2023 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management, as amended by the Environment Act 2021

Date: June 2023

Information	Knowsley Metropolitan Borough Council Details
Local Authority Officer	Helen Bradshawe
Department	Environmental Protection Officer
Address	Knowsley Metropolitan Borough Council Municipal Buildings Archway Road, Huyton, L36 9YU
Telephone	0151 443 4742
E-mail	Environmental.health@knowsley.gov.uk
Report Reference Number	Knowsley 2023 ASR
Date	June 2023

Executive Summary: Air Quality in Our Area

Air Quality in Knowsley Metropolitan Borough Council

This section needs to go on our website so needs to be easy to read

Air pollution is associated with several 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 29,000 to 43,000 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 industrial sources and road traffic vehicle emissions. 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 southwest of Knowsley as well as major glass manufacturing sites in St Helens.

---

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

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

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

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

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

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 Borough, running Northwest to Southeast. 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) had 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 because of the completion of the contract with We Care 4 Air 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. In February 2022, an area within Halewood was incorporated within the network of diffusion tube monitoring. The diffusion tube network within Knowsley has demonstrated long term compliance with the AQS objective.

Previous reports have identified an area of concern in Huyton, at the junction of Whitefield Lane / Cronton Road. The NO_2 levels in the areas of concern in Huyton has reduced this year, when compared to the previous year's results, although the results have been adjusted using the national bias adjustment. In previous years Knowsley MBC were able to calculate a local bias adjustment factor using the continuous monitor positioned on Cronton Road in Huyton, however this was decommissioned in September 2021, and therefore the national bias adjustment factor is now being used.

There are still 2 areas of concern in Huyton, due to the concentrations being within 10% of the AQS Objective, these are H3a/H3b and H6Aa/H6Ab. We will continue to monitor using diffusion tubes in this area in 2023. The air quality in other parts of Huyton, monitored using the diffusion tubes, continues to be good, and the results are significantly below the NO_2 AQS objective.

Monitoring in Kirkby showed that site K1a/b reported an NO_2 concentration within 10% of the AQS objective of 39.1 µg/m3, however following the fall-off with distance correction, the NO_2 concentration is significantly below the AQS objective, reporting a concentration of 27.1 µg/m3.

In 2022, the measured NO_2 concentrations across Knowsley predominantly saw decreases throughout the passive monitoring sites, when the national bias adjustment factor was applied, except for five sites in Kirkby that saw a slight increase, however they were all below the AQS objective.

Within the Prescot area, we changed the location of seven diffusion tube monitoring sites as they had continued to show NO_2 levels significantly below the AQS objective. Following concerns raised by residents the new tubes were relocated to areas where the traffic was reported to have increased. Concerns of increased traffic was also raised within an area of Halewood; therefore, three new monitoring sites were introduced in February 2022.

With regards to the first year of monitoring in Halewood, site HW3Aa/b has reported concentrations within 10% of the AQS, therefore NO_2 concentrations will continue to be closely monitored at this location.

Knowsley MBC have not introduced any Air Quality Management Areas (AQMAs) in 2022.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, there are some areas where local action is needed to protect people and the environment from the effects of air pollution.

The Environmental Improvement Plan[5] sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term $PM_{2.5}$ targets. The National Air Quality Strategy, due to be published in 2023, will provide more information on local authorities' responsibilities to work towards these new targets and

[5] Defra. Environmental Improvement Plan 2023, January 2023

reduce $PM_{2.5}$ in their areas. The Road to Zero[6] details 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.
- 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.
- As part of the LCR combined authority we have been included in a new air quality monitoring exercise. 'EarthSense Zephyr' monitors have been installed close to traffic light junctions throughout the region. These sensors monitor for variety of pollutants. For further information see (www.earthsense.co.uk/zephyr)

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

Conclusions and Priorities

In 2022, there were no exceedances of any of the relevant NO_2 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, with a decrease in concentrations at sites within Huyton, Kirkby and Prescot due to the use of the national bias adjustment figure, there is still concern for air quality within the areas discussed above, therefore Knowsley MBC will continue to use their diffusion tube network to closely monitor these hotspot areas.

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 and to be able to calculate the local bias adjustment figure, which will provide a more accurate picture of air quality within the area.

Knowsley will continue to work with the LCR combined authority to progress improvements to air quality in the area, and will continue with the EarthSense Zephyr scheme, setup by LCR in 2022.

The council will continue to raise 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 2022 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.

Local Responsibilities and Commitment

This ASR was prepared the Environmental Health Department on behalf of Knowsley MBC:

- Helen Bradshawe – Environmental Health
- Ian Gaskell – Environmental Health

With the support and agreement of the following officers and departments:

- Sarah McNulty – Public Health
- Richard Thorpe – Strategic Infrastructure

This ASR has been approved by:

- Brian Toolan (Head of Safety, Resilience and Community Protection (N&C Services))
- 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:

Huyton Municipal Buildings (2nd Floor),
Archway Road,
Huyton.
L36 9YU.

Telephone: 0151 443 4712
Email: environmental.health@knowsley.gov.uk

Table of Contents

Figures

Tables

1 Local Air Quality Management

This report provides an overview of air quality in Knowsley Metropolitan Borough Council (Knowsley MBC) during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), 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 order to achieve and maintain the objectives and the dates by which each measure will be carried out. 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.2.

2 Actions to Improve Air Quality

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 18 months. The AQAP should specify how air quality targets will be achieved and maintained and provide dates by which measures will be carried out.

Knowsley MBC currently does not have any declared AQMA's. A local air quality strategy is under development to prevent and reduce pollution activities.

Our results showed that no monitoring sites exceeded the AQS objective following bias adjustment and distance correction, and that only three monitoring sites (two in Huyton, one in Halewood) had an NO_2 concentration within 10% of the AQS objective, these results were H3a/b (32.83µg/m3), H6Aa/b (27.93µg/m3), and HWA3a/b (31.03µg/m3) respectively.

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

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

1. *A hotspot has been identified in Kirkby where recorded NO_2 concentrations are near exceedance. Although once distance correction has been applied concentrations all fall within the objective value this area is being carefully monitored. This is encouraged.*
2. *Appropriate maps are provided showing monitoring across the borough. Maps D.2 to D.10 could be improved with the addition of North arrows.*
3. *The measures currently being undertaken by the council to improve air quality in the borough are described clearly and concisely. Sufficient detail is provided on the progress of each of these measures.*
4. *The report contains extensive discussion on trends seen in monitored concentrations throughout 2021, which is commended. This level of detail is encouraged in future reports and is considered an example of good practice.*
5. *The report itself is well structed, clear and detailed. It is considered an example of good practice. The council should continue their good work and submit an ASR in 2023.*

Knowsley MBC has taken forward a few direct measures during the current reporting year of 2022 in pursuit of improving local air quality. There are new updates for the 2022 reporting year on impact measures involving several road schemes to help improve traffic flow and improve air quality:

- Windy Arbour Road/Lickers Lane – Signalisation of junction
- Foxes Bank Lane/Cronton Road – Conversation of staggered crossroads to a roundabout
- M57 Junction 3 – Active Travel Scheme
- Kirkby Row – Active Travel Scheme

A new external scheme has been setup Liverpool City Region called EarthSense Zephyr 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. It is recognised that these monitors are not approved by Defra but the data can be used indicatively and may help identify if further monitoring is required using approved methods.

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

Site ID	Site Location	Council	XOS Grid Ref (Easting)	YOS 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

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.

$PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations.

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), 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.

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

- EarthSense Zephyr monitoring
- Any new continuous monitoring stations in Knowsley would 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.

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

This section sets out the monitoring undertaken within 2022 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 2018 and 2022 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Knowsley MBC did not undertake any automatic (continuous) monitoring within 2022, as the stations were decommissioned as discussed above. The historical information from the three sites is included within the report, Table A.1 in Appendix A shows the details of the automatic monitoring sites.

The We Care 4 Air 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 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 35 sites during 2022. Table A.2 in Appendix A presents the details of the non-automatic sites.

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.

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.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/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 2022 dataset of monthly mean values is provided in Appendix B for sites within Huyton, Prescot and Kirkby and 11 months for Halewood. 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 which had previously shown 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.

Environmental Health had received concerns from residents in areas of Prescot and Halewood, detailing an increase in traffic within the area, therefore in 2022, Knowsley MBC moved 7 of the diffusion sites within Prescot (which had previously shown no concerns) to other roads within the area and included a further 3 sites within Halewood. The information is detailed in the tables below.

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

Old Diffusion Tube Locations (Huyton)

Site ID	Site Location	X OS Grid Ref (Eastings)	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 (Huyton)

Site ID	Site Location	X OS Grid Ref (Eastings)	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.

Old Diffusion Tube Locations (Prescot)

Site ID	Site Location	X OS Grid Ref (Eastings)	Y OS Grid Ref (Northing)	Comment
P4	Stop sign on Leyland St junction with High St	346,669	392,875	Impact of junction of Leyland Street, High St & Hope Street
P5	LC010 Outside 49 High Street	346,757	392,916	Impact of junction of High St, Warrington Road and St Helens Road
P6	LC 004 Outside 31 St Helens Road	346,831	393,005	Impact of petrol station and bus stop
P7	LC005 Oliver Lyme Road near Tinling Close	347,091	392,729	Traffic queuing for Warrington Road. Customer complaint.
P8	LC070 Outside 81 Warrington Road	347,090	392,570	Traffic queuing for roundabout impacting on flats
P9	Traffic signal Outside 53 Kemble Street	346,788	392,648	Traffic queuing on Kemble St for Aspinall St junction

P10	LC008 Outside Greenall Court, Sewell Street	346,584	392,609	Properties close to street and any impact of Shakespeare North

New Diffusion Tube Locations (Prescot)

Site ID	Site Location	X OS Grid Ref (Eastings)	Y OS Grid Ref (Northing)	Comment
P4A	LC017 Outside 23 Steley Way, opposite McDonalds	346,942	392,387	Traffic increase on Steley Way, at round about to shopping complex.
P5A	LC013 Outside apartments on Steley Way, opposite roundabout	346,898	392,367	Traffic increase on Steley Way, at round about to shopping complex.
P6A	LC 009 Outside apartments on Steley Way, opposite roundabout	346,850	392,360	Traffic increase on Steley Way, at round about to shopping complex.
P7A	LC012 near to 89 Cross Lane	346,799	391,419	Traffic increase on Cross Road, cars not reducing speed over speed bumps. Complaints received of increase in traffic.
P8A	LC019 116 Cross Lane, Corner of junction with Saunders Avenue	346,792	391,617	Traffic increase on Cross Road, cars not reducing speed over speed bumps. Complaints received of increase in traffic.

New Diffusion Tube Locations (Halewood)

Site ID	Site Location	X OS Grid Ref (Eastings)	Y OS Grid Ref (Northing)	Comment
HW1	LC01 Outside 139 Roseheath Drive, Halewood	344,843	385,022	Increase in vehicle movement due to commercial area.
HW2	LC023 Outside 140 Leathers Lane, Halewood	344,827	385,202	Increase in vehicle movement due to commercial area.
HW3A	LC003, at side of bus station, off Hillingden Avenue	344,927	385,128	Bus station close to houses.

During 2022, all but 2 diffusion tube monitoring sites reported NO_2 values compliant with the NO_2 AQS objective. The 2 monitoring locations showing exceedances were H3a/b, H6Aa/b. However, once corrected for distance the levels were below the NO_2 AQS objective. In 2022, 5 sites, all in Kirkby, recorded an increase in NO_2 concentrations, although all the results for these sites were significantly below the NO_2 AQS objective. The remaining sites are well below the AQS objective. The minor increase in levels in Kirkby, when compared to 2021, may be due to the significant retail development in the town centre.

This compares to 15 sites in 2021 which showed an increase when compared to the previous year (2020). Although 2020 was the year when Covid-19 had the biggest impact on the population, due to lockdowns, and therefore an increase in 2021 was expected as life returned to normal.

Passive monitoring site H6Aa/b has reported concentrations within 10% of the AQS objective in its second year (36.7 µg/m3), therefore NO_2 concentrations will be closely monitored at this location. Site H3a/b had previously shown exceedances at the monitoring site for the past 6 years, demonstrating compliance against the AQS objective at the sensitive receptor each year. In 2022 H3a/b reported concentrations within 10% of the AQS objective (39.3 µg/m3).

Within the first year of monitoring, site HW3Aa/b has reported concentrations within 10% of the AQS (36.1 µg/m3), therefore NO_2 concentrations will be closely monitored at this location.

Figures A.1 – A.4 show annual mean NO_2 concentrations for the previous 5 years (2018–2022). The monitoring results in Huyton in 2022, when compared against the previous year,

show decreases in concentrations at all the diffusion tube monitoring sites. Our previous Annual status Report (containing 2021 data) identified 3 sites in Huyton (H2a/2b, H5Aa/Ab, and H9Aa/Ab) were the NO_2 level had increased and was within 10% of the 40 µg/m^3 AQS objective. However, in 2022, these have reduced and are now below the 10% of the 40 µg/m^3 AQS objective.

In 2021, we reported that three sites were above the AQs objective (H3a/3b, H6a/6b and H8a/8b). Of these three sites, only two are now reported to be within 10% of the 40 µg/m3 AQS objective (H3a/3b, H6a/6b), in 2022.

Monitoring in Kirkby (2021) showed that site K1a/b reported an NO_2 concentration within 10% of the AQS objective of 39.1 µg/m^3, although following the fall-off with distance correction, the NO_2 concentration is significantly below the AQS objective, reporting a concentration of 27.1 µg/m^3. For 2022, the site reported a decrease in NO_2 concentrations, as the result did not fall within 10% of the AQS objective.

The three automatic monitoring stations within Knowsley captured data from 2018 – 2021 (2022 was not monitored due to contract termination with We Care 4 Air). 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 2018 – 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 was no clear trend, but the results for the past 4 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 four years.

In 2022, NO_2 levels were also monitored at various locations using EarthSense Zephyr Sensors. Whilst it is recognised that these sensors are not Defra approved and the information is indicative only, our results have been discussed below.

NO_2 did not exceed 200µg/m^3 (1 hour mean) at any time during the monitoring period. The annual mean was calculated for each site and did not exceed the 40µg/m^3.

See Appendix E for further information.

3.2.2 Particulate Matter (PM_{10})

Table A.6 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 40µg/m^3.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.
From 2020 we have no data for PM_{10} for both Huyton and Halewood. Monitoring for PM_{10} continued in Kirkby until 2021. Historical data can still be seen in Table A.7.

In 2022, PM_{10} levels were monitored at various locations using EarthSense Zephyr Sensors. Whilst it is recognised that these sensors are not Defra approved and the information is indicative only. The results showed that the PM_{10} level did not exceed 50µg/m^3 (24 hour mean) at any time during the monitoring period. The annual mean was calculated for each site, and it did not exceed the 40µg/m^3 objective.

See Appendix E for further information.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years.

From 2020 we have no data for $PM_{2.5}$ from our automatic monitoring stations. Historical data can still be seen in Table A.8.

In 2022, $PM_{2.5}$ levels were monitored at various locations using EarthSense Zephyr Sensors. Whilst it is recognised that these sensors are not Defra approved and the information is indicative only. The results showed that the $PM_{2.5}$ level did not exceed 20µg/m^3 (annual mean).

See Appendix E for further information.

