Knowsley Metropolitan Borough Council
2022 Annual Status Report

Bureau Veritas

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Knowsley Council

2022 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: August, 2022

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Executive Summary: Air Quality in Our Area

Air Quality in Knowsley Metropolitan Borough Council

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children, 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].

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

The main sources of air pollution in Knowsley, as identified from previous air quality reviews and assessments, as well as the work carried out in the Merseyside Atmospheric Emissions Inventory[5], are from road traffic vehicle emissions and industrial sources. Knowsley is home to a wide range of industrial and commercial developments and is an important location for employment in the Liverpool City Region. The borough has large industrial bases concentrated mainly on Knowsley Business Park (situated in Kirkby), Huyton, Kings and Prescot Business Parks (situated in the centre of the borough), and Jaguar Land Rover car plant (situated in Halewood). Neighbouring authorities also house large industries that can have an impact on the air quality in Knowsley. For example, the Shell oil refinery and petro-chemical complex in Ellesmere Port lies to the south west of Knowsley as well as major glass manufacturing sites in St Helens.

Traffic movements within the borough also play a significant role when considering air quality. Knowsley has a variety of road connections. The M57 is the 'backbone' of the

[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, July 2021

[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

[5] https://aether-uk.com/News/2009-2011/Merseyside-emissions-inventory

Borough, running North West to South East. The M62 and A580 (East Lancashire Road) link with the M57 and cut through the Borough East to West. The A5300 acts as the southerly extension of the M57. The motorway and main A-roads are connected via a network of smaller roads, which link towns and villages in the Borough.

Knowsley Metropolitan Borough Council (MBC) has 3 automatic monitoring stations located in Huyton, Halewood and Kirkby, which were operated from 2008 to September 2021.

In 2021, the air quality monitoring stations monitored the following pollutants:

- Kirkby – nitrogen dioxide (NO_2) and particulate matter less than 10 microns (PM_{10})
- Halewood and Huyton both reported for NO_2 only, as the TEOM particulate monitors installed in these units were no longer producing data that could be used, as it couldn't be validated against the volatile correction model.

All 3 automatic monitors demonstrated long-term compliance with the air quality strategy (AQS) objectives for Nitrogen Dioxide (NO_2) and particulate matter (PM_{10}), both are principal pollutants of concern for air quality.

The automatic monitoring stations were decommissioned in September 2021 as a result of the completion of the contract with 'WeCare4Air' and the failure to secure the necessary funding required to update the monitors. Knowsley MBC have continued to monitor NO_2 within the areas of Huyton, Prescot and Kirkby through use of diffusion tubes. The diffusion tube network within Knowsley has demonstrated long term compliance with the AQS objective, however within 2021 three sites reported exceedances of the NO_2 AQS objective.

Previous reports have identified an area of concern in Huyton at the junction of Whitefield Lane / Cronton Road. The same reports have also demonstrated that air quality in other parts of Huyton, monitored using the diffusion tubes, is good, and the results have been significantly below the NO_2 AQS objective. Taking this into account, in 2021, Knowsley MBC moved five tubes showing no concerns and concentrated them around the Whitefield Lane / Cronton Road junction.

Within Kirkby in 2021, the automatic monitoring site had a data capture of less than 85% therefore the 90.4th percentile has been calculated, which was 48. The monitoring location is situation on traffic island within a junction subject to heavy traffic flows. The nearest relevant exposure is approximately 20 metres away. The monitoring data will continue to be reviewed over the subsequent years, and in the event of continual or potential exceedances, further assessment will be completed.

In 2021, the measured NO_2 concentrations across Knowsley predominantly saw increases throughout the passive monitoring sites, with the exception of two sites that saw a decrease, within Huyton and Prescot. Passive monitoring sites H6Aa/b and H8Aa/b have reported concentrations within 10% of the AQS objective in its first year, therefore NO_2 concentrations will be closely monitored at this location. Site H3a/b has shown exceedances at the monitoring site for the past 5 years, but has demonstrated compliance against the AQS objective at the sensitive receptor each year.

Knowsley MBC have not introduced any Air Quality Management Areas (AQMAs) in 2021.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades and will continue to improve due to national policy decisions, there are some areas where local action is needed to improve air quality further.

The 2019 Clean Air Strategy[6] sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero[7] sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

To improve the air quality in the borough, Knowsley MBC continues to work with the Liverpool City Region (LCR) local authorities, Merseytravel, Environment Agency and a range of other partners. The LCR Combined Authority Air Quality Group has been established to identify opportunities in the LCR to improve air quality and, of equal importance, the associated benefits to health and well-being, whilst supporting the growth and development of the region.

Key completed measures in Knowsley are:

- Regular Air Quality Technical Group meetings.
- Worked with the planning system to embed the role of air quality in sustainable development.

[6] Defra. Clean Air Strategy, 2019

[7] DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

- Developed local supplementary planning documents, to mitigate air quality impacts.
- Established a LCR Air Quality Website, to improve information provided to the general public: www.liverpoolcityregion-ca.gov.uk/air-quality/
- Introduced active travel measures (Constructed cycle ways/walkways in the borough), to promote alternative travel modes to reduce traffic volumes, leading to reduced emissions.
- Improved the efficiency of road junctions and signals, to reduce idling traffic and congestion.

Conclusions and Priorities

In 2021, there were no exceedances of any of the relevant NO_2 or PM_{10} (Kirkby) AQS objectives at areas of relevant exposure following fall of with distance corrections. As such, compliance has been achieved throughout the Borough.

Although compliance has been achieved, there was an increase in concentrations at 25 out of 32 passive monitoring locations in 2021, therefore Knowsley MBC will continue to use their diffusion tube network to closely monitor hotspot areas.

Owing to the failure to validate particulate matter data against the volatile correction model, the data in 2021 for the Huyton and Halewood sites (which use Tapered Element Oscillating Microbalance (TEOMS) to measure PM_{10} and $PM_{2.5}$) was not presented in 2021. The Kirkby automatic monitoring site reported an exceedance of the 24-hour mean limit PM_{10} in 2021 for the period January to September via the 90.4th percentile. It has increased from 2020 and reports noncompliance against the 24-hour mean PM_{10} AQS objective for the first time since monitoring. Knowsley will continue to review data over the subsequent years, and in the event of continual or potential exceedances, further assessment will be completed.

Knowsley MBC will continue to use the passive monitoring network to monitor air quality levels, and to ensure that compliance is maintained throughout the district, including continuing to look at ways the continuous monitoring regime can be brought back into use. The addition of 5 new passive monitors at Whitefield Lane have been utilised to further closely monitor an area of concern. Knowsley will continue to work with the LCR combined authority to progress improvements to air quality in the area , including the introduction of a new scheme, setup by LCR in 2022, which uses ‘EarthSense Zephyr air quality monitors’, installed near traffic junctions throughout the region to measure for a variety of pollutants (www.earthsense.co.uk/zephyr).

Continuing on from 2020, the council will be raising awareness and understanding of air pollution, primarily through participating in the national Clean Air Day.

Local Engagement and How to get Involved

- Knowsley MBC was involved in the 2021 National Clean Air Day and worked with schools and taxi firms.
- Schools have been provided resources to encourage walking, biking, or scooting to school, educating through assemblies and lessons.
- Officers are asking taxi firms to promote clean air day by sending messages to drivers to stop idling where possible.

Further local engagement strategies have been limited due to COVID–19.

Local Responsibilities and Commitment

This ASR was prepared by Bureau Veritas on behalf of Knowsley MBC with the support and agreement of the following officers and departments:

- Helen Bradshawe – Environmental Health
- Ian Gaskell – Environmental Health
- Sarah McNulty – Public Health
- Richard Thorpe – Strategic Infrastructure
- This ASR has been approved by:
- Denise Best (Interim Assistant Executive Director (N&C Services))
- Sarah McNulty (Director of Public Health)
- Cllr Shelley Powell

This ASR has been signed off by a Director of Public Health.

If you have any comments on this ASR please send them to Knowsley's Environmental Health team at:

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1 Local Air Quality Management

This report provides an overview of air quality in Knowsley Metropolitan Borough Council (Knowsley MBC) during 2021. 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 Knowsley MBC to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.

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 should prepare an Air Quality Action Plan (AQAP) within 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Knowsley MBC does not currently have any AQMAs declared.

In 2019, an area of concern was identified and the possibility of declaring an AQMA discussed due to an exceedance of the annual limit for NO_2 (40µg/m^3). However, after correcting for distance to relevant exposure, the reported concentration decreased to 39.5µg/m^3, which is below the AQS objective. Likewise, in 2020 the NO_2 concentration that was recorded at this potential hotspot (Whitefield Lane) was 42.2µg/m^3, reducing to 35.3µg/m^3 after the fall-off with distance correction.

In 2021 the potential hotspot (Whitefield Lane) area recorded 3 exceedances of the AQS objective (H3a/b – 46.7 µg/m^3, H6Aa/b – 45.4 µg/m^3 and H8Aa/b – 46.9 µg/m^3), with distance correction these concentrations were reduced to 38.2 µg/m^3, 33.2 µg/m^3 and 34.8 µg/m^3.

Within Kirkby, monitoring site K1a/b reported an increase from 2020, with NO_2 concentrations now within 10% of the AQS objective at 39.1 µg/m^3 in 2021, however following the fall-off with distance correction, the NO_2 concentration reduces to 27.1 µg/m^3.

The 2021 diffusion tube results also showed three other areas in Huyton which had an NO_2 concentration within 10% of the AQS objective, these results were 38.2 µg/m^3 (H2a/b), 38.1 µg/m^3 (H5Aa/b) and 36.5 µg/m^3 (H9a/b). However, after correcting for distance to the relevant exposure the results reduced to 34.7 µg/m^3, 37.4 µg/m^3 and 32.2 µg/m^3 respectively.

Therefore, Knowsley MBC do not believe there is a need to declare an AQMA at present.

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

Defra's appraisal of last year's ASR concluded:

1. *"The report is well structured, detailed, and provides the information specified in the Guidance. The report is considered an example of good practice.*
2. *The report contains extensive discussion on trends seen in monitored concentrations throughout 2020, which is commended. This level of detail is encouraged in future reports and is considered an example of good practice.*
3. *The Council are commended on their ability to maintain consistency in their air quality monitoring work during the course of the Covid-19 pandemic, which has resulted in excellent data capture for 2020.*
4. *Diffusion tube mapping is sufficient, with sites labelled in accordance with the IDs listed in the results tables.*
5. *Appendix F: Impact of COVID-19 upon LAQM has been completed in detail, clearly demonstrating the Councils' understanding of the implications of the pandemic on current and future air quality within the local area."*

Knowsley (MBC) has taken forward a number of direct measures in pursuit of improving local air quality. There are new updates for the 2021 reporting year on impact measures involving a number of road schemes to help improve traffic flow and improve air quality:

Signalisation

- Stoney Lane/Dragon Lane – Signalisation of existing Give Way junction;
- Windy Arbor Road/Lickers Lane – Signalisation of Give Way existing junction;
- Cumber Lane/Stoney Lane – Signalisation of Give Way existing junction;

Traffic Measures

- Kirkby Row/Glovers Brow and Greene's Road/Windy Arbor Road – carriageway widening at signalised junction to improve capacity to ease traffic congestion, leading to decreased emissions from traffic idling.

- Prescot Road/Cronton Road/Fox's Bank Lane – New roundabout to replace a staggered crossroads, and sections of the Prescot to Cronton cycleway, to ease traffic congestion and improve capacity of cars at junction, leading to reduced idling periods and improved air quality – these locations are on Manchester Road, South Avenue, KGV Playing Fields and Prescot Parkway.

Cycleway

- Kirkby Row and M57 Jct 3 / Pyes Lane / Stockbridge Lane – new cycleway path, to promote alternative modes of travel, by making cycling routes safer and more accessible.

A new external scheme has been setup Liverpool City Region called EarthSence Sensors:

- A scheme has been set up by Liverpool City Region to install AQ monitoring equipment at traffic junctions throughout the region. The Intelligent Transport Systems (ITS) Zephyr® is an ambient air quality monitor that accurately measures harmful gases and particle matter, the monitors provide detailed air quality measurements in real time to help identify pollution hotspots at a localised level such as busy road junctions. They can be used to redirect traffic and, adjust timing on traffic lights in heavy polluted areas, creating smarter and cleaner towns.

The sensors within Knowsley were installed in 07/08th March 2022, at junctions detailed below:

Site ID	Site Location	Council	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)
Cronton Road	Whitefield Lane (Junction)	Knowsley	345553	389405
County Road	Westhead Ave	Knowsley	341465	398820
Hall Lane	Millbrook Drive	Knowsley	341159	398942
County Road	Melling Drive	Knowsley	341243	399491
Old Rough Lane	Near Bigdale Drive	Knowsley	341974	398961
(New Location)	Old Rough Lane / Roughwood Drive (1081)	-	-	-

Knowsley (MBC) have several policies which can directly or indirectly impact on air quality in the borough. These range from national requirements, through to local Supplementary Planning Documents:

- **Knowsley Local Plan Core Strategy** – Policy CS2 Development Principles (design to reduce travel and mitigate AQ impact of traffic, encourage sustainable transport, requiring assessments to be carried out). Policy CS7 Transport Network (to encourage sustainable transport and design out AQ impacts, including improving infrastructure). Policy CS23 Renewable and Low Carbon Infrastructure (supporting low carbon and renewable energy initiatives which don't impact AQ)

- **Supplementary Planning Document – Ensuring a Choice of Travel** – Includes various initiatives to be implemented through the development process, such as Air Quality Assessments, Travel Plans and Electric Vehicle Charging Infrastructure.

- **New Residential Development Supplementary Planning Document** – Criteria for minimum numbers and standards of Electric Vehicle Charging points in new housing developments, sustainability and energy efficiency of new houses.

- **Area-specific Supplementary Planning Documents** - (for example Halsnead and East of Halewood Masterplan SPD's) which ensure cycling and pedestrian links are provided as part of larger developments, along with Travel Plans were deemed feasible.

Public Health Policies

- **The Joint Health and Wellbeing Strategy 2020-2025** – In 2020, the COVID-19 pandemic had a profound impact Knowsley community and has expanded the gap of existing health inequalities. The purpose of the strategy is to address matters in areas where Knowsley under performs in comparison to other parts of the country and to improve mental health, well- being and social isolation among all age groups. The Council recognises the importance of air quality as it can contribute to poorer health of the most vulnerable in society such as children, older people and those with heart disease and lung conditions. Knowsley has declared a Climate Emergency early in 2020 and work is underway to mitigate the impacts of climate change on the social and environmental determinants of health.

- **Knowsley Healthy Weight Plan 2019-2022** – The Plan identifies the Obesogenic Environment as a cause for the high overweight and obesity rates in Knowsley compared to the rest of the country. Acknowledges the need to continue to explore

and better understand reasons behind low active travel through surveys and insight as well as working with partners to ensure healthy weight is integrated into locality through transformational plans. By encouraging active travel and having cleaner air, this will help improve a healthier lifestyle and contribute to air quality.

- **Active Travel Fund** – This has plans in place both short term and long term to improve the walking and cycling routes throughout the borough, especially in areas with poor levels of air quality (Cronton Road) and encouraging access to retail and places of work such as Jaguar Land Rover, the boroughs largest employer.

