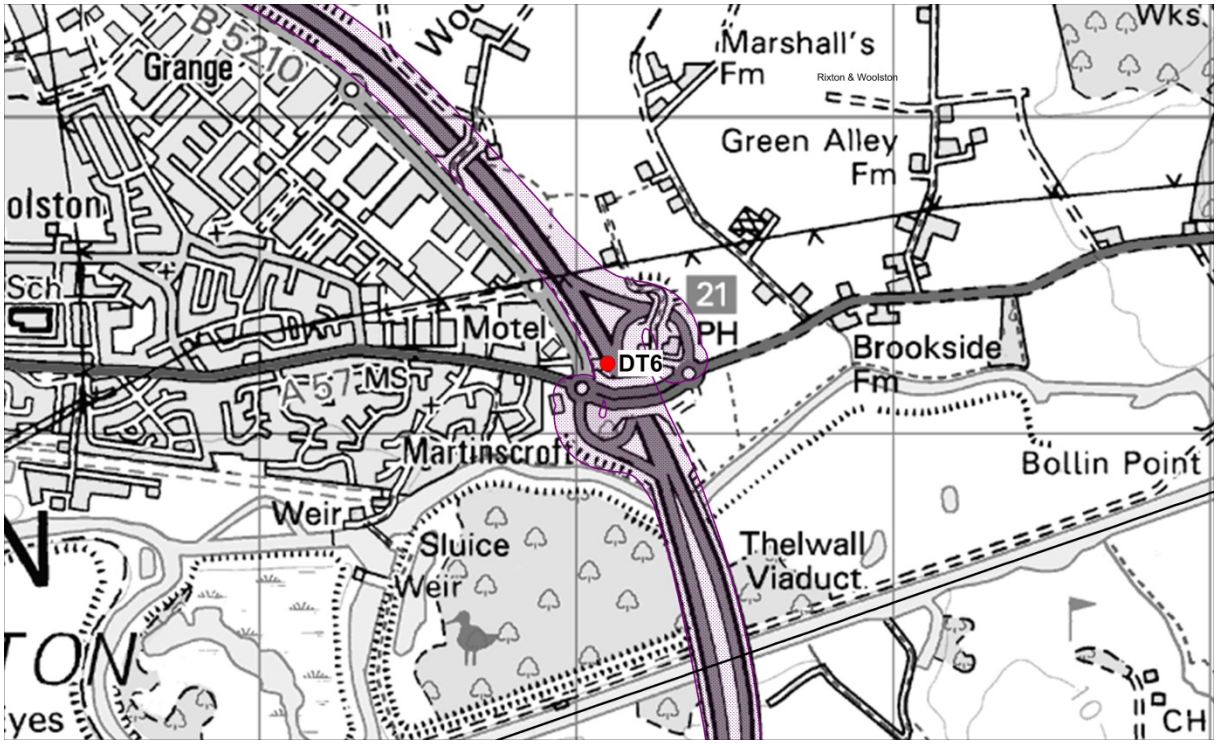


Map D.5 – Winwick Road monitoring locations

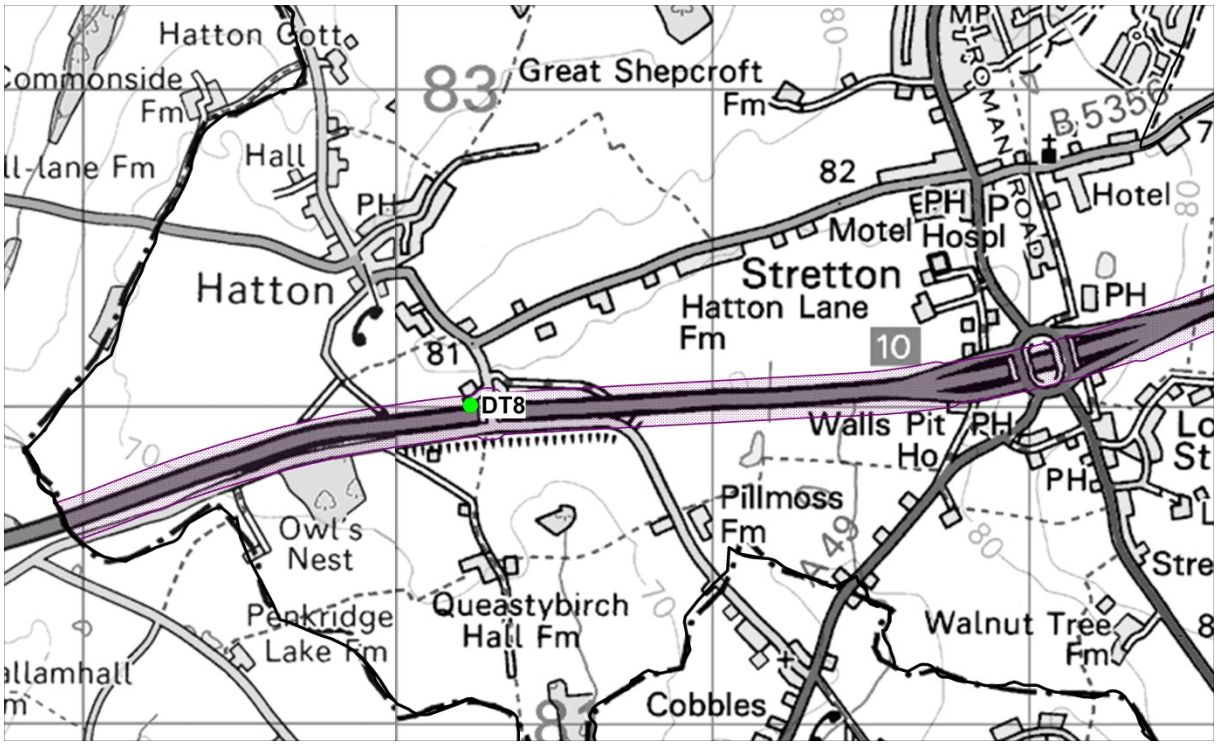