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	NO2, PM10(3), PM2.5(3)	NO	Chemiluminescent, TEOMS*	18	2	2
Halewood	Higher Road, Halewood	Roadside	345213	384691	NO2, PM10(3), PM2.5(3)	NO	Chemiluminescent, TEOMS*	10	2	2
Kirkby	Old Rough Lane, Kirkby	Roadside	341414	398991	NO2, PM10,	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	NO2	NO	3.6	2.2	No	2.5
H2a, H2b	Outside 2 Whitefield Lane	Roadside	345537	389407	NO2	NO	1.5	1.2	No	2.4
H3a, H3b	Outside 1 Whitefield Lane	Kerbside	345563	389399	NO2	NO	2.8	0.8	No	2.3
H4a, H4b	Opp Smithford Walk	Roadside	345517	389329	NO2	NO	3.8	1.3	No	2.4
H5Aa, H5Ab	Positioned on drainpipe on side of house of 1 Whitefield Lane	Roadside	345563	389397	NO2	NO	0.2	2.9	No	2.2
H6Aa, H6Ab	Traffic light column adjacent to 2 Whitefield Lane	Kerbside	345543	389390	NO2	NO	5.6	0.5	No	2.3
H7Aa, H7Ab	LC 011 outside of 2 Cronton Road	Roadside	345503	389429	NO2	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	NO2	NO	9.5	1.9	No	2.4
H9Aa, H9Ab	LC 001 outside 3 Whitefield Lane	Suburban	345555	389392	NO2	NO	2.8	1.6	No	2.3
H10a, H10b	Outside 9 Ribchester Way	Suburban	345424	389325	NO2	NO	4.9	1.6	No	2.2
H11a, H11b	Outside 12 Windy Arbor Brow	Suburban	346329	389782	NO2	NO	3.1	1.9	No	2.2
H12a, H12b	Halsnead development	Roadside	346425	389669	NO2	NO	-	2.4	No	2.5
K1a, K1b	LC056A Junction of M57 and Valley Road	Roadside	340355	397795	NO2	No	15.9	1.6	No	2.3
K2a, K2b	LC006 Outside Kirkby C of E School, Hall Lane	Roadside	341165	398953	NO2	No	13.5	6.4	No	2.4
K3a, K3b	LC005 outside 12 Hall Drive	Roadside	341317	399000	NO2	No	8.1	1.6	No	2.4
K4a, K4b	LC021 to rear of 12 Brakenhurst Grove	Roadside	341464	398997	NO2	No	10.1	3.0	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)
K5a, K5b	LC091 Junction of Old Rough Lane and County Road	Roadside	341407	398988	NO2	No	20.3	3.2	No	2.4
K6a, K6b	LC085 On County Road near 18 Kelday Close	Roadside	341426	398922	NO2	No	8.9	1.1	No	2.4
K7a, K7b	LC067 Corner of County Road and Webster	Roadside	341576	398654	NO2	No	6.6	1.4	No	2.4
K8a, K8b	LC002 Outside Webster Drive	Roadside	341371	398537	NO2	No	10.6	1.3	No	2.4
K9a, K9b	LC 017 on Cherryfield Drive	Roadside	341387	398504	NO2	No	5.4	0.9	No	2.4
K10a, K10b	Outside 19 Moorgate Road (A5207)	Roadside	342421	397755	NO2	No	1.4	6.9	No	2.4
P1a, P1b	LC227 Near Liverpool Road	Roadside	345816	392660	NO2	NO	6.9	3.5	No	2.4
P2a, P2b	LC003 Outside 50 Derby Street	Roadside	346164	392807	NO2	NO	0.6	2.0	No	2.4
P3a, P3b	LC014 Adjacent 2 Stanley Crescent	Roadside	346393	392844	NO2	NO	5.6	3.0	No	2.4
P4Aa, P4Ab	LC017 Outside 22 Steley Way, opposite McDonalds	Roadside	346942	392387	NO2	NO	4.2	1.5	No	2.4
P5Aa, P5Ab	LC013 Outside apartments on Steley Way, opposite roundabout	Roadside	346898	392367	NO2	NO	4.3	1.8	No	2.4
P6Aa, P6Ab	LC009 Outside apartments on Steley Way, opposite roundabout	Roadside	346850	392360	NO2	NO	5.5	1.7	No	2.4
P7Aa, P7Ab	LC012 near to 89 Cross Lane	Roadside	346799	391419	NO2	NO	10.2	1.5	No	2.4
P8Aa, P8Ab	LC019 116 Cross Lane, corner of junction with Saunders Avenue	Roadside	346792	391617	NO2	NO	7.7	2.4	No	2.4
P9Aa, P9Ab	LC012 Outside 39 Delph Lane	Roadside	347950	392325	NO2	NO	7.2	3.1	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)
P10Aa, P10Ab	LC051 Outside 115 and 117 Warrington Road	Roadside	347393	392307	NO2	NO	5.8	2.0	No	2.2
HW1a, HW1b	LC014 Outside 139 Roseheath Drive, Halewood	Roadside	344843	385022	NO2	No	8.5	3.0	No	2.4
HW2a, HW2b	LC023 Outside 140 Leathers Lane Halewood	Roadside	344827	385202	NO2	No	4.5	3.6	No	2.3
HW3Aa, HW3Ab	LC003 at side of bus station, off Hillingden Avenue	Roadside	344927	385128	NO2	No	3.9	2.5	No	2.3

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 NO2 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 2022 (%) (2)	2018	2019	2020	2021	2022
Huyton	345552	389413	Roadside	72.5	72.5	37.4	37.6	29.5	36	
Halewood	345213	384691	Roadside	74.5	74.5	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.TG22.**

☒ **Reported concentrations are those at the location of the monitoring site (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 NO2 annual mean objective of 40µg/m^3 are shown in **bold**.

All means have been "annualised" as per LAQM.TG22 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 NO2 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 2022 (%) (2)	2018	2019	2020	2021	2022
H1a, H1b	345552	389413	Roadside	100	100.0	37.5	37.4	29.5	34.4	28.4
H2a, H2b	345537	389407	Roadside	100	100.0	**41.0**	**40.8**	35.1	38.2	30.1
H3a, H3b	345563	389399	Kerbside	100	100.0	**49.3**	**48.0**	**42.2**	**46.7**	39.3
H4a, H4b	345517	389329	Roadside	100	100.0	29.8	31.4	25.3	30.1	25.0
H5Aa, H5Ab	345563	389397	Roadside	100	100.0	-	-	-	38.1	31.4
H6Aa, H6Ab	345543	389390	Kerbside	100	100.0	-	-	-	**45.4**	36.7
H7Aa, H7Ab	345503	389429	Roadside	100	100.0	-	-	-	33.1	25.7
H8Aa, H8Ab	345577	389394	Roadside	82.7	82.7	-	-	-	**46.9**	34.4
H9Aa, H9Ab	345555	389392	Suburban	100	100.0	-	-	-	36.5	30.3
H5a, H5b	345676	389366	Roadside	-	-	26.8	27.4	21.4	-	-
H6a, H6b	345878	389437	Roadside	-	-	30.0	32.1	28.6	-	-
H7a, H7b	345996	389471	Roadside	-	-	36.8	37.2	33.9	-	-
H8a, H8b	345301	389479	Roadside	-	-	26.6	29.3	22.7	-	-
H5a, H5b	345676	389366	Roadside	-	-	26.8	27.4	21.4	-	-
H10a, H10b	345424	389325	Suburban	92.1	92.1	23.3	23.9	19.1	22.2	18.5
H11a, H11b	346329	389782	Suburban	92.1	100.0	26.4	28.9	23.3	21.9	21.6
H12a, H12b	346425	389669	Roadside	100	100.0	33.5	32.8	27.2	35.9	28.7
K1a, K1b	340355	397795	Roadside	100	100.0	-	**45.4**	38.0	33.3	34.0
K2a, K2b	341165	398953	Roadside	100	100.0	-	26.9	22.1	20.1	19.6
K3a, K3b	341317	399000	Roadside	100	100.0	-	25.3	22.5	19.8	20.1
K4a, K4b	341464	398997	Roadside	90.7	90.7	-	32.5	26.9	26.3	23.6
K5a, K5b	341407	398988	Roadside	100	100.0	-	35.1	30.9	28.1	28.9
K6a, K6b	341426	398922	Roadside	100	100.0	-	35.3	28.1	26.6	28.7
K7a, K7b	341576	398654	Roadside	100	100.0	-	29.6	24.1	21.7	20.0
K8a, K8b	341371	398537	Roadside	100	100.0	-	32.4	28.7	25.8	24.7
K9a, K9b	341387	398504	Roadside	92.6	92.6	-	35.3	27.7	27.1	28.6
K10a, K10b	342421	397755	Roadside	100	100.0	-	29.4	24.1	22.9	20.6
P1a, P1b	345816	392660	Roadside	100	100.0	-	26.8	22.6	25.1	21.9
P2a, P2b	346164	392807	Roadside	100	100.0	-	26.9	22.4	25.6	22.4
P3a, P3b	346393	392844	Roadside	100	100.0	-	29.6	26.4	25.7	24.9
P4Aa, P4Ab	346942	392387	Roadside	100	100.0	-	-	-	-	23.5
P5Aa, P5Ab	346898	392367	Roadside	100	100.0	-	-	-	-	20.4
P6Aa, P6Ab	346850	392360	Roadside	92.3	92.3	-	-	-	-	21.1

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 2022 (%) [2]	2018	2019	2020	2021	2022
P7Aa, P7Ab	346799	391419	Roadside	92.3	92.3	-	-	-	-	17.9
P8Aa, P8Ab	346792	391617	Roadside	100	100.0	-	-	-	-	17.9
P9Aa, P9Ab	347950	392325	Roadside	100	100.0	-	-	-	-	24.0
P10Aa, P10Ab	347393	392307	Roadside	100	100.0	-	-	-	-	18.6
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	-
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	-
HW1a, HW1b	344843	385022	Roadside	100	92.3	-	-	-	-	15.7
HW2a, HW2b	344827	385202	Roadside	100	92.3	-	-	-	-	20.5
HW3Aa, HW3Ab	344927	385128	Roadside	100	67.1	-	-	-	-	36.1

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

☒ **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 NO2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO2 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.TG22 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 NO2 Concentrations (Automatic Monitors)

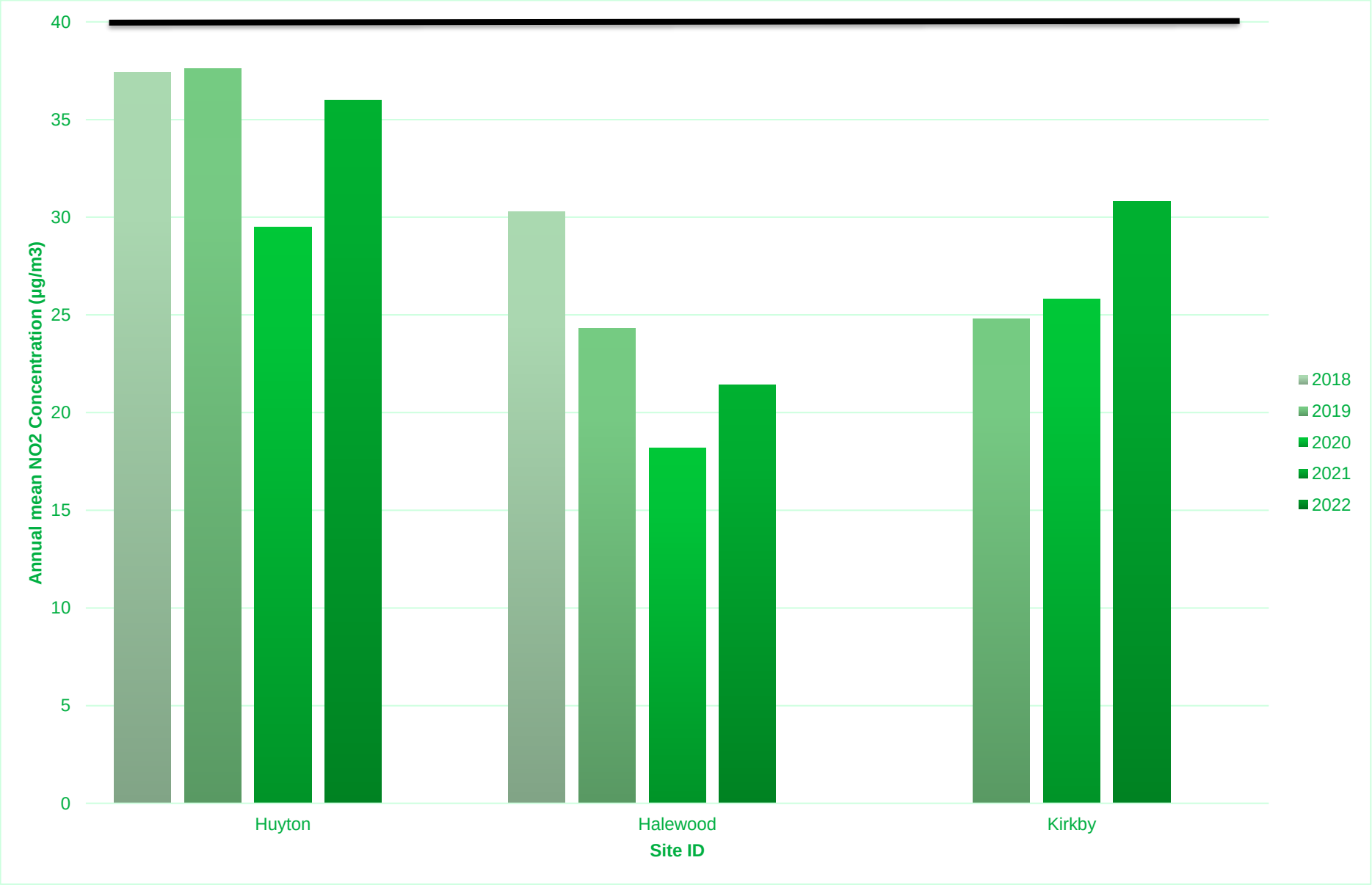


Figure A.2 – Trends in Annual Mean NO2 Concentrations (Huyton)

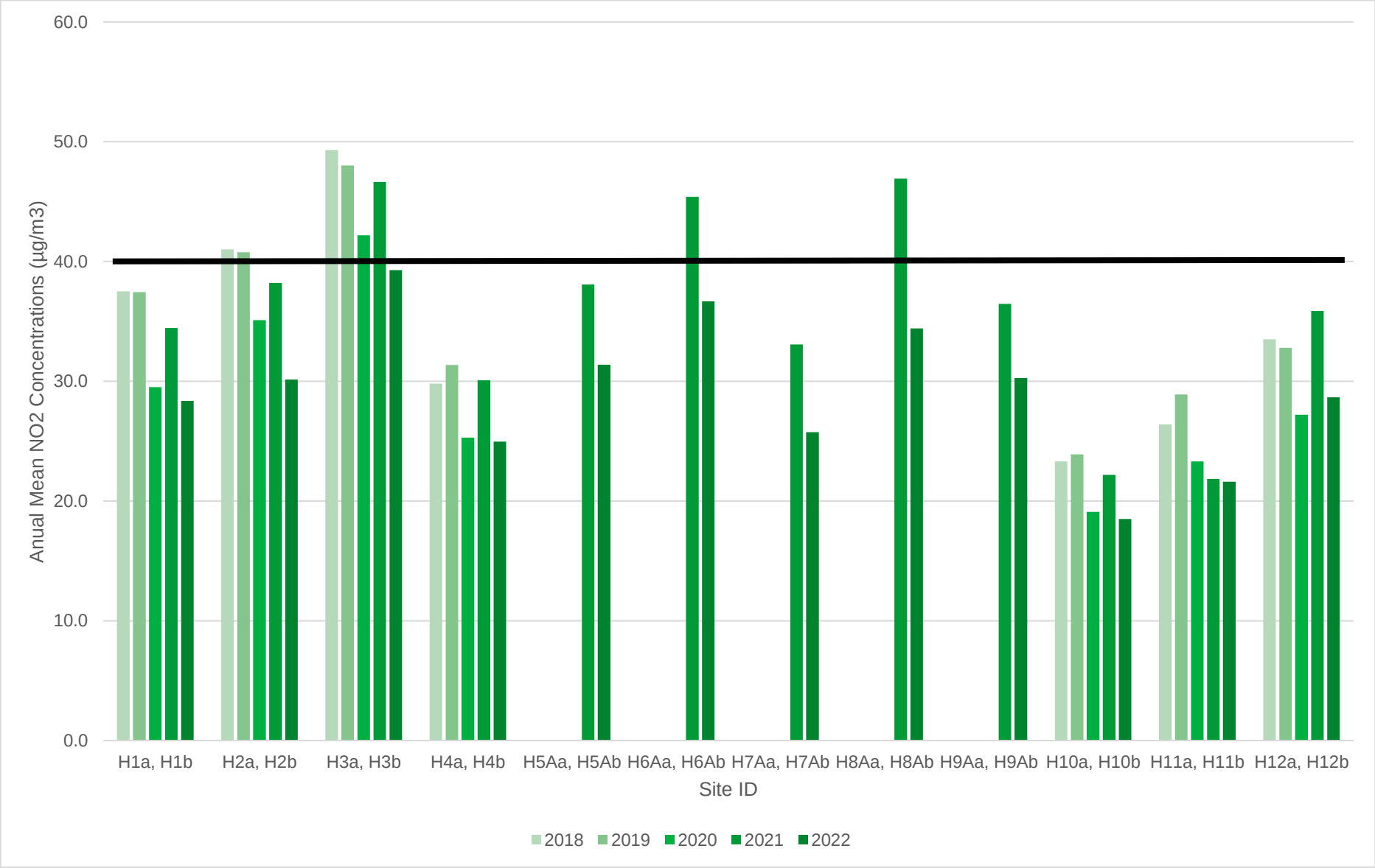


Figure A.3 – Trends in Annual Mean NO2 Concentrations (Kirkby)