- **Reducing Health Inequalities** – One of the objectives in reducing health inequalities is to ensure deprived areas have access to the same opportunities to those living in less deprived zones. This will include entry to open spaces that are of good quality by reducing air pollution such as decreasing or slowing down traffic in neighbourhoods predominantly around schools, to help protect children's health as they are particularly vulnerable to air pollution. Promoting walking and cycling to school will also correspond with being active and improving cleaner air, as those living in disadvantages communities are more at risk to poor air quality and more likely to be in poorer health.

- **Regeneration of Town Centres** – To support the improvement of air quality will be to focus on sustainable transport options into and out of town centres. This includes plans for a new train station in Kirkby, adding cycle storage areas throughout, completing a clear pathway in Huyton between the train station, town centre and bus station. Also providing links and signposts to cycle and walking routes between town centres and other attractions such as green spaces, creation of green corridors largely in Kirkby from Valley Drive through to Kirkby Town centre. Additionally, Highways are currently bidding for funding to bring forward their cycling and walking infrastructure work to improve connections throughout the borough such as from Kirkby to Speke, along the East Lancashire Road and also between Prescot and St Helens.

- **Housing Developments** – Part of new housing developments is to encourage promoting the use of bike or walking trips with segregated cycleways and pedestrian routes and the use of green corridors that creates a safe space for residents. An

example of this is having better lit areas so that the spaces can be used after dark and allow for traffic movement in a way that reduces air pollution around the homes. Electrical charging points to be installed in all new housing developments.

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 2.5 µm 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.

Long-term exposure to particulate pollution is understood to be one of the leading causes of death from cardiovascular and respiratory conditions and from lung cancer. The Public Health Outcomes Framework (PHOF)[8] for England provides an indicator of the fraction of adult mortality that is attributable to long-term exposure to particulate pollution. Based on the latest available data using a new method for the 2020 period, the attributable fraction in England is 5.6%, whilst for the north-west region this is slightly lower at 5.0%. However, the value for Knowsley is higher than the north-west and England average at 5.7%.

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

- Any new continuous monitoring stations in Knowsley should hopefully include a $PM_{2.5}$ monitor.
- Identify any developments that have the potential to increase $PM_{2.5}$ levels through the planning regime and environmental permitting, and where necessary use conditions or enforcement to secure improvements. $PM_{2.5}$ will be the focus of new planning applications and environmental permitting.

[8] Public Health Outcomes Framework (PHOF): Fingertips, Public Health Data

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

This section sets out the monitoring undertaken within 2021 by Knowsley MBC and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021, to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Knowsley MBC undertook automatic (continuous) monitoring at three sites from a period of January 2021 to September 2021. Table A.1 in Appendix A shows the details of the automatic monitoring sites[9]. The wecare4air page presented the automatic monitoring results for Knowsley MBC and whilst there is no current data, due to the contract ending, the historic data is still available at the time of writing this report.

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

3.1.2 Non-Automatic Monitoring Sites

Knowsley MBC undertook non-automatic (i.e., passive) monitoring of NO_2 at 32 sites during 2021. Table A.2 in Appendix A presents the details of the non-automatic sites. Each site had a duplicate, resulting in 64 diffusion tubes being deployed across the borough. Within 2021 5 new diffusion tube monitoring sites were deployed and 5 sites were decommissioned.

Maps showing the location of the monitoring sites are provided in Appendix D: Map(s) of Monitoring Locations and AQMAs. 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.

[9] Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.1.3 Nitrogen Dioxide (NO_2)

Table A.3 and Table A.4 in Appendix A show the ratified automatic monitoring results and the bias adjusted non-continuous monitoring results, respectively, for NO_2, over the past 5 years. The results have been compared against the air quality objective of 40 µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e., the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Previous reports have identified an area of concern in Huyton at the junction of Whitefield Lane / Cronton Road. The same reports have also demonstrated that air quality in other parts of Huyton, monitored using the diffusion tubes, is good, and the results have been significantly below the NO_2 AQS objective. Taking this into account, in 2021, Knowsley moved five of the tubes showing no concerns and concentrated them around the Whitefield Lane / Cronton Road junction. The tables below (Old Diffusion Tube Locations and New Diffusion Tube Locations) indicate where Knowsley MBC have stopped monitoring and where we have started monitoring.

Table A.1 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200 µg/m^3, not to be exceeded more than 18 times per year.

During 2021, all diffusion tube monitoring locations except three locations reported NO_2 values compliant with the NO_2 AQS objective. Monitoring locations H3a/b, H6Aa/b and H8Aa/b reported exceedances, however, once distanced corrected concentrations correct below the NO_2 AQS objective.

From 2020 – 2021, 25 sites recorded an increase in NO_2 concentrations, with 4 sites within 10% of the NO_2 AQS objective. The remaining sites are well below the AQS objective. An

overall increase from 2020 is likely due to the result of the COVID – 19 pandemic had on traffic volumes across the UK, responsible for reduced concentrations in 2020.

Figures A.1 – A.4 show annual mean NO_2 concentrations for the previous 5 years (2017–2021). The graphs show there is a general increase in NO_2 concentrations from 2020 at Kirkby, Prescot and Huyton. The monitoring in Huyton show increases in concentrations at six diffusion tube monitoring sites. Three of the sites (H2a/2b, H5Aa/Ab, H9Aa/Ab) have all increased to within 10% of the 40 µg/m^3 AQS objective from 2020, with three other sites increasing to exceedances (H3a/3b, H6a/6b and H8a/8b). However, following the fall-off with distance correction, concentrations at exceeding sites reduced below the 10% threshold at H8a/8b and H6a/6b, but H3a/3b and H5a/5b still remain within the 10% threshold at 38.2 and 37.8 µg/m^3. Monitoring in Kirkby showed that site K1a/b reported an NO_2 concentration within 10% of the AQS objective of 39.1 µg/m^3, however following the fall-off with distance correction, the NO_2 concentration is well below the AQS objective, reporting a concentration of 27.1 µg/m^3.

The three automatic monitoring stations within Knowsley captured data from January – September in 2021 (a full year was not monitored due to contract termination with WeCare4Air). Within this period all three stations reported an increase in annual NO_2 concentrations from 2020. The Kirkby monitoring station over the previous three years showed an increasing trend in concentrations and continues to follow this. Huyton showed an increase in results from 2017 – 2019, a decrease in 2020 due to COVID – 19, followed by an increase in 2021, with a concentration similar to the pre-pandemic levels. For Halewood there is no clear trend, but the results for the past 5 years are significantly below the AQS objective and not of a concern. The 1-hour mean for NO_2 was not exceeded in 2021, maintaining the trend seen over the last five years.

Old Diffusion Tube Locations

Site ID	Site Location	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Comment
H5	LC001 Sevenoak Grove off Cronton Road	345675	389363	To assess impact of petrol station and traffic congestion nearby. Impact of Sevenoaks
H6	LC 023 on Cronton Road near junction with Wilson Road	345840	389407	To assess impact at Wilson Road / Cronton Road junction.

H7	LC 029 on Cronton Road near Tarbock Island	345996	389471	Assess impact at Tarbock Island on hotel and bus stop
H8	LC 005 on Cronton Road opposite Natruscot	345301	389479	To assess tailback of traffic approaching junction and potential impact on receptor at Natruscot
H9	LC 013 outside 29 Southford Road	345596	389180	A location away from the junction but potentially still impacted by M62

New Diffusion Tube Locations

Site ID	Site Location	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Comment
H5A	Positioned on drainpipe on side of house of 1 Whitefield Lane	345563	389397	To assess impact of the traffic congestion at the T-junction. Impact of receptor.
H6A	Traffic light column adjacent to 2 Whitefield Lane	345543	389390	To assess impact at Wilson Road / Cronton Road junction.
H7A	LC 011 outside of 2 Cronton Road	345503	389429	Assess impact at Wilson Road / Cronton Road junction.
H8A	LC 014 on Cronton Road on property line of 1 Whitefield Lane, just before Cymru Cronton Road.	345577	389394	Assess impact at Wilson Road / Cronton Road junction.
H9A	LC 001 outside 3 Whitefield Lane	345555	389392	Assess impact at Wilson Road / Cronton Road junction.

3.1.4 Particulate Matter (PM_{10})

Table A.2 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 40 µg/m^3.

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

Owing to the failure to validate against the volatile correction model, the data for PM_{10} from 2020 at Huyton and Halewood sites (which use TEOMS to measures PM_{10}) is not presented. Kirkby station continues to comply with the PM_{10} annual AQS objective until September 2021 (Kirkby: 32.2 µg/m^3). The results for Kirkby showed a decrease in annual concentrations from 2020.

For the number of PM_{10} 24-hours means >50 µg/m^3, Kirkby has reported improvements from 2020, with 18 exceedances for the 2021 monitoring year, however, this is only over a 9 month period, compared with 35 exceedances in 2020 (No more than 35 exceedances of this limit are allowed per year). Therefore, the 90.4th percentile was calculated due to data capture less than 85%, this reported 48 exceedances for a 100% data capture year, which is noncompliant to the 24 – hour PM_{10} AQS objective. The monitoring location is situation on traffic island within a junction subject to heavy traffic flows. The nearest relevant exposure is approximately 20 metres away

3.1.5 Particulate Matter ($PM_{2.5}$)

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

The two automatic stations that measured $PM_{2.5}$ (Huyton and Halewood), showed that in 2017-2019 the concentrations remained relatively stable at around 9 µg/m^3, as with the PM_{10} results, $PM_{2.5}$ data since 2020 is not available, due to being unable to validate the data against the volatile correction model.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
Huyton	Cronton Road, Huyton	Roadside	345552	389413	NO_2, PM_{10}(3), $PM_{2.5}$(3)	NO	Chemiluminescent, TEOMS*	18	2	2
Halewood	Higher Road, Halewood	Roadside	345213	384691	NO_2, PM_{10}(3), $PM_{2.5}$(3)	NO	Chemiluminescent, TEOMS*	10	2	2
Kirkby	Old Rough Lane, Kirkby	Roadside	341414	398991	NO_2, PM_{10},	NO	BAMS	15	1	2.4

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

(3) The TEOMS particular matter data (*) from 2020 was unable to be validated against the volatile correction model and is therefore not reported

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
H1a, H1b	Station co- location	Roadside	345552	389413	NO_2	No	3.6	2.2	Yes	2.5
H2a, H2b	Outside 2 Whitefield Lane	Roadside	345537	389407	NO_2	No	1.5	1.2	No	2.4
H3a, H3b	Outside1 Whitefield Lane	Kerbside	345563	389399	NO_2	No	2.8	0.8	No	2.3
H4a, H4b	Opp Smithford Walk	Roadside	345517	389329	NO_2	No	3.8	1.3	No	2.4
H5Aa, H5Ab	Positioned on drainpipe on side of house of 1 Whitefield Lane	Roadside	345563	389397	NO_2	No	0.2	2.9	No	2.2
H6Aa, H6Ab	Traffic light column adjacent to 2 Whitefield Lane	Roadside	345543	389390	NO_2	No	5.6	0.5	No	2.4
H7Aa, H7Ab	LC 011 outside of 2 Cronton Road	Roadside	345503	389429	NO_2	No	5.3	1.5	No	2.4
H8Aa, H8Ab	LC 014 on Cronton Road on property line of 1 Whitefield Lane, just before Cymru Cronton Road.	Roadside	345577	389394	NO_2	No	9.5	1.9	No	2.4
H9Aa, H9Ab	LC 001 outside 3 Whitefield Lane	Roadside	345555	389392	NO_2	No	2.8	1.6	No	2.3
H5a, H5b	Sevenoak Grove	Roadside	345676	389366	NO_2	No	1.4	1.5	No	2.3
H6a, H6b	Wilson Rd Jct	Roadside	345878	389437	NO_2	No	-	2.3	No	2.4
H7a, H7b	Tarbock Island	Roadside	345996	389471	NO_2	No	21.0	2.2	No	2.4
H8a, H8b	Natruscot	Roadside	345301	389479	NO_2	No	2.5	1.0	No	2.3
H9a, H9b	Outside 29 Southford Walk	Suburban	345598	389183	NO_2	No	4.0	0.9	No	2.3
H10a, H10b	Outside 9 Ribchester Way	Suburban	345424	389325	NO_2	No	4.9	1.6	No	2.2
H11a, H11b	Outside 12 Windy Arbor Brow	Suburban	346329	389782	NO_2	No	3.1	1.9	No	2.2
H12a, H12b	Halsnead development	Roadside	346425	389669	NO_2	No	-	2.4	No	2.5
K1a, K1b	LC056A Junction of M57 and Valley Road.	Roadside	340355	397795	NO_2	No	15.9	1.6	No	2.3
K2a, K2b	LC006 Outside Kirkby C of E	Roadside	341165	398953	NO_2	No	13.5	6.4	No	2.4

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	School, Hall Lane									
K3a, K3b	LC005 outside 12 Hall Drive	Roadside	341317	399000	NO_2	No	8.1	1.6	No	2.4
K4a, K4b	LC021 to rear of 12 Brakenhurst Grove	Roadside	341464	398998	NO_2	No	10.1	3.0	No	2.4
K5a, K5b	LC091 Junction of Old Rough Lane and County Road	Roadside	341407	398988	NO_2	No	20.3	3.2	No	2.4
K6a, K6b	LC085 On County Road near 18 Kelday Close	Roadside	341426	398922	NO_2	No	8.9	1.1	No	2.4
K7a, K7b	LC067 Corner of County Road and Webster	Roadside	341581	398650	NO_2	No	6.6	1.4	No	2.4
K8a, K8b	LC002 Outside Webster Drive	Roadside	341386	398560	NO_2	No	10.6	1.3	No	2.4
K9a, K9b	LC 017 on Cherryfield Drive	Roadside	341387	398504	NO_2	No	5.4	0.9	No	2.4
K10a, K10b	Outside 19 Moorgate Road (A5207)	Roadside	342421	397755	NO_2	No	1.4	6.9	No	2.4
P1a, P1b	LC227 Near Liverpool Road	Roadside	345796	392654	NO_2	No	6.9	3.5	No	2.4
P2a, P2b	LC003 Outside 50 Derby Street	Roadside	346165	392801	NO_2	No	0.6	2.0	No	2.4
P3a, P3b	LC014 Adjacent 2 Stanley Crescent	Roadside	346389	392884	NO_2	No	5.6	3.0	No	2.4
P4a, P4b	Stop sign on Leyland St junction with High St	Roadside	346668	392876	NO_2	No	0.6	2.2	No	2.4
P5a, P5b	LC010 Outside 49 High Street	Roadside	346765	392918	NO_2	No	0.4	1.9	No	2.4
P6a, P6b	LC 004 Outside 31 St Helens Road	Roadside	346831	393006	NO_2	No	4.6	1.6	No	2.4
P7a, P7b	LC005 Oliver Lyme Road near Tinling Close	Roadside	347115	392724	NO_2	No	4.5	2.7	No	2.2

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
P8a, P8b	LC070 Outside 81 Warrington Road	Roadside	347092	392569	NO_2	No	6.6	1.8	No	2.2
P9a, P9b	Traffic signal Outside 53 Kemble Street	Roadside	346788	392648	NO_2	No	0.6	1.3	No	2.4
P10a, P10b	LC008 Outside Greenall Court, Sewell Street	Roadside	346583	392611	NO_2	No	2.6	2.8	No	2.4

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.3 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
Huyton	345552	389413	Roadside	72.5	72.5	36.2	37.4	37.6	29.5	36.0
Halewood	345213	384691	Roadside	74.5	74.5	27.8	30.3	24.3	18.2	21.4
Kirkby	341414	398991	Roadside	73.4	73.4	-	-	24.8	25.8	30.8

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

☒ **Reported concentrations are those at the location of the monitoring site (annualised, as required), i.e., prior to any fall-off with distance correction Knowsley Metropolitan Borough Council.**

Notes:

The annual mean concentrations are presented as µg/m^3.