Motorway AQMA monitoring locations

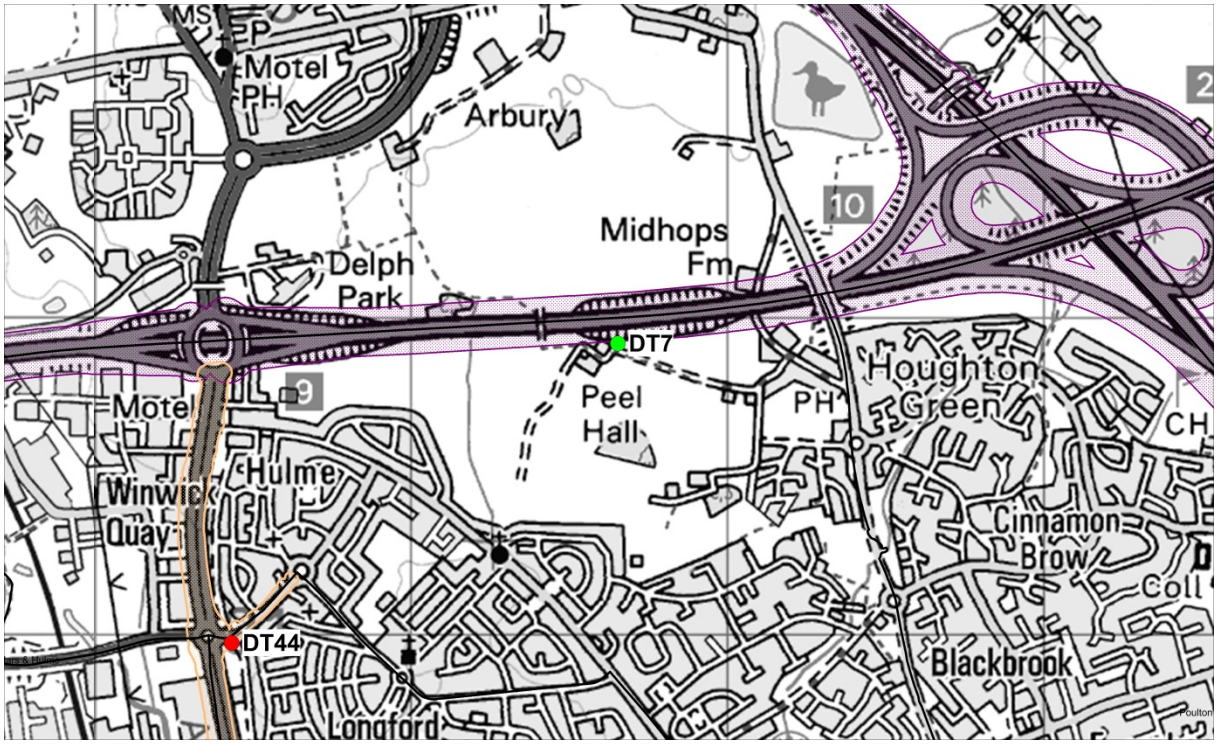
Map D.6 – M6 Motorway monitoring location