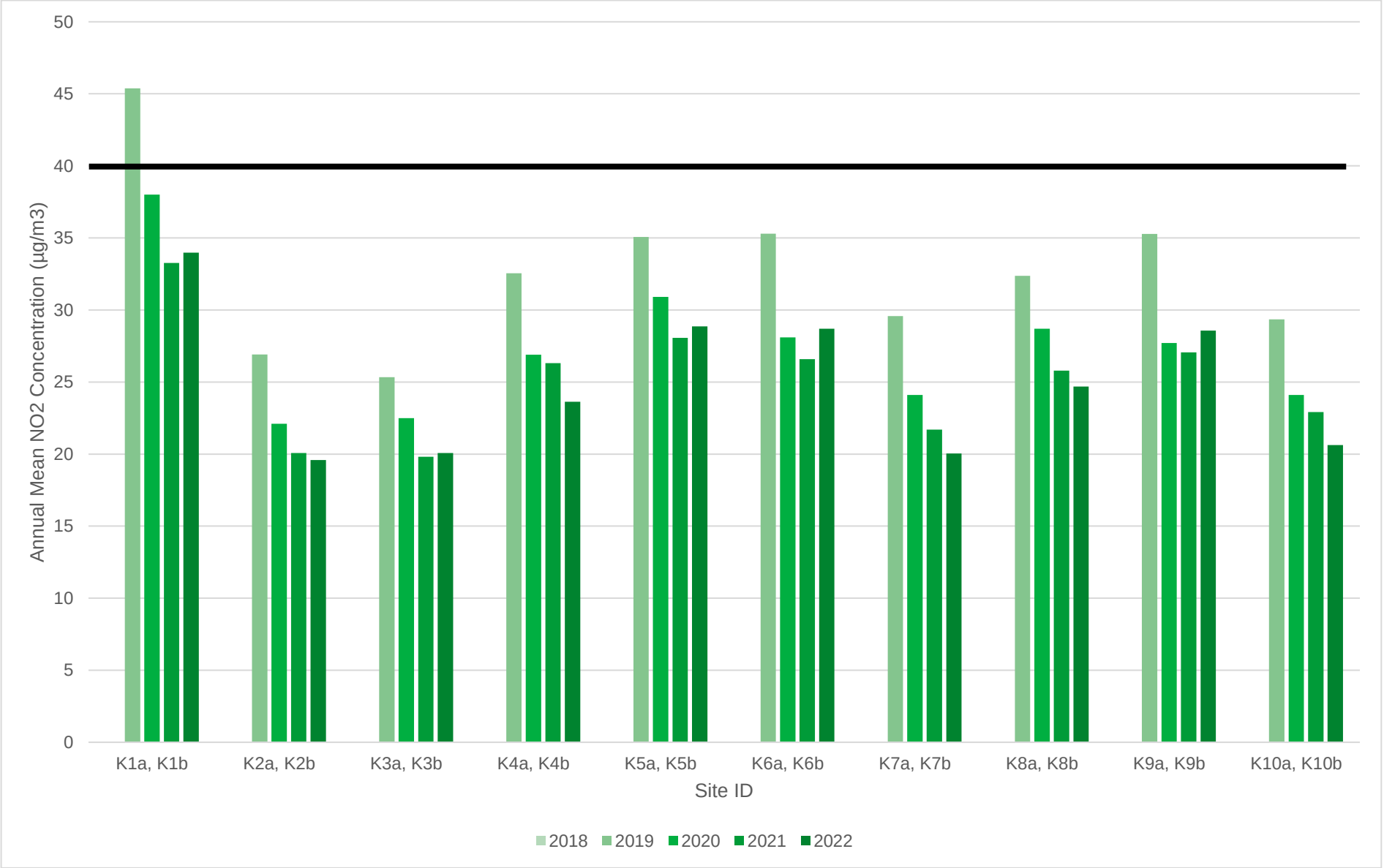


Figure A.4 – Trends in Annual Mean NO2 Concentrations (Prescot)

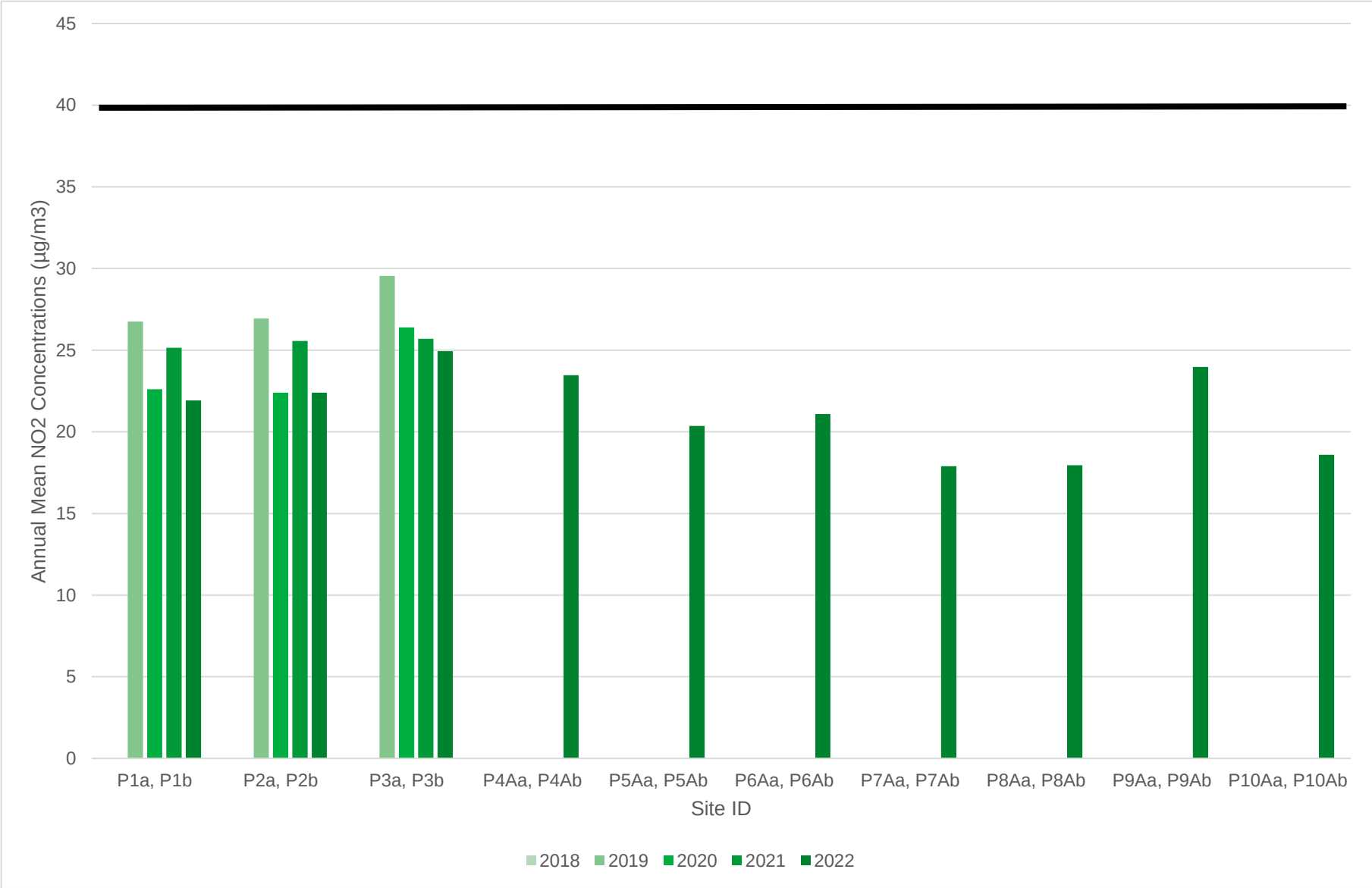


Figure A.5 – Trends in Annual Mean NO2 Concentrations (Halewood)

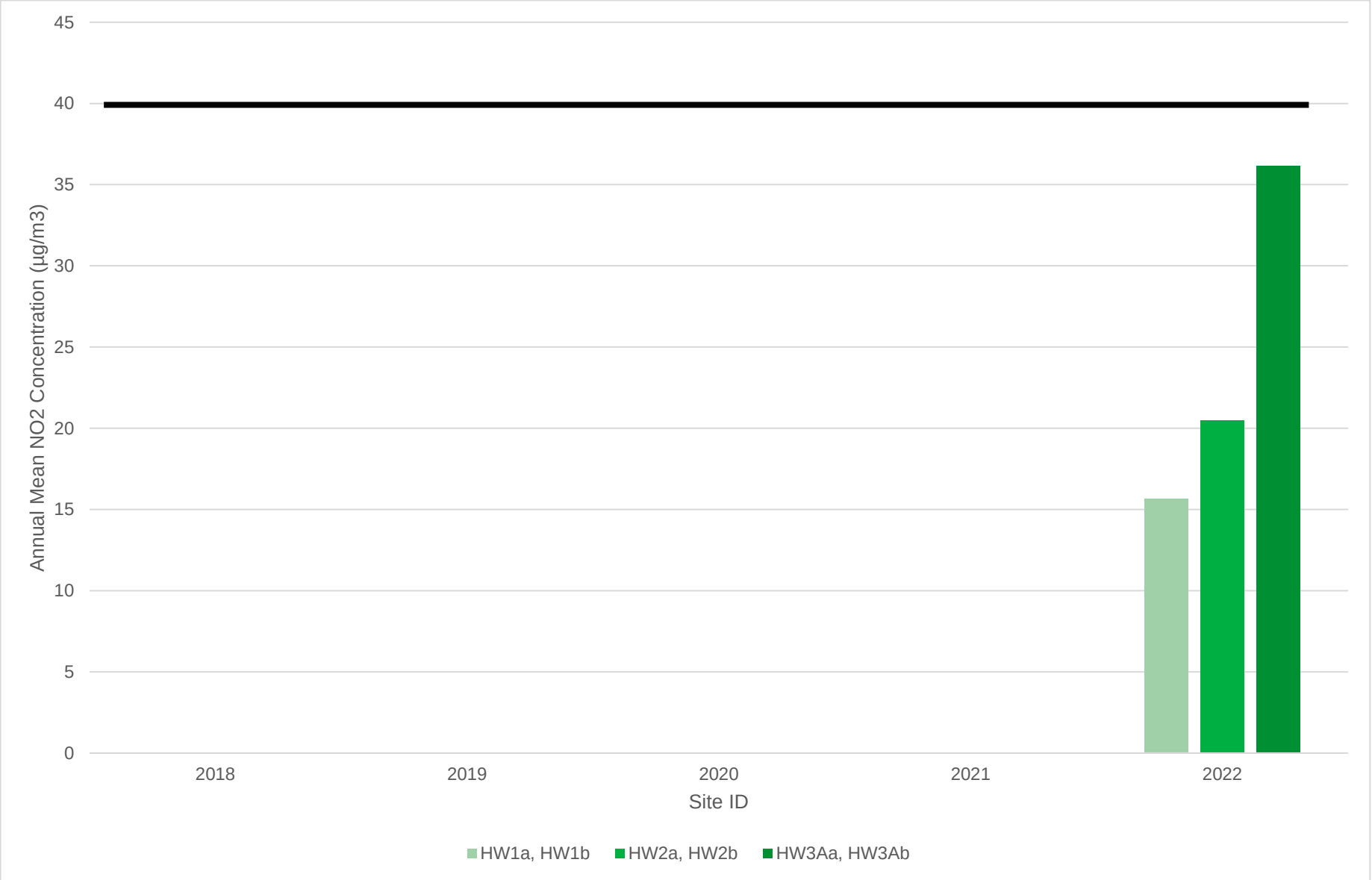


Table A.5 – 1-Hour Mean NO2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
Huyton	345552	389413	Roadside	72.5	72.5	0	0	0	**0 (119)**	
Halewood	345213	384691	Roadside	74.5	74.5	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 NO2 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.6 – 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 2022 (%) (2)	2018	2019	2020	2021	2022
Huyton	345552	389413	Roadside	63.8	63.8	21.8	22.9	-	-	
Halewood	345213	384691	Roadside	74.5	74.5	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.TG22.**

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.TG22 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.6 – Trends in Annual Mean PM_{10} Concentrations

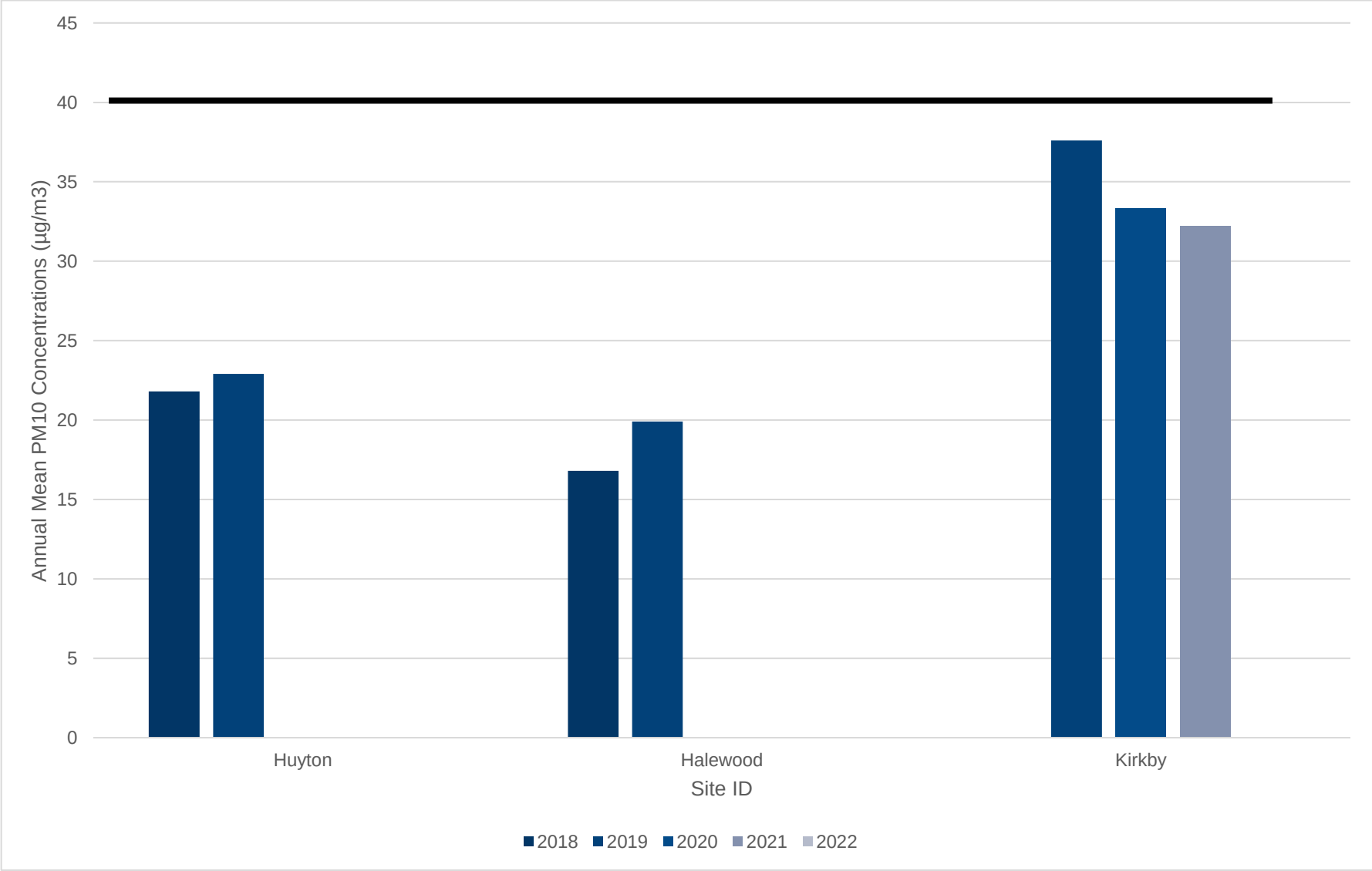


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
Huyton	345552	389413	Roadside	63.8	63.8	1	2	-	-	
Halewood	345213	384691	Roadside	74.5	74.5	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.7 – Trends in Number of 24-Hour Mean PM_{10} Results > 50µg/m³