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

All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(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%).

Table A.4 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
H1a, H1b	345552	389413	Roadside	100	100.0	**40.0**	37.5	37.4	29.5	34.4
H2a, H2b	345537	389407	Roadside	100	100.0	39.9	**41.0**	**40.8**	35.1	38.2
H3a, H3b	345563	389399	Kerbside	100	100.0	**47.7**	**49.3**	**48.0**	**42.2**	**46.7**
H4a, H4b	345517	389329	Roadside	100	100.0	26.7	29.8	31.4	25.3	30.1
H5Aa, H5Ab	345563	389397	Roadside	100	100.0	-	-	-	-	38.1
H6Aa, H6Ab	345543	389390	Roadside	100	100.0	-	-	-	-	**45.4**
H7Aa, H7Ab	345503	389429	Roadside	100	100.0	-	-	-	-	33.1
H8Aa, H8Ab	345577	389394	Roadside	100	100.0	-	-	-	-	**46.9**
H9Aa, H9Ab	345555	389392	Roadside	100	100.0	-	-	-	-	36.5
H5a, H5b	345676	389366	Roadside	-	-	25.1	26.8	27.4	21.4	-
H6a, H6b	345878	389437	Roadside	-	-	29.2	30.0	32.1	28.6	-
H7a, H7b	345996	389471	Roadside	-	-	36.2	36.8	37.2	33.9	-
H8a, H8b	345301	389479	Roadside	-	-	26.7	26.6	29.3	22.7	-
H9a, H9b	345598	389183	Suburban	-	-	26.3	25.0	26.4	20.6	-
H10a, H10b	345424	389325	Suburban	100	100.0	22.9	23.3	23.9	19.1	22.2
H11a, H11b	346329	389782	Suburban	100	100.0	28.6	26.4	28.9	23.3	21.9
H12a, H12b	346425	389669	Roadside	100	100.0	35.5	33.5	32.8	27.2	35.9
K1a, K1b	340355	397795	Roadside	75.0	75.0	-	-	**45.4**	38.0	39.1
K2a, K2b	341165	398953	Roadside	100	100.0	-	-	26.9	22.1	22.8
K3a, K3b	341317	399000	Roadside	100	100.0	-	-	25.3	22.5	22.6
K4a, K4b	341464	398998	Roadside	100	100.0	-	-	27.1	26.9	30.9
K5a, K5b	341407	398988	Roadside	100	100.0	-	-	32.1	30.9	32.5
K6a, K6b	341426	398922	Roadside	100	100.0	-	-	35.3	28.1	31.5
K7a, K7b	341581	398650	Roadside	100	100.0	-	-	29.6	24.1	25.0
K8a, K8b	341386	398560	Roadside	100	100.0	-	-	32.4	28.7	29.7
K9a, K9b	341387	398504	Roadside	100	100.0	-	-	29.4	27.7	32.2
K10a, K10b	342421	397755	Roadside	100	100.0	-	-	29.4	24.1	26.6
P1a, P1b	345796	392654	Roadside	100	100.0	-	-	26.8	22.6	25.1
P2a, P2b	346165	392801	Roadside	100	100.0	-	-	26.9	22.4	25.6
P3a, P3b	346389	392884	Roadside	100	100.0	-	-	29.6	26.4	25.7
P4a, P4b	346668	392876	Roadside	100	100.0	-	-	29.7	25.7	25.8
P5a, P5b	346765	392918	Roadside	90.4	90.4	-	-	35.8	32.0	35.0
P6a, P6b	346831	393006	Roadside	100	100.0	-	-	24.7	21.0	21.8
P7a, P7b	347115	392724	Roadside	100	100.0	-	-	24.2	20.0	21.6
P8a, P8b	347092	392569	Roadside	100	100.0	-	-	27.4	23.0	25.3

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
P9a, P9b	346788	392648	Roadside	100	100.0	-	-	23.5	19.5	22.7
P10a, P10b	346583	392611	Roadside	100	100.0	-	-	24.9	20.5	21.0

☐ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

☒ **Diffusion tube data has been bias adjusted.**

☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e., prior to any fall-off with distance correction.**

Notes:

The annual mean concentrations are presented as µg/m^3.

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**.

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

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(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%).

Figure A.1 – Trends in Annual Mean NO_2 Concentrations (Automatic Monitors)

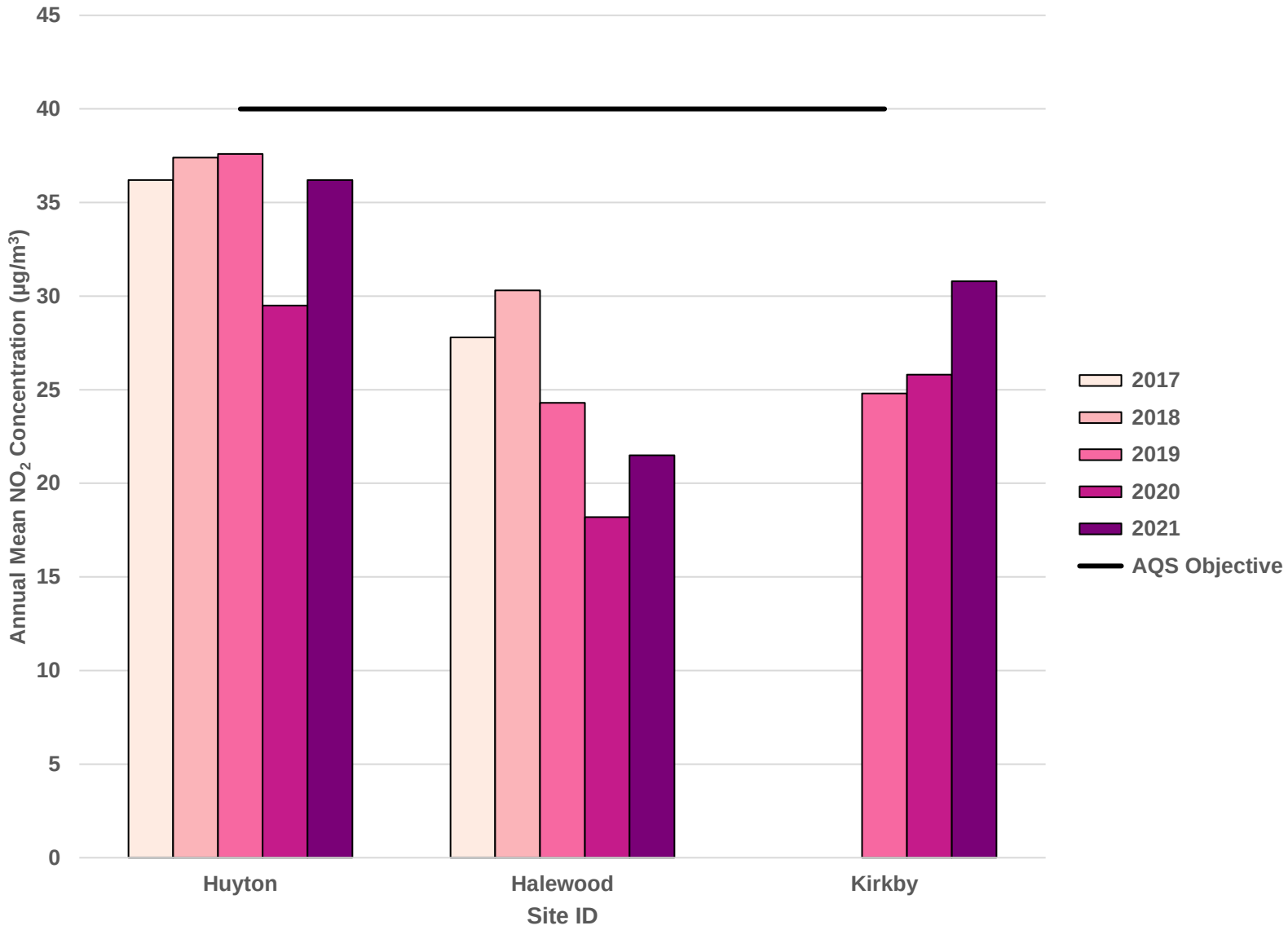


Figure A.2 – Trends in Annual Mean NO_2 Concentrations (Huyton)

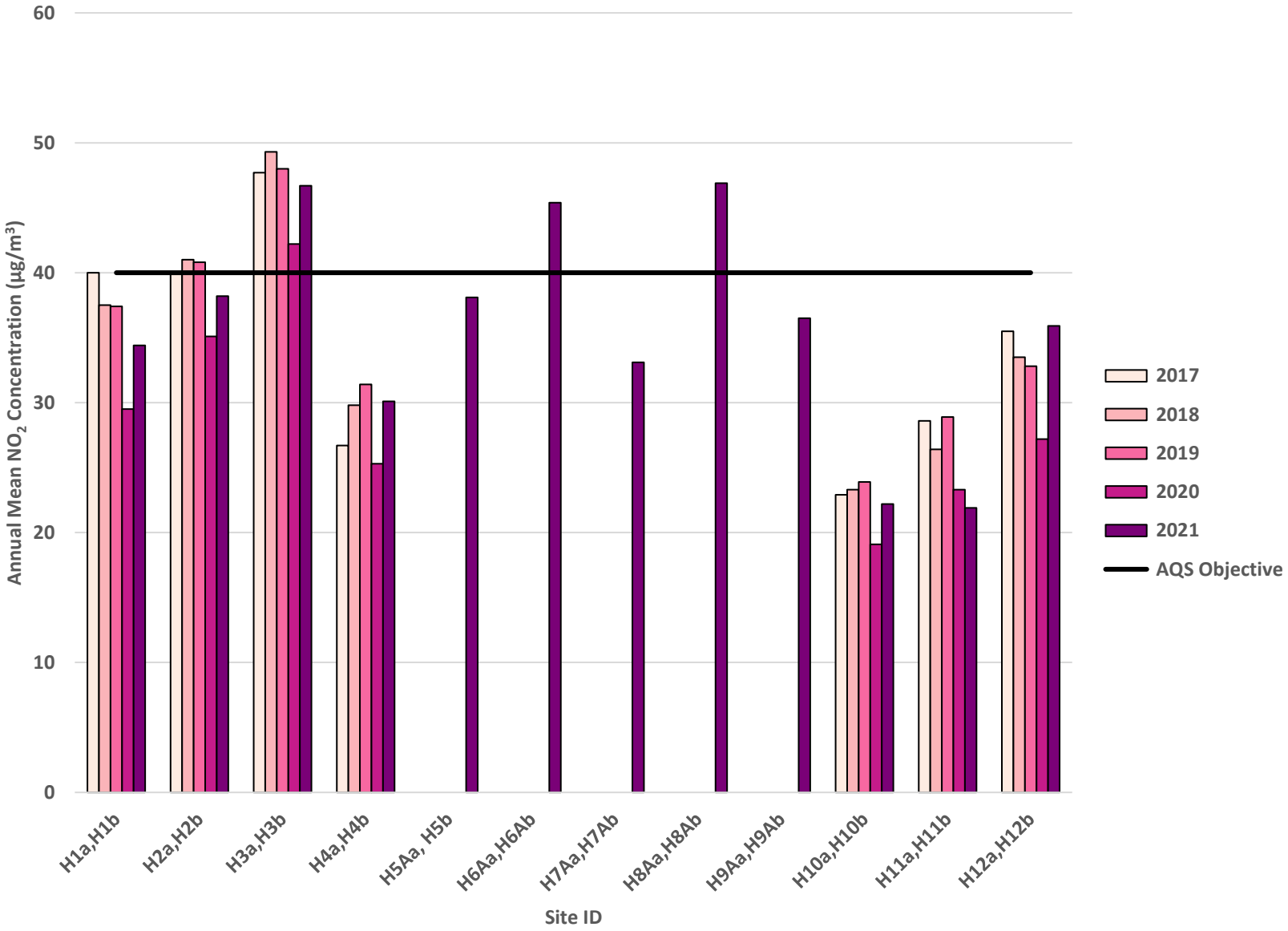


Figure A.3 – Trends in Annual Mean NO_2 Concentrations (Prescot)

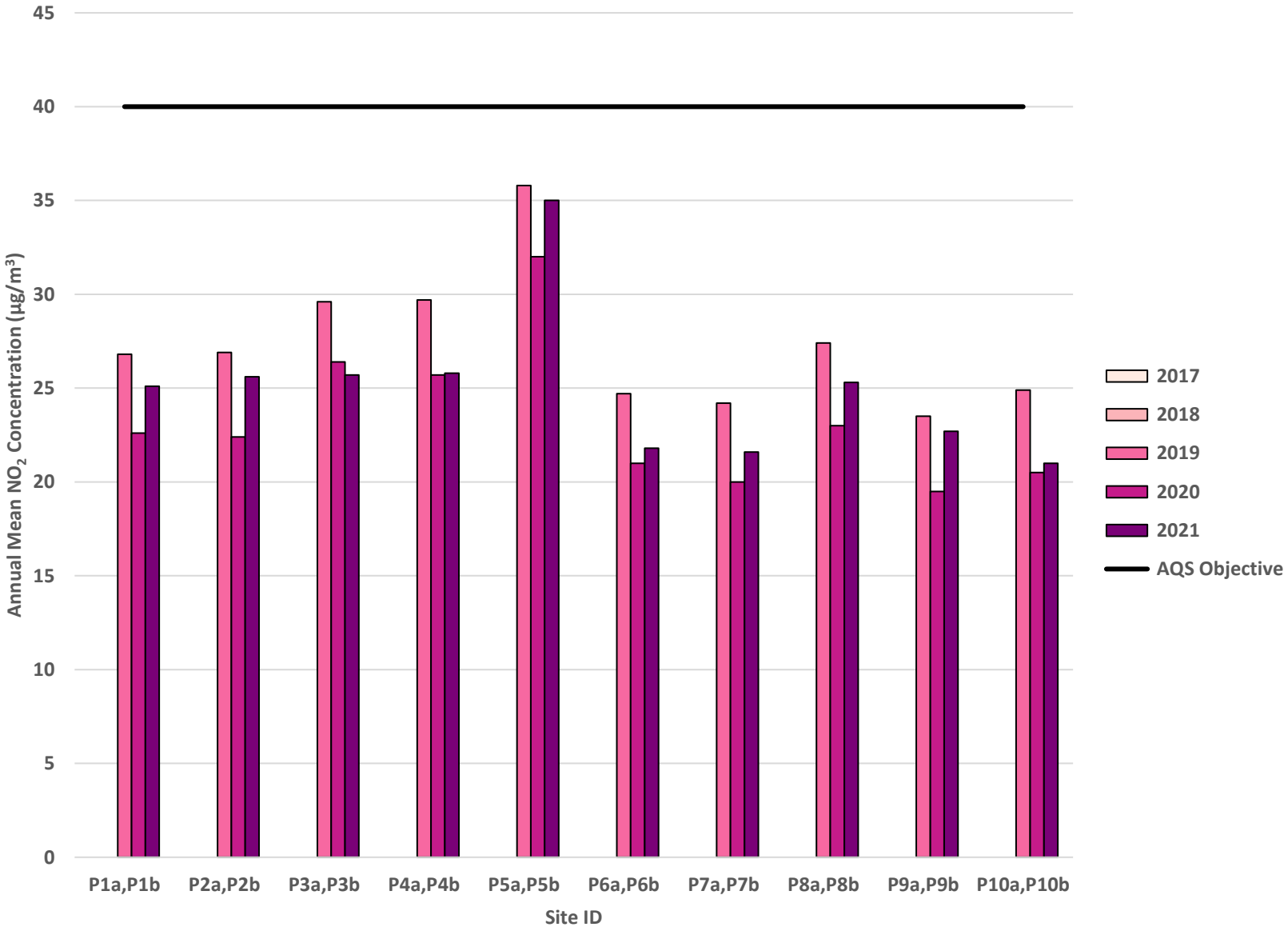


Figure A.4 – Trends in Annual Mean NO_2 Concentrations (Kirkby)