Map D.7 – M56 Motorway monitoring location

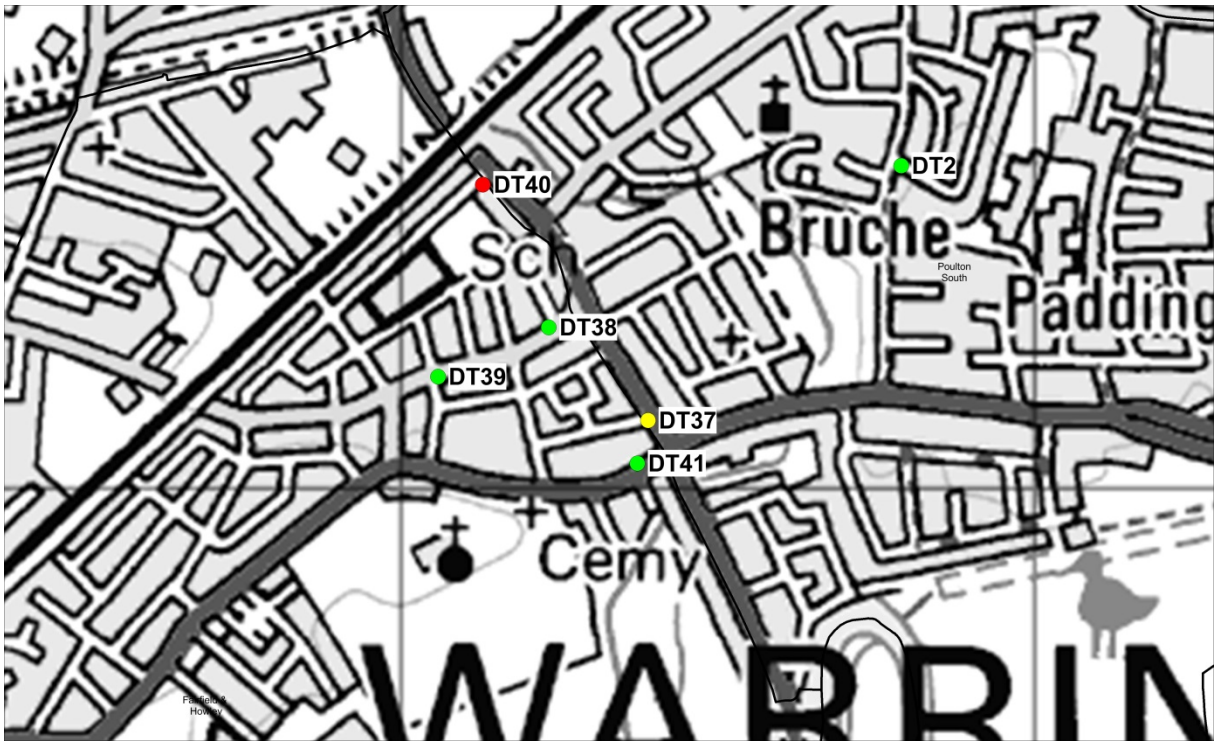


Map D.8 – M62 Motorway monitoring location



Padgate monitoring

Map D.9 – Padgate monitoring locations



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
BAM	Beta Attenuation Monitor
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
LTP4	Local Transport Plan version 4
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
WHO	World Health Organization

References

Abatement cost guidance for valuing changes in air quality, Defra, May 2013

Air Quality Action Plan, Warrington Borough Council 2018

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

Annual Status Report 2017, Warrington Borough Council

Detailed Assessment, Warrington Borough Council 2016

DfT Transport data 2018

Environmental equity, air quality, socioeconomic status and respiratory health, 2010

Environmental Protection SPD, Warrington Borough Council 2013

Local Air Quality Management Technical Guidance TG(16)

Local Air Quality Management Policy Guidance PG(16)

Local Plan (Draft), Warrington Borough Council

Local Transport Plan LTP4 (Draft), Warrington Borough Council

Public Health Outcomes Framework Indicator 3.01 – Fraction of mortality attributable to particulate pollution, 2017