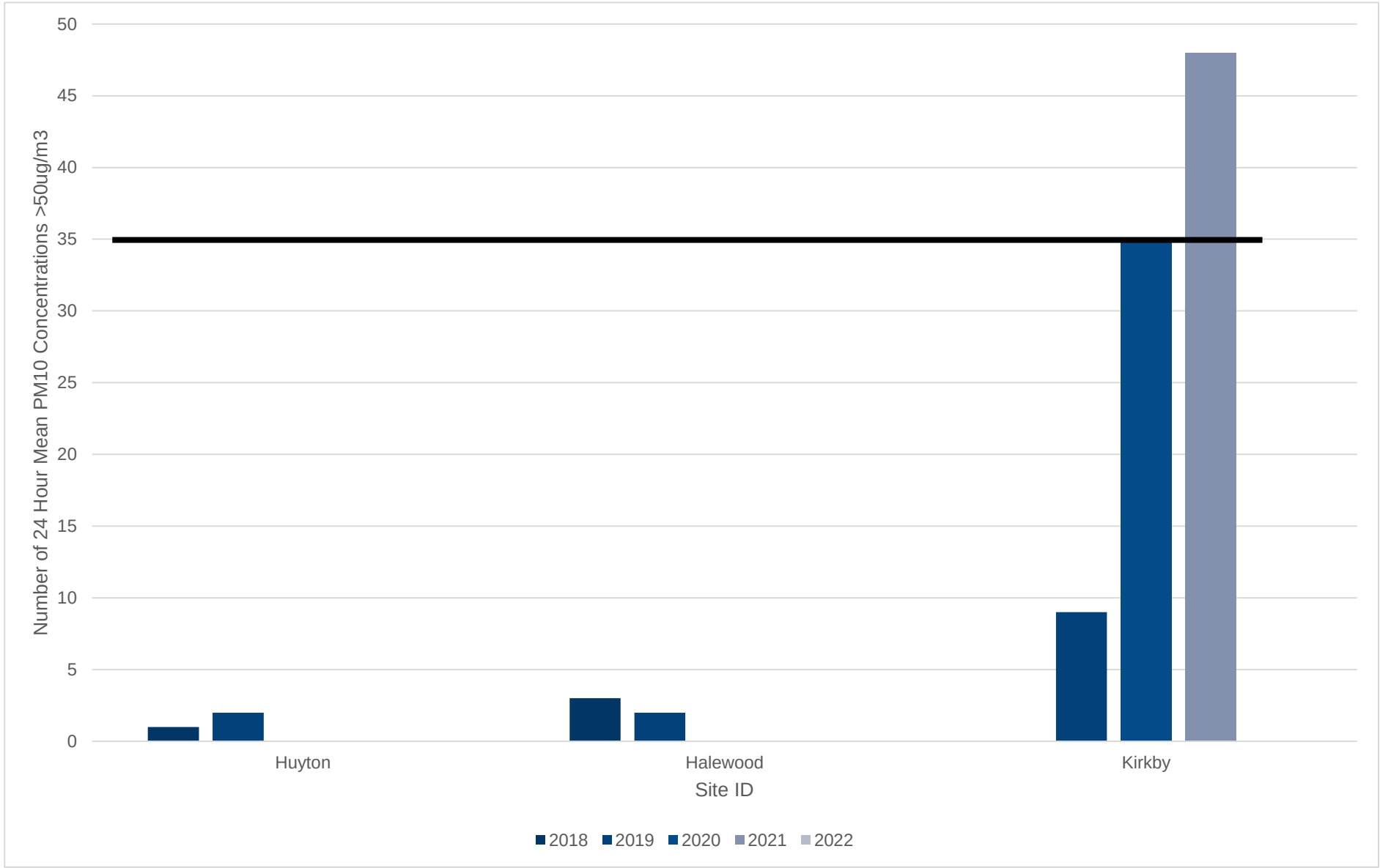


Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
Huyton	345552	389413	Roadside	72.4	72.4	9.1	10.8	-	-	-
Halewood	345213	384691	Roadside	74.2	74.2	9.2	9.2	-	-	-

☐ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

Notes:

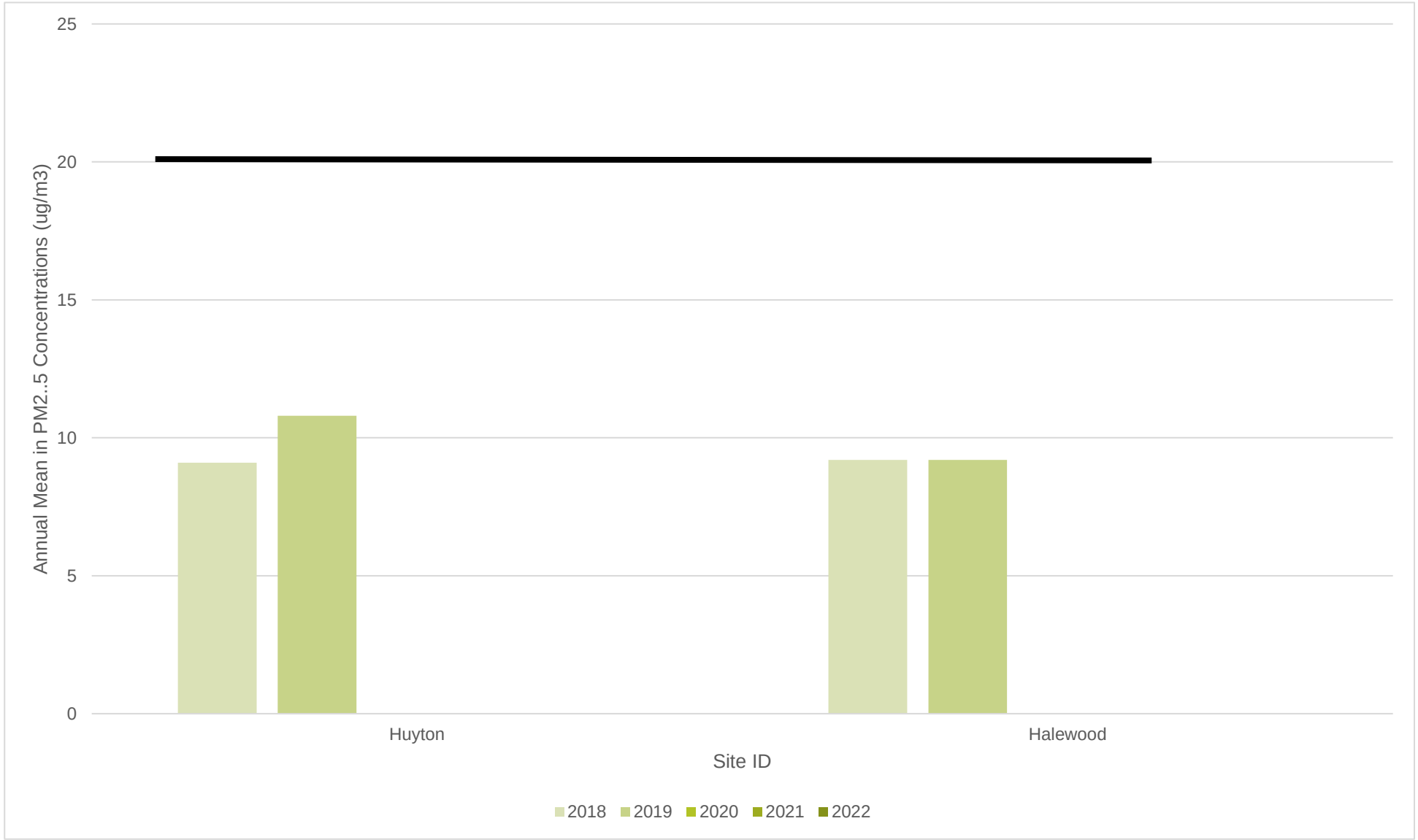
The annual mean concentrations are presented as $\mu g/m^3$.