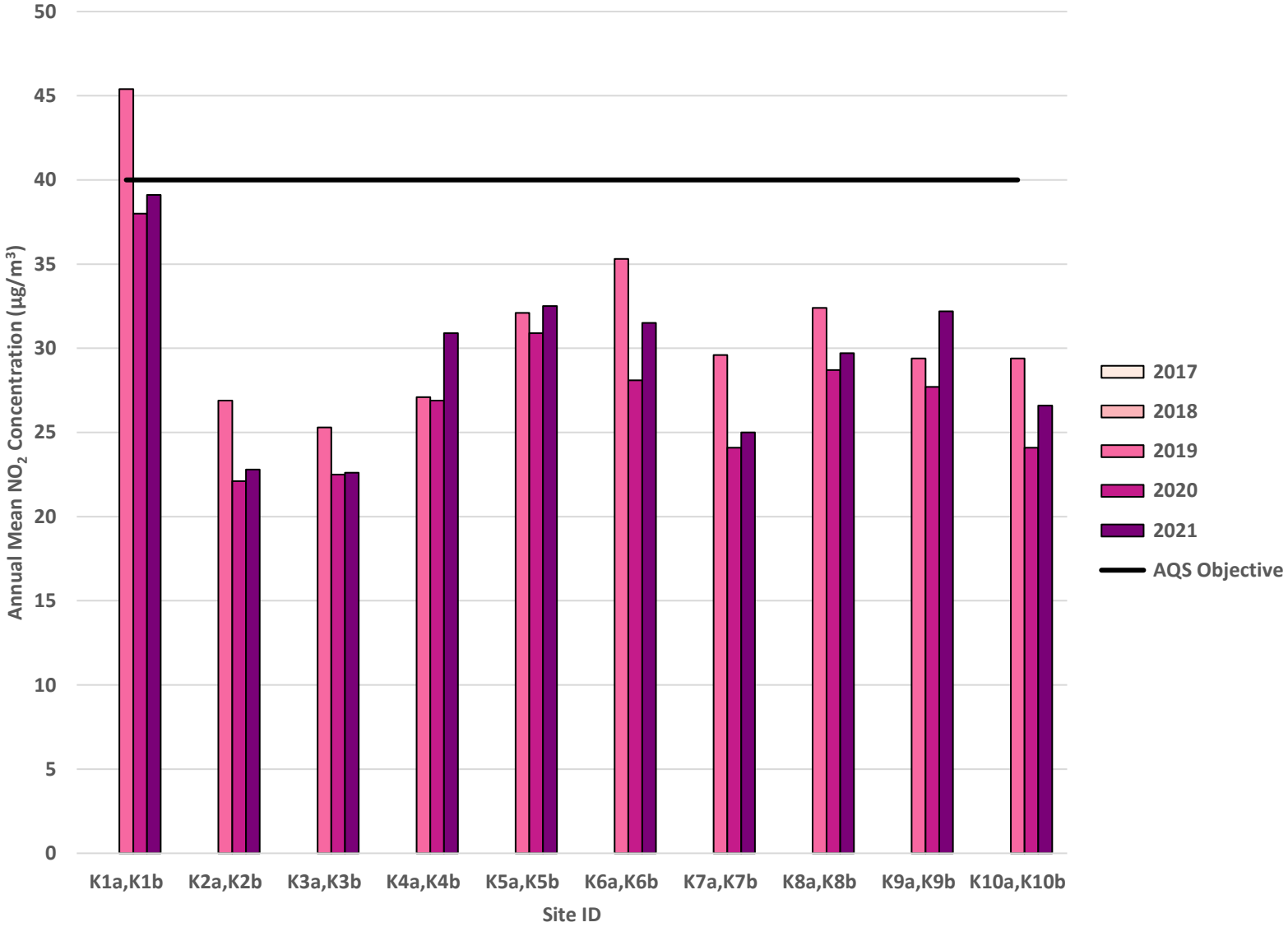


Table A.1 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
Huyton	345552	389413	Roadside	72.5	72.5	0	0	0	0	0 (119)
Halewood	345213	384691	Roadside	74.5	74.5	0	0	0	0	0 (74)
Kirkby	341414	398991	Roadside	73.4	73.4	-	-	0	0	0 (113)

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m^3 have been recorded.

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**.

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

(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%).

Table A.2 – Annual Mean PM_{10} Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
Huyton	345552	389413	Roadside	63.8	63.8	22.5	21.8	22.9	-	-
Halewood	345213	384691	Roadside	74.5	74.5	20.8	16.8	19.9	-	-
Kirkby	341414	398991	Roadside	69.1	69.1	-	-	37.6	33.3	32.2

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

Notes:

The annual mean concentrations are presented as $\mu g/m^3$.

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

All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(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%).

Figure A.5 – Trends in Annual Mean PM_{10} Concentrations

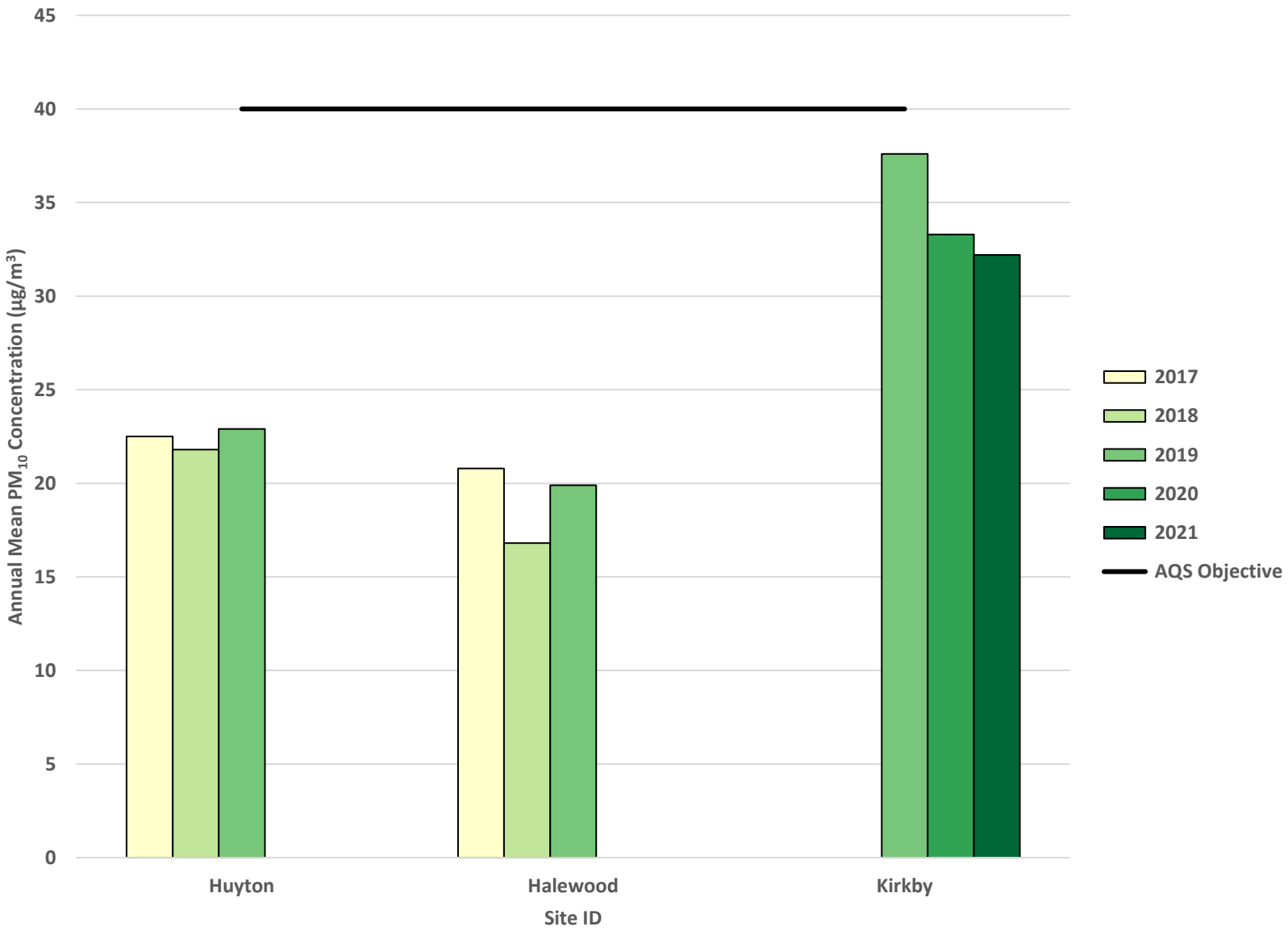


Table A.3 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
Huyton	345552	389413	Roadside	63.8	63.8	5	1	2	-	-
Halewood	345213	384691	Roadside	74.5	74.5	5	3	2	-	-
Kirkby	341414	398991	Roadside	69.1	69.1	-	-	9	35	18 (48)

Notes:

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m^3 have been recorded.

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**.

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

(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%).

Figure A.6 – Trends in Number of 24-Hour Mean PM_{10} Results > 50µg/m^3

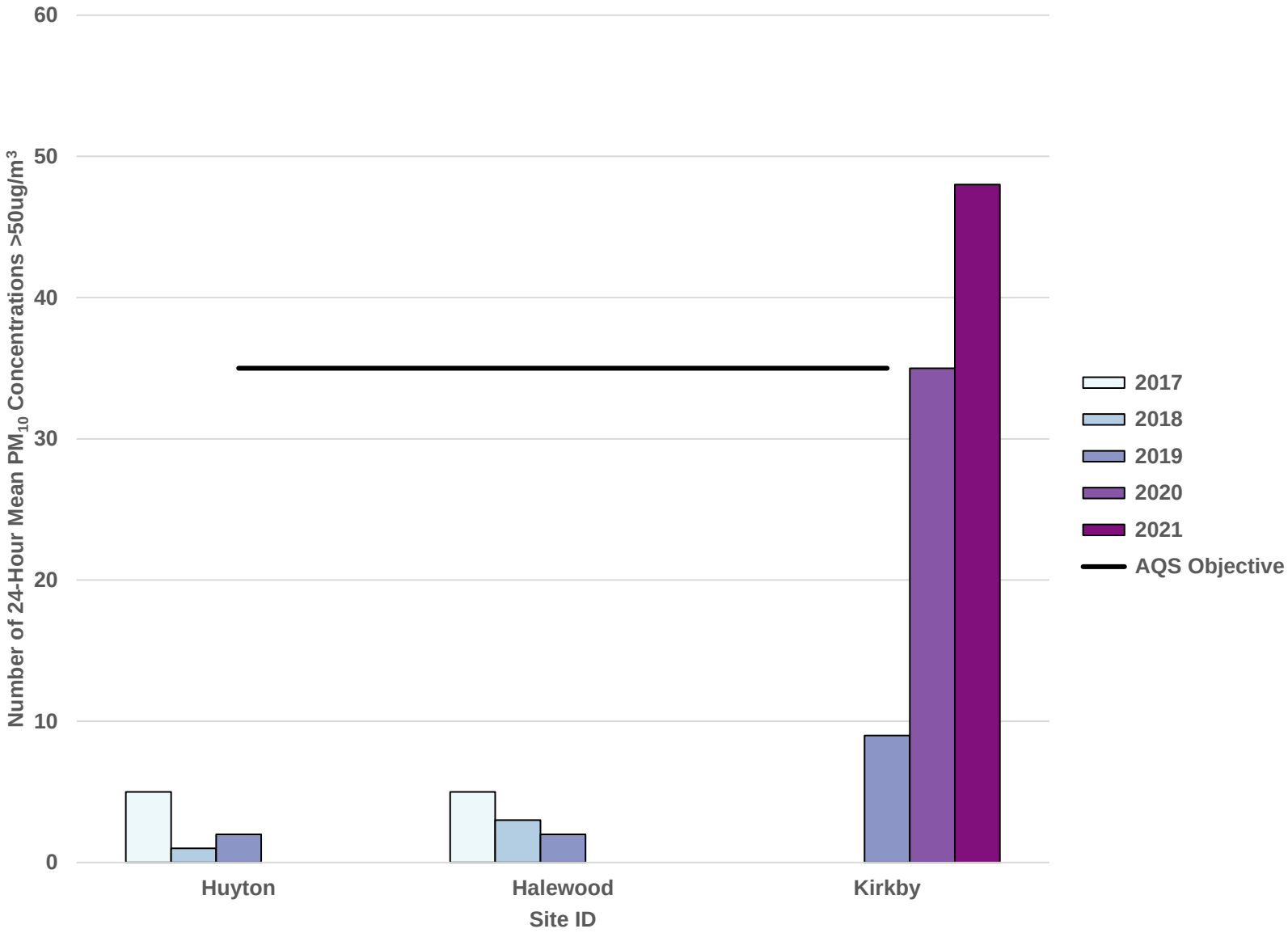


Table A.4–Annual Mean $PM_{2.5}$ Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
Huyton	345552	389413	Roadside	72.4	72.4	9.5	9.1	10.8	-	-
Halewood	345213	384691	Roadside	74.2	74.2	8.6	9.2	9.2	-	-

☐ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

Notes:

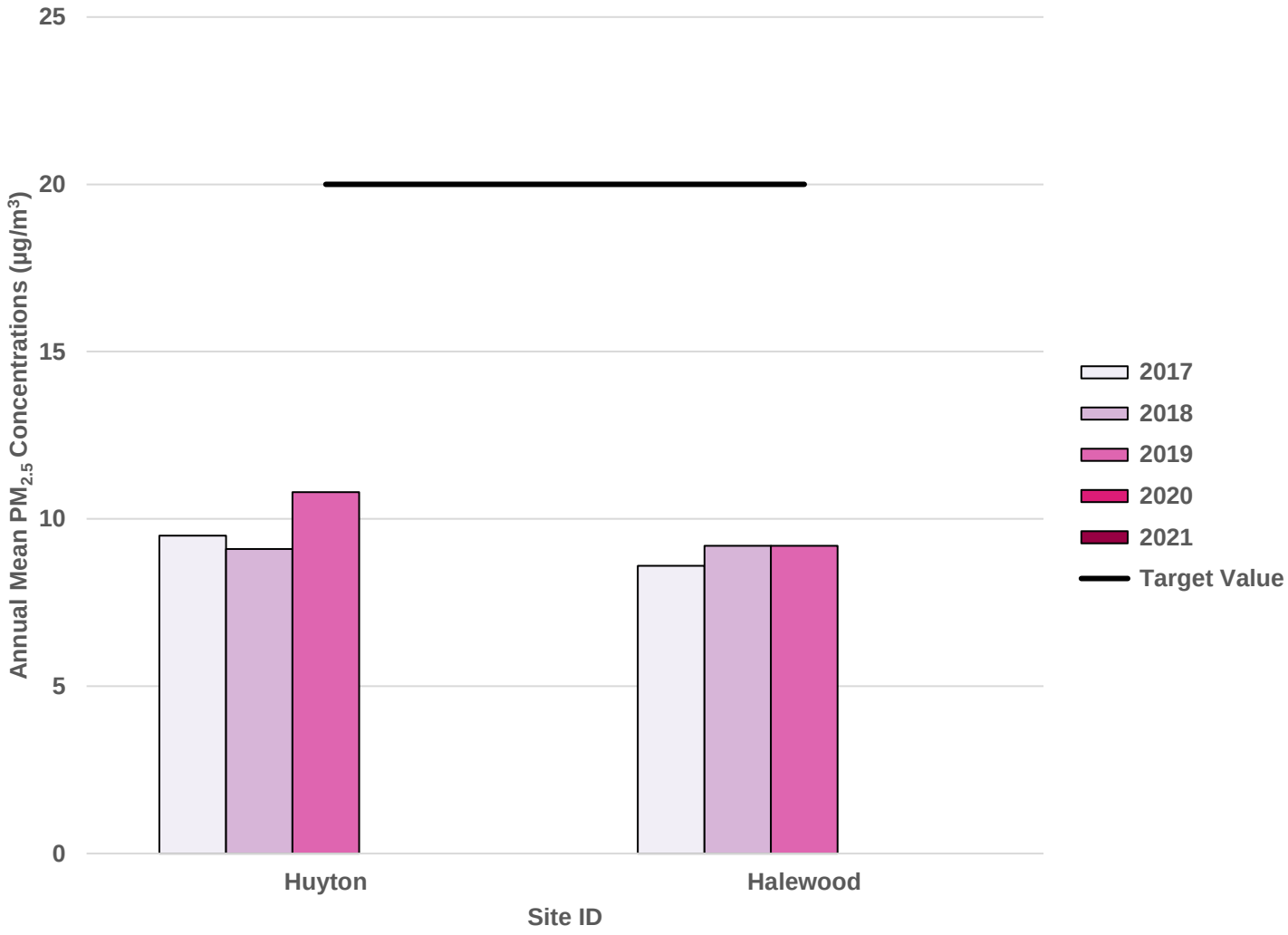
The annual mean concentrations are presented as $\mu g/m^3$.

All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(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%).

Figure A.7 – Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Diffusion Tube Results ($\mu g/m^3$)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.93)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
H1a	345552	389413	44.5	35.4	36.9	38.6	36.8	27.3	33.6	28.2	40.4	36.8	36.1	47.4	-	-		Duplicate Site with H1a and H1b - Annual data provided for H1b only
H1b	345552	389413	41.8	36.0	39.1	37.1	37.5	29.8	34.4	27.0	38.3	37.8	40.6	47.5	37.0	34.4		Duplicate Site with H1a and H1b - Annual data provided for H1b only
H2a	345537	389407	51.0	44.5	41.4	36.0	34.6	38.0	39.0	35.3	43.5	40.3	47.2	47.7	-	-		Duplicate Site with H2a and H2b - Annual data provided for H2b only
H2b	345537	389407	44.5	41.3	38.5	43.7	38.2	38.4	36.8	34.3	46.4	37.8	41.3	46.7	41.1	38.2	34.7	Duplicate Site with H2a and H2b - Annual data provided for H2b only
H3a	345563	389399	45.5	49.1	52.5	51.7	52.0	45.0	43.2	37.2	57.7	49.3	55.0	50.1	-	-		Duplicate Site with H3a and H3b - Annual data provided for H3b only
H3b	345563	389399	50.8	53.7	48.0	48.9	49.7	48.8	43.3	46.8	61.9	52.8	53.2	57.7	50.2	**46.7**	38.2	Duplicate Site with H3a and H3b - Annual data provided for H3b only
H4a	345517	389329	43.5	37.6	35.0	31.8	30.0	24.6	23.8	26.8	37.1	28.3	35.1	35.4	-	-		Duplicate Site with H4a and H4b - Annual data provided for H4b only
H4b	345517	389329	41.6	40.6	32.9	33.8	20.3	25.8	25.2	28.6	36.4	32.1	29.4	40.4	32.3	30.1		Duplicate Site with H4a and H4b - Annual data provided for H4b only
H5Aa	345563	389397	41.0	45.1	37.4	45.4	37.7	30.2	38.8	35.4	45.4	41.3	47.9	46.3	-	-		Duplicate Site with H5Aa and H5Ab - Annual data provided for H5Ab only
H5Ab	345563	389397	42.4	42.8	37.4	41.7	43.0	37.7	36.8	34.6	46.5	40.3	43.9	43.8	41.0	38.1	37.8	Duplicate Site with H5Aa and H5Ab - Annual data provided for H5Ab only
H6Aa	345543	389390	58.3	49.0	48.6	44.8	46.7	44.7	46.1	44.3	55.3	43.4	54.5	50.3	-	-		Duplicate Site with H6Aa and H6Ab - Annual data provided for H6Ab only
H6Ab	345543	389390	48.1	49.7	49.2	51.1	51.1	45.6	46.6	43.3	46.8	44.7	57.9	51.4	48.8	**45.4**	33.2	Duplicate Site with H6Aa and H6Ab - Annual data provided for H6Ab only
H7Aa	345503	389429	45.5	40.6	31.7	36.0	27.3	28.8	28.2	30.6	42.4	34.8	41.0	44.4	-	-		Duplicate Site with H7Aa and H7Ab - Annual data provided for H7Ab only
H7Ab	345503	389429	48.4	36.6	32.2	37.8	30.6	30.4	31.7	28.3	38.6	31.0	34.5	42.1	35.6	33.1		Duplicate Site with H7Aa and H7Ab - Annual data provided for H7Ab only
H8Aa	345577	389394	58.8	49.8	55.3	49.8	45.1	46.0	37.1	43.4	59.0	46.2	57.1	65.7	-	-		Duplicate Site with H8Aa and H8Ab - Annual data provided for H8Ab only
H8Ab	345577	389394	59.6	50.0	46.9	49.9	49.1	35.9	47.2	42.0	51.0	46.7	64.9	54.4	50.5	**46.9**	34.8	Duplicate Site with H8Aa and H8Ab - Annual data provided for H8Ab only
H9Aa	345555	389392	47.1	43.0	39.5	40.5	40.7	31.3	30.9	31.6	41.1	37.6	42.5	44.4	-	-		Duplicate Site with H9Aa and H9Ab - Annual data provided for H9Ab only
H9Ab	345555	389392	45.9	39.1	38.9	41.9	30.2	35.8	36.4	32.8	46.3	37.9	44.7	41.0	39.2	36.5	32.2	Duplicate Site with H9Aa and H9Ab - Annual data provided for H9Ab only
H10a	345424	389325	35.9	24.5	25.8	19.1	20.1	17.9		18.2	25.8	22.2	25.8	33.0	-	-		Duplicate Site with H10a and H10b - Annual data provided for H10b only
H10b	345424	389325	35.6	27.9	23.4	19.8	18.6	18.8	17.6	10.5	29.1	23.1	30.1	32.2	23.9	22.2		Duplicate Site with H10a and H10b - Annual data provided for H10b only
H11a	346329	389782	34.4	27.8	31.6	18.1	18.9	15.6	16.3	14.7	23.8	24.5	29.6	31.4	-	-		Duplicate Site with H11a and H11b - Annual data provided for H11b only
H11b	346329	389782	32.1	26.1	29.6	22.9	18.0	15.9	16.2	14.1	24.1	19.5	28.4	30.4	23.5	21.9		Duplicate Site with H11a and H11b - Annual data provided for H11b only
H12a	346425	389669	42.8	31.5	39.0	28.7	46.8	42.7	32.3	29.4	38.1	43.7	42.3		-	-		Duplicate Site with H12a and H12b - Annual data provided for H12b only
H12b	346425	389669	40.1	30.8	34.7	28.6	43.4	46.9	32.3	27.2	38.1	39.3	46.2	50.3	38.6	35.9		Duplicate Site with H12a and H12b - Annual data provided for H12b only

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.93)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
K1a	340355	397795	54.9	45.4	46.1	41.1	36.8	38.1	39.0	34.9	36.5	53.2	53.4	12.7	-	-		Duplicate Site with K1a and K1b - Annual data provided for K1b only
K1b	340355	397795	59.2	47.1	46.5	36.2	50.6	38.0	35.6	36.7	35.9	50.7	50.5	29.0	42.0	39.1		Duplicate Site with K1a and K1b - Annual data provided for K1b only
K2a	341165	398953	39.6	40.9	24.1	23.7	22.2	16.9	17.2	16.9	17.5	27.1	31.8	22.7	-	-		Duplicate Site with K2a and K2b - Annual data provided for K2b only
K2b	341165	398953	35.5	33.8	19.2	21.5	21.0	16.9	16.7	17.8	16.9	31.7	26.2	30.3	24.5	22.8		Duplicate Site with K2a and K2b - Annual data provided for K2b only
K3a	341317	399000	35.7	34.6	21.2	22.8	22.0	16.0	15.5	15.2	21.5	29.0	31.8	27.7	-	-		Duplicate Site with K3a and K3b - Annual data provided for K3b only
K3b	341317	399000	40.8	37.1	23.8	22.8	21.0	16.1	14.6	18.6	20.7	29.5	25.0	20.4	24.3	22.6		Duplicate Site with K3a and K3b - Annual data provided for K3b only
K4a	341464	398997	54.8	40.6	36.4	37.3	35.4	23.4	26.3	25.1	18.6	35.1		39.2	-	-		Duplicate Site with K4a and K4b - Annual data provided for K4b only
K4b	341464	398997	45.6	39.6	38.2	31.5	33.8	24.6	25.1	24.9	19.5	35.5	40.6	26.3	33.3	30.9		Duplicate Site with K4a and K4b - Annual data provided for K4b only
K5a	341407	398988	52.6	41.2	35.3	31.5	22.3	31.3	36.3	26.6	24.2	39.2	51.2	25.3	-	-		Duplicate Site with K5a and K5b - Annual data provided for K5b only
K5b	341407	398988	49.4	43.2	35.8	26.8	23.9	33.8	35.1	29.8	26.5	39.1	47.5	29.6	34.9	32.5		Duplicate Site with K5a and K5b - Annual data provided for K5b only
K6a	341426	398922		38.7	31.7			30.7	34.7	29.4	20.3	46.6	50.6	34.5	-	-		Duplicate Site with K6a and K6b - Annual data provided for K6b only
K6b	341426	398922		34.1	31.7			25.6	32.2	28.3	16.4	42.7	48.1	32.7	33.8	31.5		Duplicate Site with K6a and K6b - Annual data provided for K6b only
K7a	341576	398654	42.8	35.6	27.5	21.1	20.0	21.2	21.6	18.5	29.0	27.9	29.6	28.1	-	-		Duplicate Site with K7a and K7b - Annual data provided for K7b only
K7b	341576	398654	35.2	35.6	27.3	28.3	21.2	18.4	22.8	18.3	28.7	27.0	33.4	26.5	26.9	25.0		Duplicate Site with K7a and K7b - Annual data provided for K7b only
K8a	341371	398537	45.8	39.3	30.5	26.9	31.0	25.3	26.9	23.4	37.1	33.9	37.0	34.0	-	-		Duplicate Site with K8a and K8b - Annual data provided for K8b only
K8b	341371	398537	46.6	40.8	29.1	24.9	24.3	22.4	26.3	25.4	38.0	34.0	37.6	24.9	31.9	29.7		Duplicate Site with K8a and K8b - Annual data provided for K8b only
K9a	341387	398504	47.3	29.2	31.9	33.4		32.0	27.9	27.4	32.5	41.3	38.8	31.9	-	-		Duplicate Site with K9a and K9b - Annual data provided for K9b only
K9b	341387	398504	54.4	41.7	34.8	34.8	32.1	27.8	31.6	28.9	32.5	41.7	35.6	28.3	34.6	32.2		Duplicate Site with K9a and K9b - Annual data provided for K9b only
K10a	342421	397755	42.5	40.4	27.5	30.1	21.9	23.0	18.3	20.6	32.1	29.9	35.3	23.3	-	-		Duplicate Site with K10a and K10b - Annual data provided for K10b only
K10b	342421	397755	45.6	37.3	25.5	28.9	23.4	21.6	21.8	20.5	32.0	28.4	31.5	25.1	28.6	26.6		Duplicate Site with K10a and K10b - Annual data provided for K10b only
P1a	345816	392660	37.3	31.8	30.6	23.5	25.8	22.0	24.0	23.4	24.3	28.5	16.7	33.4	-	-		Duplicate Site with P1a and P1b - Annual data provided for P1b only
P1b	345816	392660	39.1	31.2	22.9	26.2	24.6	21.4	26.1	22.4	24.0	27.1	36.7	25.9	27.0	25.1		Duplicate Site with P1a and P1b - Annual data provided for P1b only
P2a	346164	392807	37.5	28.1	25.9	25.2	23.7	21.7	25.9	21.9	30.9	26.4	37.7	23.8	-	-		Duplicate Site with P2a and P2b - Annual data provided for P2b only
P2b	346164	392807	36.8	27.7	25.7	27.4	26.0	21.4	24.1	21.8	29.3	26.4	36.5	27.7	27.5	25.6		Duplicate Site with P2a and P2b - Annual data provided for P2b only
P3a	346393	392844	40.3	36.2	23.9	24.3	24.5	19.2	23.4	21.0	36.1	30.3	35.2	26.1	-	-		Duplicate Site with P3a and P3b - Annual data provided for P3b only
P3b	346393	392844	35.5	34.0	23.4	24.5	27.9	22.2	21.8	22.2	31.1	31.4	26.5	22.1	27.6	25.7		Duplicate Site with P3a and P3b - Annual data provided for P3b only
P4a	346669	392875	39.3	30.0	29.3	27.3	22.2	25.6	29.6	24.4	30.1	26.2	37.0	15.2	-	-		Duplicate Site with P4a and P4b - Annual data provided for P4b only
P4b	346669	392875	28.1	30.2	28.2	18.1	27.9	23.6	28.8	24.8	31.6	26.6	32.1	30.1	27.8	25.8		Duplicate Site with P4a and P4b - Annual data provided for P4b only