All means have been “annualised” as per LAQM.TG22 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.8 – Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO2 2022 Diffusion Tube Results (µg/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 (0.76)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
H1a	345552	389413	52.9	36.7	44.9	34.8	28.0	30.2	32.9	33.7	27.8	37.0	41.2	42.7	-	-	-	Duplicate Site with H1a and H1b - Annual data provided for H1b only
H1b	345552	389413	52.3	37.7	40.6	38.5	30.8	29.9	34.9	35.0	30.2	37.5	41.3	44.5	37.3	28.4	-	Duplicate Site with H1a and H1b - Annual data provided for H1b only
H2a	345537	389407	48.9	35.4	53.9	45.5	32.7	31.4	34.0	42.6	38.7	40.5	40.7	37.9	-	-	-	Duplicate Site with H2a and H2b - Annual data provided for H2b only
H2b	345537	389407	52.3	36.2	35.8	44.5	30.3	31.4	34.8	43.0	34.5	38.6	38.8	49.2	39.7	30.1	-	Duplicate Site with H2a and H2b - Annual data provided for H2b only
H3a	345563	389399	63.3	47.1	62.5	54.5	43.8	39.9	45.9	55.4	50.9	52.1	50.1	59.2	-	-	-	Duplicate Site with H3a and H3b - Annual data provided for H3b only
H3b	345563	389399	63.2	48.3	65.0	55.2	41.3	42.6	44.7		41.1	49.9	49.8	59.4	51.7	39.3	32.8	Duplicate Site with H3a and H3b - Annual data provided for H3b only
H4a	345517	389329	38.3	29.4	42.9	33.8	22.1	22.5	26.2	31.1	28.6	35.1	35.7	42.5	-	-	-	Duplicate Site with H4a and H4b - Annual data provided for H4b only
H4b	345517	389329	47.1	23.4	42.8	36.3	21.7	24.6	26.2	32.2	26.6	32.3	39.9	46.7	32.8	25.0	-	Duplicate Site with H4a and H4b - Annual data provided for H4b only
H5Aa	345563	389397	54.7	40.5	53.1	43.0	34.4	31.8	34.2	42.8	36.4	38.9	43.4	50.5	-	-	-	Duplicate Site with H5Aa and H5Ab - Annual data provided for H5Ab only
H5Ab	345563	389397	55.9	40.8	50.5	44.7	33.8	33.4	26.6	41.3	27.0	40.7	42.0	50.7	41.3	31.4	-	Duplicate Site with H5Aa and H5Ab - Annual data provided for H5Ab only
H6Aa	345543	389390	61.6	42.7	54.2	49.3	40.2	42.3	43.3	50.9	45.7	41.5	44.5		-	-	-	Duplicate Site with H6Aa and H6Ab - Annual data provided for H6Ab only
H6Ab	345543	389390	63.3	43.3	54.1	50.3	42.4	43.9	44.1	52.3	47.8	42.5	44.7	56.7	48.3	36.7	27.9	Duplicate Site with H6Aa and H6Ab - Annual data provided for H6Ab only
H7Aa	345503	389429	38.4	30.8	43.5	35.7	23.7	22.7	29.1	33.8	31.8	28.6	38.7	39.1	-	-	-	Duplicate Site with H7Aa and H7Ab - Annual data provided for H7Ab only
H7Ab	345503	389429	47.1	30.4	44.7	34.4	25.5	23.0	27.6	33.1	34.3	32.9	38.2	46.0	33.9	25.7	-	Duplicate Site with H7Aa and H7Ab - Annual data provided for H7Ab only
H8Aa	345577	389394	53.9	44.2	58.8	61.6	33.4	33.0	41.1	47.5	49.5	37.4			-	-	-	Duplicate Site with H8Aa and H8Ab - Annual data provided for H8Ab only
H8Ab	345577	389394	64.8	38.2	51.2	51.3	35.3	34.3	41.3	44.1	42.2	42.4			45.3	34.4	-	Duplicate Site with H8Aa and H8Ab - Annual data provided for H8Ab only
H9Aa	345555	389392	49.1	34.3	51.5	44.1	29.8	30.8	32.5	35.3	38.0	40.7	42.5	48.2	-	-	-	Duplicate Site with H9Aa and H9Ab - Annual data provided for H9Ab only
H9Ab	345555	389392	44.0	35.0	49.9	40.6	32.9	30.8	34.7	41.1	38.2	38.6	43.4	50.0	39.8	30.3	-	Duplicate Site with H9Aa and H9Ab - Annual data provided for H9Ab only
H10a	345424	389325	33.0	21.3	30.8	21.1	13.9		18.1	22.3	19.0	22.7	28.9	34.0	-	-	-	Duplicate Site with H10a and H10b - Annual data provided for H10b only
H10b	345424	389325	35.7	21.9	30.1	23.5	14.8		17.4	19.2	19.8	25.0	26.3	36.8	24.3	18.5	-	Duplicate Site with H10a and H10b - Annual data provided for H10b only
H11a	346329	389782	42.8	38.5	28.1	23.9	29.2	27.6	25.2	23.6	16.3	25.9	28.4	22.5	-	-	-	Duplicate Site with H11a and H11b - Annual data provided for H11b only
H11b	346329	389782	43.9	36.3	28.7	25.3		26.9	24.9	24.7	16.6	26.4	30.1	37.6	28.4	21.6	-	Duplicate Site with H11a and H11b - Annual data provided for H11b only
H12a	346425	389669	56.2		35.1	32.1	35.1	39.1	37.7	34.3	30.4	36.5	41.2	34.8	-	-	-	Duplicate Site with H12a and H12b - Annual data provided for H12b only
H12b	346425	389669	51.1	35.4	35.5	31.9	35.0	40.2	36.1	34.1	31.3	38.1	42.5	46.3	37.7	28.7	-	Duplicate Site with H12a and H12b - Annual data provided for H12b only
K1a	340355	397795	50.3	50.2	46.9	42.6	39.7	35.8	40.2	37.4	34.1	49.9	55.3	44.6	-	-	-	Duplicate Site with K1a and K1b - Annual data provided for K1b 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 (0.76)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
K1b	340355	397795	58.6	46.7	49.6	39.8	38.8	38.6	40.7	36.9	38.6	48.7	57.8	51.4	44.7	34.0	-	Duplicate Site with K1a and K1b - Annual data provided for K1b only
K2a	341165	398953	37.0	22.8	35.0	21.8	18.4	15.7	17.9	19.8	21.6	33.0	32.5	32.1	-	-	-	Duplicate Site with K2a and K2b - Annual data provided for K2b only
K2b	341165	398953	30.7	22.7	35.5	25.6	19.0	17.1	19.2	20.1	21.8	30.3	33.5	35.6	25.8	19.6	-	Duplicate Site with K2a and K2b - Annual data provided for K2b only
K3a	341317	399000	36.9	24.1	33.0	24.3	17.5	15.0	18.5	18.6	21.6	30.9	38.8	38.9	-	-	-	Duplicate Site with K3a and K3b - Annual data provided for K3b only
K3b	341317	399000	36.9	19.8	34.5	23.6	18.2	14.2	20.0	18.7	20.9	31.0	36.8	41.2	26.4	20.1	-	Duplicate Site with K3a and K3b - Annual data provided for K3b only
K4a	341464	398997	39.4		37.3		24.2	24.0	25.0	22.5	25.0	31.5	39.1	42.6	-	-	-	Duplicate Site with K4a and K4b - Annual data provided for K4b only
K4b	341464	398997	46.1	31.0	34.2		25.6	24.2	25.1		23.6		37.9	40.7	31.1	23.6	-	Duplicate Site with K4a and K4b - Annual data provided for K4b only
K5a	341407	398988	53.2	37.1	34.2	32.1	32.4	33.1	33.7	26.5	36.3	38.5	38.5	49.5	-	-	-	Duplicate Site with K5a and K5b - Annual data provided for K5b only
K5b	341407	398988	57.7	38.8	44.1	37.4	32.5	32.8	31.9	28.9	34.7	38.1	43.9	45.7	38.0	28.9	-	Duplicate Site with K5a and K5b - Annual data provided for K5b only
K6a	341426	398922	54.0	37.6	36.9	33.7	30.0	32.4	31.3	29.5	35.6	37.5	51.4	43.4	-	-	-	Duplicate Site with K6a and K6b - Annual data provided for K6b only
K6b	341426	398922	49.5	39.2	39.8	35.2		30.0	32.9	30.0	37.9	42.2	46.2	40.2	37.8	28.7	-	Duplicate Site with K6a and K6b - Annual data provided for K6b only
K7a	341576	398654	41.2	21.5	35.9	21.4	20.4	15.7	19.9	18.8	22.2	27.1	30.6	35.4	-	-	-	Duplicate Site with K7a and K7b - Annual data provided for K7b only
K7b	341576	398654	43.0	24.1	36.9	19.6	17.9	17.6	20.3	20.0	22.4	28.1	32.4	40.3	26.4	20.0	-	Duplicate Site with K7a and K7b - Annual data provided for K7b only
K8a	341371	398537	36.4	33.4	39.8	30.8	25.8	25.2	28.7	29.2	27.7	29.0	38.4	38.8	-	-	-	Duplicate Site with K8a and K8b - Annual data provided for K8b only
K8b	341371	398537	43.5	31.8	37.1	30.8	25.0	24.4	28.3	29.9	24.7	34.8	39.0	47.3	32.5	24.7	-	Duplicate Site with K8a and K8b - Annual data provided for K8b only
K9a	341387	398504	46.3	35.9	41.9	32.5	29.2		35.1	32.6	36.2	38.7	42.1	40.3	-	-	-	Duplicate Site with K9a and K9b - Annual data provided for K9b only
K9b	341387	398504	52.3	36.1					35.5	36.1	33.3	37.0	41.8		37.6	28.6	-	Duplicate Site with K9a and K9b - Annual data provided for K9b only
K10a	342421	397755	43.2	24.4	35.2	24.4	19.7	17.9	21.9	23.8	24.6	20.5	39.2	21.7	-	-	-	Duplicate Site with K10a and K10b - Annual data provided for K10b only
K10b	342421	397755	36.7	25.2	35.0	27.2	19.1	18.7	20.5	22.9	25.7	29.1	37.6	37.1	27.1	20.6	-	Duplicate Site with K10a and K10b - Annual data provided for K10b only
P1a	345816	392660	42.5	31.6	24.7	26.3	23.0	22.2	21.4	24.9	23.9	27.8	30.8	40.3	-	-	-	Duplicate Site with P1a and P1b - Annual data provided for P1b only
P1b	345816	392660	42.0	30.3	32.3	27.6	22.9	23.9	23.8	26.7	25.1	26.2	32.8	39.2	28.8	21.9	-	Duplicate Site with P1a and P1b - Annual data provided for P1b only
P2a	346164	392807	43.5	30.3	33.0	29.9	23.9	23.5	23.9	24.9	28.9	24.4	33.6	33.8	-	-	-	Duplicate Site with P2a and P2b - Annual data provided for P2b only
P2b	346164	392807	41.3	29.3	33.2	30.1	24.2	24.6	24.1	25.0	26.2	26.7	32.3	36.6	29.5	22.4	-	Duplicate Site with P2a and P2b - Annual data provided for P2b only
P3a	346393	392844	47.3	35.0	39.5	30.9	28.8	27.3	23.7	25.1	20.4	39.2	43.7	45.7	-	-	-	Duplicate Site with P3a and P3b - Annual data provided for P3b only
P3b	346393	392844	45.0	32.9	32.7	31.6	28.6	27.3	25.3	24.6	23.2	35.6	46.3	27.9	32.8	24.9	-	Duplicate Site with P3a and P3b - Annual data provided for P3b only
P4Aa	346942	392387	47.0	30.3	37.8	30.2	23.4	21.9	23.5	23.3	28.6	32.2	37.3	41.6	-	-	-	Duplicate Site with P4Aa and P4Ab - Annual data provided for P4Ab only
P4Ab	346942	392387	46.0	30.4	35.9	30.5	22.7	21.9	24.3	23.1	25.2	30.2	34.7	39.1	30.9	23.5	-	Duplicate Site with P4Aa and P4Ab - Annual data provided for P4Ab only
P5Aa	346898	392367	38.5	23.3	30.4	26.7	19.6	18.6	21.0	25.5	22.6	25.5	31.9	38.1	-	-	-	Duplicate Site with P5Aa and P5Ab - Annual data provided for P5Ab 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 (0.76)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
P5Ab	346898	392367	36.8	22.8	32.8	26.3	20.8	17.5		24.7	24.2	26.3	29.3	38.7	26.8	20.4	-	Duplicate Site with P5Aa and P5Ab - Annual data provided for P5Ab only
P6Aa	346850	392360	41.9		34.4	28.7	21.4	20.6	21.5	23.8	22.1	29.1	33.9	24.6	-	-	-	Duplicate Site with P6Aa and P6Ab - Annual data provided for P6Ab only
P6Ab	346850	392360	41.4		35.1	26.9	20.5	20.4	21.9	25.4	21.3	28.5	31.4	35.7	27.8	21.1	-	Duplicate Site with P6Aa and P6Ab - Annual data provided for P6Ab only
P7Aa	346799	391419	33.2		28.5	21.5	16.9	17.7		20.7	17.3	21.5	29.2	27.3	-	-	-	Duplicate Site with P7Aa and P7Ab - Annual data provided for P7Ab only
P7Ab	346799	391419	34.3		29.8	21.4	16.3	15.6	17.6		20.3	26.7		34.8	23.6	17.9	-	Duplicate Site with P7Aa and P7Ab - Annual data provided for P7Ab only
P8Aa	346792	391617	35.4	26.5	25.5	20.8	17.3	15.9		20.7	14.5	25.1	28.4	34.3	-	-	-	Duplicate Site with P8Aa and P8Ab - Annual data provided for P8Ab only
P8Ab	346792	391617	33.6	27.3	26.3	20.0	16.6	16.5	17.8	18.7	19.7	24.9	27.9	35.2	23.6	17.9	-	Duplicate Site with P8Aa and P8Ab - Annual data provided for P8Ab only
P9Aa	347950	392325	44.4	27.8	35.2	26.4	23.4	25.3	26.4	28.9	28.1	30.1	42.5	43.5	-	-	-	Duplicate Site with P9Aa and P9Ab - Annual data provided for P9Ab only
P9Ab	347950	392325	48.7	29.4	43.0	26.6	23.3	24.2	26.3	29.4	22.2	33.9	45.1	22.9	31.5	24.0	-	Duplicate Site with P9Aa and P9Ab - Annual data provided for P9Ab only
P10Aa	347393	392307	37.0	24.3	32.7	22.6	17.7	16.8	17.8		20.8	25.0	34.4	34.5	-	-	-	Duplicate Site with P10Aa and P10Ab - Annual data provided for P10Ab only
P10Ab	347393	392307	38.9	23.4	30.7	22.9	17.4	17.1	17.8	19.6	20.0	26.7	32.1	17.5	24.5	18.6	-	Duplicate Site with P10Aa and P10Ab - Annual data provided for P10Ab only
HW1a	344843	385022		19.7	29.6	21.5	15.0	14.6	17.5	18.2	18.5	18.8	25.1	31.0	-	-	-	Duplicate Site with HW1a and HW1b - Annual data provided for HW1b only
HW1b	344843	385022		21.8	21.9	20.1	16.7	13.6	17.1	19.0	17.0	20.9	24.7	28.4	20.6	15.7	-	Duplicate Site with HW1a and HW1b - Annual data provided for HW1b only
HW2a	344827	385202		27.5	36.2	27.5	21.9	18.6	21.5	22.7	24.0	27.7	33.3	39.7	-	-	-	Duplicate Site with HW2a and HW2b - Annual data provided for HW2b only
HW2b	344827	385202		25.4	32.3	24.2	19.7	20.6	18.6	23.7	23.4	27.4	36.4	37.2	27.0	20.5	-	Duplicate Site with HW2a and HW2b - Annual data provided for HW2b only
HW3Aa	344927	385128					46.7	50.1	32.3	34.5	35.4	50.5	52.3	53.8	-	-	-	Duplicate Site with HW3Aa and HW3Ab - Annual data provided for HW3Ab only
HW3Ab	344927	385128					44.2	47.6	31.4	33.6	36.0	49.0	51.3	53.7	44.4	36.1	31.0	Duplicate Site with HW3Aa and HW3Ab - Annual data provided for HW3Ab only

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

☐ **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 MBC confirm that all 2022 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.**

Notes:

Exceedances of the NO2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO2 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 2022

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

21/00847/FUL - Date Granted: 12 April 2022

Address/Location of Development:

Florence Roby Overbrook Lane Knowsley Business Park Kirkby L34 9FB

Description of Development:

INSTALLATION OF STEAM GENERATION PLANT AND HOUSING TOGETHER WITH ASSOCIATED CONNECTION TO SEWER WORKS

21/00480/FUL - Date Granted: 15 June 2022

Address/Location of Development:

Former Syntor Fine Chemicals Site Acornfield Road Knowsley Industrial Park Kirkby Knowsley L33 7UG

Description of Development:

ERECTION OF 6 NO. CONTAINERISED GAS-POWERED GENERATORS TOGETHER WITH THE ERECTION OF A SINGLE STOREY PREFABRICATED SECURITY CABIN, UPGRADES TO EXISTING BOUNDARY TREATMENTS INCLUDING THE INSTALLATION OF 2.4M HIGH PALISADE FENCING AND ACCESS GATES, VEHICLE PARKING AND OTHER ASSOCIATED WORKS

Air Quality Report included.

21/00718/FUL - Date Granted: 15 June 2022

Address/Location of Development:

Land to the East Of Marl Road, Knowsley, Kirkby, L33 7UH

Description of Development:

THE CONSTRUCTION AND OPERATION OF AN ELECTRICITY GENERATION PLANT COMPRISING OF A MAXIMUM OF 10NO GAS GENERATORS SITED WITHIN INDIVIDUAL SOUNDPROOF CONTAINERS TOGETHER WITH ASSOCIATED DEVELOPMENT.

Air Quality Report included.

21/00857/FUL - Date Granted: 17 August 2022

Address/Location of Development:

Image Business Park Acornfield Road Knowsley Industrial Park Kirkby Knowsley L33 7UF

Description of Development:

ERECTION OF 1 NO. INDUSTRIAL UNIT (MIXED E(G)(III), B2 & B8 USES) WITH ANCILLARY OFFICES, CAR PARKING, SERVICE AREA AND SOFT LANDSCAPING

Air Quality Report included.

21/00959/FUL - Date Granted: 22 September 2022

Address/Location of Development:

Imagination 2 Image Business Park Acornfield Road Knowsley Industrial Park Kirkby Knowsley

Description of Development:

ERECTION OF A DETACHED INDUSTRIAL BUILDING (MIXED E(G)(III), B2 & B8 USES) WITH ANCILLARY OFFICES, CAR PARKING, SERVICE AREA AND SOFT LANDSCAPING

Air Quality Report included.

22/00163/FUL - Date Granted: 29 November 2022

Address/Location of Development:

Land Bounded by Villiers Road & Penrhyn Road Knowsley Business Park Knowsley

Description of Development:

ERECTION OF AN INDUSTRIAL/COMMERCIAL BUILDING (USE CLASSES B2/B8 AND E (G) (III)) INCLUDING MEZZANINE ANCILLARY OFFICE SPACE TOGETHER WITH THE CONSTRUCTION OF 2 NO. NEW VEHICULAR ACCESSES TO VILLIERS ROAD, SERVICE YARDS, CAR/CYCLE PARKING, LANDSCAPING AND OTHER ASSOCIATED WORKS.

Air Quality Report included.

Additional Air Quality Works Undertaken by Knowsley Metropolitan Borough Council During 2022

Knowsley MBC has not completed any additional works within the reporting year of 2022.

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 2022 reporting year, based on 26 studies, a national bias adjustment factor of 0.76 was derived from the national bias adjustment calculation spreadsheet (version number 03/22).

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 AR049 (January – February 2022) and AIR-PT AR050 (May – June 2022), 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 2022, 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, except for Halewood, within Knowsley MBC recorded data capture of 75% therefore it was not required to annualise any monitoring data.

To assist with the annualisation of the Halewood data three continuous background monitoring locations were used, within a 10-mile radius:

- Liverpool Speke
- Widnes Milton Road
- St Helens Linkway

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.1 presents the annualisation summary.

Table C.1 – Annualisation Summary (concentrations presented in µg/m^3) for one monitoring location within Halewood

Site ID	Annualisation Factor Liverpool Speke	Annualisation Factor Widnes Milton Road	Annualisation Factor St Helens Linkway	Annualisation Factor <Site 4 Name>	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
HW3Aa	1.1020	1.0490	1.0614		1.0708	-	-
HW3Ab	1.1020	1.0490	1.0614		1.0708	44.4	47.6

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2023 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance regarding the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Knowsley Metropolitan Borough Council have applied a national bias adjustment factor of 0.76 to the 2022 monitoring data. A summary of bias adjustment factors used by Knowsley MBC over the past five years is presented in Table C.2.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	National	03/22	0.76
2021	Local	-	0.93
2020	Local	-	0.89
2019	Local	-	0.81
2018	Local	-	0.79

NO2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO2 concentrations corrected for distance are presented in Table C.3.

The annual mean NO2 concentration was corrected for distance to relevant exposure at three diffusion tube sites (H3a/b, H6a/b, and HW3a/b). These diffusion tubes were subject to the fall-off with distance correction due to the annual mean concentrations greater than 36 µg/m3 and the site not located at a point of relevant exposure. After distance correction calculations, all sites reported concentrations below 10% of the NO2 AQS.

Table C.3 – NO2 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
H3a, H3b	0.8	3.6	39.3	16.9	32.8	
H6Aa, H6Ab	0.5	6.1	36.7	16.9	27.9	
HW3Aa, HW3Ab	2.5	6.4	36.1	13.9	31.0	

QA/QC of Automatic Monitoring

The Kirkby station used Beta Automatic Mass (BAM) monitors to measure PM10. As per TG.16, the BAM met the equivalence criteria for monitoring providing the results were corrected for slope. The data in this report had the correction factor applied so it could be compared to the National Air Quality Objectives. Both PM10 and PM2.5 were previously recorded at the Huyton and Halewood sites using TEOMS. All three sites had NO2 monitors installed. Data from the analyser was stored as 'raw' or 'uncorrected' data on the logger and therefore needed to be corrected or validated. To validate the data, the NO2 analyser needed to be checked against a referenced standard of 'zero' air and 'span' gas. Data was corrected using either daily or monthly calibration checks to verify that the analyser was corrected for any response change.

A regular manual calibration check was performed on all three automatic monitoring stations. For the NO2 analyser, this check was performance to verify the response of the analyser in reference to 'zero' and 'span' by introducing a high concentration of NO gas. These results provided a validation of the NOx 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 We Care 4 Air, resulting in contract termination in September 2021 as the monitors used for PM10 and PM2.5 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 2021 and the year 2022.

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

PM10 and PM2.5 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

Knowsley Metropolitan Borough Council did not have any automatic monitoring locations in 2022.