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.93)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
P5a	346757	392916	43.7	30.2	35.5	37.1	36.8	37.1	39.4	31.5	43.4	37.5	49.2	28.5	-	-		Duplicate Site with P5a and P5b - Annual data provided for P5b only
P5b	346757	392916	44.7	37.9	35.6	31.4	33.7	35.7	41.5	31.4	43.1	36.2	47.6	34.3	37.6	35.0		Duplicate Site with P5a and P5b - Annual data provided for P5b only
P6a	346831	393005	38.7	29.2	23.4	17.9	17.1	18.7	18.7	17.7	22.5	24.1	28.1	23.6	-	-		Duplicate Site with P6a and P6b - Annual data provided for P6b only
P6b	346831	393005	37.5	30.4	22.6	12.0	20.2	17.4	19.5	17.7	28.0	24.4	29.3	24.3	23.5	21.8		Duplicate Site with P6a and P6b - Annual data provided for P6b only
P7a	347091	392729	38.1	29.9	21.2	19.7	19.5	17.0	19.4	19.0	22.9	22.1	29.4	24.0	-	-		Duplicate Site with P7a and P7b - Annual data provided for P7b only
P7b	347091	392729	36.1	30.8	23.7	22.8	21.8	14.1	19.4	16.7	22.3	22.9	20.4	25.4	23.3	21.6		Duplicate Site with P7a and P7b - Annual data provided for P7b only
P8a	347090	392570	33.3	31.3	23.4	22.9	23.8	20.3	22.9	21.5	26.9	29.8	30.9	34.5	-	-		Duplicate Site with P8a and P8b - Annual data provided for P8b only
P8b	347090	392570	38.5	28.2	25.2	26.5	23.0	19.8	23.4	20.9	24.4	29.3	34.6	38.6	27.2	25.3		Duplicate Site with P8a and P8b - Annual data provided for P8b only
P9a	346788	392648	36.6	28.8	21.7	21.0	21.6	19.2	22.8	15.7	27.8	21.8	27.9	25.1	-	-		Duplicate Site with P9a and P9b - Annual data provided for P9b only
P9b	346788	392648	34.0	28.0	22.9	23.7	21.8	18.7	23.1	18.8	27.1	22.1	27.9	26.9	24.4	22.7		Duplicate Site with P9a and P9b - Annual data provided for P9b only
P10a	346584	392609	28.8	28.8	20.7	20.2	20.8	13.7	16.9	15.2	23.6		30.8	26.6	-	-		Duplicate Site with P10a and P10b - Annual data provided for P10b only
P10b	346584	392609	34.4	25.3		19.0	20.9	17.6	18.5	17.4	23.7		28.9	24.1	22.6	21.0		Duplicate Site with P10a and P10b - Annual data provided for P10b only

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1.**

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

☒ **Local bias adjustment factor used.**

☐ **National bias adjustment factor used.**

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column.**

☒ **Knowsley Metropolitan Borough Council confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.**

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**.

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Knowsley Metropolitan Borough Council During 2021

Knowsley MBC have identified the following planning applications as having the potential to impact air quality:

21/00563/FUL - Granted 22 December 2021

Development:

The construction of a new railway station including station building (and associated platform works), 270 space car park, bus stops, cycle parking, sub-station compound and associated line side works including the section of rail line between Kirkby station and Headbolt Lane to be twin track, bridge works (two bridges over County Road and Simonswood Brook) new signalling, erection of 1.8m high fencing to operational site boundaries, removal of redundant platform at Kirkby station, pedestrian and road bridge over Kirkby brook, re-grading works and new road junction at Headbolt Lane/ Fallowfield.

Location:

Land Bounded By Headbolt Lane And Amenity Open Space Including The Existing Rail Line Running Between Kirkby (Adjacent Lingtree Road) And Headbolt Lane (Adjacent Limetree Road) And Associated Land To The North And South Of The Rail Line.

- **Air Quality Assessment was submitted and accepted**

20/00467/FUL - Granted 30 July 2021

Development:

Erection of 6 no. Industrial units (use class b1(c)/b2/b8) and 5 no. Trade counter units (use class b8) together with car parking, landscaping and associated works.

Location:

Academy Business Park Lees Road Knowsley Industrial Park Kirkby Knowsley L33 7SA

- **Air Quality Assessment submitted and accepted**

20/00376/OUT – Granted 03 February 2021

Development:

Outline Planning Permission For 30,530 Sq M Of Employment Floor Space (Use Class B1 / B8) - Access To Be Considered At This Stage (All Other Matters Reserved).

Location:

Earlsfield (Land Off Knowsley Lane) Huyton Knowsley L34 4AH

- **Air Quality Assessment submitted and accepted**

20/00329/FUL - Granted 08 December 2021

Development:

Erection of a residential development of 43 no. Dwellings comprising 14 no. Apartments and 29 no. Houses together with access, car parking and associated development (demolition of existing barn).

Location:

Land At Windy Arbor Brow / Windy Arbor Road Whiston Knowsley

- **Air Quality assessment submitted and accepted**

20/00115/FUL – Granted 15 December 2021

Development:

Residential development comprising of the erection of 178 no. Dwellings together with associated infrastructure works.

Location:

Land Adjacent To Hillside Avenue Huyton Knowsley

- **No Air Quality Assessment submitted**

20/00063/FUL – Granted 23 August 2021

Development:

Residential development for the erection of 413 no. Dwellings comprising:

Plot 2 - erection of 98 no. Dwellings and the creation of vehicular access from greensbridge lane;

Plot 4 - erection of 315 no. Dwellings and the creation of vehicular access from baileys lane; together with associated works (landscaping, access, roads, sewers, substations, drainage, engineering works to form surface water storage areas and other infrastructure).

Location:

Plot 2 - Land To North Of Railway Line Bounded By Lower Road Greensbridge Lane And Ditton Brook Watercourse, Halewood;

And Plot 4 - Land To South Of Railway Line Bounded By Finch Lane, Baileys Lane And Higher Road, Halewood

- **Air Quality Assessment submitted and accepted**

19/00521/HYB – Granted 11 May 2021

Development:

Hybrid planning application for the erection of up to 730 dwellings comprising:

Plot 1 - full planning application for the re- grading of the site, engineering works to form a flood storage area and the erection of 148 dwellings with associated works (including landscaping, access, roads and other associated infrastructure); and,

Plot 3 - full planning application for the re- grading of the site, and the erection of 196 dwellings with associated works (including landscaping, access, roads and other associated infrastructure) and outline planning application for up to 386 dwellings (access to be considered)

Location:

Plot 1 - Land To North Of Railway Line Bounded By Lower Road, Greensbridge Lane And Ditton Brook Watercourse, Halewood;

And Plot 3 - Land To South Of Railway Line Bounded By Lower Road, Finch Lane And Baileys Lane, Halewood

- **Air Quality Assessment submitted as part of an Environmental Statement, this was accepted.**

19/00104/FUL – Granted 07 April 2021

Development:

Demolition of existing buildings and erection of 162 no. Dwellings together with landscaping, infrastructure, and associated works

Location: RSPCA Higher Road Halewood L26 9TX

- **Air Quality Assessment submitted and accepted**

18/00283/HYB – Granted 17 March 2021

Development:

Hybrid application comprising full application for erection of 123 no. Dwellings, construction of vehicular/pedestrian accesses, laying out of public open space and associated works; outline application for erection of up to 237 no. Dwellings, car park and associated works (access into site to be considered - all other matters reserved for future approval).

Location:

Land North Of M62 Motorway Off Windy Arbor Road (Halsnead) Whiston Knowsley L35 1RB

- **Air Quality Assessment submitted and accepted**

20/00688/FUL – Granted 27 October 2021

Development:

The erection of 3 no. Industrial/warehouse units (use classes b2/b8) with ancillary office space together with the construction of new accesses, hard and soft landscaping and other associated works.

Location:

Land Bounded By Acornfield Road, Draw Well Road And Ashcroft Road Knowsley Industrial Park Kirkby Knowsley L33 7BJ

- **Air Quality Assessment submitted and accepted**

The following permit is in place, which may impact air quality in the borough:

B/0192/6.6/1: Permit to operate a Part 'B' Installation granted to DAMS Furniture Limited.

- Process Type: Timber PG6/2 Section 6.6 & Timber Combustion PG 1/12 Section 1.1.
- Fuel Type: Wood waste.
- Process Description: Chipboard is cut to the desired specification on a range of wood working machines. The sawdust waste is then fed into a 999kW MWE Talbott Biomass heat system – emissions vent through an eight-metre chimney.

Additional Air Quality Works Undertaken by Knowsley Metropolitan Borough Council During 2021

Knowsley MBC has not completed any additional works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied and analysed by SOCOTEC Didcot using the 50% triethanolamine (TEA) in acetone preparation method. For the 2021 reporting year, based on 25 studies, a national bias adjustment factor of 0.78 was derived from the national bias adjustment calculation spreadsheet (version number 06/22).

SOCOTEC Didcot, a UKAS accredited laboratory, participate in the AIR-PT scheme for NO_2 diffusion tube analysis and the Annual Field Intercomparison Exercise. These provide strict criteria relating to performance that participating laboratories must meet, thereby ensuring that the reported NO_2 concentrations are of a high calibre. In the latest AIR-PT results, AIR-PT AR036 (January – February 2021) and AIR-PT AR040 (September – October 2021), SOCOTEC were awarded a score of 100% - the percentage score is an indication of the results deemed satisfactory based upon the z-score of $<\pm 2$. For all observations in 2021, the precision of the NO_2 diffusion tubes supplied by SOCOTEC Didcot was classified as 'good'. The precision is an indication of the laboratory's performance and consistency in the preparation, analysis, and handling of the diffusion tubes. All diffusion tubes were collected in line with the monitoring calendar.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Knowsley MBC recorded data capture of 75% therefore it was not required to annualise any monitoring data.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2021 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.TG16 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/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Knowsley Metropolitan Borough Council have applied a local bias adjustment factor of 0.93 to the 2021 monitoring data. The local bias adjustment factor should be used with caution due to the Cronton Road Huyton Air Quality Monitoring Station (AQMS) reporting <90% data capture. However, the local bias adjustment was used over the national bias adjustment as the local bias factor is higher than the national bias factor (0.78), therefore is a more conservative approach, providing the worst-case scenario. A summary of bias adjustment factors used by Knowsley Metropolitan Borough Council over the past five years is presented in Table C.1.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local	-	0.93
2020	Local	-	0.89
2019	Local	-	0.81
2018	Local	-	0.79
2017	National	03/18	0.77

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has

been estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table C.4

The annual mean NO_2 concentration was corrected for distance to relevant exposure at six diffusion tube sites (H2a/b, H3a/b, H5Aa/b, H6a/b, H8a/b and K9a/b). These diffusion tubes were subject to the fall-off with distance correction due to the annual mean concentrations greater than 36 µg/m^3 and the site not located at a point of relevant exposure. After distance correction calculations, four sites reported concentrations below 10% of the NO_2 AQS, with H3a/b and H5Aa/b within 10% at 38.2 µg/m^3 and 37.8 µg/m^3, respectively.

QA/QC of Automatic Monitoring

The Kirkby station used Beta Automatic Mass (BAM) monitors to measure PM_{10}. As per TG.16, the BAM met the equivalence criteria for monitoring providing the results are corrected for slope. The data in this report has had the correction factor applied so it can be compared to the National Air Quality Objectives. Both PM_{10} and $PM_{2.5}$ were previously recorded at the Huyton and Halewood sites using TEOMS. All three sites have NO_2 monitors installed. Data from the analyser is stored as ‘raw’ or ‘uncorrected’ data on the logger and therefore needs to be corrected or validated. To validate the data, the NO_2 analyser needs to be checked against a referenced standard of ‘zero’ air and ‘span’ gas. Data is corrected using either daily or monthly calibration checks to verify that the analyser is corrected for any response change.

A regular manual calibration check is performed on all three automatic monitoring stations. For the NO_2 analyser, this check is performance to verify the response of the analyser in reference to ‘zero’ and ‘span’ by introducing a high concentration of NO gas. These results provide a validation of the NO_x analyser in the automatic monitoring station.

For the year 2021, all automatic monitors (Huyton, Halewood and Kirkby) were only in operation from January – September. Knowsley have not renewed their contract with WeCare4Air, resulting in contract termination in September as the monitors used for PM_{10} and $PM_{2.5}$ were unable to be validated against the volatile correction model and costs associated with updating equipment was not feasible at the time of contract renewal. There is no automatic monitoring data for October, November and December.

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

PM_{10} and $PM_{2.5}$ data is corrected using the volatile correction model. However, in 2021 the TEOMS measurements at the Huyton and Halewood monitoring stations were unable to be validated against the volatile correction model, as there were no FDMS instruments within 130 km of the sites.

Automatic Monitoring Annualisation

The LAQM.TG(16) states that annualisation is required for any site which has a data capture of less than 75%, but greater than 25%. All three automatic monitoring sites recorded below the acceptable data capture in 2021 for NO_2, PM_{10} and $PM_{2.5}$, therefore required annualisation. Annualisation was carried out for the annual mean NO_2 and PM_{10} at Kirkby Old Rough Lane (with data captures of 73.4% and 69.1% for each pollutant, respectively) NO_2 at Halewood (74.5%) and Huyton Cronton Road (72.5%). Four continuous background monitoring locations were used, the three locations within a 50 mile radius were selected to annualise the data:

- Glazebury
- Wirral Tranmere
- Wigan Centre
- Salford Eccles

These continuous background monitoring sites were applicable to use as they all had >85% data capture and therefore could be used for annualisation. Table C.2 and Table C.3 presents the annualisation summary.

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the NO_2 fall-off with distance calculator available on the LAQM Support website.

No automatic NO_2 monitoring locations within Knowsley MBC required distance correction during 2021.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3) for Annual Mean NO_2

Site ID	Annualisation Factor Wirral Tranmere	Annualisation Factor Wigan Centre	Annualisation Factor Glazebury	Annualisation Factor Salford Eccles	Averaged Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
Huyton	1.0847	1.1199	1.0570	1.060	1.0804	33.3	36.0	
Halewood	1.0769	1.1086	1.0457	1.050	1.0702	20.0	21.4	
Kirkby	1.0730	1.1033	1.0421	1.046	1.0662	28.9	30.8	

Table C.3 – Annualisation Summary (concentrations presented in µg/m^3) for Annual Mean PM_{10}

Site ID	Annualisation Factor Wirral Tranmere	Annualisation Factor Wigan Centre	Annualisation Factor Salford Eccles	Averaged Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
Kirkby	0.9743	0.9915	0.9769	0.9809	32.8	32.2	

Table C.4 – NO_2 Fall off With Distance Calculations (concentrations presented in µg/m^3)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
H2a, H2b	1.2	2.7	38.2	17.7	34.7	
H3a, H3b	0.8	3.6	46.7	17.7	38.2	
H5Aa, H5Ab	2.9	3.1	38.1	17.7	37.8	
H6Aa, H6Ab	0.5	6.1	45.4	17.7	33.2	
H8Aa, H8Ab	1.9	11.4	46.9	17.7	34.8	
H9Aa, H9Ab	1.6	4.4	36.5	17.7	32.2	
K1a, K1b	1.6	17.5	39.1	16.6	27.1	

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

Figure D.1 – Map of Automatic Monitoring Sites across Knowsley Metropolitan Borough Council

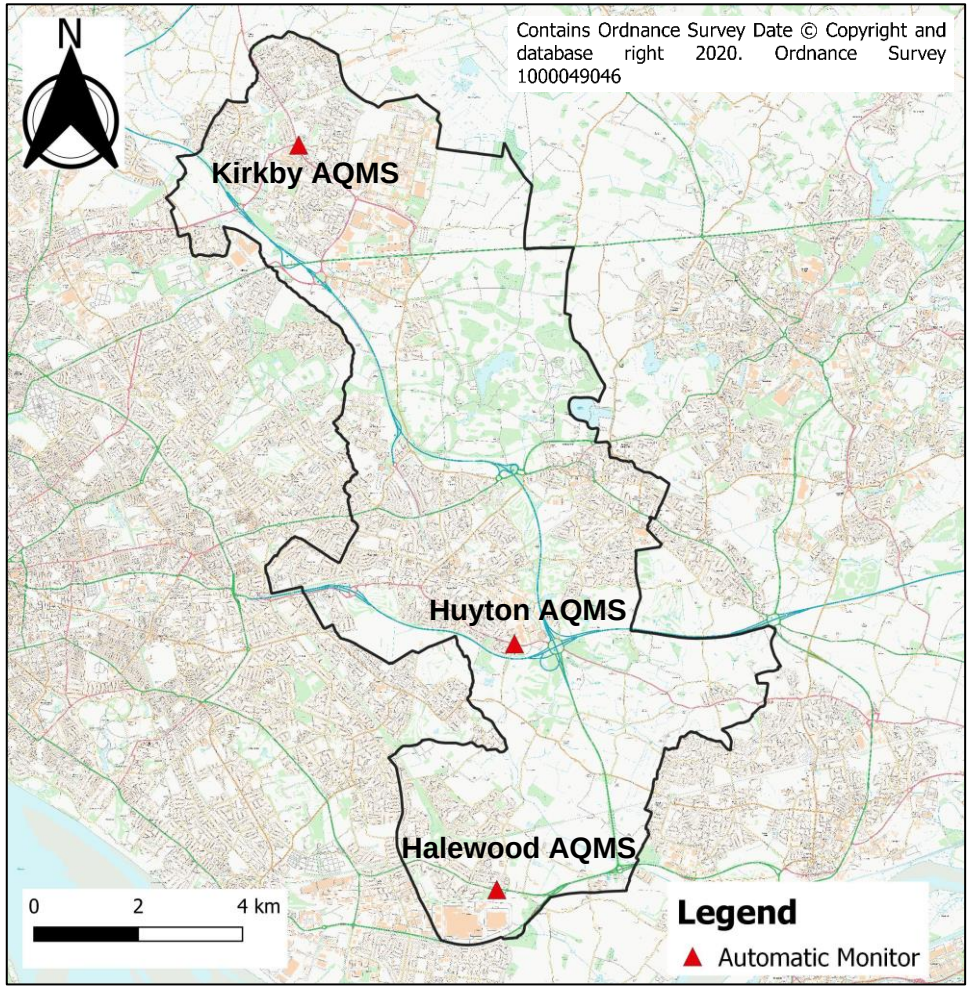


Figure D.2 – Map of Huyton Automatic Monitoring Station (Cronton Road)

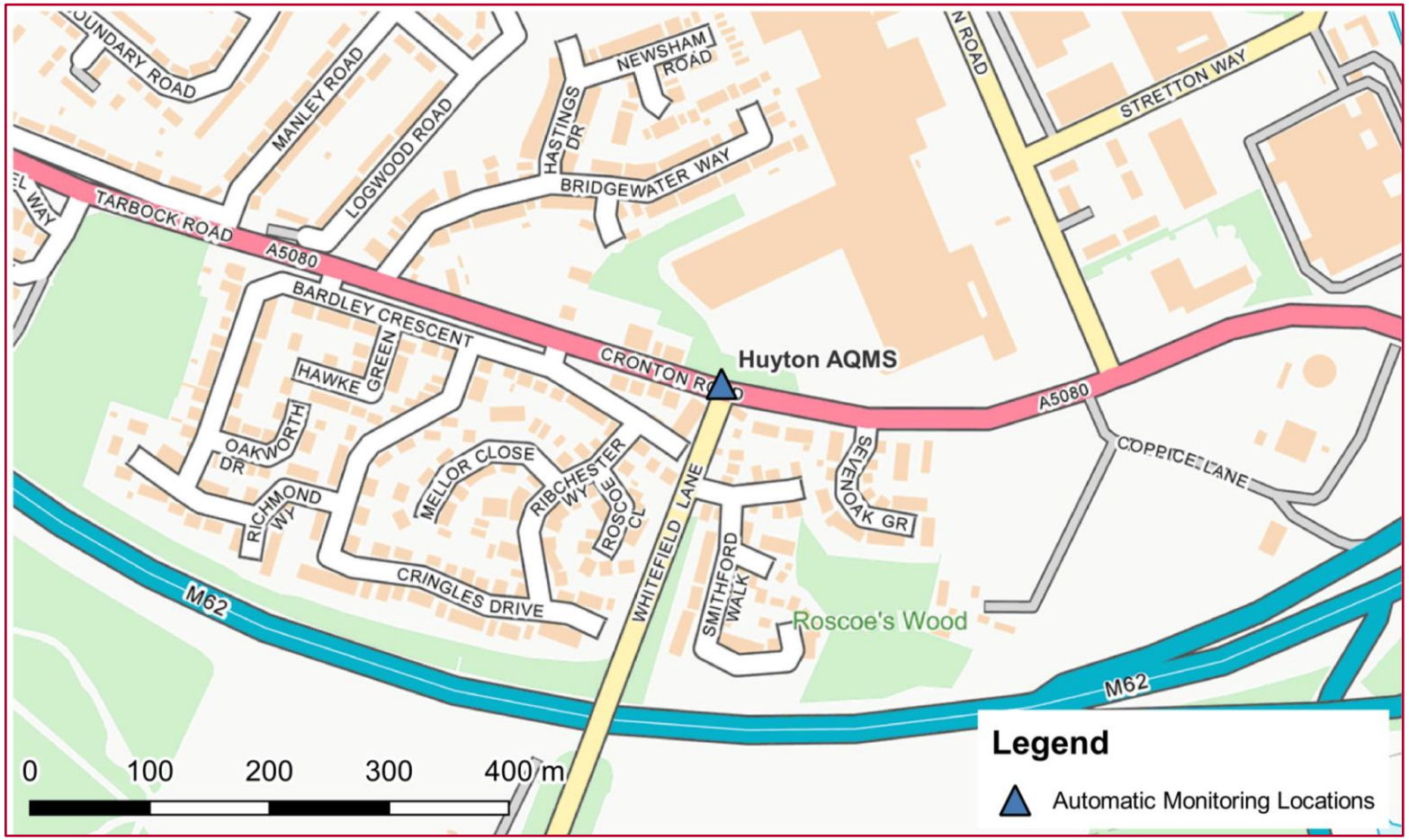


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Figure D.3 – Map of Kirkby Automatic Monitoring Station (Old Rough Lane)

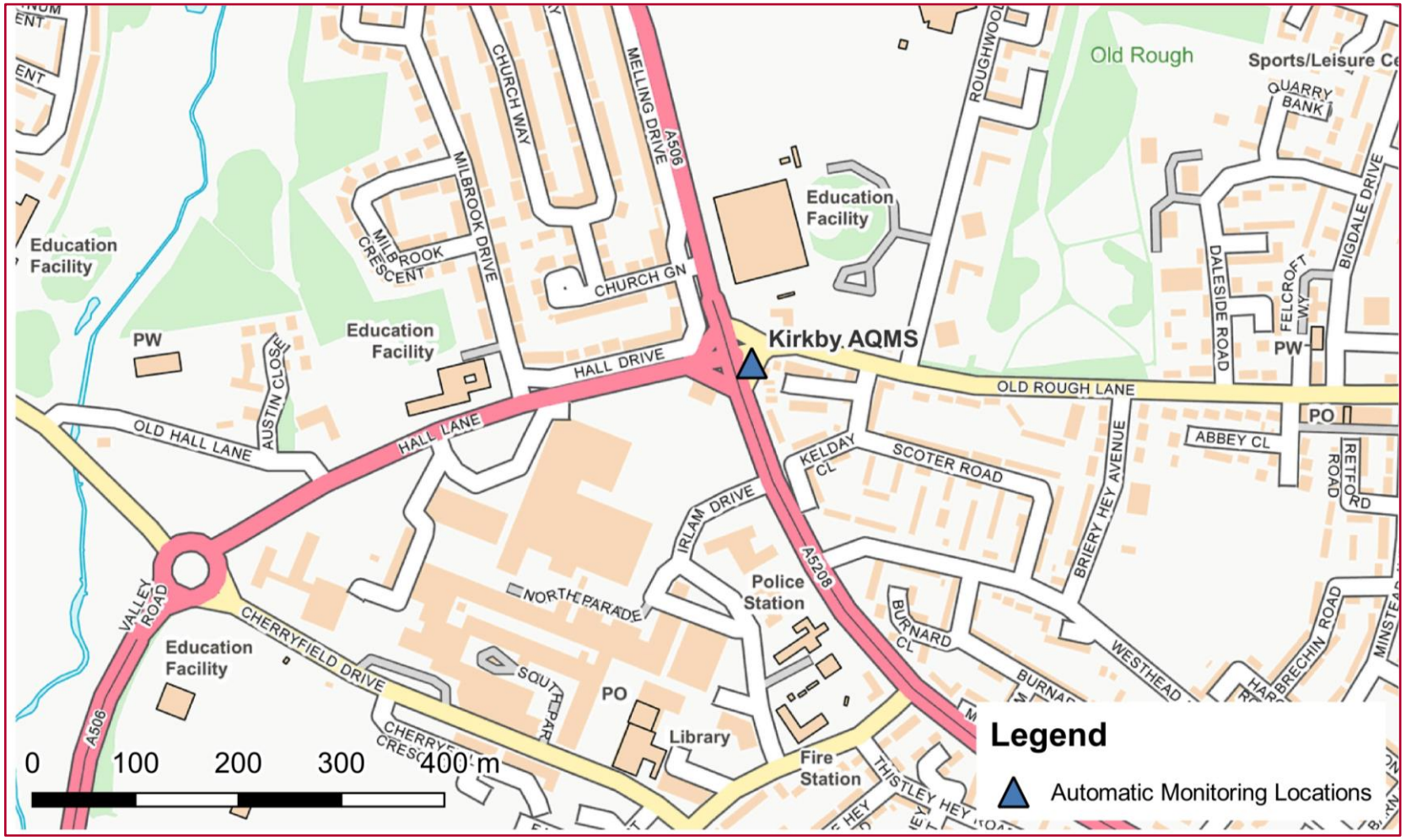

Figure D.4 – Map of Halewood Automatic Monitoring Station (Higher Road)

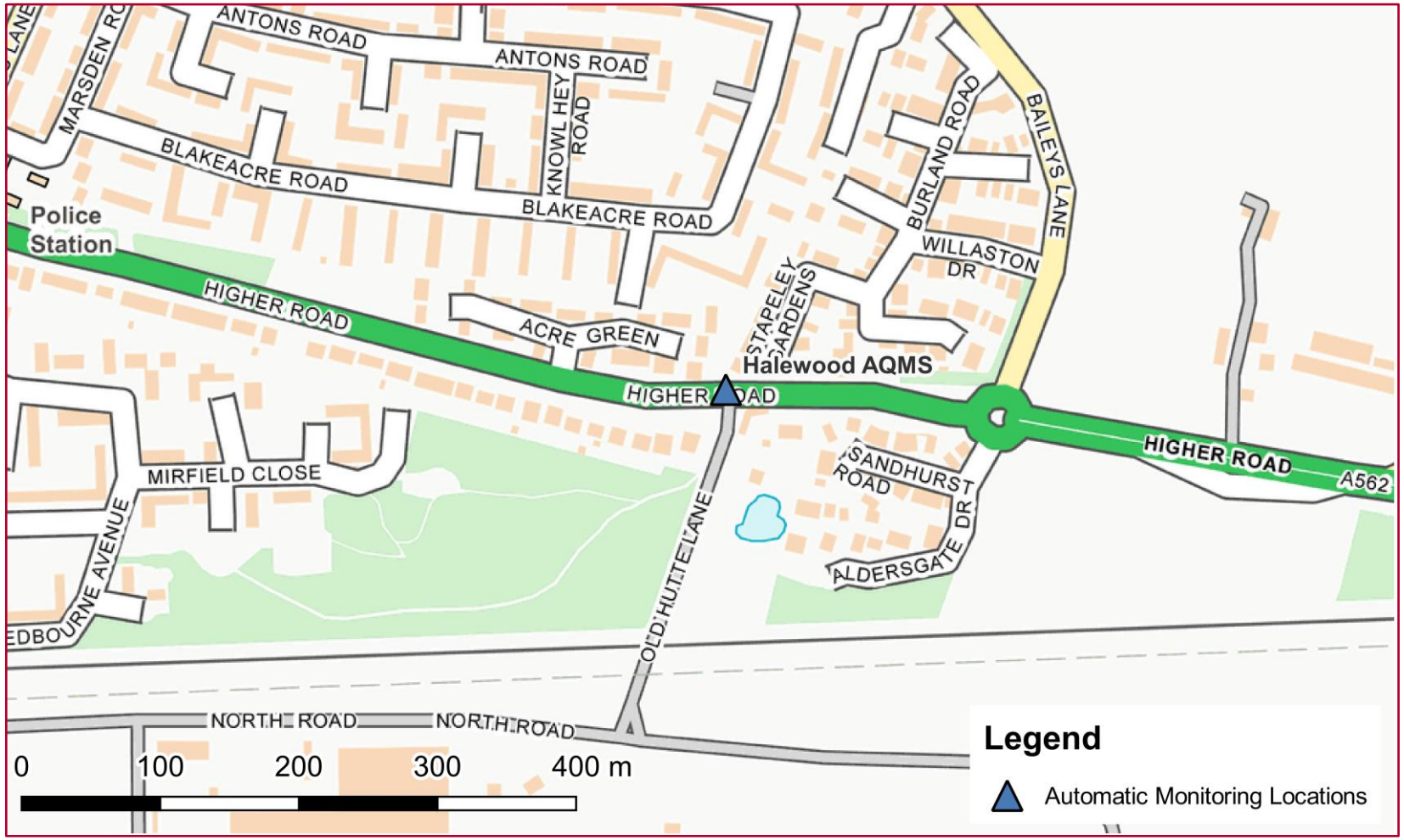

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Figure D.5 – Map of Non-Automatic (Diffusion Tube) Sites in Huyton, Cronton Road