In 2021 all three automatic monitoring sites recorded below the acceptable data capture for NO2, PM10 and PM2.5, therefore required annualisation. Annualisation was carried out for

the annual mean NO2 and PM10 at Kirkby Old Rough Lane (with data captures of 73.4% and 69.1% for each pollutant, respectively) NO2 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. This information was presented within the 2022 ASR.

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

Figure D.1 – Map of Non-Automatic Monitoring Site across Knowsley Metropolitan Borough Council for 2021, sites not current in 2022.

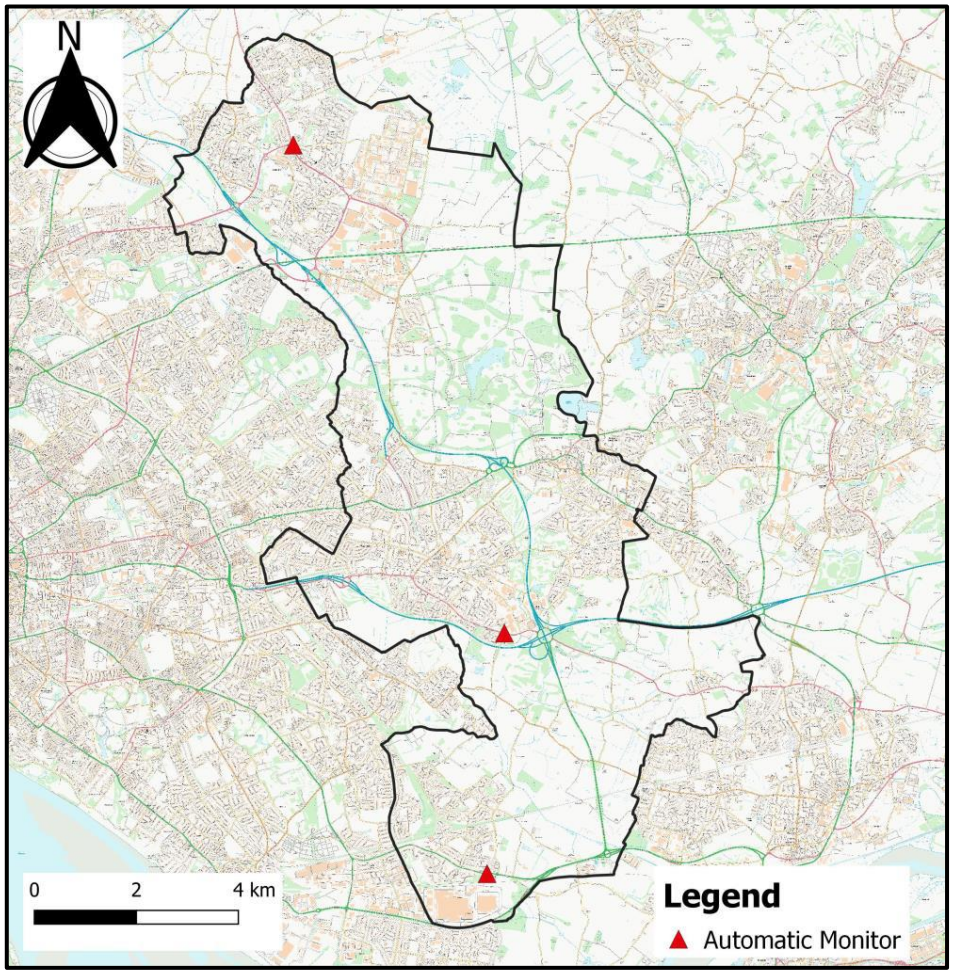


Figure D.2 – Map of Non-Automatic (Diffusion Tube) Sites in Huyton, Cronton Road

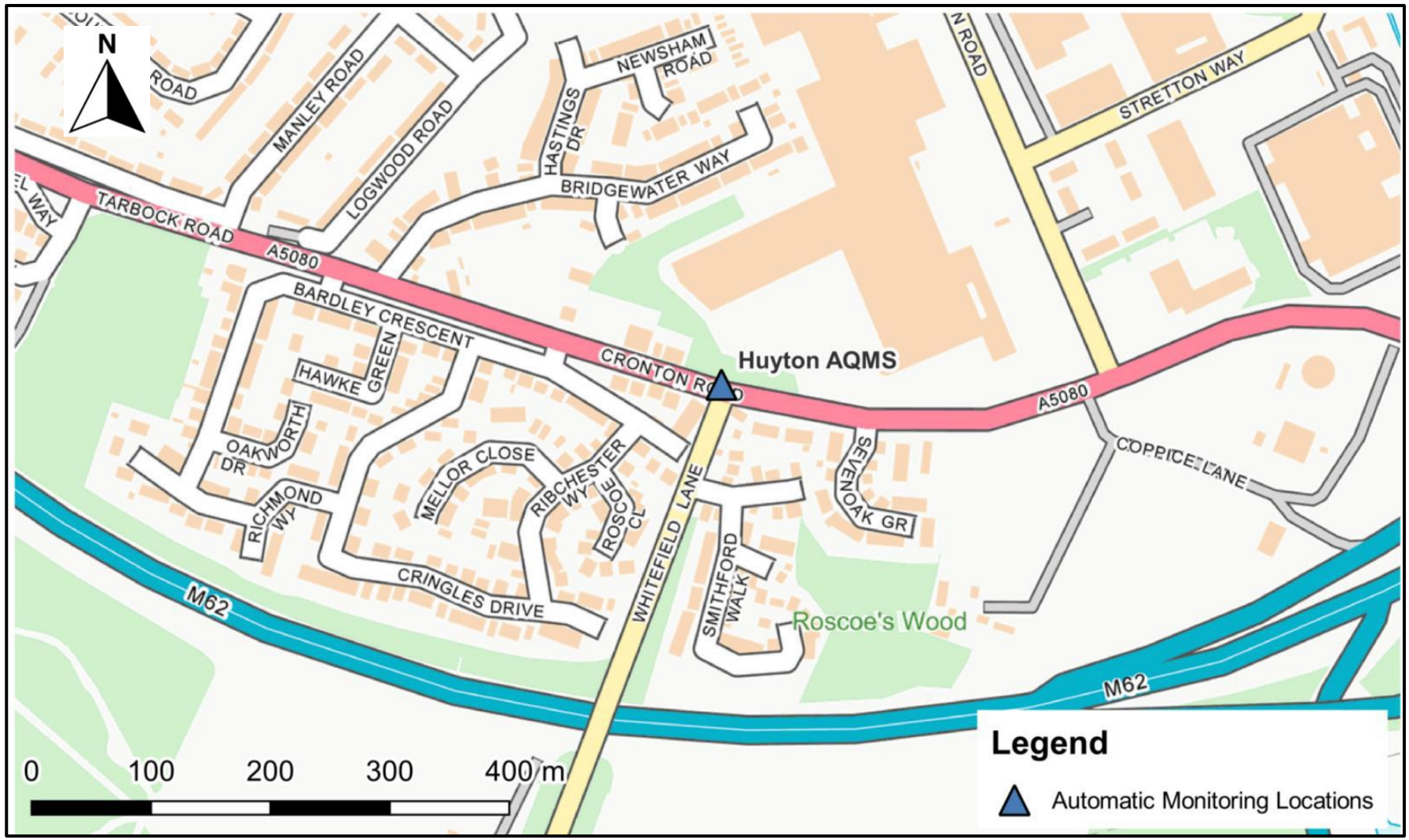


Figure D.3 – Map of Kirkby Automatic Monitoring Station (Old Rough Lane)

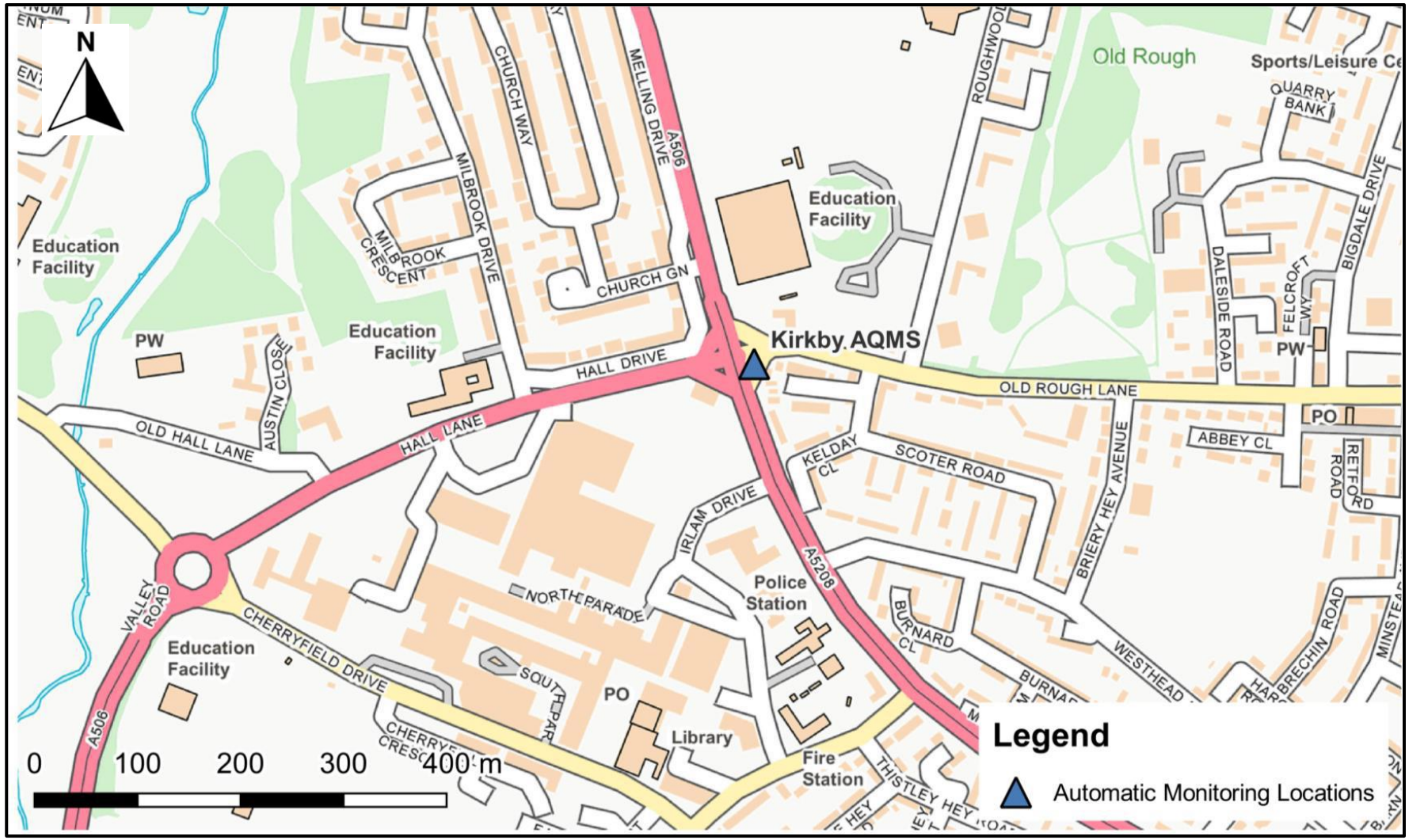


Figure D.4 – Map of Halewood Automatic Monitoring Station (Higher Road)