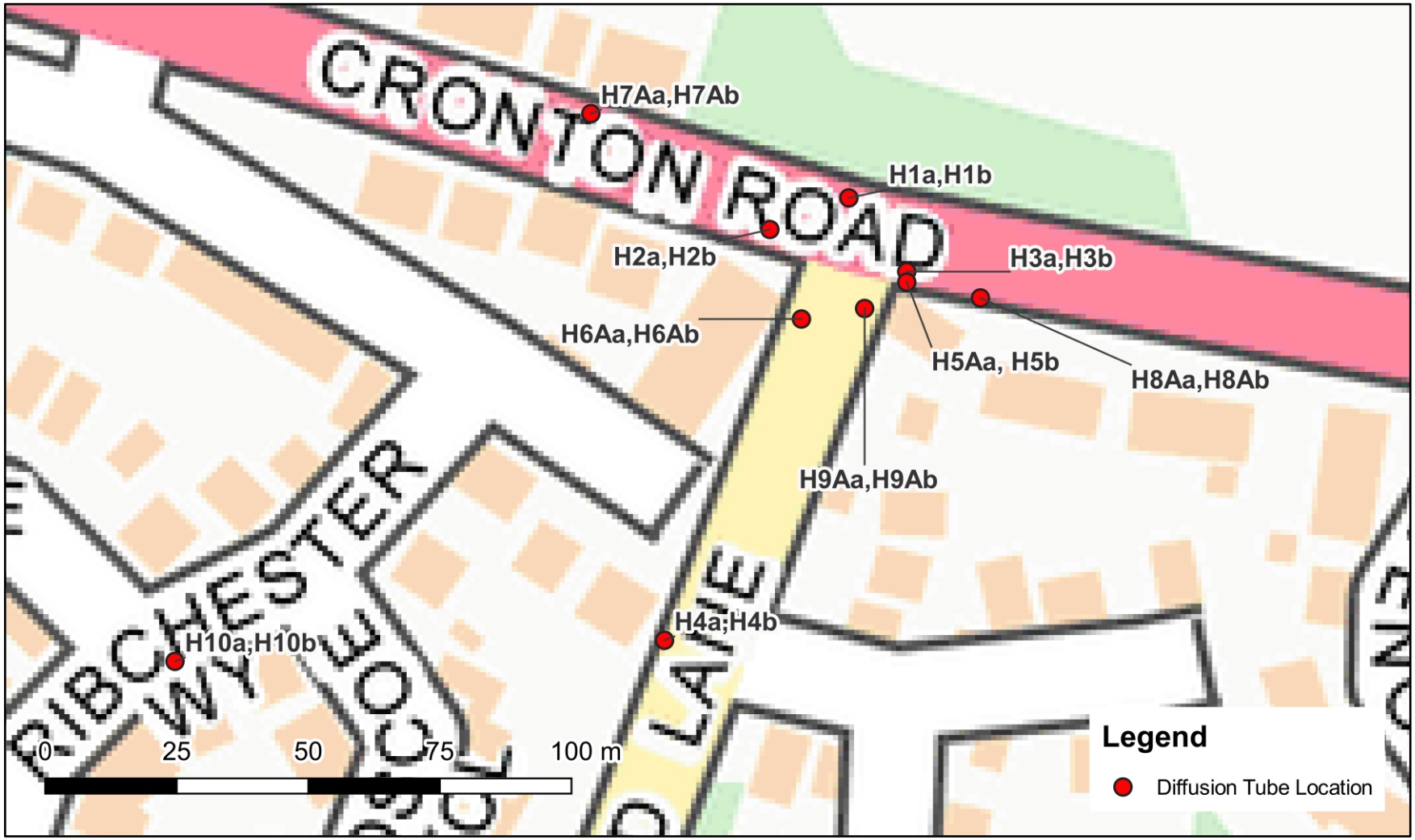


Figure D.6 – Map of Non-Automatic (Diffusion Tube) Sites in Huyton

Figure D.7 – Map of Non-Automatic (Diffusion Tube) Sites in Prescot

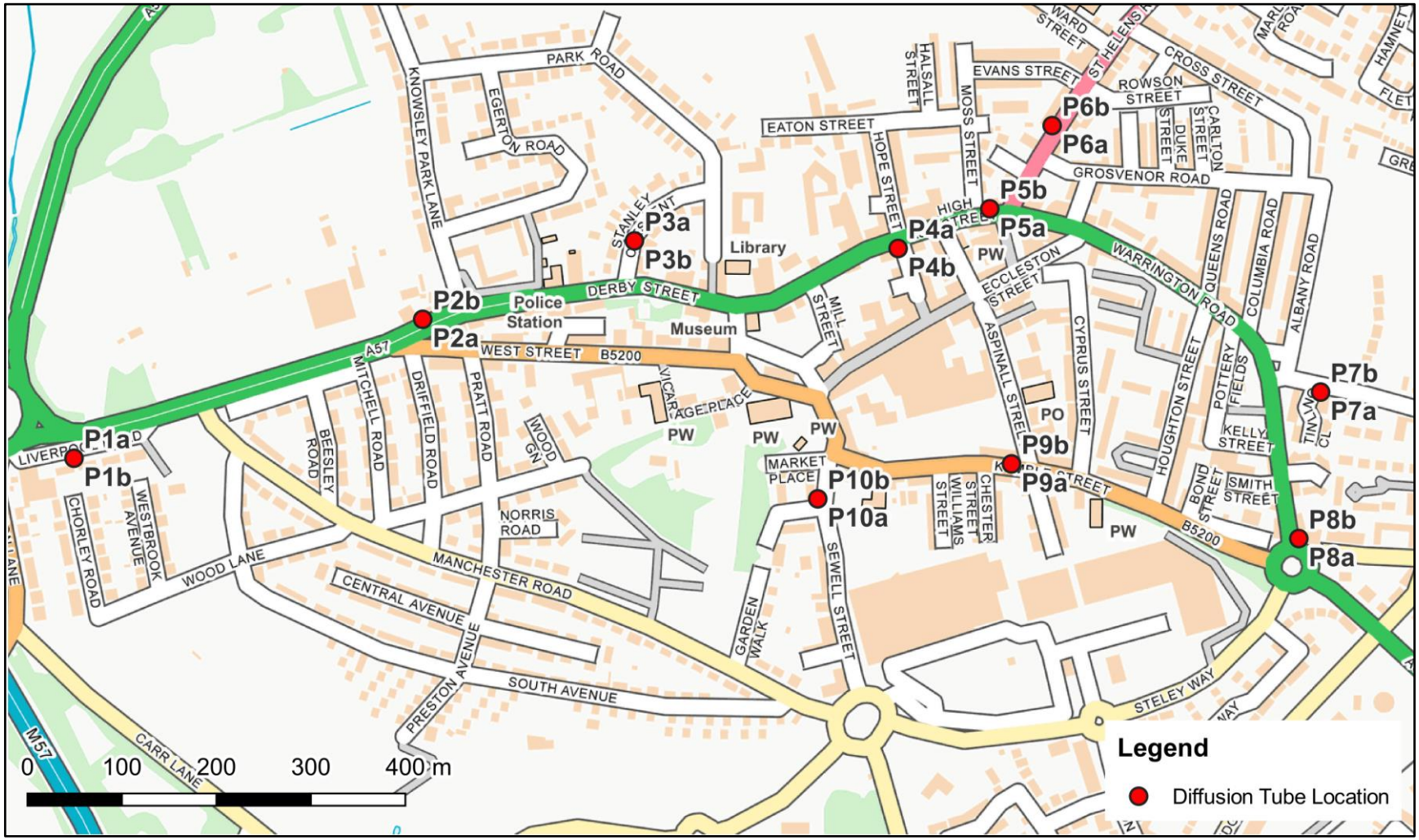


Figure D.8 – Map of Non-Automatic (Diffusion Tube) Sites in Kirkby (Town Centre)

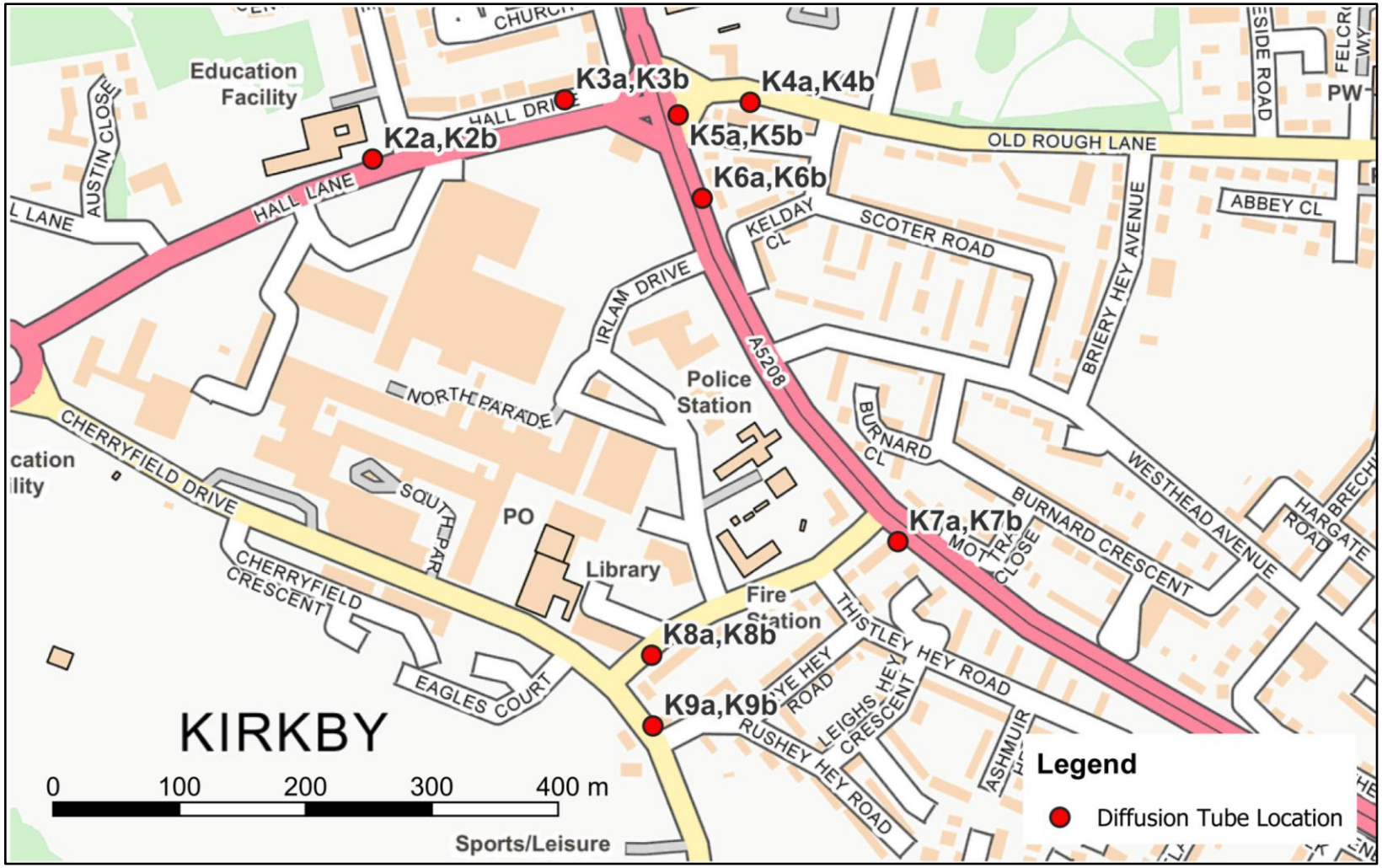
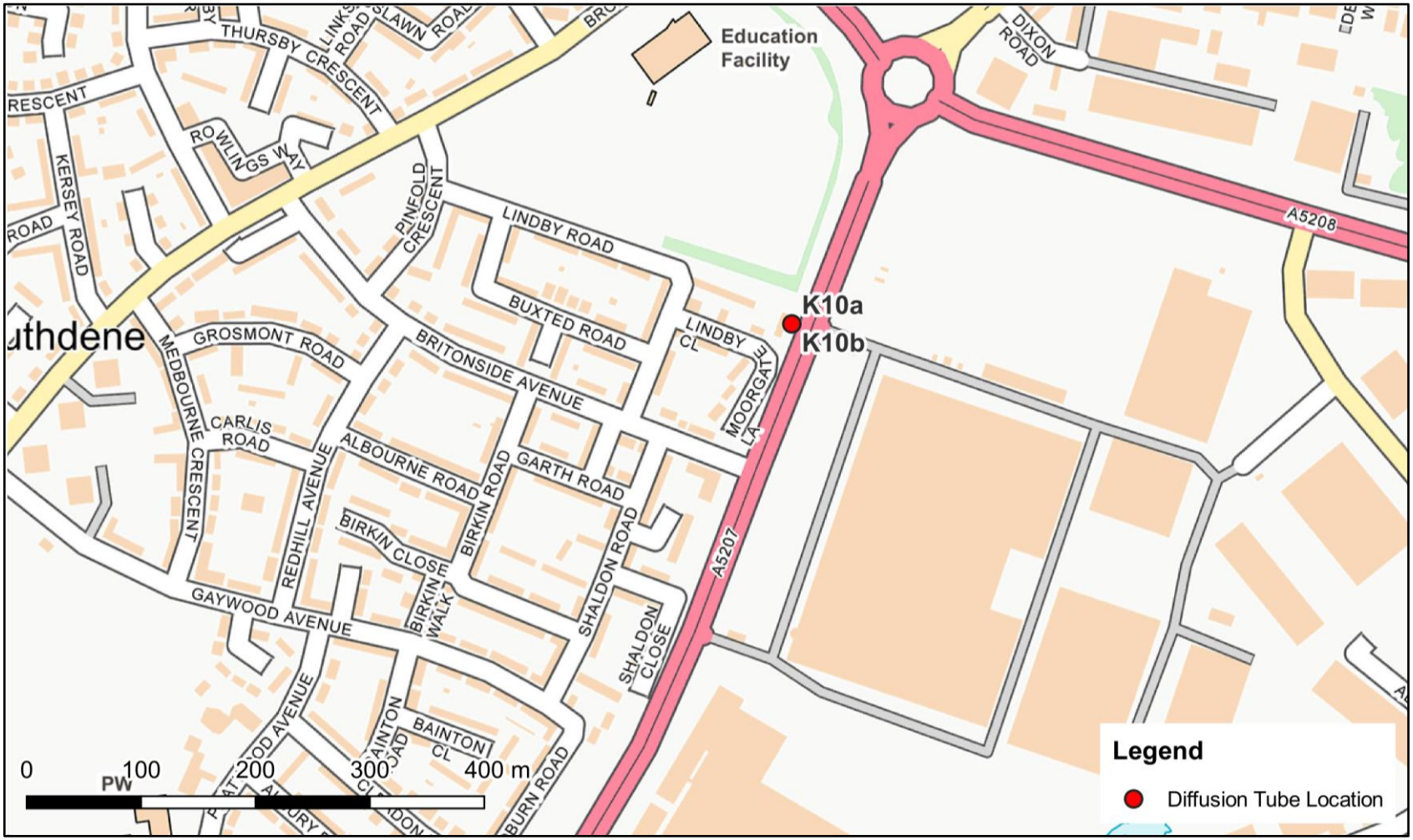


Figure D.9 – Map of Non-Automatic (Diffusion Tube) Sites in Kirkby (M57 Junction 6)

Figure D.10 – Map of Non-Automatic (Diffusion Tube) Sites in Kirkby (Moorgate Road)



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

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
Particulate Matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM_{10})	40µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO_2)	125µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO_2)	266µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

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	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
AQS	Air Quality Strategy

References

- Local Air Quality Management Technical Guidance LAQM.TG16. April 2021. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.