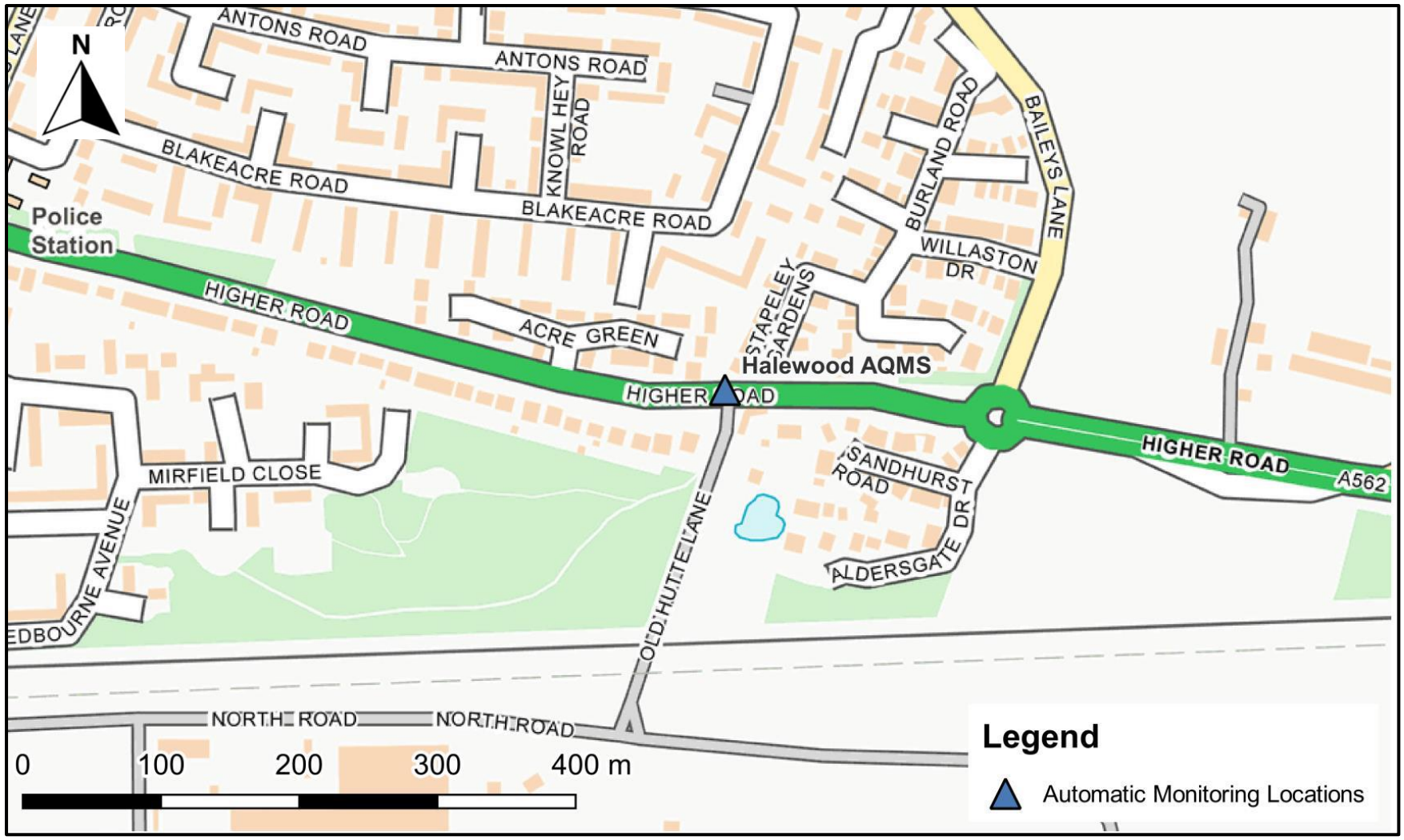


Figure D.5 – Map of Non-Automatic (Diffusion Tube) Sites in Huyton

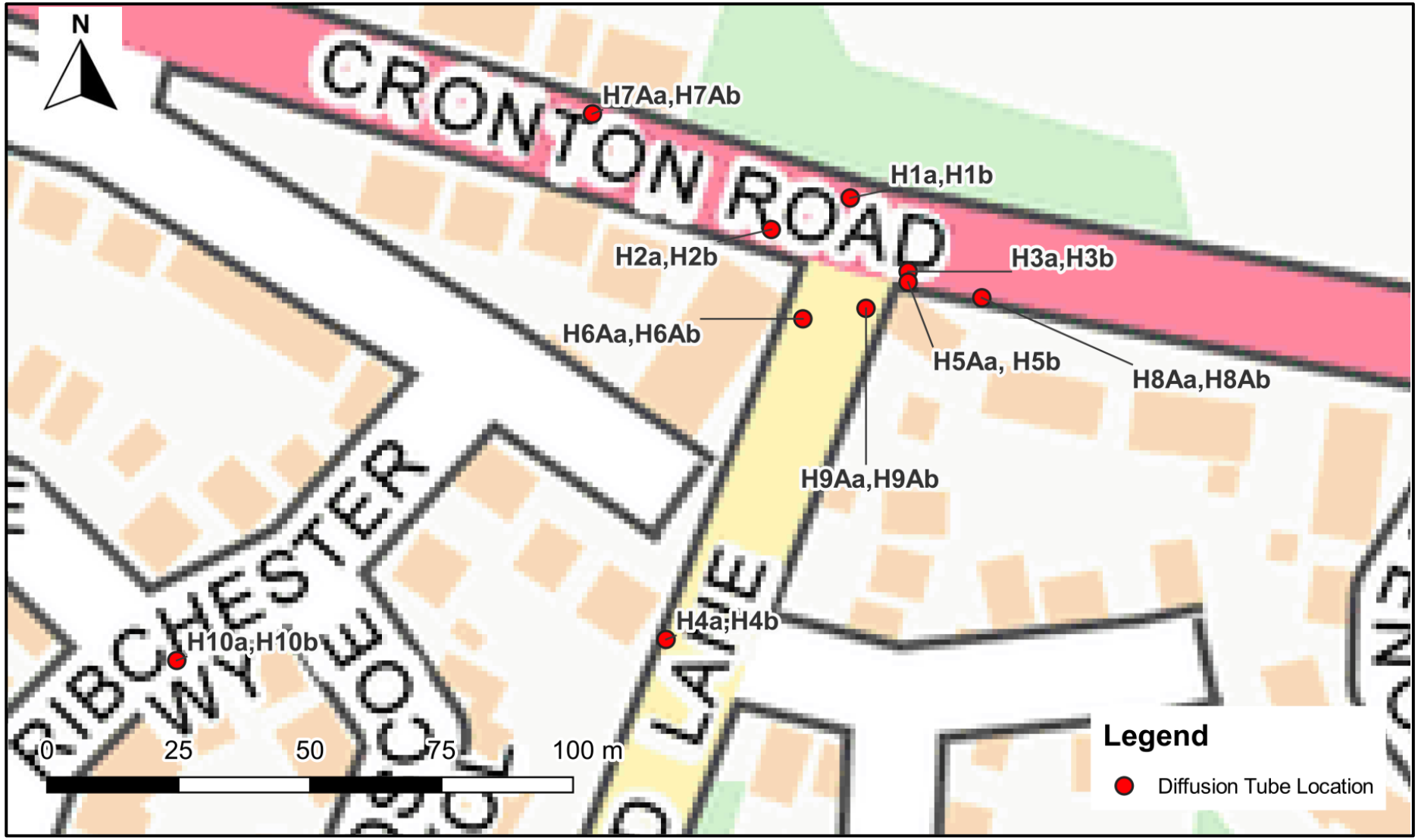


Figure D.6 – Map of Non-Automatic (Diffusion Tube) Sites in Huyton

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

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

Figure D.9 – Map of Non-Automatic (Diffusion Tube) Sites in Prescot

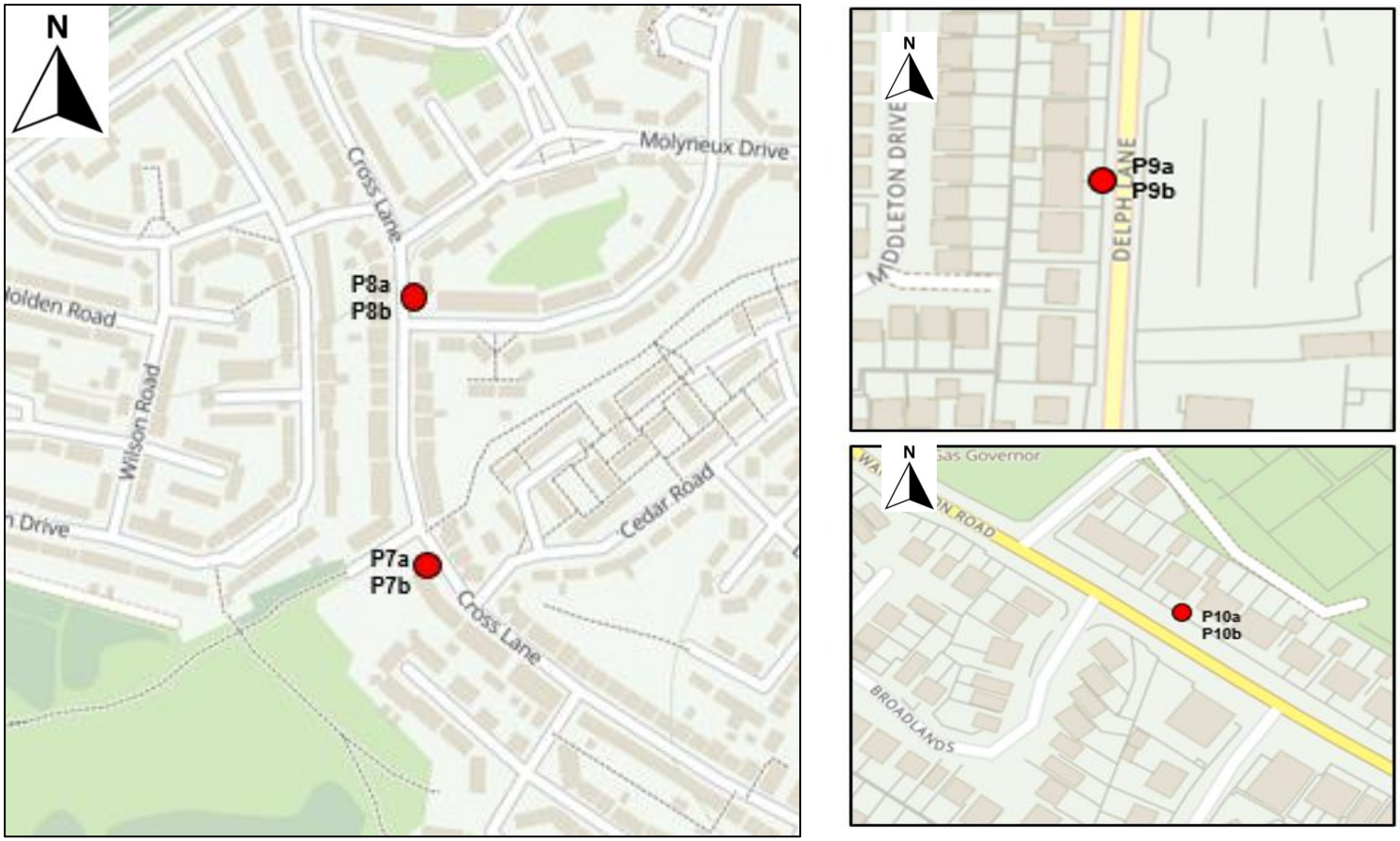


Figure D.10 – Map of Non-Automatic (Diffusion Tube) Sites in Kirkby (Town Centre)

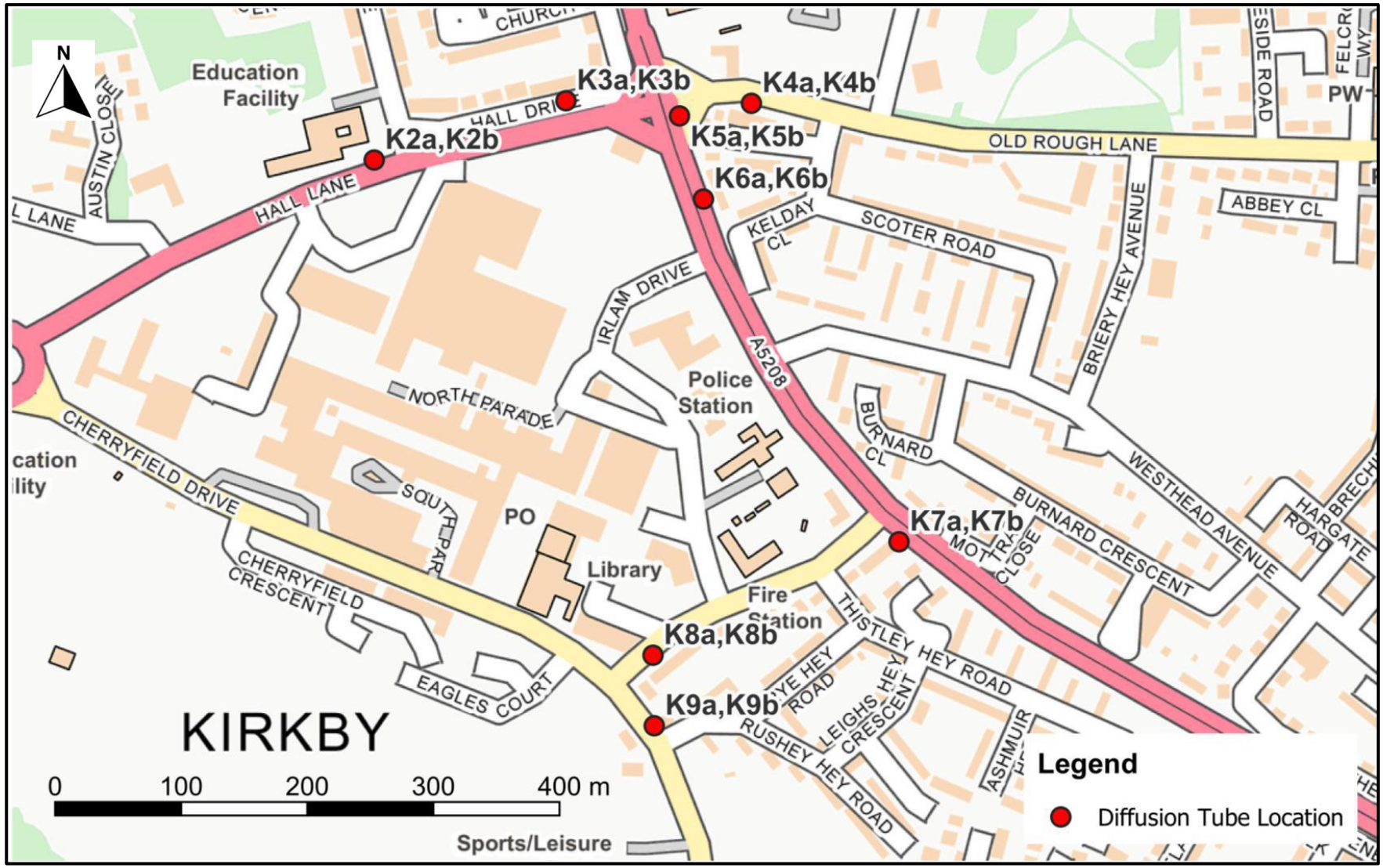


Figure D.11 – Map of Non-Automatic (Diffusion Tube) Sites in Kirkby (M57 Junction 6)

Figure D.12 – Map of Non-Automatic (Diffusion Tube) Sites in Kirkby (Moorgate Road)

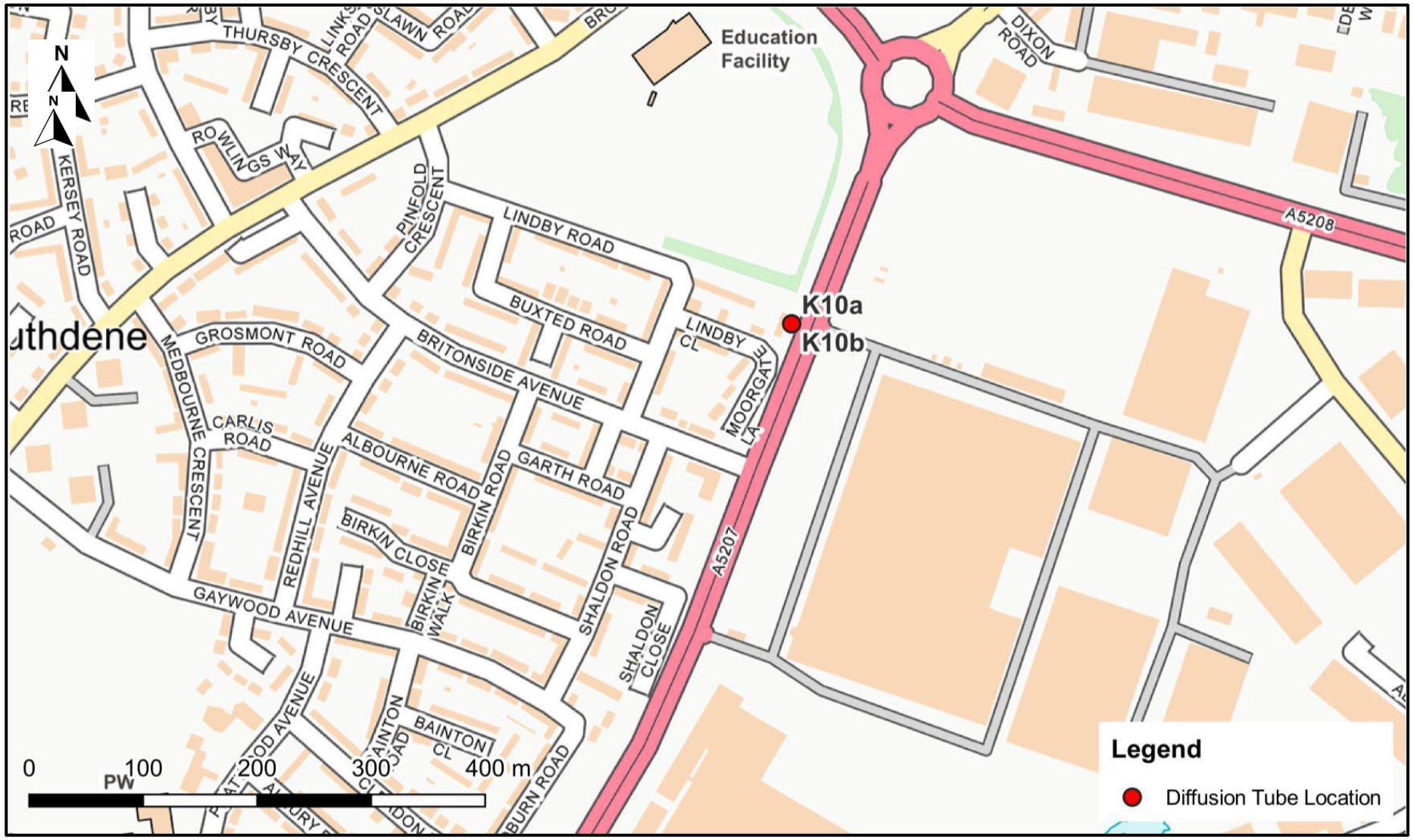
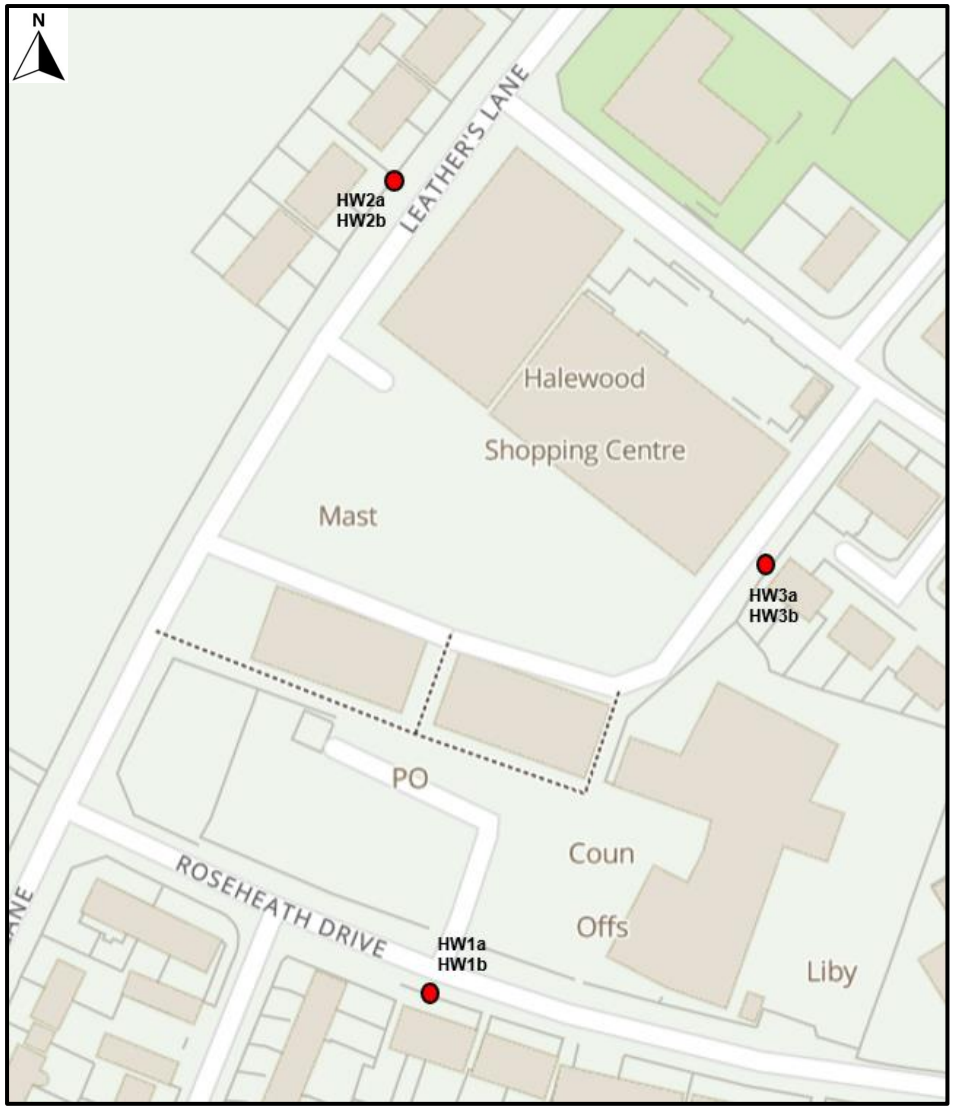


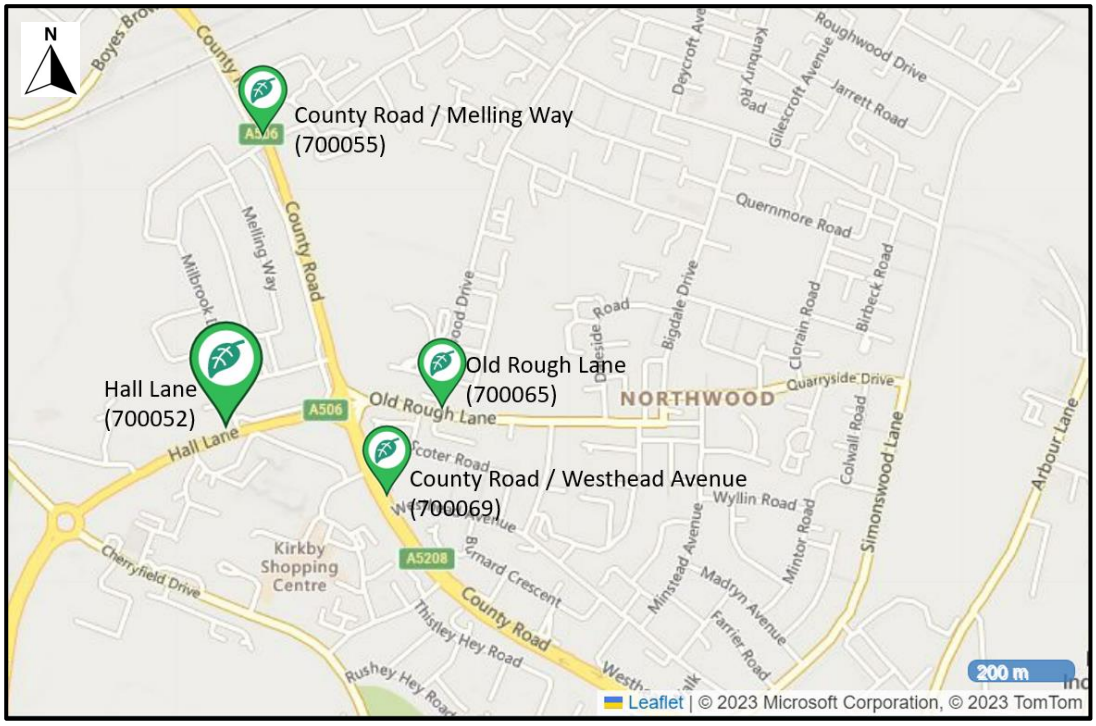
Figure D.13 – Map of Non-Automatic (Diffusion Tube) Sites in Halewood



Appendix E: Map(s) of Monitoring Locations of Zephyr Automatic Stations and Analysis of Monitoring Results

Maps of Monitoring Locations

Kirkby



Huyton

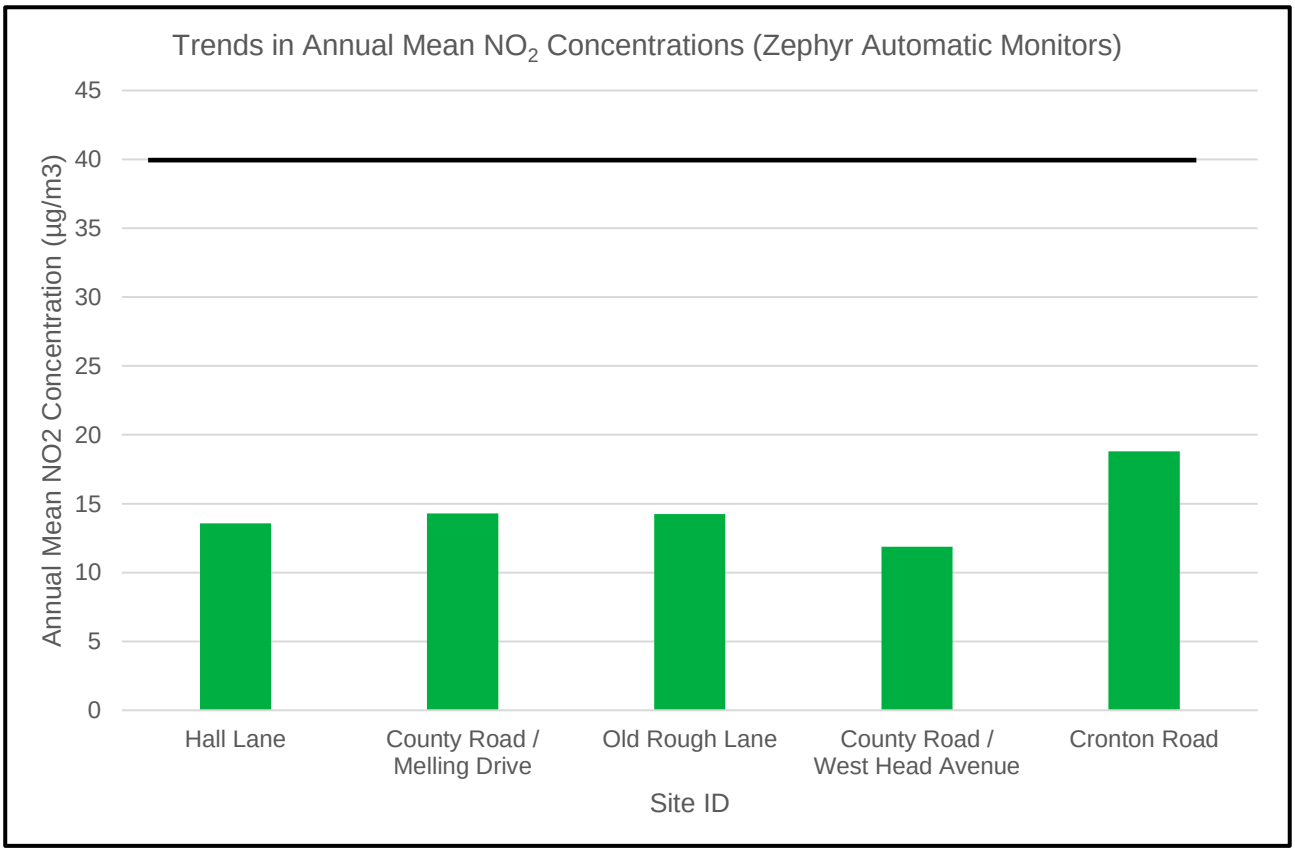
Data

The National air quality objectives were used to analyse the data from the Zephyr Automatic Stations. The data collated was from 29th March 2022 until 31st December 2022. The data was found to have insufficient (<85%) annual data capture and as this is a trial there were no sites available to annualise the data. The information is to be used indicatively.

Data was collated for NO2, PM10 and PM2.5.

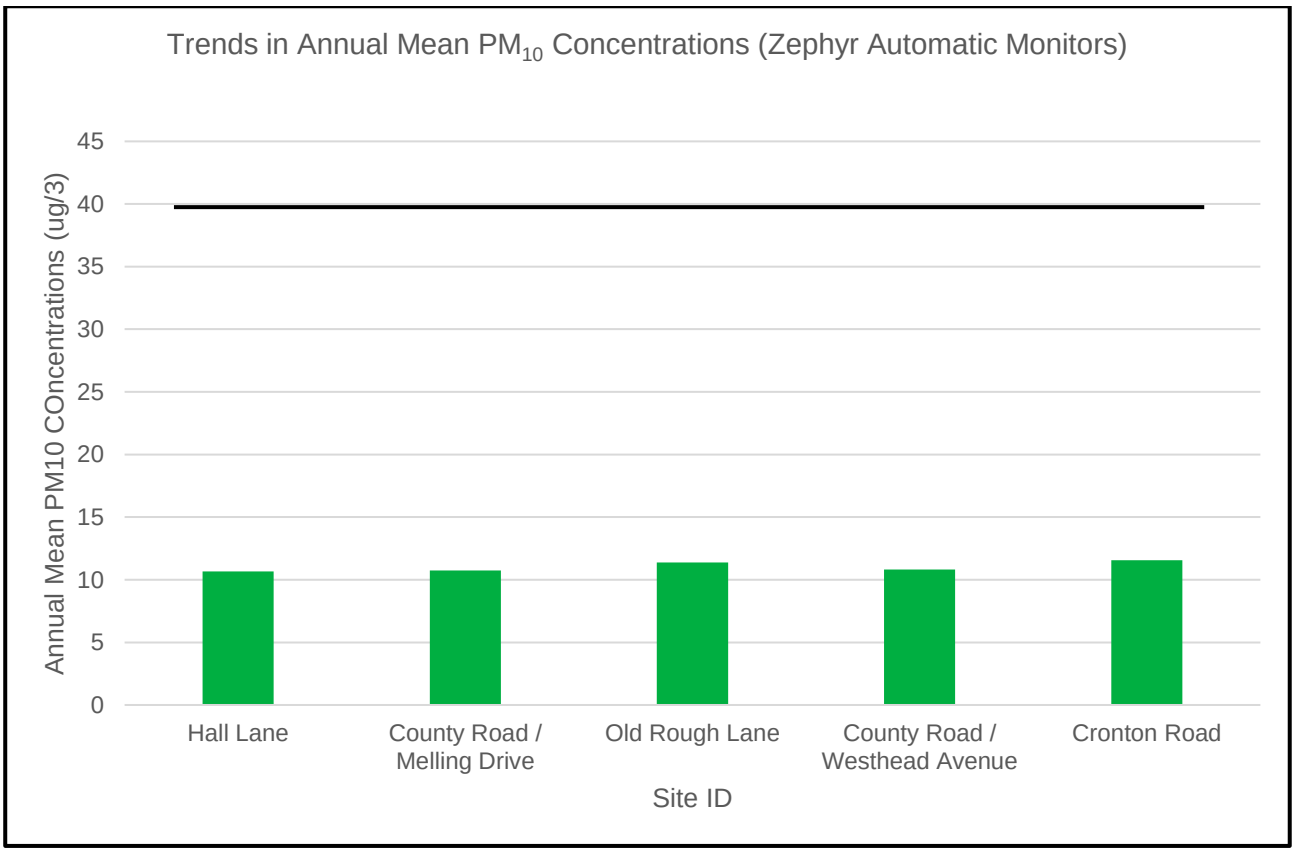
Nitrogen Dioxide

NO2 did not exceed 200µg/m^3 (1 hour mean) at any time during the monitoring period. The annual mean was calculated for each site and did not exceed the 40µg/m^3



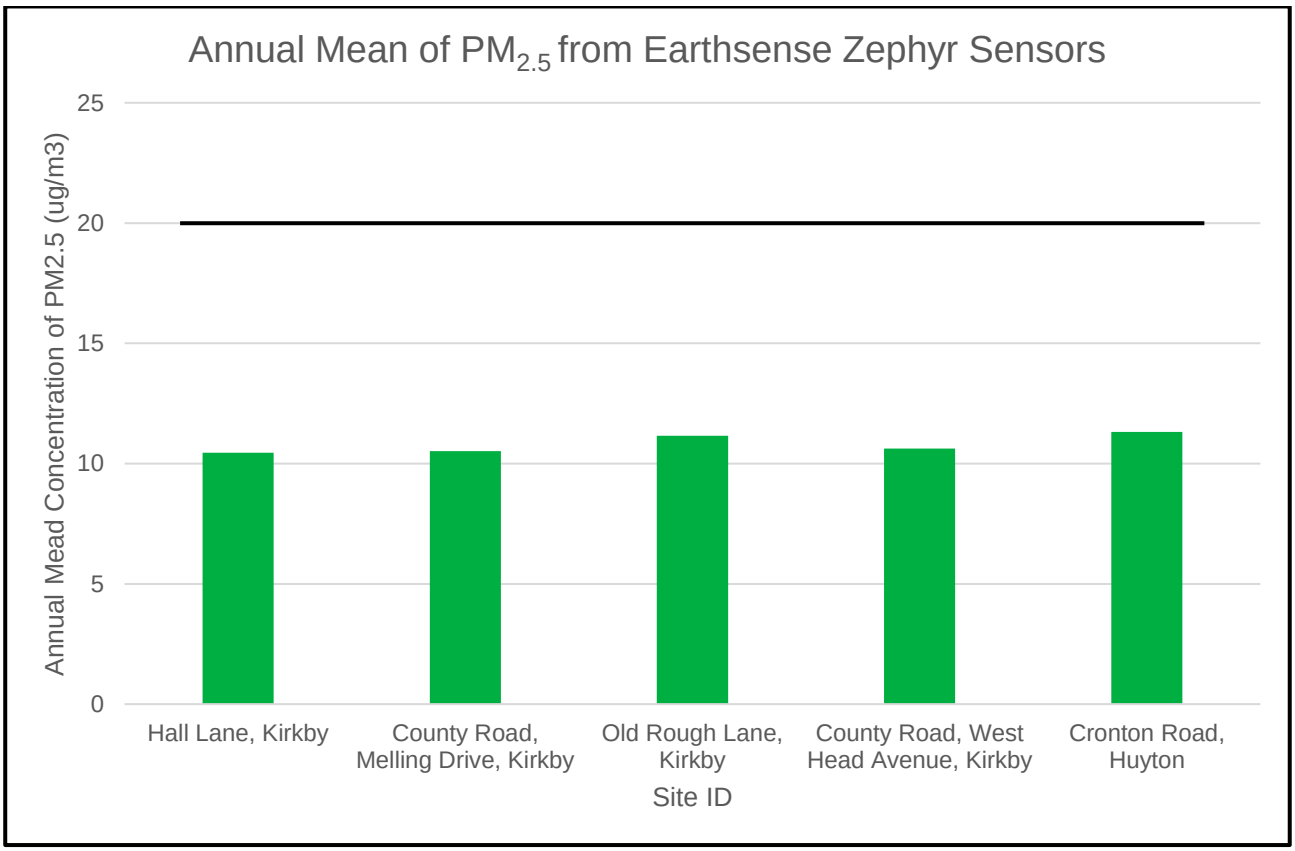
PM10

PM10 did not exceed 50µg/m^3 (24 hour mean) at any time during the monitoring period. The annual mean was calculated for each site and did not exceed the 40µg/m^3.



$PM_{2.5}$

$PM_{2.5}$ did not exceed 20µg/m^3 (annual mean).



Appendix F: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[7]

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO2)	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

Table E.2 – Air Quality Objectives in England[8]

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO2)	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

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

[8] 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	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
NO2	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

References

- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. 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.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.